Appointment

From: Christian, Megan [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=64A0F5E0E9D94271B23CAD28DB653851-LIZOTTE, ME]

Sent: 12/15/2017 7:03:36 PM

To: Orme-Zavaleta, Jennifer [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=3c5a111dc377411595e5b24b5d96146b-Orme-Zavaleta, Jennifer]; ORD-Exec-Council-Directors [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=27ecb6069df540d1b77c19b84ba8dea4-ORD-Exec-Co]; ORD-Mgmt-Council [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=0d052b33344446a58a540f6b8c1ed50f-ORD-Mgmt-Council]; Hodgson, Andrea [AHodgson@nas.edu]

CC: Watkins, Tim [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=4cbd1c572f584fd7b0a3b5945f118558-Watkins, Tim]; Gonzalez, Daniel [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a733a96e955248a081c5be5078a8c960-DGonzal1]; Gilliland, Alice [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=27ce1fdb154d448fa46ba4c656463213-Gilliland, Alice]; Baxter, Lisa [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=f8ac9ee6b44e428aa33bc858e6cbf73e-Baxter, Lisa]; Blancato, Jerry [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=232de363dadb4cd9961900e10f56fddf-Blancato, Jerry]; Crofton, Kevin [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=f3a23824ad1d466c92e9a86b0485a93e-Crofton, Kevin]; Greene, Mary [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=9aaa7190f96e4bfca7b06f8be3f35d45-Greene, Mary]; Sinks, Tom [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=001007b7d256453a8a19b91df704e22c-Sinks, Tom]; Deener, Kathleen [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=b9a2ff1c086249ea8f6414afde8a5e54-Deener, Kathleen]; Mayes, Desmond [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=8935afbdddc242168a2023218214f1fd-Mayes, Desmond]; Holt, Kay [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=60d01f6d16bb4d7fb1ad488c35448c40-Holt, Vanessa Kay]; Vette, Alan [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=b327c9db99da43a691a6e68ea28f6d66-Vette, Alan]; Costa, Dan [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=85a43a85690b42e4b58749a6967cb0b8-Costa, Daniel]; Blackburn, Elizabeth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a080eb90549a453aaa6a357f5257c0b7-Blackburn, Elizabeth]; Frithsen, Jeff [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=e3743bd6f3c345baaae407c1d6f78e92-FRITHSEN, JEFF]; Gentry, James [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=3aecc141db1e402f9b33295563c142ca-Gentry, James]; vanDrunick, Suzanne [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=4954f39d5bfa4c16a0ee0f8aed860580-vanDrunick, Suzanne]; Steenbock, John [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=2a04bcfaca5747b5b8609c8a1ba7d72c-Steenbock,]; ORD-NPD-Support [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=c1e570dedf174de6b36939db4e56d573-ORD-NPD-Support]; Garland, Jay [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=8344688361ec4461b89037afbf43f5aa-Garland, Jay]; Keely, Scott [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=94faecd8636d43738f3ff3b2fa7be84d-Keely, Scott]; Guiseppi-Elie, Annette [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=63d3e2eaeb9c4acba2609baa90b0f735-Guiseppi-El]; Hines, Ronald [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=464f333922cc4aa68db2a1677122ab58-Hines, Ronald]; Hubal, Elaine [/o=ExchangeLabs/ou=Exchange Administrative Group

(FYDIBOHF23SPDLT)/cn=Recipients/cn=d871bc8ab3c94a7c9a4716a951aa70ec-Cohen-Hubal, Elaine]; Padilla, Stephanie [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=b62af73a1ebb4a9091350c553d235d12-Padilla, Stephanie]; Tal, Tamara [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=39eaebc8dd7c4503975c2f58f0bff7af-Tal, Tamara]; Hunter, Sid [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=f3d45d0ca2824cfe9a1d27e9e70a1d52-Hunter, Sid]; Wood, Charles [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=b6814f41b9df4161895fc17c39246b9c-Wood, Charles]; Betancourt, Doris [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=6ac2ad201ce54d9cbe6d88ceb737b803-Betancourt, Doris]; Dean, Timothy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=76b4d733360e45e1a3343e556180c3dd-Dean, Timothy]; Brinkman, Nichole [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=683001568e90428db1b835b299275e1c-Brinkman, Nichole]; Kolb, Laura [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a810d575769b428f960cb5a0348c6247-LKOLB]; Owens, Beth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=7a35939bccca4a2197d5e4446bb83d67-Owens, Beth]; Kenneke, John [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=6439ff5240f04a5baf0b4f03f1a35aba-Kenneke, John]; Mortensen, Holly [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=876959ca44a24a538c4e81d12b9accba-Mortensen, Holly]; Lowit, Anna [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=1d3428a2c0b84d5099124a0460babd53-Anna B. Lowit]; Barone, Stan [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a4f8618acbba418da24c110f3123a2af-Barone, Stan]; Ohanian, Edward [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=f119491e2ba8476381a39c57a456ac55-EOhanian]; Mazza, Carl [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=0ef03c34ecaf4e219c037be57464ecf9-CMazza]; Raffaele, Kathleen [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=cc48281bbab34bf5bf3ab1a63780d5ca-Kathleen Raffaele]; Foster, Stiven [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=43d242767f304355ad415ec856988213-sfoste02]; Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Firestone, Michael [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=32a70f97969d462da98320e25d27fe23-Mfiresto]; Axelrad, Daniel [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=6a51eaa06cef403abd7d28275fd278b4-DAxelrad]; Hillger, Robert [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=4e85f2bd03ed4855a3d6f93028355851-Hillger, Robert]; Duncan, Bruce [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=ff04bb22dfc44cbb9fb60c1de6f6e130-Duncan, Bruce]; O'shea, Marie [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=da3e674612b54b8c8d42fd0d659300b1-OShea, Marie]; Poeske, Regina [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a239b4e724f149bcb07fe4e0010298c9-Rpoeske]; Taylor, Dawn [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=b984d00ec06544e498ee5d986f97047c-Taylor, Dawn]; Braverman, Carole [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=3ccd3a39e400489d8b69566f10292b7e-CBraverm]; Morton, Michael [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=2775ae2d0afe4a3c9d056987ff4acc40-Morton, Michael]; Shields, Amy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=327b6ac1fa0a4aef9b49c0a1c4198d91-SHIELDS, AMY]; Small, Matthew [/o=ExchangeLabs/ou=Exchange Administrative Group

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[/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=bea4f49a79c44d47b1672554e9068296-Matney, Rac]; Geller, Andrew [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=51de0a18e67b4886a0020fe9c2e93f48-Geller, Andrew]

Subject: NAS Microbiome Briefing
Attachments: Microbiome_PREPUB PDF5.pdf; Briefing_EPA_NIEHS.pptx
Location: 41213 RRB; call-in Ex. 6 code: Ex. 6

Start: 12/19/2017 7:00:00 PM
End: 12/19/2017 8:00:00 PM
Show Time As: Busy

Attached: Prepublication copy of *Environmental Chemicals. The Human Microbiome and Health Risks: A Research Strategy*. **This document is currently under embargo. DO NOT DISTRIBUTE.**

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Message

From: Spire, Paul [PSpire@aap.org]
Sent: 1/6/2018 4:51:08 PM
To: Goldman, Lynn [goldmanl@gwu.edu]
CC: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Balk, Sophie [sbalk@montefiore.org]; Jennifer Lowry [jlowry@cmh.edu]
Subject: FW: Green Book - Water chapter - response requested by September 18
Attachments: 17 - Water.docx; 17 - Water - COEH comments.docx
Importance: High

Hi Dr. Goldman.

I'm sorry to pester you, but it appears that we have not yet received your chapter and we are really down to the wire on publication deadlines. Do you think you would be able to get this to us within 2 weeks, by Friday, Jan 19?

Many thanks,

Paul

From: Spire, Paul
Sent: Friday, November 17, 2017 6:04 PM
To: Goldman, Lynn <goldmanl@gwu.edu>
Cc: Etzel, Ruth <etzel.ruth@epa.gov>; Balk, Sophie <sbalk@montefiore.org>; Jennifer Lowry <jlowry@cmh.edu>
Subject: RE: Green Book - Water chapter - response requested by September 18
Importance: High

Hi Dr. Goldman.

It appears that we have not yet received your chapter. Do you think it would be possible to receive by Nov 30?

Thanks much for your continued support,

Paul

From: Spire, Paul
Sent: Friday, October 27, 2017 5:20 PM
To: Goldman, Lynn <goldmanl@gwu.edu>
Cc: Etzel, Ruth <etzel.ruth@epa.gov>; Balk, Sophie <sbalk@montefiore.org>; Jennifer Lowry <jlowry@cmh.edu>
Subject: FW: Green Book - Water chapter - response requested by September 18

Hi Dr. Goldman.

It appears that we have not heard back from you yet regarding the requested adjustments to the "Water" chapter. We are unfortunately starting to push-up again some firm publication deadlines. Is there any chance you could respond within 2 weeks, by November 10?

Many thanks for considering and for your continued support.

Best,

Paul

From: Spire, Paul
Sent: Thursday, September 28, 2017 12:19 PM
To: Goldman, Lynn <goldmanl@gwu.edu>
Cc: Etzel, Ruth <etzel.ruth@epa.gov>; Balk, Sophie <sbalk@montefiore.org>; Jennifer Lowry <jlowry@cmh.edu>
Subject: FW: Green Book - Water chapter - response requested by September 18

Hi Dr. Goldman.

It appears that we have not yet received a response from you regarding the updated "Water" chapter. Any chance you get this to us by Friday, Oct 13?

Many thanks,

Paul

From: Spire, Paul
Sent: Thursday, August 17, 2017 6:59 PM
To: Goldman, Lynn <goldmanl@gwu.edu>
Cc: Etzel, Ruth <etzel.ruth@epa.gov>; Balk, Sophie <sbalk@montefiore.org>; Jennifer Lowry <jlowry@cmh.edu>
Subject: Green Book - Water chapter - response requested by September 18
Importance: High

Dear Dr. Goldman,

I am writing on behalf of the Green Book editorial team to follow-up on the development of the "Water" chapter for the *Pediatric Environmental Health, 4th Edition* manual (Green Book).

Attached please find a copy of the draft chapter as it was reviewed by the AAP's Council on Environmental Health (COEH), as well as comments from the committee members that emanated from this review. We are requesting that you review these comments and adjust the chapter to address these issues. If there are any items that you will not be addressing or that you disagree with, it would be helpful to receive a short explanation of these issues for the committee's consideration.

We also wanted to share one new request and additional guidance that has emerged as this project has progressed:

- Please write 3 - 5 bullet points for your chapter that summarize key issues and take-home messages. These are being added at the start of each chapter.
- Please pay special attention to providing citations wherever it would be appropriate to do so, ensuring that all sources are cited and acknowledged.
- If you are using information from another AAP policy statement (or other Academy document), please modify the content so that it is not worded exactly like the existing policy document.
- Please continue to make all adjustments utilizing Word's "Track Changes" feature.

We are hoping to receive all updated chapters within one month, by Monday, September 18.

Thanks again for your ongoing support. If you have any questions or need anything more, please do not hesitate to let me know.

Many thanks,

Paul

Message

From: Spire, Paul [PSpire@aap.org]
Sent: 8/18/2017 12:13:24 AM
To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]
Subject: reminder for Ruth re cancer chapter
Attachments: 47 - Cancer - COEH comments.docx

Importance: High

Hi Ruth.

You had asked me to drop you a note when I convey the Cancer chapter with the COEH comments back to Mary Ward, which I just did. I think you were contemplating calling her to have a conversation about the requested changes? This information is below and attached again here for your convenience.

Also, just wanted to let you know that I got the last 8 COEH chapter reviews that were on my plate out the door and back to the authors, so I'm currently caught-up with those. I also sent reminders to those that had a past-due deadline for getting us either a chapter or a chapter revision.

Best,

Paul

From: Spire, Paul
Sent: Thursday, August 17, 2017 6:58 PM
To: Ward, Mary <wardm@mail.nih.gov>
Cc: Etzel, Ruth <etzel.ruth@epa.gov>; Balk, Sophie <sbalk@montefiore.org>; Lowry, Jennifer <jlowry@cmh.edu>
Subject: Green Book - Cancer chapter - response requested by September 18
Importance: High

Dear Dr. Ward,

I am writing on behalf of the Green Book editorial team to follow-up on the development of the "Cancer" chapter for the *Pediatric Environmental Health, 4th Edition* manual (Green Book).

Attached please find a copy of the draft chapter as it was reviewed by the AAP's Council on Environmental Health (COEH). This version includes embedded comments and "track changes" suggestions that emanated from this review. (Please note that these comments were entered by the assigned lead reviewer but represent the input and discussion of the entire committee.)

The following comment was also offered:

> Importantly, the authors completely miss the point that there has been a cumulative increase in incidence of pediatric cancer in the USA since 1970 of about 35% and an increase in incidence of testicular cancer among adolescents in the same time period of 55+%. These are key points that require emphasis.

We are requesting that you review the provided comments and adjust the chapter to address these issues. If there are any items that you will not be addressing or that you disagree with, it would be helpful to receive a short explanation of these issues for the committee's consideration.

We also wanted to share one new request and additional guidance that has emerged as this project has progressed:

- Please write 3 - 5 bullet points for your chapter that summarize key issues and take-home messages. These are being added at the start of each chapter.
- Please pay special attention to providing citations wherever it would be appropriate to do so, ensuring that all sources are cited and acknowledged.
- If you are using information from another AAP policy statement (or other Academy document), please modify the content so that it is not worded exactly like the existing policy document.
- Please continue to make all adjustments utilizing Word's "Track Changes" feature.

We are hoping to receive all updated chapters within one month, by Monday, September 18.

Thanks again for your ongoing support. If you have any questions or need anything more, please do not hesitate to let me know.

Many thanks,

Paul

Message

From: Hackel, Angela [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=B2E0A52DBEBC4D8C84961F50C117334D-HACKEL, ANGELA]
Sent: 4/18/2018 2:03:36 PM
To: Curtis, Mellasonda [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=acf49921e9ad4fa9a95819e18d9e69a4-Curtis, Mel]
CC: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]
Subject: FW: CHPAC April 2018 Meeting Materials
Attachments: OCHP Update.pdf; 2017.03.24_chpac_lead_hazard_reduction_letter.pdf; 2017.03.30_chpac_tsca_letter.pdf

Hi Sonda,

Please see the attached. I will send you the other materials in a separate email.

Thanks!

Angela

Angela Hackel, M.A.
Director, Program Implementation and Coordination Division
Office of Children's Health Protection | Office of the Administrator
U.S. Environmental Protection Agency
Room 1131 EPA West Building
Washington, DC 20460
Office: 202.566.2977

From: EPA_CHPAC
Sent: Friday, April 13, 2018 9:56 AM
To: 'EPA_CHPAC@icf.com' <EPA_CHPAC@icf.com>
Cc: 'Hackel, Angela' <Hackel.Angela@epa.gov>
Subject: CHPAC April 2018 Meeting Materials

Dear CHPAC,

We look forward to seeing you next week! OCHP will be holding a pre-meeting on April 19 from 8:30 am-9:45 am. In this meeting OCHP will be walking members through how to provide public comment and potential upcoming public comment periods that relate to topics that CHPAC has heard about at past meetings. We encourage members to attend the pre-meeting. The plenary session will follow this meeting at 10:00 am.

Please find attached the April 2018 CHPAC Plenary Meeting agenda, OCHP Update, and 2017 lead and TSCA letters. In preparation for the meeting, please take some time to review the attached documents.

If you're interested, EPA's responses to the lead and TSCA letters are also available on the CHPAC website.

The attached documents are also available in the CHPAC document share site and may be accessed using the link and login below. We will upload speaker presentations here as we receive them.

CHPAC Meeting Materials Share Site: Ex. 6

CHPAC Login
Login: Ex. 6
Password: Ex. 6

In terms of workgroups, we have been exploring some options for future workgroups. We will follow up on workgroups as soon as possible.

A group dinner reservation has been made at Clyde's Gallery Place (707 7th Street, NW Washington, DC 20001) at 7:00 PM on April 19. The restaurant will provide separate checks for each member. All CHPAC members are invited to attend.

Please let us know if you have any questions.

Kind regards,
Laura

The ICF Meeting Planning Team
EPA_CHPAC@icf.com

Children's Health Protection Advisory Committee

Office of Children's Health Protection Updates

(as of 3/31/18)

PRESIDENT'S TASK FORCE ON ENVIRONMENTAL HEALTH RISKS AND SAFETY RISKS TO CHILDREN

- On February 15, 2018, EPA Administrator Pruitt held a Principals meeting with members of the *President's Task Force on Environmental Health Risks and Safety Risks to Children* to discuss the development of a "Federal Strategy to Reduce Childhood Lead Exposures and Eliminate Associated Health Impacts."
- Members of the Task Force agreed that addressing childhood lead exposure is a priority for their agencies/departments and agreed on the five goals within the Strategy.

EPA'S CHILDREN'S HEALTH NEWS & ANNOUNCEMENTS

- In response to Administrator Pruitt's vision for a collaborative multi-federal agency approach to reduce childhood lead exposure across the country, EPA Region 8 (R8) created a Lead Strategy that identifies specific areas for engagement with federal, state, tribal and local partners. Programmatic areas of focus include Drinking Water, Lead-Based Paint, Superfund, Brownfields, Response and the Resource Conservation and Recovery Act (RCRA). A R8 cross program lead strategy implementation team was recently formed and is meeting to finalize the Strategy, establish specific commitments and the communication plan.
- The EPA Schools website epa.gov/schools now has a Disaster Preparedness and Recovery Resources section.
- **Dr. Leon Guo**, M.D., M.P.H., Ph.D, the current Director of Taiwan's National Institute for Environmental Health Sciences spoke at the Office of Children's Health Protection on April 3rd, 2018. Dr. Guo presented on the research in Taiwan surrounding health investigations of phthalates and actions to protect children's health.
- **EPA Settles with Amazon for Distributions of Illegal Pesticides:** In February 2018, EPA announced an agreement with Amazon to protect the public from the hazards posed by unregistered and misbranded pesticide products. In August 2015 and January 2016, EPA issued FIFRA Stop Sale, Use, or Removal Orders against Amazon Services LLC to prohibit the sale of illegal pesticide products that can easily be mistaken for black-board or side-walk chalk, especially by children. After receiving the stop sale orders, Amazon immediately removed the products from the marketplace, prohibited foreign sellers from selling pesticides, and cooperated with EPA during its subsequent investigation. The orders, as well as EPA's subsequent engagement with the company, prompted Amazon to more aggressively monitor its website for illegal pesticides. As a result, Amazon has created a robust compliance program comprised of a sophisticated computer-based screening system backed-up by numerous, trained staff. In October 2016, Amazon notified all customers who purchased the illegal pesticides between 2013 and 2016 to communicate safety concerns with these products and urge disposal. Amazon also refunded those customers the cost of the products, approximately

$130,000. Under the terms of this recent agreement, Amazon will pay an administrative penalty of $1,215,700 and will develop an online training course on pesticide regulations and policies that will be mandatory for all entities planning to sell pesticides on Amazon.com. This settlement is intended to prevent children from being inadvertently exposed to illegal pesticides, particularly those mimicking chalk. For more information on this settlement or to read a copy of the consent agreement and final order, go to: https://www.epa.gov/enforcement/amazon-services-llc-fifra-settlement.

- The EPA Office of Pollution Prevention and Toxics' (OPPT) is currently developing a proposed rule regarding Dust Lead Hazard Standards, which identify dangerous levels of lead in paint, dust, and soil. It also provides benchmarks on which to base remedial actions that help safeguard children from the adverse health effects of childhood lead exposure. OCHP is supporting workgroup efforts to develop technical approaches to evaluate children's health exposures and develop lead hazard standards.

PUBLIC COMMENT OPPORTUNITIES

- **Draft Human Health Risk Assessments for Pesticide Registration Reviews for Public Comment by April 30, 2018.** Registration review is EPA's periodic review of pesticide registrations to ensure that each pesticide continues to satisfy the statutory standard for registration, that is, the pesticide can perform its intended function without unreasonable adverse effects on human health or the environment. As part of the registration review process, the Agency has completed comprehensive draft human health and/or ecological risk assessments for a number of pesticides. Please note that only children's health concerns are highlighted here. For more information, see: https://www.gpo.gov/fdsys/pkg/FR-2018-02-27/pdf/2018-03986.pdf.
    - Acetamiprid is a neonicotinoid insecticide registered for use on fruit and vegetable crops and in a number of residential sites, including indoor application as a crack/crevice/bedbug treatment, applications to gardens, and pet (i.e., dogs) spot-on treatment. The acute dietary analysis is just below the level of concern for children 1<2 years old, as is the aggregate risk assessment. Using developmental toxicological endpoints, certain occupational uses result in estimated risks of concern. For the Draft Human Health Risk Assessment for Acetamiprid, see: https://www.regulations.gov/document?D=EPA-HQ-OPP-2012-0329-0025.
    - Butralin is an herbicide used as a plant growth regulator on tobacco. There are no dietary or spray drift risks of concern for children. The Agency has considered the exposure to humans from residues in tobacco smoke by assessing the short-term inhalation exposure and risks for adults only. For the Draft Human Health Risk Assessment for Bifenthrin, see: https://www.regulations.gov/document?D=EPA-HQ-OPP-2010-0384-0247.
    - Cypermethrins are pyrethroid insecticides registered for use on a wide variety of agricultural food/feed crops, livestock, and sod farms; at recreational sites (i.e., golf courses, athletic fields); at indoor residential sites, on residential lawns; on gardens and trees; on mosquitoes and termites, and on pets. There are

estimated risks of concern for children from certain uses on lawns, indoors, and pet collars. For the Draft Human Health Risk Assessment for the Cypermethrins, see: https://www.regulations.gov/document?D=EPA-HQ-OPP-2011-0720-0020.

- Glyphosate is an herbicide used on fruit, vegetable, and field crops, turf, and aquatic application scenarios. There are no dietary, residential or spray drift risks of concern for children. In response to concern from segments of the general public related to the presence of glyphosate in human milk, the EPA analyzed human milk samples collected by the National Children's Study for residues of glyphosate and its metabolites; there were no detection in the 39 samples from 39 mothers. EPA has determined glyphosate to be "Not likely to be carcinogenic to humans." For the Draft Human Health Risk Assessment for Glyphosate, see: https://www.regulations.gov/document?D=EPA-HQ-OPP-2009-0361-0068. For the Analysis of Human Milk for Incurred Residues of Glyphosate and its Metabolites, see https://www.regulations.gov/document?D=EPA-HQ-OPP-2009-0361-0085.
- Prometon is an herbicide used in non-agricultural and non-residential locations, including parking lots, roadsides, and under pavement. When using modeling data, drinking water estimates are of concern for children; however, when using monitoring data there is no concern. Spray drift estimates require a 10-foot buffer from the field edge. For the Draft Human Health Risk Assessment for Prometon, see: https://www.regulations.gov/document?D=EPA-HQ-OPP-2013-0068-0019.
- Pymetrozine is an insecticide used in agricultural field and orchard/vineyard crops, on Christmas trees and ornamentals, and interior plantscapes. Acute and chronic dietary risk estimates, mainly from drinking water, are of concern for children. EPA has classified Pymetrozine as a "likely human carcinogen". For the Draft Human Health Risk Assessment for Pymetrozine, see: https://www.regulations.gov/document?D=EPA-HQ-OPP-2013-0368-0017.

UPCOMING EVENTS & WEBINARS

- Region 8 is coordinating a session at the National Green Schools Conference and Expo May 4, 2018. The conference session is titled, "Extreme Weather and Natural Disasters: Supporting Schools Plan and Recover." Presenters from state, local, federal government and research organization will present on how schools play an important role during disasters. Presenters will provide lessons learned as well as consideration of emotional needs during and after disaster.

Message

From: Spire, Paul [PSpire@aap.org]
Sent: 11/7/2017 11:23:21 PM
To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]
Subject: Green Book - Cancer - for editor review
Attachments: 47 - Cancer - editor review.docx

Dear Ruth,

I am writing to convey the attached Cancer chapter for editor review. Mary Ward was the lead author for this chapter.

Phil Landrigan served as the primary reviewer. COEH's comments were conveyed to Mary as track changes embedded in the draft. Additionally, the following comment was forwarded:

- - - - - -

> Importantly, the authors completely miss the point that there has been a cumulative increase in incidence of pediatric cancer in the USA since 1970 of about 35% and an increase in incidence of testicular cancer among adolescents in the same time period of 55+%. These are key points that require emphasis.

- - - - - -

The next step for this chapter will be stakeholder review. We will need to distribute "clean" chapters for review, so at this point we will need to "accept" track changes. I would be happy to do this, or feel free to return a clean chapter to me.

Many thanks,

Paul

Message

From: Spire, Paul [PSpire@aap.org]
Sent: 11/22/2017 11:26:23 PM
To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]
Subject: FW: Green Book - Pesticides - for editor review
Attachments: 39 - Pesticides - COEH comments.docx; 39 - Pesticides - editor review.docx

Hi Ruth.
Re-sending in follow-up to your inquiry about this chapter.
Best,
Paul

From: Spire, Paul
Sent: Monday, October 30, 2017 12:10 PM
To: Etzel, Ruth <etzel.ruth@epa.gov>
Subject: Green Book - Pesticides - for editor review

Dear Ruth,

I am writing to convey the attached "Pesticides" chapter for editor review. Nicholas Newman was the lead author for this chapter.

Alan Woolf served as the primary reviewer. Also attached is a document compiling the COEH's comments, to which Dr. Newman has added responses.

In his email submitting the chapter, Dr. Newman wrote the following:

> Sorry that it took me longer than I thought that it would to get this edited. I responded to the reviewer's comments and I marked my responses in italics in the comments document. I'm not sure about adding information about thallium or fluorides. I reviewed the 2015 Annual Review of the American Association of Poison Control Centers and found only exposures to sulfuryl fluoride (fumigant – most cases in adults) as well as 11 cases of thallium exposure. I removed the reference to fluorides in the introductory section and did not include any information regarding thallium poisoning. I also made some additional corrections through the text (beyond what was suggested – all with changes tracked) and removed all the comments that had new citations as these are all included in the new "references" section.

The next step for this chapter will be stakeholder review. We will need to distribute "clean" chapters for review, so at this point we will need to "accept" track changes. I would be happy to do this, or feel free to return a clean chapter to me.

Many thanks,

Paul

Message

From: Spire, Paul [PSpire@aap.org]
Sent: 8/17/2017 11:58:16 PM
To: Newman, Nicholas (Nick) [Nicholas.Newman@cchmc.org]
CC: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Balk, Sophie [sbalk@montefiore.org]; Jennifer Lowry [jlowry@cmh.edu]
Subject: Green Book - Pesticides chapter - response requested by September 18
Attachments: 39 - Pesticides.docx; 39 - Pesticides - COEH comments.docx; DRAFT - Red Book chapter addressing DEET.docx; August 2016 Wylie_Insect_Repellants_During_Pregnancy_in_the_Era_of.98642.pdf; Neonicotinoid insecticides.docx
Importance: High

Dear Dr. Newman,

I am writing on behalf of the Green Book editorial team to follow-up on the development of the "Pesticides" chapter for the *Pediatric Environmental Health, 4th Edition* manual (Green Book).

Attached please find a copy of the draft chapter as it was reviewed by the AAP's Council on Environmental Health (COEH), as well as comments from the committee members that emanated from this review. We are requesting that you review these comments and adjust the chapter to address these issues. If there are any items that you will not be addressing or that you disagree with, it would be helpful to receive a short explanation of these issues for the committee's consideration.

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We are hoping to receive all updated chapters within one month, by Monday, September 18.

Thanks again for your ongoing support. If you have any questions or need anything more, please do not hesitate to let me know.

Many thanks,

Paul

Message

From: Arnold P. Wendroff, PhD [mercurywendroff@mindspring.com]
Sent: 5/4/2017 3:50:27 PM
To: rafael.rodriguez@salud.pr.gov
CC: mercy.echeverria@salud.pr.gov; mabel.cabeza@salud.pr.gov; Guerrero, Carmen [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=5ca33d0466a54184a34d8951c512d393-Guerrero, C]; carmen.velez2@upr.edu; Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; jose.cordero6@upr.edu; mercurywendroff@mindspring.com
Subject: FW: "Toxic effects of mercury exposure persists for multiple generations, study suggests" Washington State University 05 03 17
Attachments: WENDROFF LANCET NEURO corrected 06 16 14.docx; NYAS HARBOR MERCURY HISTOGRAM 05 02.pdf

To: Rafael Rodriguez Mercado, MD, Secretary of Health, **Puerto Rico Department of Health** (787) 767-8181

cc: Mercy Echeverria, Secretary to: Rafael Rodriguez Mercado, MD, Secretary of Health, **Puerto Rico Department of Health** (787) 767-8181

cc: Mabel Cabeza, Environmental Health, **Puerto Rico Department of Health**

cc: Mayra Toro Tirado, Environmental Health?, **Puerto Rico Department of Health (**787) 765-2929

cc: Carmen Guerrero, MSc, Director, Caribbean Environmental Protection Division (CEPD) **EPA Region 2, Puerto Rico**

cc: Carmen Milagros Vélez Vega, PhD., MSW, Catedrática, Programa Doctoral en Determinantes Sociales de la Salud, Co Investigadora Participación Comunitaria: PROTECT, dept. Ciencias Sociales,
Escuela de Salud Pública, Recinto de Ciencias Médicas, **Universidad de Puerto Rico**

Ruth Etzel, MD, PhD, Director, Children's Health Protection, **EPA** (202) 564-2188

cc: : Jose Cordero, MD,MPH, Dean of the **Graduate School of Public Health, University of Puerto Rico**

From: Arnold P. Wendroff, PhD, MScEd, Director, **Mercury Poisoning Project** (718) 499-8336 www.mercurypoisoningproject.org Key Words < mercury Santeria >

Dear Secretary Rodriguez Mercado,

This paper describes a mercury related environmental health threat that the PRDOH and the NIEHS-funded CRECE and PROTECT projects should be aware of, investigate,
and address. It is certain to be occurring in Puerto Rico, given the enormity of past and current mercury exposure.

Sincerely,

Arnold

==========

From: Arnold P. Wendroff, PhD [mailto:mercurywendroff@mindspring.com]
Sent: Wednesday, **May 03, 2017 8:33 PM**
To: bruskec@niehs.nih.gov; 'Grandjean, Philippe'; 'Guerrero, Carmen'; 'Sutter-Montalvo, Lisa'; 'Carmen M Velez Vega'; sutter.lisa@epa.gov; jguzmanpereira@marchofdimes.org; rcaballero4@suagm.edu; nunez1@suagm.edu; aalsha@coe.neu.edu; jcordero@uga.edu; helen.suh@tufts.edu; meekerj@umich.edu; p.brown@neu.edu; carmen.velez2@upr.edu; e.zimmerman@neu.edu; j.manjourides@neu.edu; vulpe@berkeley.edu; debjwat@umich.edu; peggy@weact.org; schantz@illinois.edu; crece@northeastern.edu; sanjuanweeklypr@gmail.com; Ex. 6
Cc: mercurywendroff@mindspring.com
Subject: "Toxic effects of mercury exposure persists for multiple generations, study suggests" Washington State University 05 03 17

To: Christine Flowers, MPA, Director, Office of Communications and Public Liaison, **NIEHS** (919) 541-3665
Philippe Grandjean, MD, **Department of Environmental Health, Harvard School of Public Health**

Carmen Guerrero, MSc, Director, Caribbean Environmental Protection Division (CEPD) **EPA Region 2, Puerto Rico** (787) 977-5875
Carmen Milagros Vélez Vega, PhD., MSW, Catedrática, Programa Doctoral en Determinantes Sociales de la Salud, Co Investigadora Participación Comunitaria: PROTECT, dept. Ciencias Sociales,
Escuela de Salud Pública, Recinto de Ciencias Médicas, **Universidad de Puerto Rico**
Lisa Sutter, Assistant to **Carmen Guerrero**, MSc, Director, Caribbean Environmental Protection Division (CEPD) **EPA Region 2, Puerto Rico** (787) 977-5875
Jose R. Guzman Pereira, MPH, Associate Director of Programs, **March of Dimes Puerto Rico Chapter** (787) 765-6052
Rafael A. Caballero, Director, Instituto de Education Ambiental (INEDA) UMET (787) 288-1100 ext. 1373
Carmen Nunez, Coordinadora de Adiestramientos " " " (787) 288-1100 ext. 1381
Akram Alshawabkeh, Director, Administrative Core Leader
José Cordero, **Health Specialist and Human Subjects Core (HSC) Leader**
Helen Suh MacIntosh, **Project 1 Leader**
John Meeker, **Project 3 Leader**
Phil Brown, **Community Outreach and Translation Core (COTC) Leader**
Emily Zimmerman, **Project 1**, **Administrative Core**, **COTC**
Justin Manjourides, **Project 1**, **Project 2**
Bhramar Mukherjee, **Project 3**
Chris Vulpe, **Project 2**
Deborah Watkins, **Project 3**
Peggy Shepard **– We Act for Environmental Justice** ["**Act**" is an appropriate appellation in this context!]
Yasmin Pedrogo **– UPR – Medical Campus*****
Susan Schantz – University of Illinois
Aaron Christiana, Editor, ***San Juan Daily/Weekly Star*** (787) 743-3346
John McPhaul, Reporter, ***San Juan Star*** (939) 204-5615

From: Arnold P. Wendroff, PhD, MScEd, Director, **Mercury Poisoning Project** (718) 499-8336 www.mercurypoisoningproject.org Key Words < **mercury Santeria** >

Dear All,

I spoke with the corresponding author, Michael Skinner, PhD, today, at 6:18 pm (Eastern Time), and asked him if his findings of the effects of methylmercury were
equally applicable to those from elemental mercury, as mercury vapor inhalation from magico-religious mercury use.

With no hesitation, **he assured me that MeHg and Hg were, at least in this case, essentially toxicologically equivalent.**

In my attached 2014 letter to *The Lancet Neurology*, critiquing Drs. Grandjean and Landrigan's paper "Neurobehavioral effects of developmental toxicity" I stated that
"The Hg+ ion is the toxic moiety in methylmercury," and that appears to be the case, at least according to Dr. Skinner.

Feel free to contact Dr. Skinner to verify my assertion.

I again suggest that this is a fertile field for you NIEHS-funded scientists to explore, and not merely due to its academic interest.

Better yet, let those Caribbean and Latino families currently residing in mercury-contaminated dwellings continue to marinate in their neurotoxic
atmosphere for another few generations, just like the Zebrafish that Carvan et al studied, first having your several IRB's pronounce on the ethical
implications of such a study. The NIEHS will likely pay you to do so.

Sincerely yours,

Arnold Wendroff

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==

Toxic effects of mercury exposure persists for multiple generations, study suggests

May 3, 2017 *Robert Frank*

PULLMAN, Wash. – Zebrafish exposed to very low levels of methylmercury as embryos not only passed on toxic effects of the chemical exposure to their offspring, but also to the third generation, according to a study that investigated both epigenetic changes – chemical modifications to the DNA – and **abnormal neuro-behavior** associated with exposure.

The study, by researchers at Washington State University and the University of Wisconsin-Milwaukee, is the first to show that health problems associated with exposure to the neurotoxin are sustained for multiple generations.

"Effects previously observed and suspected now have been shown to be passed to future generations, not simply the individual exposed," said Michael Skinner, coauthor and founding director of the Center for Reproductive Biology in WSU's School of Biological Sciences. "This dramatically impacts the health hazards of **mercury** exposure."

If the same effects occur in people, it means the health hazards from exposure to mercury, which is present in waterways and fish, **is dramatically underestimated**, said Michael Carvan, a professor of freshwater sciences at the UW-Milwaukee.

Scientists have already found evidence that methyl**mercury is a neurotoxin for both children and adults.** But those studies have come from examining single, direct exposures to high doses.

The researchers looked at a single cell type – sperm – to compare across three generations, and also tracked two observed abnormal behaviors. The first generation was exposed to a level of methylmercury that could be present in humans who eat a large amount of fish.

Two abnormal behaviors observed across generations after at this level of initial exposure were impaired vision and **hyperactivity**.

"We tested genome-wide, epigenetic effects and found many genes with alterations," Carvan said. "We also looked at the two behaviors and each were caused by independently inherited epigenetic effects." The effects in the originally exposed generation are not as pronounced in the second and third generations, but more individual fish were affected in the offspring, the researchers found.

The work was published May 2 in the journal PLOS ONE.

Mercury is released into the air from a variety of sources, from power plants to volcanoes, and is washed into bodies of water by rainfall. Once in water, microbes change it into methylmercury, which accumulates in the bodies of fish.
The main way people are exposed to methylmercury is by consuming large amounts of fish.

If the study results translate to people, those who would be most affected are East Asians, Pacific Islanders and Native Americans, populations that eat more fish than most. Among women of childbearing age in those populations, 27 percent have enough of the toxin in their bodies to inflict damage to the nervous system of a fetus.

Carvan said the takeaway message from the study is that women who are of childbearing age should be especially selective in how much and what kind of seafood they eat, especially in Wisconsin, northern Minnesota and the Upper Peninsula of Michigan where fishing in small inland lakes is prevalent. The heavy metal collects at a higher percentage in small lakes.

The extent of exposure also depends on what types of fish are eaten. Store-bought oysters, Pacific salmon and rainbow trout contain much less methylmercury than catfish, swordfish and large, wild-caught fish from small lakes.

Media Contact:

- **Michael Skinner**, WSU School of Biological Sciences, **509-335-1524**, **skinner@wsu.edu**

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https://sbs.wsu.edu/faculty/?faculty/155

Name:	**Michael Skinner**
Field of Study:	Reproduction / Environmental Epigenetics
Title:	Professor
Degrees:	Ph.D., Biochemistry, Washington State University
Homepage:	Click
Office:	507 Abelson
Email:	skinner@wsu.edu
Phone:	335-1524
Mailing Address:	School of Biological Sciences PO Box 644236 Pullman, WA 99164-4236

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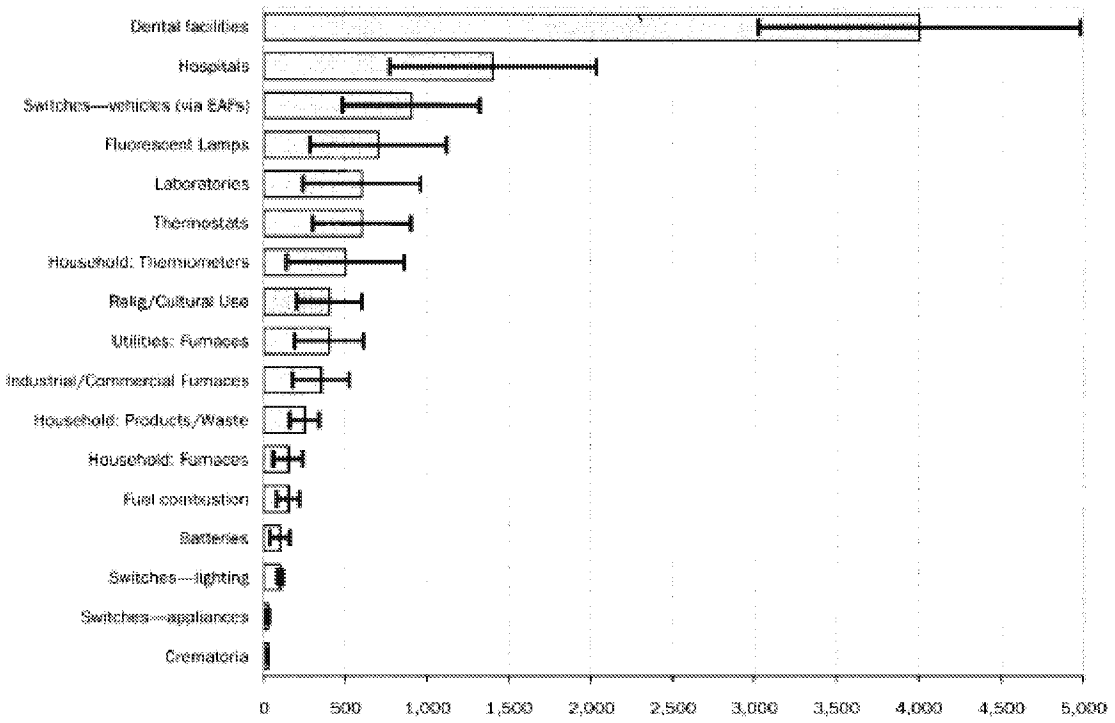
Note that "Relig[ious]/Cultural Use" of elemental mercury is tied as the median source of mercury entering the New York - New Jersey Harbor, slightly greater than mercury emanations from coal-fired electric power plants. The EPA R2, which commissioned this 2002 report, had no interest in ascertaining the human health effects of these mercury emanations from inside primarily Caribbean and Latino housing.

FIGURE 1. Margin of Error for Estimated Mercury Inputs (kg/yr) to the NY/NJ Harbor



THE LANCET Neurology

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The Lancet Neurology, Volume 13, Issue 7, Pages 646 - 647, July 2014

doi:10.1016/S1474-4422(14)70116-4Cite or Link Using DOI

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Neurodevelopmental toxicity: still more questions than answers

Arnold P Wendroff a

In their Review, Grandjean and Landrigan expressed concern about the neurodevelopmental toxicity of methylmercury,[1] but did not assess the dangers of serious and widespread inhalation exposures to elemental mercury vapour (Hg0) from its magico-religious uses in some Caribbean and Latino communities and the presumptive associated latent epidemic of developmental neurotoxicity this constitutes.

In the belief that it attracts good and repels evil, practitioners of folk magic and Caribbean religions including Espiritismo, Santería, and Voodoo, sprinkle mercury on floors and furnishings where it accumulates levels of mercury vapour, ~~about 80% of which is inhaled or absorbed.~~ **[about 80% of which inhaled is absorbed.]** The Hg_+ ion is the toxic moiety in methylmercury. Mercury vapour, like methylmercury, is lipophilic and readily crosses the placental and blood—brain barriers and enters breast milk.

The mean weight of mercury sold by botanicas for ritualistic use is about 10 g. Mercury spilt during ritualistic ceremonies that permeates flooring and furnishings can persist for decades, during which time it continually produces mercury vapour. Hence, most exposures are probably second-hand, from ritualistic spills by previous occupants of an individual's dwelling.[2, 3] Unlike methylmercury ingested in seafood, occupants of such contaminated dwellings cannot control their inhalation exposure and will be unaware of the neurotoxicity of residual mercury in flooring.

Mercury sales in The Bronx in New York (USA), where many people of Caribbean origin live, suggest that in 1995 alone,[4] between 25 500 and 155 000 homes might have been contaminated with mercury and data from similar Caribbean communities in New Jersey showed that at least 2% of apartments had mercury vapour consistent with its cultural use.[5]

Environmental health scientists, long aware of the hazards posed by ritualistic mercury use and its probable neurodevelopmental sequelae, have not put into action the "precautionary approach that emphasizes prevention and does not require absolute proof of toxicity" advocated for by the authors.[1] Despite Grandjean's previous observation that in "some ethnic groups, metallic mercury is used for magical purposes that may cause substantial exposure to mercury vapor",[6] these exposures and their neurodevelopmental ~~affects~~ **[effects]** are not routinely assessed.

That ritualistic mercury exposure contributes to the "silent pandemic of neurodevelopmental toxicity"[1] is suggested by a case of acute magico-religious mercury poisoning in a 3-year-old Puerto Rican girl, apparently due to ritualistic mercury spills by the previous Dominican occupants of the apartment in which she lived.[2, 3]

Despite more than two decades of awareness of these ritualistic practices and a variety of research on ritualistic mercury sales, use, and reported environmental and clinical mercury levels, the authors' observation that recognition of widespread subclinical toxicity often did not occur until decades after the initial evidence of neurotoxicity is exemplified by the failure of government agencies and the environmental medical community to substantively assess these exposures.

I declare no competing interests.

References

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2 Mercer JJ, Bercovitch L, Muglia JJ. Acrodynia and hypertension in a young girl secondary to elemental mercury toxicity acquired in the home. *Pediatric Dermatology* 2012; **29**: 199-201. PubMed

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4 Zayas LH, Ozuah PO. Mercury use in espiritismo: a survey of botanicas. *Am J Public Health* 1996; **86**: 111-112. PubMed

5 Garetano G1, Stern AH, Robson M, Gochfeld M. Mercury vapor in residential building common areas in communities where mercury is used for cultural purposes versus a reference community. *Sci Total Environ* 2008; **397**: 131. 19 PubMed

6 Grandjean P. Mercury. In: Landrigan PJ, Etzel RA, eds. Textbook of children's environmental health. Oxford: Oxford University Press, 2014: 273-280.

a Mercury Poisoning Project, 544 8th Street, Brooklyn, NY 11215, USA

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http://www.thelancet.com/journals/laneur/article/PIIS1474-4422(14)70121-8/fulltext

The Lancet Neurology, Volume 13, Issue 7, Pages 648 - 649, July 2014

<Previous Article | Next Article>

doi:10.1016/S1474-4422(14)70121-8 Cite or Link Using DOI
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Neurodevelopmental toxicity: still more questions than answers — Authors' response

Original Text

Philippe Grandjean a b, Philip J Landrigan c

We are grateful for the comments on our review.1 Our aim was to present a balanced assessment based on our best professional judgement concerning toxicity of industrial chemicals to the developing human brain. The diversity of opinion expressed in these letters reflects the serious absence of neurotoxicity information about most chemicals, but we interpret all four letters as supportive of a call for intensified research.

Goldstein and Saltmiras echo Monsanto's oft-repeated defence that glyphosate is a safe herbicide. Still, the toxicity documentation publicly available on this widely used substance is limited. We have been unable to find documentation of any neurotoxicity testing of glyphosate considered valid by the US Environment Protection Agency. Experimental evidence lends support to the likelihood of neurotoxicity.2 On the basis of clinical reports mentioned by Goldstein and Saltmiras, we therefore believe that glyphosate should be considered a neurotoxic hazard. Monsanto's argument for safety relies on the relative absence of research results rather than on data documenting safety.

We agree with Feldman that fluoride is important for children's oral health. However, the fact that a trace element has beneficial effects at low doses in specific tissues does not negate the possibility that neurotoxicity might also be occurring, especially at increased levels of exposure. Indeed, concerns about fluoride toxicity were already raised by a National Research Council expert committee.[3] Feldman describes the recent meta-analysis[4] as selective and based on old, confounder-ridden studies. In support of her claims, she refers to two previous reports that reviewed some of the same studies, although without access to important background information. Feldman makes other serious errors—eg, by linking, without justification, a rise in population mean intelligent quotient (IQ) to the introduction of water fluoridation.

Similarly, Gelinas and Allukian dispute the validity of previous studies on fluoride exposure and neurobehavioural deficits. We do not deny the importance of a dose-response relation, which has been a unifying concept in toxicology since the time of Paracelsus. However, as we emphasised in our Review, emerging evidence on developmental neurotoxicity makes it clear that the timing of exposure is also of great importance, especially during highly vulnerable windows of brain development. Due to the growing evidence on adverse effects, US authorities now recommend that fluoridation of community water should not exceed 0·7 mg/L.[5]

We agree with Wendroff's perspective, but have been unable to identify epidemiological support for a claim of developmental neurotoxicity from exposure to mercury vapour. As elemental mercury might soon be added to the list of confirmed developmental neurotoxicants, we support the evidence-informed prevention of mercury exposures suggested by Wendroff.

In writing our Review, we have tried to steer a middle course between advocates for particular public-health actions and spokespersons for the chemical industry. We believe that sufficient evidence is already available that industrial chemicals endanger human brain development and that unrestrained production and release of such chemicals are short-sighted, dangerous, unsustainable, and fundamentally immoral. We call for a thorough revision of chemical safety policies and for the establishment of a documentation centre on developmental neurotoxicity modelled after the International Agency for Research on Cancer.
We declare no competing interests.

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1 Grandjean P, Landrigan P.J.. Neurobehavioural impact of developmental toxicity. *Lancet Neurol* 2014; **13**: 330-338. Summary | Full Text | PDF(609KB) | PubMed

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a Department of Environmental Medicine, University of Southern Denmark, Odense, Denmark

b Department of Environmental Health, Harvard School of Public Health, Boston, MA 02215, USA

c Department of Preventive Medicine, Mount Sinai School of Medicine, New York, NY; USA

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A LATENT EPIDEMIC OF NDURODEVELOPMENTAL DEFICITS DUE TO EXPOSURE TO MERCURY PUT TO MAGICO-RELIGIOUS USE IN CARIBBEAN & LATINO COMMUNITIES

Initial Draft: letter to editor -- ***The Lancet Neurology*** -- in press for July 2014

Clinicians concerned about neurodevelopmental toxicity of methylmercury,[1] have neglected to assess serious and widespread inhalation exposures to elemental mercury vapor (Hg^0) emanating from its magico-religious uses in some Caribbean and Latino communities, and its presumptive associated latent epidemic of developmental neurotoxicity. The Hg^+ ion is the toxic moiety in methylmercury. Mercury vapor, like methylmercury, is lipophilic, readily crossing placental and blood-brain 'barriers', and entering breast milk.

In the belief that it attracts good and repels evil, practitioners of folk magic, Caribbean religions including Espiritismo, Santeria and Voodoo,[a] sprinkle mercury on floors and furnishings, where it evolves developmentally neurotoxic levels of mercury vapor, ~80% of which inhaled is absorbed.

The mean weight of mercury sold by botanicas for ritualistic use is ~10g.[a,b] Ritualistic spills permeate flooring and furnishings, persisting for decades, while continually evolving mercury vapor.[c] Hence, most exposures are likely at second-hand, from ritualistic spills by prior occupants.[2,3,d] Unlike methylmercury ingested in seafood, occupants of ritualistically-contaminated dwellings cannot control their inhalation exposure, are unaware of residual mercury in flooring, and of the existence and neurotoxicity of mercury vapor.

Mercury sales in the heavily Caribbean Bronx, New York, suggest that in 1995 alone, 2% to 12% of homes were ritualistically contaminated,[e] and data from similar Caribbean communities in New Jersey, found at least 2% of apartments with the presence of mercury vapor consistent with its cultural use.[f,g,h]

Environmental health scientists, long aware of hazards posed by ritualistic mercury use,[a] and likely neurodevelopmental sequelae, have failed to operationalize the "precautionary approach that emphasizes prevention and does not require absolute proof of toxicity."[1] Despite Grandjean's observation that "In ... some ethnic groups, metallic mercury is used for magical purposes that may cause substantial exposure to mercury vapor,"[4] these exposures and their neurodevelopmental impact have yet to be assessed. They have been no measurements of mercury vapor levels in occupied dwellings, and of their correlation with biomarker mercury levels and neurodevelopmental sequelae of exposed occupants.

That ritualistic mercury exposure contributes to the "silent pandemic of neurodevelopmental toxicity"[1] is suggested by a case of acute magico-religious mercury poisoning of a three year-old Puerto Rican girl, apparently due to ritualistic mercury spills by the prior Dominican occupant of her apartment.[2,3] Although neither paper mentioned it, her eight and ten year-old siblings and 32 year-old mother had highly elevated urine mercury levels of 73, 38 and 49µg/L respectively, yet were asymptomatic, albeit with no neurological assessment.[5]

Despite over two decades of awareness of these practices, and a variety of published research on ritualistic mercury sales, use, and associated environmental and clinical mercury levels,[i] the authors' observation that "recognition of widespread subclinical toxicity often did not occur until decades after the initial evidence of neurotoxicity," is exemplified by the failure of government agencies and the environmental medical community to substantively assess these exposures, due to a variety of political and economic, as opposed to medical, rationales.[j]

Documentation of the environmental health threat posed by magico-religious mercury use is accessible using the key words < **mercury Santeria** >.

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2. Mercer JJ, Bercovitch L, Muglia JJ. Acrodynia and Hypertension in a Young Girl Secondary to Elemental Mercury Toxicity Acquired in the Home. *Pediatric Dermatology* 2012; 29:2:199-201

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Message

From: Spire, Paul [PSpire@aap.org]
Sent: 8/17/2017 8:29:47 PM
To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Jennifer Lowry [jlowry@cmh.edu]
Subject: RE: "Pesticides" Green Book chapter
Attachments: 39 - Pesticides.docx; 39 - Pesticides - COEH comments.docx; 18 - Food Safety.docx

Hi Jennifer and Ruth.

The "Pesticides" chapter is still in active development. We received a first draft a couple of months ago from Nick Newman, which was reviewed on the last COEH conference call. Alan was the primary reviewer and I have his comments. I will attach these 2 items here which together provide the most recent information we have on this chapter.

Incidentally, however, I have a question I have been meaning to ask before I convey the chapter back to Nick for revision. In Alan's comments, his second comment (highlighted in yellow) is about the chapter missing discussion of pesticide residues on food. This topic is covered, though, in the food safety chapter (which is why it wasn't included in previous versions of the pesticides chapter). I will also attach the latest draft we have of the food safety chapter for reference.

Therefore, okay with me deleting the highlighted comment about discussing pesticide residues before sending this back to Nick Newman?

Many thanks,

Paul

From: Etzel, Ruth [mailto:Etzel.Ruth@epa.gov]
Sent: Thursday, August 17, 2017 3:14 PM
To: Jennifer Lowry <jlowry@cmh.edu>
Cc: Spire, Paul <PSpire@aap.org>
Subject: RE: "Pesticides" Green Book chapter

Hi Jennifer,

I could not find it either. The most recent update I saw was this note from Nick Newman. Paul, has Nick sent any updates?

Best,

Ruth

From: Spire, Paul [mailto:PSpire@aap.org]
Sent: Thursday, April 27, 2017 5:13 PM
To: Newman, Nicholas (Nick) <Nicholas.Newman@cchmc.org>

Cc: Etzel, Ruth <Etzel.Ruth@epa.gov>; Jennifer Lowry <jlowry@cmh.edu>
Subject: RE: "Pesticides" Green Book chapter

Nick,
No problem and thanks for your ongoing support. We'll look forward to receiving the chapter in the near future.
Best,
Paul

From: Newman, Nicholas (Nick) [mailto:Nicholas.Newman@cchmc.org]
Sent: Wednesday, April 26, 2017 4:25 PM
To: Spire, Paul <PSpire@aap.org>
Cc: Etzel, Ruth <etzel.ruth@epa.gov>; Jennifer Lowry <jlowry@cmh.edu>
Subject: Re: "Pesticides" Green Book chapter

Paul,

I must apologize. Since this is my first book chapter I've ever revised, I underestimated the amount of work needed. Having said that, most of the heavy lifting is done and I am just finishing up by updating some of the tables with updated statistics from the Poison Control Center annual report, updating all the web links to make sure that they are working (most of them don't), and making a few minor updates in the end of the text. I will not have a problem getting it to you by May 15th. I'm sorry for the delay.

Regards,
Nick

From: Paul Spire <PSpire@aap.org>
Date: Monday, April 24, 2017 at 7:28 PM
To: Nicholas Newman <Nicholas.Newman@cchmc.org>
Cc: "Etzel, Ruth" <etzel.ruth@epa.gov>, "jlowry@cmh.edu" <jlowry@cmh.edu>
Subject: RE: "Pesticides" Green Book chapter

Hi Dr. Newman,

I am writing to follow-up regarding the revision of the "Pesticides" chapter for the ***Pediatric Environmental Health, 4th Edition*** manual. The Council on Environmental Health will be meeting and reviewing draft chapters on May 23. We are hoping to receive all remaining draft chapters in advance of this date for review at the meeting. Our hope is to wrap-up primary development of the chapters soon, in order to meet our goal of releasing the new edition during the AAP's 2018 National Conference and Exhibition.

We very much appreciate your support and are hoping you can help us meet our publication timeline. Any chance you would be able to return your revisions by May 15?

Many thanks,

Paul

From: Spire, Paul
Sent: Thursday, March 16, 2017 3:17 PM
To: Newman, Nicholas (Nick) <Nicholas.Newman@cchmc.org>
Subject: RE: "Pesticides" Green Book chapter

No problem at all.
Thanks for the follow-up.
Best,
Paul

From: Newman, Nicholas (Nick) [mailto:Nicholas.Newman@cchmc.org]
Sent: Thursday, March 16, 2017 1:38 PM
To: Spire, Paul <PSpire@aap.org>
Subject: Re: "Pesticides" Green Book chapter

Paul,

I'm sorry, this is taking longer than I thought. Could I have another 10 days?

Nick

Nicholas C. Newman, D.O., M.S., FAAP

Assistant Professor, Pediatrics & Environmental Health

University of Cincinnati College of Medicine

Director, Pediatric Environmental Health and Lead Clinic

Cincinnati Children's Hospital Medical Center

3333 Burnet Ave, MLC 7035

Cincinnati, OH 45229

From: Spire, Paul <PSpire@aap.org>
Sent: Wednesday, March 1, 2017 10:03 AM
To: Newman, Nicholas (Nick)
Subject: RE: "Pesticides" Green Book chapter

No problem. Thanks for checking-in and thanks for your efforts.

Best,

Paul

From: Newman, Nicholas (Nick) [mailto:Nicholas.Newman@cchmc.org]
Sent: Tuesday, February 28, 2017 8:31 PM
To: Spire, Paul <PSpire@aap.org>
Subject: Re: "Pesticides" Green Book chapter

Paul,

I'm working on the pesticides chapter, but I'm writing to you to get a 2 week extension. Would that be possible?

Thanks,

Nick

From: Paul Spire <PSpire@aap.org>
Date: Thursday, January 19, 2017 at 11:48 AM
To: Nicholas Newman <Nicholas.Newman@cchmc.org>
Cc: "Etzel, Ruth" <etzel.ruth@epa.gov>, "jlowry@cmh.edu" <jlowry@cmh.edu>
Subject: RE: "Pesticides" Green Book chapter

Hi Nick.

This was the chapter that appeared in the 3rd edition Green Book, which was published/copyrighted in 2012. The chapter was likely worked on 12 - 18 months before publication, so somewhere in the 2010/2011 timeframe.

Best,

Paul

From: Newman, Nicholas (Nick) [mailto:Nicholas.Newman@cchmc.org]
Sent: Tuesday, January 17, 2017 10:18 AM
To: Spire, Paul <PSpire@aap.org>
Cc: Etzel, Ruth <etzel.ruth@epa.gov>; Jennifer Lowry <jlowry@cmh.edu>
Subject: Re: "Pesticides" Green Book chapter

Paul,

I'm happy to work on it. Two months sounds reasonable. When was this version created?

Thanks,

Nick

From: Paul Spire <PSpire@aap.org>
Date: Tuesday, January 3, 2017 at 4:12 PM
To: Nicholas Newman <Nicholas.Newman@cchmc.org>
Cc: "Etzel, Ruth" <etzel.ruth@epa.gov>, "jlowry@cmh.edu" <jlowry@cmh.edu>
Subject: "Pesticides" Green Book chapter

Dear Dr. Newman,

With apologies for the delay in responding, we very much appreciate your willingness to contribute to the next edition of "Pediatric Environmental Health" manual. I am writing on behalf of Drs. Etzel and Lowry to request your assistance by leading the revision of the "Pesticides" chapter.

A copy of the previous, 3rd edition version of the chapter is attached in Word format to serve as a starting point for revision. The "track changes" feature has been enabled, and if you are comfortable doing so, it would be preferred that you update the document using this feature.

Do you think a 2-month timeframe would be do-able (ie, returned by March 3)? Please let us know what you think.

Thank you again for your support. If you have any questions or need anything more, please do not hesitate to let us know.

Best regards,

Paul

Paul Spire
Manager, Division of Technical & Medical Services
American Academy of Pediatrics

phone: Ex. 6
email: pspire@aap.org

From: Newman, Nicholas (Nick) [mailto:Nicholas.Newman@cchmc.org]
Sent: Friday, October 21, 2016 5:25 PM
To: Spire, Paul <PSpire@aap.org>
Subject: Re: COEH ListServ - seeking member volunteers to assist in revision of 4 Green Book chapters - response by Nov 2

Paul,

I'm interested in working on this project. I could work on any of the chapters, but I'm best suited to "Children's Unique Vulnerabilities to Environmental Hazards" and "Pesticides"

Thanks,

Nick

Nicholas Newman, DO, MS, FAAP

Assistant Professor of Pediatrics and Environmental Health

University of Cincinnati College of Medicine

Director, Environmental Health and Lead Clinic

Site Director, Pediatric Environmental Health Specialty Unit

Cincinnati Children's Hospital Medical Center

Cincinnati, OH 45229

From: COEH <COEH@LISTSERV.AAP.ORG> on behalf of Paul Spire <PSpire@AAP.ORG>
Date: Wednesday, October 19, 2016 at 5:20 PM
To: "COEH@LISTSERV.AAP.ORG" <COEH@LISTSERV.AAP.ORG>
Subject: COEH ListServ - seeking member volunteers to assist in revision of 4 Green Book chapters - response by Nov 2

Dear COEH Member,

The COEH Executive Committee, working in collaboration with Editor Dr. Ruth Etzel and Associate Editor Dr. Sophie Balk, are in the process of developing the next edition of the AAP's landmark ***Pediatric Environmental Health*** manual (commonly referred to as "The Green Book"). Hopefully you are familiar with the Green Book, but for those who are not, it is the AAP policy manual on the identification, prevention, and treatment of pediatric environmental health problems. Additional information here: http://shop.aap.org/Pediatric-Environmental-Health-3rd-Edition-Paperback

Revision of most of the previous, 3rd edition chapters are underway. At this time, however, we are seeking COEH member volunteers to lead revision of the following 4 chapters:

- Children's Unique Vulnerabilities to Environmental Hazards
- Food Safety
- Pesticides
- Birth Defects and Other Adverse Developmental Outcomes

Please note that these 4 chapters exist in the current 3rd edition, so this is a revision process, not a matter of creating something new from scratch. The key objectives of the revision are to ensure that the information, guidance, references, and resources are up-to-date. Authors will be provided the previous edition text in Word format as a starting point; the updated chapter would be requested by the end of January 2017.

If you might be interested and able to help support the revision of this important publication, please respond within 2 weeks, by Wednesday, Nov 2. Please indicate which chapter you are interested in revising and provide a short statement of your interest and background in this topic area.

If you have any questions or need any additional information, please do not hesitate to let me know.

Many thanks for
considering,

Paul

Paul Spire
Manager, Division of Technical & Medical Services
American Academy of Pediatrics

phone: Ex. 6
email: pspire@aap.org

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Message

From: Sophie Balk [SBALK@montefiore.org]
Sent: 12/20/2017 10:57:22 PM
To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Lowry, Jennifer [jlowry@cmh.edu]
CC: Spire, Paul [PSpire@aap.org]; Sophie Balk [SBALK@montefiore.org]
Subject: Re: Green Book - Endocrine Disrupting Chemicals chapter - editor review
Attachments: 29 - Endocrine Disrupting - editor review sjb122017.docx; 29 - Endocrine Disrupting - editor review sjb122017 CLEAN.docx

Ruth and Paul,
Please see attached in marked up and clean versions - changes made for readability and to clarify certain things.
Paul, both of Maida's versions you sent appeared the same to me. I worked from one of them.
Ruth, in FAQ's, Maida added some fact sheets - this is not what we have done in other chapters. Please let me know what you would like to do with them.

Thanks, please comment on changes. if needed.

Thanks,
Sophie

Sophie J Balk MD
Attending Pediatrician
Children's Hospital at Montefiore
Professor of Pediatrics
Albert Einstein College of Medicine
Ex. 6
718 405-8091 (fax)

From: Etzel, Ruth <Etzel.Ruth@epa.gov>
Sent: Tuesday, December 19, 2017 7:44 PM
To: Sophie Balk
Cc: Spire, Paul
Subject: Re: Green Book - Endocrine Disrupting Chemicals chapter - editor review

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Hi Sophie,

That would be terrific! Thank you.

Best,

Ruth

On Dec 19, 2017, at 6:38 PM, Sophie Balk <SBALK@montefiore.org> wrote:

Ruth,
OK with you if I review within the next couple of days and get this back to you with any edits and comments?

Sophie

Sophie J Balk MD
Attending Pediatrician
Children's Hospital at Montefiore
Professor of Clinical Pediatrics
Albert Einstein College of Medicine
Ex. 6
718 405-8091 (fax)

From: Spire, Paul <PSpire@aap.org>
Sent: Tuesday, December 19, 2017 6:15:20 PM
To: Etzel, Ruth; Sophie Balk
Subject: Green Book - Endocrine Disrupting Chemicals chapter - editor review

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Dear Ruth and Sophie,

I am writing to convey the attached "Endocrine Disrupting Chemicals" chapter for editor review. Maida Galvez and Michele La Merrill were the lead authors for this chapter.

Ari Bernstein served as the primary reviewer. The COEH review comments were conveyed to Drs. Galvez and La Merrill embedded in the document as track changes and comments.

Please note that Maida returned a clean draft, which is attached. I have also used Word's "compare documents" feature to create a version that shows Maida and Michelle's last round of edits in track changes, so you can see what they've updated. I've also attached a document labeled "Ari's comments," which shows Ari's comments and the earlier track changes history of this document.

The next step for this chapter will be stakeholder review. We will need to distribute "clean" chapters for review, so at this point we will need to "accept" track changes. I would be happy to do this, or feel free to return a clean chapter to me.

Many thanks,

Paul

From: Galvez, Maida [mailto:maida.galvez@mssm.edu]
Sent: Tuesday, December 19, 2017 4:32 PM
To: Spire, Paul <PSpire@aap.org>
Cc: Etzel, Ruth <etzel.ruth@epa.gov>; Balk, Sophie <sbalk@montefiore.org>; Jennifer Lowry <jlowry@cmh.edu>; 'Michele Andrea La Merrill' <mlamerrill@ucdavis.edu>
Subject: RE: Green Book - Endocrine Disrupting Chemicals chapter - response requested by December 15

Hello all,

Sincere thanks for the COEH's careful review (and your collective patience!).

I addressed all the comments, amended the FAQs and added a ref to BPA analogs as requested.

Please see attached revision.

Cheers,

Maida and Michele

From: Spire, Paul [mailto:PSpire@aap.org]
Sent: Friday, November 17, 2017 5:04 PM
To: Galvez, Maida
Cc: Etzel, Ruth; Balk, Sophie; Jennifer Lowry
Subject: Green Book - Endocrine Disrupting Chemicals chapter - response requested by December 15

Dear Dr. Galvez,

I am writing on behalf of the Green Book editorial team to follow-up on the development of the "Endocrine Disrupting Chemicals" chapter for the *Pediatric Environmental Health, 4th Edition* manual (Green Book).

Attached please find a copy of the draft chapter as it was reviewed by the AAP's Council on Environmental Health (COEH), with comments from the committee embedded in the document in track changes. We are requesting that you review these comments and adjust the chapter to address these issues. If there are any items that you will not be addressing or that you disagree with, it would be helpful to receive a short explanation of these issues for the committee's consideration.

We also wanted to share one new request and additional guidance that has emerged as this project has progressed:

- Please write 3 - 5 bullet points for your chapter that summarize key issues and take-home messages. (A temple space for this has been added to the chapter.) These are being added at the start of each chapter.
- Please pay special attention to providing citations wherever it would be appropriate to do so, ensuring that all sources are cited and acknowledged.

- If you are using information from another AAP policy statement (or other Academy document), please modify the content so that it is not worded exactly like the existing policy document.
- Please continue to make all adjustments utilizing Word's "Track Changes" feature.

We are hoping to receive all updated chapters within one month, by Friday, December 15.

Thanks again for your ongoing support. If you have any questions or need anything more, please do not hesitate to let me know.

Many thanks,

Paul

Message

From: Ex. 6 - R. Etzel personal email
Sent: 3/28/2015 5:32:24 PM
To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]
Subject: paper
Attachments: ijerph-11-04449.pdf

http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4025008/pdf/ijerph-11-04449.pdf

Int. J. Environ. Res. Public Health **2014**, *11*, 4449-4527; doi:10.3390/ijerph110404449

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Review

Non-Hodgkin Lymphoma and Occupational Exposure to Agricultural Pesticide Chemical Groups and Active Ingredients: A Systematic Review and Meta-Analysis

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Received: 12 February 2014; in revised form: 31 March 2014 / Accepted: 1 April 2014 / Published: 23 April 2014

Abstract: This paper describes results from a systematic review and a series of meta-analyses of nearly three decades worth of epidemiologic research on the relationship between non-Hodgkin lymphoma (NHL) and occupational exposure to agricultural pesticide active ingredients and chemical groups. Estimates of associations of NHL with 21 pesticide chemical groups and 80 active ingredients were extracted from 44 papers, all of which reported results from analyses of studies conducted in high-income countries. Random effects meta-analyses showed that phenoxy herbicides, carbamate insecticides, organophosphorus insecticides and the active ingredient lindane, an organochlorine insecticide, were positively associated with NHL. In a handful of papers, associations between pesticides and NHL subtypes were reported; B cell lymphoma was positively associated with phenoxy herbicides and the organophosphorus herbicide glyphosate. Diffuse large B-cell lymphoma was positively associated with phenoxy herbicide exposure. Despite compelling evidence that NHL is associated with certain chemicals, this review indicates the need for investigations of a larger variety of pesticides in more geographic areas, especially in low- and middle-income countries, which, despite producing a large portion of the world's agriculture, were missing in the literature that were reviewed.

Keywords: pesticides; insecticides; herbicides; fungicides; lymphoma; non-Hodgkin; occupational; agricultural

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1. Introduction

Striking increases in the incidence of non-Hodgkin lymphoma (NHL) cancer have occurred in the last 30 years [1,2], and interest in identifying environmental and occupational exposures associated with this cancer has accompanied this trend. Several environmental exposures have been proposed and investigated as potentially important—pesticides, dioxins, solvents, oils, and viruses, among others [3,4]. Farmers experience low overall mortality but high rates of some cancers; this suggests that some or several agricultural exposures may be key determinants [5,6]. Indeed, positive associations between NHL and farm related exposures, including pesticides, fertilizers, chemicals, animals, viruses, and endotoxin, have been observed previously [3,5,7]. However, the wide variety of chemical and microbial exposures that occur simultaneously in agricultural production makes disentangling the effects of these factors challenging. Of the many exposures experienced in farm settings, pesticides have drawn particular attention, especially since the increased incidence of NHL in the mid- to late-1900s followed widespread use of synthetic organic pesticides [4]. Also, several epidemiologic studies have reported positive associations between NHL and pesticide exposure in occupational manufacturing settings [8,9].

The United States Environmental Protection Agency defines pesticides as substances intended to prevent, destroy, repel, or mitigate a pest [10]. Within this broad category, pesticides are often grouped according to the type of pests that they control; for example, fungicides are used to kill fungi, insecticides to kill insects, and herbicides to kill weeds and plants. In addition to function, pesticides vary in terms of structure, and they are sometimes grouped according to chemical relationships. Furthermore, applicators often use a variety of pesticides simultaneously. These characteristics make designing and conducting epidemiologic studies of their health effects both challenging and expensive.

Because pesticides are thought to have different toxicologic and immunologic effects, identifying the chemicals and chemical groups that are most dangerous to humans and non-target living organisms is important [11]. From a research perspective, the decision about what chemicals to investigate has implications for disease prevention, and it impacts the information that is available to policy makers and the public.

These challenges and needs motivated us to systematically review the published epidemiologic literature of relationships of NHL with occupational exposures to agricultural pesticide chemical groups and active ingredients. The primary objectives of this paper were to investigate the depth of the literature on the relationship between specific pesticide chemicals and NHL, to identify gaps in this area of research, and to elucidate pesticide chemical groups and active ingredients that have shown particularly strong relationships with NHL. To help us to achieve these objectives, we conducted a series of meta-analyses of associations of individual pesticide chemicals with NHL.

2. Methods

2.1. Article Identification

We performed a search of literature on associations between occupational pesticide exposure and NHL. We restricted our search to articles published since 1980. This time period is consistent with that used in previous meta-analyses of farming exposures [5], and it captured the epidemiologic literature

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that has not been reviewed by early IARC monograph evaluations of pesticides [12]. The search used combinations of the following words: occupational exposure, pesticides, insecticides, herbicides, fungicides, neoplasms, cancer, lymphomas, non-Hodgkin lymphoma, cancer mortality, agricultural workers' diseases/chemically induced, and humans. We entered combinations of these terms into PubMed and Web of Science. Details of the search are given in Supplementary file S1.

2.2. Article Selection

To identify eligible studies, we reviewed the titles and abstracts of papers. When it was unclear from the abstract and title whether the paper fit these criteria, the full text of the paper was reviewed. We included estimates from papers with the following characteristics:

(1) Written and published in English;
(2) Reported results of analyses of case control or cohort epidemiology studies;
(3) Reported results of studies that used interviews, questionnaires, and/or exposure matrices to assess exposure;
(4) Reported associations of NHL with occupational, agricultural pesticide exposures;
(5) Reported quantitative associations of NHL overall and/or NHL subtypes with specific individual active ingredients or chemical groups.

We excluded papers with the following characteristics:

(1) Written in a language other than English;
(2) Did not report on associations with NHL;
(3) Were a commentary, letter to the editor, or monograph;
(4) Did not report associations with individual pesticide active ingredients or chemical groups; we excluded papers that reported associations with only the broadly defined categories of pesticide, insecticide, herbicide, or fungicide;
(5) Reported results of analyses of ecologic studies;
(6) Reported results of analyses of data from studies that were not case control or cohort in design;
(7) The exposure definition/classification was ambiguous;
(8) The exposure route was not occupational;
(9) The exposure route was not agricultural;
(10) Reported only associations within unique subpopulations (e.g., HIV positive patients);
(11) Reported analyses of manufacturing cohorts;
(12) Reported associations with NHL as a second primary;
(13) Reported results of studies in which exposure was assessed using biological markers.

2.3. Data Extraction

We extracted the following information from the full text of each eligible paper:

- author;
- publication year;
- study location;

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- study design (case-control or cohort);
- source population for the controls in case-control studies;
- whether case-control studies were matched, and if so, the matching factors;
- diagnosis period if a case-control study or cancer follow-up period if a cohort study;
- number of cohort participants or number of cases and controls;
- cancer definition or ICD codes used to identify the cancers;
- method of assessing exposure;
- exposure metrics and definitions;
- referent categories used in the analysis;
- active ingredient(s) and/or chemical group(s) studied;
- covariates entered into the model to adjust for confounding;
- type of effect estimate reported;
- number of exposed participants;
- effect estimates and confidence interval limits; and
- gender restrictions, if any.

We also identified papers that were related to each other (e.g., pooled analyses that used data that were analyzed and reported on previously, papers that reported on different analyses from the same study, studies that were follow up analyses of the same population). In cases of related papers, we used a specific set of rules to decide which effect estimate to report and use in the meta-analyses; this rule is described in Section 2.5.

2.4. Chemical Group Classification

We reported results for all chemical groups for which there was information from the available literature. We did not consider exposures to chlorophenols in this paper, since much of the exposure to this chemical group comes from non-agricultural settings. We classified pesticide active ingredients into chemical groups based on Alan Wood's classification system [13].

2.5. Reporting of Results for the Systematic Review

From every relevant paper, we extracted an effect estimate for each active ingredient and/or chemical group. We extracted results for associations with NHL, and when available, for associations with subtypes of NHL.

We used the following algorithm to determine which effect estimates to use:

(1) For related papers that examined the same exposure/outcome association, we used the results from the most complete and updated analysis with the greatest number of participants;
(2) If more than one exposure definition was considered and reported, we used the definition that best represented agricultural exposures (e.g., we selected results for farmers who worked with phenoxy herbicides, instead of results for herbicide applicators, gardeners, or landscapers);
(3) The various papers used different confounder adjustment sets, which were selected based on different criteria. In an effort to use the most unbiased estimate, we extracted the most adjusted effect estimate;

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(4) Most papers defined exposure dichotomously. Papers that reported results according to more than two categories used a variety of definitions for the exposure metrics, including duration of use, days/year of use, time since first exposure, and cumulative days of exposure. Because the definitions and metrics used to define categories varied, it was not possible to combine estimates based on multiple categories of exposure in formal meta-analyses. Therefore, for the meta-analyses, we used the result for the dichotomously defined exposure with the greatest number of exposed cases. To assess dose-response relationships, we qualitatively examined results in association with multiple categories;

(5) Some papers only reported results in association with multiple categories of exposure. We extracted these results for the systematic review, since they can be used to qualitatively evaluate trends in association of NHL with active ingredient or chemical group and are important for identifying dose-response relationships;

(6) Some studies only reported estimates of association between pesticide exposures and subtypes of NHL. We abstracted these estimates for presentation and analysis of association of pesticide exposures with NHL subtypes.

We present results from the systematic review sorted by chemical group and, within chemical group, by active ingredient.

2.6. Meta Analysis

2.6.1. Grouping

When possible, we conducted separate meta-analyses for each chemical group and active ingredient. We conducted meta-analyses for associations of these pesticides with NHL and NHL subtypes. Although we abstracted results according to dichotomous exposure and multiple levels of exposure, we conducted formal meta-analyses for dichotomously categorized exposures only.

2.6.2. Analytic Methods

Because we identified a variety of sources of heterogeneity between papers, we decided a priori to calculate meta- risk ratio (RR) estimates and 95% confidence intervals (CIs) using random effect models, allowing between study heterogeneity to contribute to the variance [14,15]. We report I^2 values, which represent the percentage of the total variance explained by study heterogeneity and measure inconsistency in results. Larger I^2 values indicate greater inconsistency [15]. We did not perform formal heterogeneity tests; Cochran's Q statistic has been shown to have low power to detect true heterogeneity across studies, especially in meta-analyses that include a small number of papers [15]. Following recommendations for meta-analyses of observational studies, we also identified possible sources of heterogeneity and used sensitivity analyses to evaluate these, as described in Section 2.6.3 [16]. We evaluate the meta- estimates of association based on the magnitude of the point estimate and interpret the associated 95% CIs as indicators of precision. To aid this interpretation, we have calculated and reported confidence limit ratios (CLRs), which are the ratio of the upper to the lower CI limit [17]. We also present forest plots for meta-analyses to which five or more papers contributed.

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2.6.3. Sensitivity Analysis

We conducted sensitivity analyses to evaluate robustness of our results to the following sources of heterogeneity: study design (case-control versus cohort), gender (male only versus both genders), geographic area, decade of cancer diagnosis, and source of the controls in case-control studies (population-based versus hospital).

One paper presented results of analyses of women only [18]. Thus, we were not able to conduct a sensitivity analysis for analyses of women; we were able to conduct sensitivity analyses using papers that reported results for men and for men and women. Only two papers reported estimates of association from studies in which controls were drawn from hospitals, and these two studies reported associations of NHL with different pesticides. Therefore, our sensitivity analysis of the control source in case-control studies was restricted to controls drawn from the population. Data from only one cohort study contributed to our meta-analyses. Therefore, we could not restrict meta-analyses to cohort studies only.

The geographic areas that we investigated separately in sensitivity analyses were North America, the United States, Europe, and Sweden. We selected these because there was more than one study within each area that investigated associations of NHL with a particular pesticide. In addition to maintaining Sweden and the United States in sensitivity analyses of Europe and North America, respectively, we analyzed results from Sweden separately from the rest of Europe, and results from the United States separately from Canada. We conducted these separate analyses because more than one paper reported effect estimates of association with a pesticide from each of these countries, and because we believed effects might be different when separated from the rest of the continent. Although we identified papers from Australia and New Zealand we were not able to analyze these separately because there was not more than one effect estimate of association with an individual pesticide from either country.

We investigated the following diagnosis periods: 1975–1989, 1990–1999, and year 2000 and later. If any part of the diagnosis period overlapped these periods, we included the estimate from the paper in the sensitivity analysis. We selected these periods based on the periods that appeared in the papers that we reviewed and on the different editions of the ICD coding systems [1].

After performing meta-analyses for each active ingredient or chemical group, we repeated analyses, removing studies that differed from the others based on the above-described characteristics. In cases when results from individual studies were also represented in papers that analyzed these data pooled with data from other studies, we performed sensitivity analyses by replacing the results from the pooled analyses with the individual studies, or the individual studies with the results from the pooled analyses.

3. Results

3.1. Systematic Review

The PubMed and Web of Science searches yielded 858 unique articles (Figure 1). After screening the abstracts and titles, we excluded 737 articles. Of the remaining 121 articles, 47 were excluded because they reported results within a non-agricultural population. We decided to exclude non-agricultural populations because the nature of exposure they receive is different compared to agricultural groups. Because of contamination and production of multiple chemicals simultaneously, it is difficult to determine the exact chemical to which manufacturing cohort participants have been exposed.

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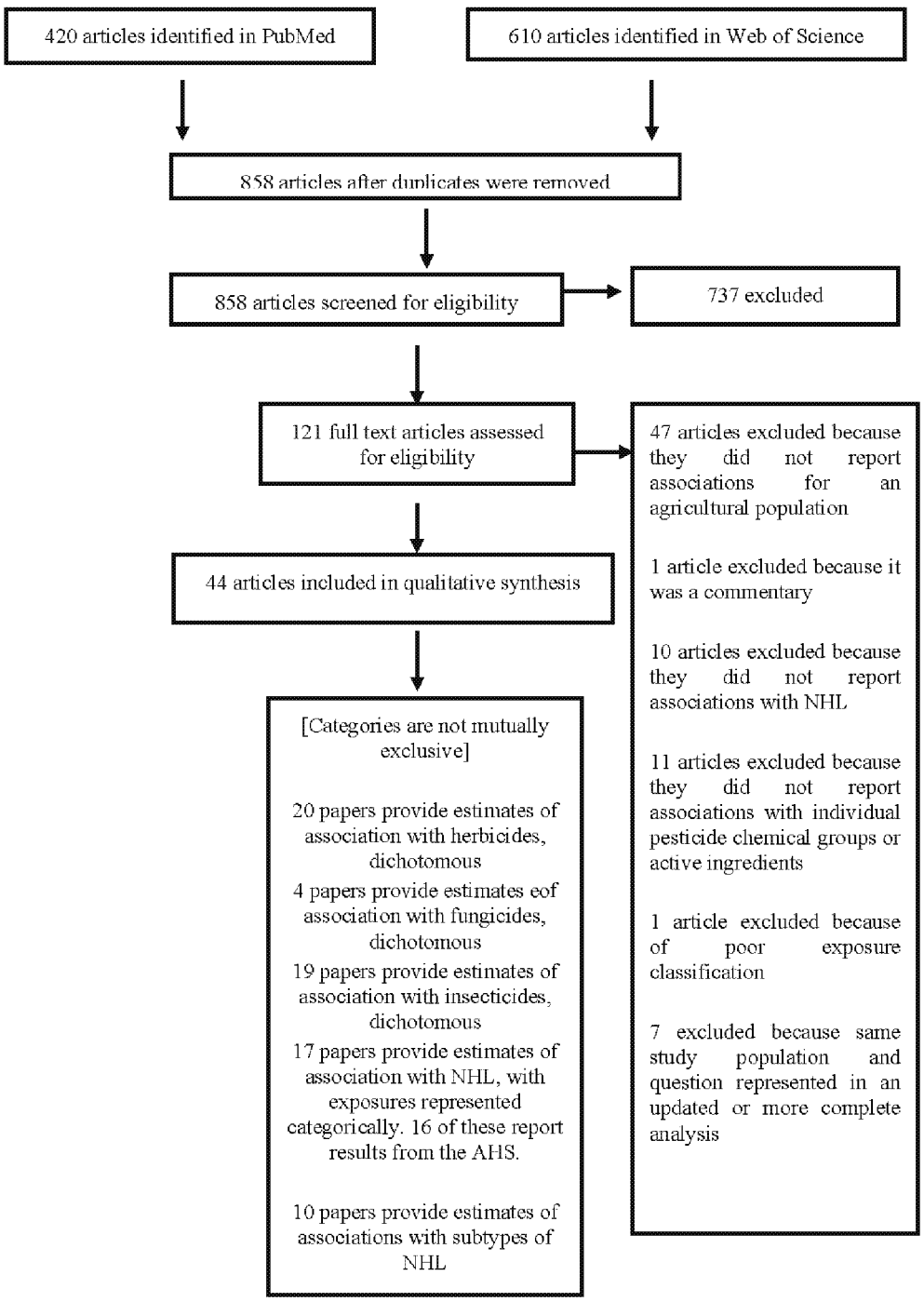
Figure 1. Flow chart showing the articles that were included and excluded in the systematic review, with reasons for the exclusions.



After excluding 27 additional articles because they did not meet one or more of the inclusion criteria described in the methods section, we included 44 papers in our qualitative synthesis. Of these, 20 papers provided estimates of association with herbicide chemical groups or active ingredients, four papers provided estimates of association with fungicides, and 17 with insecticides.

3.2. Summary of Studies from Which Estimates were Extracted

A summary of the 44 papers from which effect estimates were abstracted is presented in Table 1.

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Table 1. Summary of papers from which effect estimates were extracted.

Author, year, location	Design	Source for controls	Matching	Diagnosis or follow-up period (cancer)	No. Participants	Exposure assessment	Referent category for exposure, exposure definition(s)/metric	Men only	Adjustment set	Pesticides	Reported results by subtype
Barry 2012 [19] Iowa and North Carolina, USA	C (AHS)	NA	NA	1993–2007	53,588	Self-administered questionnaire completed during enrollment and interviewer administered follow-up questionnaire	Referent: No exposure Intensity weighted lifetime exposure days, 15 year lag Intensity weighted lifetime exposure days, no lag	No	Age, gender, race, state of residence, applicator type, enrollment year, cigarette smoking, alcohol consumption, education, family history of cancer, 5 most correlated pesticides	Methyl bromide	No
Baris 1998 [20] Iowa, Kansas, Minnesota, Nebraska, USA	Pooled analysis of 3 CC studies	Population	Matched by race, gender, age, and vital status at the time of interview, year of death for controls matched to deceased cases	Dx period [1]: 1979–1983	993 cases/2,918 controls	Telephone interviews (Kansas and Nebraska, USA), In-person interviews (Iowa and Minnesota)	Referent: Non-farmers Used *vs.* did not use on crops and animals , Used *vs.* did not use on crops, Used *vs* did not use on animals Duration of use, in years (1-4, 5-9, ≥10) Days/year of use (≤5, >5)	Yes	Age, state of residence	DDT	Yes
Beane Freeman 2005 [21] Iowa and North Carolina, USA	C (AHS)	NA	NA	1993–2007	23,106	Two self-administered questionnaires	Referent: No exposure Lifetime exposure days Intensity weighted exposure days	Yes	Age, smoking, education, family history of cancer, state of residence, total days of any pesticide application	Diazinon	No
Beane Freeman 2011 [22] Iowa and North Carolina, USA	C (AHS)	NA	NA	1993–2007	36,357	A self-administered questionnaire	Referent 1: No exposure Referent 2: Lowest quartile of exposure Lifetime days of exposure Intensity weighted lifetime days of exposure	No	Age, state, license type, gender, smoking status, alcohol consumption, education, use of most highly correlated pesticides	Atrazine	Yes

Table 1. *Cont.*

Author, year, location	Design	Source for controls	Matching	Diagnosis or follow-up period (cancer)	No. Participants	Exposure assessment	Referent category for exposure, exposure definition(s)/metric	Men only	Adjustment set	Pesticides	Reported results by subtype
Blair 1998 [23] Iowa, Kansas, Minnesota, Nebraska, USA	CC	Population	Matched by race, gender, age, vital status at the time of interview	Dx period [1]: 1979–1983	987 cases/2,895 controls	Telephone interviews (Kansas and Nebraska, USA), In-person interviews (Iowa and Minnesota)	Referent: nonfarmer Farmers who ever used Days/year of use (≤4 days, ≥5 days) First lindane use (≥20 years ago, <20 years ago)	Yes	Age, proxy/direct interview, state of residence	Lindane	Yes
Bonner 2010 [24] Iowa and North Carolina, USA	C (AHS)	NA	NA	1993–2005	44,624	Self-administered questionnaires	Referent 1: Nonexposed Referent 2: Lowest tertile of exposure Intensity weighted lifetime exposure days	No	Age, gender, education, family history of cancer, smoking, alcohol, year of enrollment, state of residence, correlated pesticides	Terbufos	No
Bonner 2005 [25] Iowa and North Carolina, USA	C (AHS)	NA	NA	1993–2001	49,877	Self-administered questionnaire	Referent 1: Nonexposed Referent 2: Lowest tertile of exposure Lifetime exposure days Intensity weighted lifetime exposure days	No	Age, gender, education, family history of cancer, smoking, alcohol, year of enrollment, state of residence, exposure to correlated pesticides	Carbofuran	No
Bonner 2007 [26] Iowa and North Carolina, USA	C (AHS)	NA	NA	1993–2002	19,717	Self-administered questionnaire	Referent 1: Nonexposed Referent 2: Lowest tertile of exposure Lifetime exposure days, Intensity weighted lifetime exposure days	No	Age, gender, smoking, alcohol, education, family history of cancer, year of enrollment, state of residence	Malathion	No

Table 1. *Cont.*

Author, year, location	Design	Source for controls	Matching	Diagnosis or follow-up period (cancer)	No. Participants	Exposure assessment	Referent category for exposure, exposure definition(s)/metric	Men only	Adjustment set	Pesticides	Reported results by subtype
Cantor 1992 [27] Iowa and Minnesota, USA	CC	Population	Matched by 5-year age group, vital status at time of interview, and state of residence	Dx period [1]: 1979–1983	622 cases/1,245 controls	In-person interviews	Referent: Non-farmers Ever handled, Handled prior to 1965 Handled without protective equipment	Yes	Age, vital status, state, cigarette smoking, family history of lymphohematapoeitic cancer, high risk occupations, high risk exposures	2,4-D, 2,4,5-T, alachlor, atrazine, aldrin, bentazon, butylate, carbofuran, carbaryl, chlordane, chloramben, copper acetoarsenate, cyanazine, coumaphos, diazinon, dicamba, dichlorvos, DDT, famphur, Flyspray, fonofos, glyphosate, heptachlor, lindane, malathion, methoxychlor, metribuzen, nicotine, phorate, popachlor, rotenone, toxaphene, trifluralin, turbufos,	No
Cocco 2013 [28] Multicentre; Czech Republic, France, Germany, Italy, Ireland, Spain	CC	Population (German and Italian centers), Hospital (Czech Republic, French, Irish, Spanish centers)	Matched by gender, 5-year age group, and residence area	1998–2004	2,348 cases/2,462 controls	Structured in-person interviews conducted by trained interviewers, jobs were coded by industrial hygienists; industrial hygienists and occupational experts reviewed the questionnaires and job modules to assess exposures to pesticides (with the help of a crop exposure matrix)	Referent: Never exposed Ever exposed, by level of industrial hygienists's degree of confidence that the participant was truly exposed to the agent: Any level of confidence High confidence	No	Age, gender, education, study center	Carbamates, OPs, OC, Triazines and triazoles, phenoxy acids, chlorophenols, mancozeb, methomyl, dimethoate, glyphosate, DDT, endosulfan, 2,4-D, MCPA	Only reported for subtypes
Delancey 2009 [29] Iowa and North Carolina, USA	C (AHS)	NA	NA	1993–2004	23,072	Two self-administered questionnaires	Referent: Lowest tertile of exposure Lifetime exposure days Intensity weighted lifetime exposure days	Yes	Age, smoking, alcohol consumption, education, family history of cancer, state of residence, exposure to all pesticides	Metribuzin	No

Table 1. *Cont.*

Author, year, location	Design	Source for controls	Matching	Diagnosis or follow-up period (cancer)	No. Participants	Exposure assessment	Referent category for exposure, exposure definition(s)/metric	Men only	Adjustment set	Pesticides	Reported results by subtype
de Roos 2003 [30] Iowa, Kansas, Minnesota, Nebraska, USA	CC	Population	Matched by race, gender, age, vital status at the time of interview	Dx period [1]: 1979–1983	650 cases/1,933 controls	Telephone interviews (Kansas and Nebraska, USA), In-person interviews (Iowa and Minnesota)	Referent: Not exposed Exposed	Yes	Age, study site, use of all other pesticides	Aldrin, bufencarb, carbaryl, carbofuran, chlordane, copper acetoarsenite, coumaphos, DDT, diazinon, dichlorvos, dieldrin, dimethoate, ethoprop, famphur, fly/tick/lice spray, fonofos, heptachlor, lead arsenate, lindane, malathion, methoxychlor, nicotine, phorate, pyrethrins, rotenone, tetrachlorvinphos, toxaphene, terbufos, alachlor, atrazine, bentazon, butylate, chloramben, cyanazine, 2,4-D, dicamba, EPTC, glyphosate, linuron, MCPA, metolachlor, metribuzin, paraquat, propachlor, sodium chlorate, 2,4,5-T, trifluralin	No
de Roos 2005 [31] Iowa and North Carolina, USA	C (AHS)	NA	NA	1993–2001	54,315	Self-administered questionnaire	Referent 1: Never used Referent 2: Lowest tertile of exposure Ever used Cumulative exposure days Intensity weighted exposure days	No	Age at enrollment, education, cigarette smoking, alcohol consumption, family history of cancer, state of residence, other pesticides	Glyphosate	No
Eriksson 2008 [32] Sweden	CC	Population	Matched in 10 year age and gender groups to mirror the age and gender distribution of the cases	Dx period: 1999–2002	1,163 cases/1,016 controls	Telephone interview on life style factors and diseases; Self-administered questionnaire on work history and chemical exposures; follow up telephone interviews to collect incomplete data	Referent: Never exposed Ever exposed, Days of exposure (categorized at the median of the exposure distribution),	No	Age, gender, year of Dx/enrollment	Phenoxyacetic acids, MCPA, 2,4,5-T and/or 2,4-D, glyphosate	Yes

Table 1. *Cont.*

Author, year, location	Design	Source for controls	Matching	Diagnosis or follow-up period (cancer)	No. Participants	Exposure assessment	Referent category for exposure, exposure definition(s)/metric	Men only	Adjustment set	Pesticides	Reported results by subtype
Hardell 2002 [33] Sweden	CC, pooled analysis of two studies, one of hairy cell lymphoma and one of NHL	Population	Matched by age and county	Dx period: 1987–1990 (NHL); 1987–1992 (hair cell lymphoma)	515 cases/1,141 controls	Self-administered questionnai-re supplement-ed by telephone interviews by a trained interviewer when information was unclear	Referent 1: Not exposed Ever exposure, High exposure (>median number of days for exposed participants) Low exposure (<median number of days for exposed participants) Years between first exposure and diagnosis: Referent 2: 1-10years, >10-20 years, >20-30 years, >30 years Years between last exposure and diagnosis: Referent 3: 1-10 years, >10-20 years, >20-30 years, >30 years Decade of exposure	Yes	Study, study area, vital status, age	Phenoxy acids, MCPA, 2,4-D + 2,4,5-T, glyphosate, DDT, mercurial seed dressing, pyrethrins, arsenic	No
Hoar 1986 [34] Kansas, USA	CC	Population	Matched by age and vital status	Dx period: 1976–1982	170 cases of NHL/948 controls (no. included in NHL analysis unclear)	Telephone interviews, with questions on years living/ working on a farm, and herbicides/insecticides used.	Referent: Non-farmers Ever use, Duration of use (years), Frequency of use (days/year), First year of use	Yes	Age	Phenoxyacetic acids, Triazine herbicides, Amide herbicides, Benzoic herbicides, Carbamate herbicides, Trifluralin herbicides, Uracil herbicides	No

Table 1. *Cont.*

Author, year, location	Design	Source for controls	Matching	Diagnosis or follow-up period (cancer)	No. Participants	Exposure assessment	Referent category for exposure, exposure definition(s)/metric	Men only	Adjustment set	Pesticides	Reported results by subtype
Kang 2008 [35] Iowa and North Carolina, USA	C (AHS)	NA	NA	1993–2002	50,127	Self-administered questionnai-res completed during enrollment and interviewer administered follow-up questionnaires	Referent 1: Nonexposed Referent 2: Lowest tertile of exposure Lifetime exposure days, Intensity weighted lifetime exposure days	No	Age at enrollment, education, cigarette smoking, alcohol consumption, family history of cancer, state of residence, top five most highly correlated pesticides	Trifluralin	No
Koutros 2009 [36] Iowa and North Carolina, USA	C (AHS)	NA	NA	1993–2004	49,398	Self-administered questionnaire	Referent: Nonexposed Intensity weighted lifetime exposure days	No	Age, year of enrollment, race	Imazethapyr	No
Koutros 2008 [37] Iowa and North Carolina, USA	C (AHS)	NA	NA	1993–2004	49,762	Self-administered questionnaire	NA	No	Not applicable, since an adjusted effect estimate for an association with NHL was not reported	Dichlorvos	No
Lee 2004 [38] Iowa and North Carolina, USA	C (AHS)	NA	NA	1993–2001	54,383	Self-administered questionnaire	Referent 1: Nonexposed Lifetime exposure days, Intensity weighted lifetime exposure days	No	Age, gender, alcohol consumption, smoking history, educational level, family history of cancer, year of enrollment, state of residence, use of 4 correlated pesticides	Chlorpyrifos	No
Lee 2004 [39] Iowa and North Carolina, USA	C (AHS)	NA	NA	1993–2000	49,980	Self-administered questionnaire	Referent 1: Nonexposed Exposed, Referent 2: Lowest quartile of exposure Lifetime exposure days, Intensity weighted lifetime exposure days	No	Age, sex, alcohol, smoking, education, family history of cancer, enrollment year, state of residence, 5 correlated pesticides	Alachlor	No

Table 1. *Cont.*

Author, year, location	Design	Source for controls	Matching	Diagnosis or follow-up period (cancer)	No. Participants	Exposure assessment	Referent category for exposure, exposure definition(s)/metric	Men only	Adjustment set	Pesticides	Reported results by subtype
Lynch 2009 [40] Iowa and North Carolina, USA	C (AHS)	NA	NA	1993–2004	19,655	Self-administered questionnaire	Referent 1: Nonexposed Referent 2: Lowest tertile of exposure Lifetime exposure days, Intensity weighted lifetime exposure days	No	Age at enrollment, gender, race, smoking status, education, family history of cancer, atrazine, 5 most correlated pesticides	Butylate	No
Lynch 2006 [41] Iowa and North Carolina, USA	C (AHS)	NA	NA	1993–2002	50,800	Self-administered questionnaire	Referent: Lowest tertile of exposure[1] Lifetime exposure days, Intensity weighted lifetime exposure days	No	Age, race, gender, alcohol consumption, smoking status, education level, family history of cancer, state of residence, 5 most correlated pesticides	Cyanazine	No
Mahajan 2007 [42] Iowa and North Carolina, USA	C (AHS)	NA	NA	1993–2003	21,416	Self-administered questionnai-re	Referent 1: Nonexposed Referent 2: Lowest tertile of exposure Lifetime exposure days, Intensity weighted lifetime exposure days	No	Age, smoking, gender, state of residence, use of 4 correlated pesticides	Carbaryl	No
McDuffie 2001 [43] Six Canadian provinces	CC	Population	Frequency matched by age and province of residence	Dx period: 1991–1994	517 cases/1,506 controls	Self-administered postal questionnai-re followed by telephone interview with participants who had 10 or more hours of pesticide use in lifetime plus a 15% random sample of those with fewer than 10 hours pesticide use	Referent: Not exposed Exposed, Frequency of exposure (days/year)	Yes	Age, providence of residence	2,4-D, mecoprop, MCPA, DiclofopmethylGlyphosate, phosphonic acids, phenoxy herbicides, thiocarbamates,diallate, dicamba, dinitroaniline, trifluralin, carbaryl, carbofuran, methomyl, carbamate insecticides, organochlorine insecticides, chlordane, lindane, aldrin, methoxychlor, DDT, Captan, vitavax, aldehyde, formaldehyde, mercury dust, mercury liquid, malathion, carbon tetrachloride	

Table 1. *Cont.*

Author, year, location	Design	Source for controls	Matching	Diagnosis or follow-up period (cancer)	No. Participants	Exposure assessment	Referent category for exposure, exposure definition(s)/metric	Men only	Adjustment set	Pesticides	Reported results by subtype
Miligi 2006 [44] Italy	CC	Population	Stratified by gender and 5-year age groups	Dx period: 1991–1993	1,145 cases/1,232 controls	In-person interviews, including questions on crops grown and whether pesticides were used combined with exposure matrix	Reference: Those who never worked in agriculture Overall exposure, Probability of use >low and lack of protective equipment	No	Age, gender, area	Phenoxy herbicides, 2,4-D, MCPA	No
Mills 2005 [45] California	CC	Same source as the cases (United Farm Workers of America cohort)	Matched by gender, hispanic ethnicity and +/− one year of birth	Dx period: 1988–2001	60 cases/300 controls	Work histories combined with exposure matrix	Reference: Low use High use	No	Age, gender, length of union affiliation, date of first union affiliation	Methyl bromide, diazinon, malathion, dichloro-propane, captan, simazine, chlrothalonil, mancozeb, methyl parathion, nitrofen, propyzamide, toxaphene, trifluralin, 2,4-D, maneb	No
Orsi 2009 [46] France	CC	Hospital	Matched by center, age +/− 3 year, gender	2000–2004	244 cases/436 controls	Self-administered questionnai-res, followed by face to face interviews with trained staff, and review of interviews by experts to verify logical consistency with pesticide product availability, geographic location, *etc.*	Reference: Nonexposed Exposed	No	Age, center, socioeconomic characteristic (white collar vs blue collar)	Organochlorine insecticides, organophosphorus insecticides, pyrethrin, carbamate fungicides, imide fungicides, triazole fungicides, phenoline herbicides, phenoxy herbicides, picoline herbicides, triazine herbicides, amide herbicides, urea herbicides, quaternary ammonium herbicides, glyphosate	Yes
Pahwa M 2012 [47] Six Canadian provinces	CC	Population	Frequency matched by age and province of residence	Dx period: 1991–1994	513 cases/ 506 controls	Self-administered postal questionnaire followed by telephone interview with participants who had 10 or more hours of pesticide use in lifetime plus a 15% random sample of those with fewer than 10 hours pesticide use	Reference: No use Use	Yes	Age, province of residence, respondent type (self or proxy), diesel oil exposure	OC insecticides, DDT, OP insecticides, malathion, phenoxy herbicides, MCPA, mecoprop, 2,4-D	No

Table 1. *Cont.*

Author, year, location	Design	Source for controls	Matching	Diagnosis or follow-up period (cancer)	No. Participants	Exposure assessment	Referent category for exposure, exposure definition(s)/metric	Men only	Adjustment set	Pesticides	Reported results by subtype
Pearce 1987 [48] New Zealand	CC	Cancer registry	Matched by year of cancer registration and age (± 2 years)	Dx period: 1977–1981	183 cases/338 controls	Telephone interviews	Reference: Nonexposed Used any agricultural chemical spray in a farming setting	Yes	Decade of birth, type of interview respondent (self or relative)	Phenoxy herbicides	No
Persson 1989 [49] Sweden	CC	Population	Unmatched	Dx period: 1964–1986	106 cases/275 controls	Self-administered questionnaire	Reference: Not exposed Exposed	No	Age, date of Dx, gender, farming, exposure to fresh wood, other exposures associated with at least a doubled risk for hodgkins disease or NHL	Phenoxy herbicides, DDT	No
Persson 1993 [50] Sweden	CC	Population	Unmatched	Dx period: 1975–1984	93 cases/204 controls	Self-administered questionnaires	Reference: Not exposed Exposed	No	Age, other exposures investigated with OR ≥2 or significantly below unity and with at least 5 exposed subjects	Phenoxy herbicides, DDT	No
Purdue 2007 [51] Iowa and North Carolina, USA	C (AHS)	NA	NA	1993–2002	51,011	Self-administered questionnaire	Reference 1: Never use/unexposed Ever use Lifetime days of exposure Intensity weighted lifetime days of exposure	No	Age, sate, gender, education level, smoking status, alcohol use, family history of cancer, lifetime days of total pesticide application	OC insecticides, aldrin, chlordane, DDT, dieldrin, heptachlor, lindane, toxaphene	No
Rafnsson 2006 [52] Iceland	CC	Non-cases from cohort of sheep owners	Unmatched	Dx period: 1966–2003	45 cases/221 controls	Records of sheep owned, used as a proxy measure for dermal exposure from sheep dipping; sheep dipping used as a proxy for exposure to hexa-chlorocyclohexane, which is a mixture of different isomers containing around 15% lindane. <100 sheep owned was used to indicate unexposed	Referent: <100 sheep ≥100 sheep , Categories of number of sheep owned: 100-199 sheep, 200-683 sheep	Yes	Age	Hexachlorocyc-lohexane	No

Table 1. *Cont.*

Author, year, location	Design	Source for controls	Matching	Diagnosis or follow-up period (cancer)	No. Participants	Exposure assessment	Referent category for exposure, exposure definition(s)/metric	Men only	Adjustment set	Pesticides	Reported results by subtype
Rusiecki 2009 [53] Iowa and North Carolina, USA	C (AHS)	NA	NA	1993–2004	49,093	Self-administered questionnaire	Referent: Nonexposed Lifetime days of exposure Intensity weighted	No	Age, gender, race, family history of cancer, cigarette smoking, state of residence, enrollment year	Permethrin	No
Rusiecki 2006 [54] Iowa and North Carolina, USA	C (AHS)	NA	NA	1993–2002	50,193	Self-administered questionnaire	Referent: Lowest tertile of exposure Lifetime days of exposure Intensity weighted lifetime days of exposure	No	Age, gender, race, smoking, alcohol, applicator status, family history of cancer, sate of residence, most highly correlated pesticides	Metolachlor	No
van Bemmel 2008 [55] Iowa and North Carolina, USA	C (AHS)	NA	NA	1993–2004	48,378	Self-administered questionnaire	Referent: No exposure Lifetime days of exposure Intensity weighted lifetime days of exposure	Yes	Age, race, smoking, alcohol use, applicator type, family history of cancer, state of residence, total days of pesticide use	EPTC	No
Waddell 2001 [56] Iowa, Kansas, Minnesota, Nebraska, USA	Pooled analysis of 3 CC studies	Population	Matched by race, gender, age, and vital status at the time of interview, year of death for controls matched to deceased cases	Dx period [1]: 1979–1983	748 cases/2,236 controls	Telephone interviews (Kansas and Nebraska, USA). In-person interviews (Iowa and Minnesota)	Referent: Non-farmers Ever Used First used Years used Days/year of use Protective gear	Yes	Age, state of residence, respondent type (proxy or direct)	OP insecticides, dichlorvos, trichlorfon, dimethoate, diazinon, disulfoton, ethoprop, malathion, phorate, terbufos, chloropyrifos, coumaphos, crufomate, runnel, tetrachlorvinphos, fensulfothion, famphur, fonofos, parathion	Yes

Table 1. *Cont.*

Author, year, location	Design	Source for controls	Matching	Diagnosis or follow-up period (cancer)	No. Participants	Exposure assessment	Referent category for exposure, exposure definition(s)/metric	Men only	Adjustment set	Pesticides	Reported results by subtype
Woods 1987 [57] Washington state, USA	CC	Population	Matched by vital status and 5-year age group	Dx period: 1981–1984	746 cases/910 controls	In-person interviews about occupational history and self-reported chemical exposure	Referent: No exposure Farming exposures to phenoxy herbicides Any exposure to DDT Any exposure to chlordane Estimated intensity of occupational exposure to phenoxy herbicides: Low/medium/high	Yes	Age	Phenoxy herbicides, DDT, Chlordane	No
Zahm 1990 [58] Nebraska, USA	CC	Population	Matched by race, gender, vital status, age	Dx period: 1983–1986	201 cases/725 controls	In-person interviews about agricultural pesticide use	Referent: Never lived or worked on a farm Mixed or applied Days/year mixing or applying Years used on a farm First year of use	Yes	Age	2,4-D	No
Zahm 1993 [59] Iowa, Kansas, Minnesota, Nebraska, USA	Pooled analysis of 3 CC studies	Population	Matched by race, gender, age, vital status at the time of interview	Dx period [1]: 1979–1983	993 cases/2,918 controls	Telephone interviews (Kansas and Nebraska, USA), In-person interviews (Iowa and Minnesota)	Referent: Non-farmers Used atrazine [1] Personally handled Used but did not handle Duration of use (years) Days/year handled Year of first use	Yes	Age, state	Atrazine	Yes

Table 1. *Cont.*

Author, year, location	Design	Source for controls	Matching	Diagnosis or follow-up period (cancer)	No. Participants	Exposure assessment	Referent category for exposure, exposure definition(s)/metric	Men only	Adjustment set	Pesticides	Reported results by subtype
Zahm 1993 [18] Nebraska, USA	CC	Population	Matched by race, gender, vital status, and age (5 year age groups)	Dx period: 1983–1986	119 cases/471 controls	In-person interviews about agricultural pesticide use	Referent: women who never lived or worked on a farm Used on farm	No (women only)	Age	Phenoxy herbicides, triazine herbicides, amide herbicides, benzoic acid herbicides, carbamate herbicides, trifluralin herbicides, chlorinated hydrocarbons, carbamate insecticides, OP insecticides	No
Zheng 2001 [60] Nebraska, USA, Iowa and Minnesota, Kansas	Pooled analysis of 3 CC studies	Population	Matched by gender, age, race, vital status, state of residence	Dx period [1]: 1979–1983	985 cases/2,895 controls	In-person interviews about agricultural pesticide use	Referent: Non-farmers Used Personally handled Year since first use Years of use Days/year of use	Yes	Age, type of respondent (proxy or direct), state of residence, first-degree family history of cancer, use of hair dye, use of private wells, tobacco smoking	Carbaryl, carbamate herbicides, carbamate insecticides	Yes

Notes: 2,4-D, 2,4-Dichlorophenoxyacetic acid; 2,4,5-T, 2,4,5-Trichlorophenoxyacetic acid; AHS, Agricultural Health Study; C, cohort study; CC, case-control study; DDT, dichlorodiphenyltrichloroethane; DX, Diagnosis; EPTC, s-ethyl dipropylthiocarbamate; MCPA, 2-methyl-4-chlorophenoxyacetic acid; OC, organochlorine; OP, organophosphorus; [1] Diagnosis period varied by state: July 1983–June 1986 (Nebraska, USA), October 1980–September 1982 (Minnesota), March 1981-October 1983 (Iowa), 1979–1981 (Kansas).

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3.2.1. Studies Conducted in the United States

Nineteen papers [19,21,22,24–26,29,31,35,36,38–42,51,53–55] report results from analyses of data from the Agricultural Health Study, which is a prospective cohort study of licensed pesticide applicators and their spouses living in Iowa and North Carolina, USA. Enrollment began in 1993 and the study is still ongoing [61]. The number of participants included in the analyses varied due to exclusions and completeness of exposure data. The last year of follow-up was defined by the last date on which the incident cancers were identified. At enrollment, participants completed a questionnaire in which they provided historical data on exposure to pesticides. They were also given a take home questionnaire to complete. Most analyses of the Agricultural Health Study data classified active ingredient exposures using two metrics: (1) lifetime exposure days, defined as number of years of use x number of days used per year; and (2) intensity-weighted lifetime exposure days, which was defined as years of use x number of days used per year x personal protective equipment use x intensity level, which incorporates factors that modify pesticide exposure, such as mixing status, application method, equipment repair status. Four papers [31,38,39,51] also reported associations using ever/never use categories; we used these estimates in the meta-analyses.

Six papers reported results from pooled analyses of three case-control studies that were conducted by the USA National Cancer Institute [20,23,30,56,59,60], in Iowa and Minnesota, Kansas, and Nebraska. Diagnosis periods for NHL ranged from 1979 to 1986, depending upon the study. In all studies, population based controls were frequency matched to cases by race, sex, age, and vital status at the time of the interview, and lifetime exposure to pesticides was assessed via telephone interviews. Using these pooled data, De Roos *et al.* [30] examined associations of NHL with 47 active ingredients. The authors investigated pesticides for which there was exposure data from all three studies and to which at least 20 participants were exposed. They used standard logistic regression to model the association of NHL with the multiple pesticides, simultaneously. These analyses were restricted to participants with complete information on all of the pesticides. Other papers reported results from analyses of these pooled data. Baris *et al.* [20] examined associations with dichlorodiphenyltrichloroethane (DDT), Blair *et al.* [23] with lindane, Zahm *et al.* [59] with atrazine, Waddell *et al.* [56] with organophosphates, and Zheng *et al.* [60] with carbamates. We also extracted results from analyses of the individual studies. Using data from the study in Iowa and Minnesota, Cantor *et al.* [27] examined associations with multiple pesticides. In Kansas, Hoar *et al.* [34] examined associations with exposures to various herbicides. In Nebraska, Zahm *et al.* [58] examined associations with 2,4-Dichlorophenoxyacetic acid (2,4-D).

In a population based case-control study in western Washington State, USA Woods *et al.* [57], examined associations between phenoxy exposure and NHL. Controls were group matched to cases diagnosed 1981–1984, based on vital status and age. Lifetime occupational histories and self-reported pesticide chemical exposures were ascertained using in-person interviews. The authors reported exposure to phenoxy herbicides by occupational type. We extracted the result for farming exposure to phenoxy herbicides. Exposures to DDT and chlordane were reported as ever/never, but they were not stratified by occupation.

We also extracted results from a USA based case-control study nested in a cohort of primarily Hispanic members of the California farm worker labor union [45]. Cases were diagnosed 1988–2001.

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Controls were selected from the same cohort as cases and matched on the basis of gender, Hispanic ethnicity, and year of birth. Pesticide exposure was defined as low *versus* high use, with the category cut-points based on the distribution of use of the top 15 pesticides. To estimate exposure, union job history data that described crops farmed in a given month/year and county was combined with data collected by the California Pesticide Databank that describes pesticides used on a crop in a given county and time period.

3.2.2. Canadian Studies

Two papers reported results from the Cross-Canada Study of Pesticides and Health, which was a case control study conducted in six Canadian provinces [43,47]. Population based controls were frequency matched to NHL cases, diagnosed 1991–1994, based on age and province of residence. Detailed information on specific pesticide use was ascertained by telephone interviews. The questionnaires used for this study were based on the one used in the USA National Cancer Institute led case-control studies [20,23,30,56,59,60] in Nebraska [18,58] and Kansas [34]. McDuffie *et al.* [43] and Pahwa *et al.* [47] present results from some of the same analyses with the same population. When the same analysis was reported in both papers we selected the effect estimate from the paper by Pahwa *et al.* [47] because the authors excluded four NHL cases based on pathology review that occurred subsequent to the analyses reported in McDuffie *et al.* [43].

3.2.3. European Studies

Four papers [32,33,49,50] reported results from distinct case-control studies conducted in Sweden. The papers by Eriksson *et al.* [32] and Hardell *et al.* [33] reported analyses from population based case-control studies; case diagnosis periods were 1999–2002 and 1987–1992, respectively. A complete lifetime occupational and chemical exposure history was ascertained using self-administered questionnaires followed by telephone interviews when clarification was needed. The two studies by Persson *et al.* [49,50] report results from unmatched population based case-control studies; the results reported from the paper published in 1993 [50] were performed in an adjacent region of Sweden to the area represented in the earlier paper [49]. They examined the association of NHL with various occupational exposures, including phenoxy herbicides and DDT. Case diagnosis periods were 1964–1986 and 1975–1984, respectively.

We extracted results from papers that report results from analyses of data collected in France [46], Italy [44], Iceland [52], and multiple European centers that form parts of the EPILYMPH study [28]. All of these studies were case-control in design. In France [46], cases (diagnosed 2000–2004) and controls were recruited in the same hospitals. Exposure was assessed using self-administered questionnaires, followed by face-to-face interviews in which participants reported information about farms on which they worked for a minimum of six months; they reported information about location, period, crops and animals farmed, name of pesticides mixed or sprayed, duration and number of pesticide applications. Pesticide exposure was classified as possible or definite; the referent category included people never exposed to the pesticide. In the Italian study [44], cases were diagnosed from 1991 to 1993. Participants were interviewed about agricultural work, crop diseases, pesticides used to treat diseases, frequency of pesticide treatments, period of treatment, protective equipment used,

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means of application, and re-entry tasks. Exposure was classified into low, medium, and high probabilities of use. The Icelandic case-control study [52] was nested in a cohort of male sheep owners. The authors included cases diagnosed 1966–2003. Paper records on sheep dipping in hexachlorocyclohexane, an organochlorine insecticide that contains lindane, were used as a proxy measure for exposure; records were available for the period 1962–1980. Number of sheep owned was used as a surrogate measure for exposure. In the EPILYMPH study [28], in-person interviews were conducted to ascertain detailed job histories, including information about farm size, crops farmed, pests treated, types and frequency of pesticides used, protective equipment, and re-entry tasks. Industrial hygienists classified pesticide exposure as possible, probable, or certain. In analysis, contrasts were made between high confidence of ever lifetime exposure *versus* never exposure, and any level of confidence of ever exposure *versus* never exposure.

3.2.4. Studies from Australia and New Zealand

Only two papers reported results from analyses of studies conducted outside of North America and Europe. Pearce *et al.* [48] reported analyses of data from a New Zealand based case-control study of agricultural exposures. Cases were diagnosed 1977–1981. Telephone interviews were used to ascertain lifetime occupational history and work with chemicals (phenoxy herbicides). In analysis, Pearce *et al.* [48] stratified phenoxy herbicide exposure by occupation (farming, forestry, railway work, *etc.*). We extracted the estimate of association with any phenoxy herbicide exposure in farming occupations. In Australia [62], Fritschi *et al.* enrolled incident NHL cases diagnosed between 2000 and 2001. They matched controls to cases based on age, gender, and region of residence. In structured telephone interviews, participants provided occupational histories. Occupational hygienists reviewed the responses to these questions and, with the help of a pesticide crop matrix, assigned likelihood of exposure to pesticides (probable, possible, no exposure), level of exposure, and frequency of exposure. These assignments were combined to classify participants' lifetime amount of exposure (substantial, meaning the person was probably exposed to the substance at a medium or high level for more than five 8-h days per year for a combined total of five years, nonsubstantial, or none).

3.2.5. Gender

Nineteen of the papers reported results from analyses that were restricted to men only [20,21,23,27–30,33,34,43,47,48,52,55–60]. One paper reported results from an analysis that was restricted to women [18]. The other papers reported results from analyses of study populations with men and women; in the analytic models reported in these papers, gender was treated as a confounder.

3.2.6. Covariates

In all papers, age was included in models to adjust for potential confounding. Location (state of residence, study center) was also a common adjustment factor. Other variables that were included in models as covariates were race, smoking status, alcohol consumption, correlated pesticides, education level, year of study enrollment, family history of cancer (all cancers or lympho-hematopoetic),

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other environmental risk factors for NHL (e.g., gasoline exposure), and type of respondent to the interview used for exposure assessment (direct or proxy).

3.2.7. Reference Groups

In the majority of papers reviewed, the reference group contained farmers and non-farmers who were not exposed to the pesticide. However, there were exceptions to this, either because of study design or analytic decisions.

By design, all participants in the Agricultural Health Study were either pesticide applicators or spouses of applicators. Most of the analyses from this cohort contrasted exposed participants with two different referent groups: (1) participants with no exposure to the pesticide; and (2) participants in the lowest category of exposure. Similarly, all of the participants in the California based study reported in Mills *et al.* [45] were farm workers. The referent group in this analysis consisted of those with estimated low use of the pesticide being analyzed. Both cases and controls in the Icelandic study on which Rafnsson *et al.* [52] reported were sheep owners; people who owned <100 sheep made up the reference group.

By contrast, in some papers, the authors defined the reference group as those who neither worked nor lived on a farm. Miligi *et al.* [44] defined the referent group as participants who never worked in agriculture. Similarly, in papers reporting analyses of the case-control studies in Iowa, Minnesota, Nebraska, and Kansas, the referent group was defined as participants who never worked or lived on a farm. The exception to this was the paper by De Roos *et al.* [30]; the authors used pooled data from these case-control studies but defined the referent group as farmers and non-farmers who never used the pesticide being considered.

3.2.8. Exposure Period and Definition

Pesticide exposure periods and definitions varied, also. For the most part, papers investigated associations of NHL with ever lifetime pesticide exposure. However, some were more specific in their definition, and not all papers used the ever lifetime exposure metric.

In the cohort of California based union farm workers, Mills *et al.* [45] assessed pesticide exposure in the two to three year decade period prior to cancer diagnosis or enrollment. In Canada, McDuffie *et al.* [43] and Pahwa *et al.* [47] defined pesticide exposure as ever *versus* never lifetime use of pesticides for at least 10 h. In Sweden, Eriksson *et al.* [32] and Hardell *et al.* [33] required participants to have worked with the pesticide for a minimum of eight hours in a day, and the pesticide exposure was required to have occurred at least one year prior to the time of diagnosis or enrollment. Persson *et al.* [49,50] only classified as exposed those participants who were exposed to the chemical for at least one year, five to 45 years prior to case diagnosis. In the Italian study described by Miligi *et al.* [44], an agricultural pesticide questionnaire was only administered to participants who had worked on a farm for at least six months; presumably, therefore, anyone who had worked with pesticides but worked on a farm for less than six months was excluded from the exposed group. In the Icelandic study that Rafnsson *et al.* [52] described, records on sheep ownership, which were used to estimate lindane exposure, were available for the period 1962–1980; however, the cancer diagnosis period was 1966–2003.

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3.3. Individual Effect Estimates and Dose Response Relationships

Table 2 presents effect estimates from studies in which chemical exposures were represented using multiple categories. Strong dose response relationships were generally absent; most analyses that examined associations with multiple categories of exposure derived imprecise estimates with wide confidence intervals. McDuffie *et al.* [43] and Eriksson *et al.* [32] observed increased odds of NHL in association with a greater number of days/year of glyphosate exposure. De Roos *et al.* [31] did not observe a similar relationship in analyses of Agricultural Health Study data. McDuffie *et al.* [43] observed elevated effect estimates in association with exposure to 2,4-D; however, they did not observe a dose-response relationship with days/year exposed. In analyses of Agricultural Health Study data, Lynch *et al.* [40] observed a nearly three-fold increase in the rate of NHL among those with ≥26 lifetime- and intensity-weighted exposure days to butylate, although the rate ratio comparing those with one to 25 lifetime exposure days to non-exposed applicators was close to the null.

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Table 2. Effect estimates from studies that investigated associations between non-Hodgkin lymphoma and herbicides, insecticide, and fungicide exposures classified using multiple categories.

Author, date	Pesticide	Category of exposure	N exposed	Effect estimate, 95% CI
HERBICIDES				
Amide herbicides				
Lee 2004 [39]	Alachlor	Lifetime exposure days [1]		Rate ratio, 95% CI:
		Quartile 1, 0.1–19.9	5	1.0, Referent
		Quartile 2, 20.0–56.0	4	0.6, 0.1–2.5
		Quartile 3, 56.1–116.0	8	1.5, 0.4–5.4
		Quartile 4, ≥116.1	10	1.1, 0.3–4.4
				P for trend: 0.5
		Intensity weighted exposure days [1]		
		Quartile 1, 0.1–101.9	5	1.0, Referent
		Quartile 2, 102.0–253.1	3	0.6, 0.1–3.4
		Quartile 3, 253.2–710.4	10	2.4, 0.7–8.8
		Quartile 4, ≥710.5	9	1.4, 0.3–6.1
				P for trend: 0.4
Rusiecki 2006 [54]	Metolachlor	Lifetime exposure days [1]		Rate ratio, 95% CI:
		Tertile 1, ≤20	14	1.0, Referent
		Tertile 2, 21–56	11	0.8, 0.3–1.7
		Tertile 3, >56	11	0.7, 0.3–1.7
				P for trend: 0.5
		Intensity-weighted lifetime exposure days [1]		
		Tertile 1, ≤20	13	1.0,Referent
		Tertile 2, 21–56	10	0.7, 0.3–1.7
		Tertile 3, >56	13	1.0, 0.4–2.7
				P for trend: 0.7

ED_001703B_00001081_24_6ec5ec82-0171-ae23-3cb6-c7da47f64441

Table 2. *Cont.*

Author, date	Pesticide	Category of exposure	N exposed	Effect estimate, 95% CI
Dinitroaniline herbicides				
Kang 2008 [35]	Trifluralin	Lifetime days of exposure [2]		Rate ratio, 95% CI
		Non-exposed	53	1.0, referent
		Tertile1, 1-24.4	17	0.9, 0.5–1.5
		Tertile 2, 24.5-108.4	23	1.0, 0.6–1.8
		Tertile 3, Lower half, 108.5-224.75	6	0.6, 0.2–1.4
		Tertile 3, Upper half, >224.75	4	0.6, 0.2–1.7
				P for trend: 0.2
		Intensity weighted lifetime days [2]		
		Tertile 1, 0-162.1	15	0.7, 0.4–1.4
		Tertile 2, 162.2-593	20	1.1, 0.8–2.9
		Tertile 3, Lower half, 593.1-1176.0	9	0.9, 0.4–2.0
		Tertile 3, Upper half, >1176.0	4	0.4, 0.1–1.1
				P for trend: 0.1
Glyphosate				
McDuffie 2001 [43] [3]	Glyphosate	Days/year of exposure		OR, 95% CI:
		Unexposed	466 cases/1,373 controls	1.0, Referent
		>0–≤2	28 cases/97 controls	1.0, 0.6–1.6
		>2	23 cases/36 controls	2.1, 1.2–3.7
De Roos 2005 [31] [3]	Glyphosate			
		Lifetime days of exposure [2]		Rate ratio, 95% CI:
		Tertile 1, 1–20	29	1.0, Referent
		Tertile 2, 21–56	15	0.7, 0.4–1.4
		Tertile 3, 57–2678	17	0.9, 0.5–1.6
				P for trend: 0.7
		Intensity weighted exposure days [2]		
		Tertile 1, 0.1–79.5	24	1.0, Referent
		Tertile 2, 79.6–337.1	15	0.6, 0.3–1.1

ED_001703B_00001081_25_6fb12f5c-b1fa-be7e-3cd7-422b5a63fb60

Table 2. *Cont.*

Author, date	Pesticide	Category of exposure	N exposed	Effect estimate, 95% CI
		Tertile 3, 337.2–1,824.1	22	0.8, 0.5–1.4
				P for trend: 1.0
Eriksson 2008 [32] [3]	Glyphosate			OR, 95% CI:
		Days of exposure [4]		
		>0–≤10 days	12 cases/9 controls	1.7, 0.7–4.1
		>10 days	17 cases/9 controls	2.4, 1.0–5.4
Imidazolinone herbicides				
Koutros 2009 [36]	Imazethapyr	Intensity weighted exposure days [5]		Rate ratio, 95% CI:
		No exposure:	80	1.0, Referent
		Tertile 1, <54.1	15	1.0, 0.6–1.7
		Tertile 2, 54.1–<152.9	13	0.9, 0.5, 1.6
		Tertile 3, lower half, 152.9–<311.9	7	0.8, 0.3–1.8
		Tertile 3, upper half, ≥311.9	11	1.4, 0.8–2.7
				P for trend: 0.4
Phenoxy herbicides				
Fritschi 2005 [62]	Phenoxy herbicides, group	Degree of pesticide exposure [6]		OR, 95% CI:
		None	679 cases/677 controls	1.0, Referent
		Nonsubstantial	10 cases/14 controls	0.7, 0.3–1.7
		Substantial	5 cases/3 controls	1.8, 0.4–7.4
Eriksson 2008 [32] [3]	Phenoxy herbicides, group	Days of exposure [4]		
		>0–≤45 days	32 cases/13 controls	2.8, 1.5–5.5
		>45 days	15 cases/13 controls	1.3, 0.6–2.7
Hardell 2002 [33] [3]	Phenoxy herbicides, group			OR, 95% CI:
		Number of days of exposure		
		Not exposed	NR	1.0, Referent
		Low	NR	1.7, 1.0–2.7
		High	NR	1.7, 1.0–2.7

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Table 2. *Cont.*

Author, date	Pesticide	Category of exposure	N exposed	Effect estimate, 95% CI
		Years between first exposure and diagnosis		
		1–10	NR	-
		>10–20	NR	2.9, 1.1–7.7
		>20–30	NR	1.5, 0.9–2.8
		>30	NR	1.5, 0.9–2.4
		Years between last exposure and diagnosis		
		1–10	NR	3.2, 1.6–6.7
		>10–20	NR	2.1, 1.0–4.1
		>20–30	NR	1.0, 0.5–1.8
		>30	NR	1.3, 0.6–2.6
		Decade of exposure		
		1940s	4 cases/6 controls	1.5, 0.4–5.2
		1950s	35 cases/53 controls	1.4, 0.9–2.3
		1960s	43 cases/58 controls	1.7, 1.1–2.6
		1970s	32 cases/33 controls	2.4, 1.4–4.0
		1980s	16 cases/33 controls	3.3, 1.5–7.1
Eriksson 2008 [32] [3]	MCPA	Days exposed [4]		
		≤32	15 cases/5 controls	3.8, 1.4–10.5
		>32	6 cases/4 controls	1.7, 0.5–6.0
Hardell 2002 [33] [3]	MCPA			OR, 95% CI:
		Number of days of exposure		
		Not exposed	NR	1.0, Referent
		Low	NR	1.9, 0.8–4.6
		High	NR	3.6, 1.5–9.1
		Years between first exposure and diagnosis		
		1–10	NR	-
		>10–20	NR	5.4, 1.6–21

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Table 2. *Cont.*

Author, date	Pesticide	Category of exposure	N exposed	Effect estimate, 95% CI
		>20–30	NR	0.9, 0.2–3.0
		>30	NR	3.8, 1.5–10.0
		Years between last exposure and diagnosis		
		1–10	NR	3.5, 1.6–8.0
		>10–20	NR	2.3, 0.6–9.1
		>20–30	NR	0.9, 0.1–4.4
		>30	NR	-
McDuffie 2001 [43] [3]	Mecoprop	Days/year exposed		
		Unexposed	464 cases/1,425 controls	1.0, Referent
		>0–≤2	31 cases/48 controls	2.3, 1.4–3.7
		≥2	22 cases/33 controls	2.1, 1.2–3.6
Hardell 2002 [33] [3]	2,4-D + 2,4,5-T			OR, 95% CI:
		Number of days of exposure		
		Low	NR	1.9, 1.1–3.2
		High	NR	1.2, 0.7–2.1
		Years between first exposure and diagnosis		
		1–10	NR	-
		>10–20	NR	2.9, 0.8–11.0
		>20–30	NR	1.9, 1.0–3.5
		>30	NR	1.2, 0.7–1.9
		Years between last exposure and diagnosis		
		1–10	NR	4.3, 1.1–21.0
		>10–20	NR	1.9, 0.9–3.8
		>20–30	NR	0.9, 0.1–4.4
		>30	NR	1.4, 0.7–2.9
Eriksson 2008 [32] [3]	2,4,5-T and/or 2,4-D	Days exposed [4]		OR, 95% CI:
		Non-exposed		1.0, Referent

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Table 2. *Cont.*

Author, date	Pesticide	Category of exposure	N exposed	Effect estimate, 95% CI
		≤29	21 cases/11 controls	2.1, 1.0–4.4
		>29	12 cases/10 controls	1.3, 0.6–3.1
Zahm 1990 [58] [3]	2,4-D			OR, 95% CI:
		Never lived/worked on a farm	54 cases/184 controls	1.0, Referent
		Days/year mixing or applying		
		1–5	16 cases/44 controls	1.2, 0.6–2.4
		6–20	12 cases/25 controls	1.6, 0.7–3.6
		21+	3 cases/4 controls	3.3, 0.5–22.1
		Unknown	12 cases/25 controls	-
				P for trend: 0.1
		Years used on farm		
		1–5	3 cases/12 controls	0.9, 0.2–3.6
		6–15	11 cases/15 controls	2.8, 1.1–7.1
		16–20	3 cases/18 controls	0.6, 0.1–2.1
		21+	13 cases/33 controls	1.3, 0.6–2.7
		Unknown	15 cases/29 controls	-
				P for trend: 0.3
		First year of use		
		Prior to 1945	8 cases/21 controls	1.4, 0.5–3.5
		1946–1955	13 cases/39 controls	1.1, 0.5–2.3
		1956–1965	5 cases/8 controls	2.1, 0.6–7.7
		1965–1986	4 cases/12 controls	1.3, 0.3–4.9
		Unknown year	13 cases/18 controls	-
				P for trend: 0.2
McDuffie 2001 [43] [3]	2,4-D	Days/yr exposed		OR, 95% CI:
		Unexposed	406 cases/1,213 controls	1.0, Referent
		>0–≤2	55 cases/160 controls	1.2, 0.8–1.6
		>2–≤5	36 cases/82 controls	1.4, 0.9–2.1

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Table 2. *Cont.*

Author, date	Pesticide	Category of exposure	N exposed	Effect estimate, 95% CI
		>5–≤7	9 cases/20 controls	1.4, 0.6–3.2
		>7	11 cases/31 controls	1.2, 0.6–2.5
Thiocarbamate herbicides				
Zheng 2001 [60] [3]	Butylate			OR, 95% CI
		Non-farmers	243 cases/775 controls	1.0, Referent
		Years since first use		
		<20	34 cases/56 controls	1.5, 0.9–2.4
		≥20	4 cases/10 controls	1.1, 0.3–3.7
		Years of use		
		<7	21 cases/35 controls	1.5, 0.9–2.8
		≥7	20 cases/37 controls	1.5, 0.8–2.7
		Days/year of use		
		<5	3 cases/5 controls	2.6, 0.6–11.1
		≥5	2 cases/2 controls	4.7, 0.6–34.5
Lynch 2009 [40]	Butylate	Lifetime exposure days [5]		Rate ratio, 95% CI:
		No exposure	27	1.0, Referent
		Low exposure, 1–25	6	0.9, 0.4–2.0
		High exposure, ≥26	12	2.9, 1.5–5.8
				P for trend: 0.0
		Intensity weighted exposure days [5]		
		No exposure	27	1.0, Referent
		Low exposure, 1–157	5	0.8, 0.3–2.0
		High exposure, ≥158	13	2.9, 1.5–5.5
				P for trend: 0.0
Van Bemmel 2008 [55]	EPTC	Lifetime exposure days [5]		Rate ratio, 95% CI:
		No exposure	83	1.0, Referent
		Tertile 1, 1–9	10	1.2, 0.6–2.3
		Tertile 2, 10–49	7	1.5, 0.7–3.2

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Table 2. *Cont.*

Author, date	Pesticide	Category of exposure	N exposed	Effect estimate, 95% CI
		Tertile 3, 50+	5	0.8, 0.3–2.0
				P for trend:0.7
		Intensity-weighted lifetime exposure days [5]		Rate ratio, 95% CI:
		No exposure	83	1.0, Referent
		Tertile 1, 1–47	8	1.4, 0.7–2.8
		Tertile 2, 48–111	4	0.9, 0.3–2.5
		Tertile 3, 112+	10	1.1, 0.6–2.1
				P for trend:0.9
Zheng 2001 [60] [3]	EPTC + Protectant			OR, 95% CI:
		Non-farmers:		1.0, Referent
		Years since first use		
		<20	19 cases/34 controls	1.7, 0.9–3.1
		≥20	0 cases/1 control	-
		Years of use		
		<7	15 cases/20 controls	2.2, 1.1–4.4
		≥7	7 cases/26 controls	1.0. 0.4–2.4
		Days/year of use		
		<5	7 cases/12 controls	2.2, 0.8–5.8
		≥5	1 case/5 controls	0.9, 0.1–7.7
Triazine herbicides				
Lynch 2006 [41]	Cyanazine	Lifetime exposure days [5]		Rate ratio, 95% CI
		Tertile 1, 1–16	9	1.0, Referent
		Tertile 2, 17–56	18	1.6, 0.7–3.5
		Tertile 3, ≥57	9	1.3, 0.5–3.4
				P for trend: 1.0
		Intensity-weighted exposure days [5]		
		Tertile 1, 1–83	10	1.0, Referent
		Tertile 2, 84–314.35	12	1.3, 0.6–3.0

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Table 2. *Cont.*

Author, date	Pesticide	Category of exposure	N exposed	Effect estimate, 95% CI
		Tertile 3, ≥315.35	13	1.4, 0.6–3.4
				P for trend: 0.5
Zahm 1993 [59] [3]	Atrazine			OR (95% CI not presented)
		No use	445 cases/1507 controls	1.0, Referent
		Years of use		
		1–5	4 cases/14 controls	0.4
		6–15	5 cases/20 controls	0.5
		16–20	5 cases/8 controls	0.6
		≥21	7 cases/11 controls	0.8
		Days/year personally handled		
		1–5	7 cases/20 controls	0.6
		6–20	8 cases/17 controls	0.7
		≥21	1 cases/1 control	1.4
		Year of first use		
		1965 or prior	10 cases/35 controls	0.4
		1966 or later	10 cases/18 controls	1.0
Beane Freeman 2011 [22]	Atrazine	Lifetime days of exposure [5]		Rate ratio, 95% CI
		Quartile 1, >0–20	41	1.0, Referent
		Quartile 2, 21–56	41	1.1, 0.7–1.7
		Quartile 3, >56–178.5	38	0.9, 0.6–1.5
		Quartile 4, >178.5	32	1.0, 0.6–1.6
				P for trend: 0.7
		Intensity weighted lifetime days of exposure [5]		
		Quartile 1, >0–20	38	1.0, Referent
		Quartile 2, 21–56	45	1.2, 0.8–1.9
		Quartile 3, >56–178.5	34	0.9, 0.6–1.5
		Quartile 4, >178.5	34	0.9, 0.6–1.5
				P for trend: 0.5

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Table 2. *Cont.*

Author, date	Pesticide	Category of exposure	N exposed	Effect estimate, 95% CI
Triazinone herbicides				
Delancey 2009 [29]	Metribuzin	Lifetime days of exposure [5]		Rate ratio, 95% CI
		No exposure	39	
		Tertile 1, >0–8.75	5	1.0, Referent
		Tertile 2, 8.76–24.5	6	2.3, 0.6–8.6
		Tertile 3, >24.5	8	2.6, 0.8–9.1
				P for trend: 0.1
		Intensity weighted lifetime exposure days [5]		
		No exposure: 0	39	
		Tertile 1, >0–58.3	4	1.0, Referent
		Tertile 2, >58.3–174.4	6	1.4, 0.3–5.8
		Tertile 3, >174.5	9	2.5, 0.7–9.6
				P for trend: 0.1
FUNGICIDES				
McDuffie 2001 [43] [3]	Captan	Days/year exposed		OR, 95% CI:
		Unexposed	497 cases/1,482 controls	1.0, Referent
		>0–≤2	11 cases/12 controls	2.7, 1.2–6.2
		>2	9 cases/12 controls	2.8, 1.1–6.9
INSECTICIDES				
Carbamate insecticides				
Zheng 2001 [60] [3]	Carbaryl			OR, 95% CI:
		Non-farmers	243 cases/775 controls	1.0, Referent
		Years since first use		
		<20	19 cases/44 controls	1.1, 0.6–2.0
		≥20	14 cases/21 controls	1.8, 0.9–3.7
		Years of use		
		<7	16 cases/36 controls	1.1, 0.6–2.1
		≥7	15 cases/26 controls	1.5, 0.8–3.0

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Table 2. *Cont.*

Author, date	Pesticide	Category of exposure	N exposed	Effect estimate, 95% CI
		Days/year of use		
		<5	9 cases/14 controls	2.4, 1.0–5.9
		≥5	2 cases/4 controls	1.8, 0.3–10.0
Mahajan 2007 [42]	Carbaryl	Lifetime days of exposure [2]		Rate ratio, 95% CI
		No exposure	23	1.0, Referent
		Tertile 1, 1–9	5	0.7, 0.2–1.8
		Tertile 2, 10–56	8	1.2, 0.5–3.0
		Tertile 3, >56	10	1.7, 0.6–4.5
				P for trend: 0.3
Zheng 2001 [60] [3]	Carbofuran			OR, 95% CI:
		Nonfarmers	243 cases/775 controls	1.0, Referent
		Years since first use		
		<20	32 cases/63 controls	1.3, 0.8–2.1
		≥20	15 cases/30 controls	1.6, 0.8–3.1
		Years of use		
		<7	30 cases/48 controls	1.7, 1.0–2.9
		≥7	24 cases/47 controls	1.4, 0.8–2.4
		Days/year of use		
		<5	9 cases/15 controls	2.7, 1.1–6.4
		≥5	12 cases/16 controls	3.1, 1.4–6.8
Bonner 2005 [25]	Carbofuran	Lifetime days of exposure [2]		Rate ratio, 95% CI
		No exposure	44	1.0, Referent
		Tertile 1, 1–9	6	0.8, 0.3–1.9
		Tertile 2, 10–56	7	1.3, 0.6–2.9
		Tertile 3, >56	7	1.4, 0.6–3.3
				P for trend: 0.4

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Table 2. *Cont.*

Author, date	Pesticide	Category of exposure	N exposed	Effect estimate, 95% CI
Organophosphorus insecticides				
Fritschi 2005 [62]	Organophosphorus insecticides, group	Degree of exposure [6]		OR, 95% CI:
		No exposure	662 cases/660 controls	1.0, Referent
		Nonsubstantial exposure	20 cases/28 controls	0.7, 0.4–1.3
		Substantial exposure	12 cases/6 controls	2.1, 0.8–5.7
Waddell 2001 [56] [3]	Organophosphorus pesticides, group			OR, 95% CI:
		Non-farmers	243 cases/775 controls	1.0, Referent
		Years since first use		
		<20	44 cases/94 controls	1.0, 0.7–1.5
		≥20	79 cases/188 controls	1.6, 1.1–2.2
		Years used		
		<10	34 cases/69 controls	1.1, 0.7–1.7
		10–19	44 cases/71 controls	1.4, 0.9–2.1
		20+	39 cases/59 controls	1.5, 1.0–2.4
Lee 2004 [38]	Chlorpyrifos	Lifetime days of exposure [1]		Rate ratio, 95% CI:
		Nonexposed	53	1.0, Referent
		Quartile 1, 0.1–8.8	10	0.6, 0.2–1.5
		Quartile 2, 8.9–24.5	13	1.8, 0.9–3.5
		Quartile 3, 24.6–56.0	5	0.9, 0.4–2.4
		Quartile 4, ≥56.1	9	1.0, 0.4–2.4
				P for trend: 0.7
		Intensity-weighted lifetime days of exposure [1]		
		Nonexposed	53	1.0, Referent
		Quartile 1, 0.1–48.9	6	0.9, 0.3–2.2
		Quartile 2, 49.0–135.9	6	0.6, 0.2–1.8
		Quartile 3, 136.0–417.6	10	1.2, 0.6–2.7
		Quartile 4, ≥417.7	10	1.6, 0.7–3.5
				P for trend: 0.4

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Table 2. *Cont.*

Author, date	Pesticide	Category of exposure	N exposed	Effect estimate, 95% CI
Beane Freeman 2005 [21]	Diazinon			Rate ratio, 95% CI:
		No exposure	26	1.0, Referent
		Lifetime days of exposure [2]		
		Tertile 1, <20	6	1.8, 0.7–4.4
		Tertile 2, 20–38.8	3	1.4, 0.4–4.6
		Tertile 3, >38.8	2	0.9, 0.2–4.1
				P for trend: 1.0
		Intensity-weighted lifetime days of exposure [2]		
		Tertile 1	5	1.9, 0.7–5.1
		Tertile 2	2	0.7, 0.2–3.1
		Tertile 3	4	1.7, 0.6–5.2
				P for trend: 0.4
Waddell 2001 [56] [3]	Diazinon			OR, 95% CI:
		Non-farmers	243 cases/775 controls	1.0, Referent
		Years since first use		
		<20	20 cases/34 controls	1.1, 0.6–2.0
		≥20	16 cases/24 controls	1.4, 0.7–2.7
		Years used		
		<10	20 cases/40 controls	0.9, 0.5–1.7
		10–19	10 cases/11 controls	1.8, 0.7–4.4
		20+	1 cases/1 controls	1.9, 0.1–31.6
		Days/year of use		
		<5	6 cases/11 controls	1.3, 0.5–3.9
		≥5	6 cases/6 controls	2.4, 0.7–8.0

Table 2. *Cont.*

Author, date	Pesticide	Category of exposure	N exposed	Effect estimate, 95% CI
Waddell 2001 [56] [3]	Fonofos			OR, 95% CI:
		Non-farmers	243 cases/775 controls	1.0, Referent
		Years since first use		
		<20	20 cases/36 controls	1.0, 0.6–1.9
		≥20	5 cases/6 controls	1.6, 0.5–5.5
		Years used		
		<10	16 cases/25 controls	1.2, 0.6–2.4
		10–19	7 cases/9 controls	1.5, 0.5–4.1
		20+	2 cases/1 control	4.2, 0.4–47.2
		Days/year of use		
		<5	2 cases/6 controls	0.7, 0.1–3.8
		≥5	9 cases/6 controls	3.4, 1.1–10.3
McDuffie 2001 [43] [3]	Malathion	Days/year of exposure		OR, 95% CI:
		Unexposed	445 cases/1,379 controls	1.0, Referent
		>0–≤2	50 cases/88 controls	1.8, 1.3–2.7
		≥2	22 cases/39 controls	1.8, 1.0–3.0
Waddell 2001 [56] [3]	Malathion			OR, 95% CI:
		Non-farmers	243 cases/775 controls	1.0, Referent
		Years since first use		
		<20	22 cases/46 controls	0.9, 0.5–1.6
		≥20	35 cases/39 controls	1.7, 1.1–2.9
		Years used		
		<10	22 cases/39 controls	1.1, 0.6–1.9
		10–19	23 cases/23 controls	1.9, 1.0–3.5
		20+	10 cases/18 controls	1.1, 0.5–2.4
		Days/year of use		
		<5	7 cases/8 controls	2.1, 0.7–6.1
		≥5	5 cases/7 controls	1.5, 0.5–5.2

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Table 2. *Cont.*

Author, date	Pesticide	Category of exposure	N exposed	Effect estimate, 95% CI
Bonner 2007 [26]	Malathion	Lifetime days of exposure [5]		Rate ratio, 95% CI
		No exposure	1.0 Referent	
		Tertile 1, >0–9	0.6, 0.2–1.6	
		Tertile 2, 10–39	0.7, 0.3–1.8	
		Tertile 3, >39	0.8, 0.3–2.0	
		Intensity-weighted lifetime days of exposure [2]		Rate ratio, 95% CI
		No exposure	14	1.0, Referent
		Tertile 1, >0–58	5	0.5, 0.2–1.5
		Tertile 2, 59–245	9	0.7, 0.3–1.8
		Tertile 3, >245	9	0.8, 0.3–2.0
				P for trend: 0.9
Waddell 2001 [56] [3]	Phorate			OR, 95% CI:
		Non-farmers	243 cases/775 controls	1.0, Referent
		Years since first use		
		<20	19 cases/43 controls	0.8, 0.4–1.5
		≥20	14 cases/23 controls	1.3, 0.6–2.6
		Years used		
		<10	20 cases/33 controls	1.2, 0.6–2.1
		10–19	9 cases/19 controls	0.9, 0.4–2.1
		20+	4 cases/5 controls	1.5, 0.4–5.9
		Days/year of use		
		<5 days	5 cases/9 controls	1.3, 0.4–4.0
		≥5 days	7 cases/8 controls	2.0, 0.7–5.9
Waddell 2001 [56] [3]	Terbufos			OR, 95% CI:
		Non-farmers	243 cases/775 controls	1.0, Referent
		Years since first use		
		<20	23 cases/51 controls	0.9, 0.5-1.5
		≥20	0 cases/1 control	-

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Table 2. *Cont.*

Author, date	Pesticide	Category of exposure	N exposed	Effect estimate, 95% CI
		Years used		
		<10	13 cases/38 controls	0.6, 0.3–1.3
		10–19	6 cases/8 controls	1.5, 0.5–4.4
		20+	0 cases/1 control	-
		<20	23 cases/51 controls	0.9, 0.5–1.5
		≥20	0 cases/1 control	-
		Days/year of use		
		<5	3 cases/8 controls	0.8, 0.2–3.4
		≥5	7 cases/4 controls	4.0, 1.1–14.5
Bonner 2010 [24]	Terbufos	Intensity weighted lifetime exposure days [5]		Hazard ratio, 95% CI
		No exposure	69	1.0, referent
		Tertile 1, >0–107	17	1.3, 0.7–2.3
		Tertile 2, >107–352	24	1.9, 1.2–3.2
		Tertile 3, >352	15	1.2, 0.7–2.2
				P for trend: 0.6
Organochlorine insecticides				
Fritschi 2005 [62]	Organochlorines, group	Degree of exposure [6]		OR, 95% CI:
		None	674 cases/679 controls	1.0, Referent
		Nonsubstantial	14 cases/13 controls	1.1, 0.5–2.3
		Substantial	6 cases/2 controls	3.3, 0.7–16.4
Purdue 2007 [51] [3]	Organochlorines, group	Lifetime days of exposure [5]		Rate ratio, 95% CI:
		Unexposed	16	1.0, Referent
		Tertile 1, 1–110	8	1.2, 0.5–2.8
		Tertile 2, 111–450	10	1.5, 0.6–3.5
		Tertile 3, >450	11	1.5, 0.6–3.8
				P for trend: 0.3

Table 2. *Cont.*

Author, date	Pesticide	Category of exposure	N exposed	Effect estimate, 95% CI
		Intensity weighted lifetime days of exposure [5]		
		Unexposed	16	1.0, Referent
		Tertile 1, 1–110	9	1.3, 0.6–3.1
		Tertile 2, 111–450	7	1.1, 0.4–2.9
		Tertile 3, >450	13	1.7, 0.7–4.2
				P for trend: 0.3
Purdue 2007 [51] [3]	Aldrin	Lifetime days of exposure [5]		Rate ratio, 95% CI:
		Unexposed	38	1.0, Referent
		1–20	5	0.8, 0.3–2.1
		>20	4	0.4, 0.1–1.5
				P for trend: 0.2
		Intensity weighted lifetime days of exposure [5]		
		Unexposed	38	1.0, Referent
		1–20	4	0.6, 0.2–1.9
		>20	5	0.6, 0.2–1.8
				P for trend: 0.4
Purdue 2007 [51] [3]	Chlordane	Lifetime days of exposure [5]		Rate ratio, 95% CI:
		Unexposed	32	1.0, Referent
		1–9	9	1.6, 0.8–3.6
		>9	6	1.8, 0.7–4.6
				P for trend: 0.2
		Intensity weighted lifetime days of exposure [5]		
		Unexposed	32	1.0, Referent
		1–9	8	1.8, 0.8–4.0
		>9	7	1.6, 0.7–3.9
				P for trend: 0.3
Baris 1998 [20] [3]	DDT			OR, 95% CI:
		Non-farmers	243 cases/775 controls	1.0, Referent

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Table 2. *Cont.*

Author, date	Pesticide	Category of exposure	N exposed	Effect estimate, 95% CI
		Days/year of use		
		≤5	12 cases/35 controls	1.0, 0.5–2.1
		>5	11 cases/15 controls	2.1, 0.9–4.9
		Duration of use in years		
		1–4	36 cases/79 controls	1.0, 0.7–1.6
		5–9	31 cases/53 controls	1.4, 0.8–2.2
		≥15	39 cases/64 controls	1.5, 0.9–2.3
McDuffie 2001 [43] [3]	DDT	Days/year of exposure		OR, 95% CI:
		Unexposed	485 cases/1,447 controls	1.0, Referent
		>0–≤2	18 cases/32 controls	1.8, 1.0–3.2
		≥2	14 cases/27 controls	1.5, 0.8–2.9
Hardell 2002 [33] [3]	DDT			OR, 95% CI:
		Never exposed	NR	1.0, Referent
		Years between first exposure and diagnosis		
		1–10	NR	-
		>10–20	NR	2.6, 0.6–11.0
		>20–30	NR	1.6, 0.8–3.3
		>30	NR	1.2, 0.8–1.7
		Years between last exposure and diagnosis		
		1–10	NR	1.5, 0.7–3.1
		>10–20	NR	1.1, 0.6–2.0
		>20–30	NR	1.5, 0.8–2.5
		>30	NR	1.2, 0.7–2.0

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Table 2. *Cont.*

Author, date	Pesticide	Category of exposure	N exposed	Effect estimate, 95% CI
Purdue 2007 [51] [3]	DDT			
		Lifetime days of exposure [5]		Rate ratio, 95% CI:
		Unexposed	32	1.0, Referent
		1–20	5	0.7, 0.3–1.9
		>20	9	1.2, 0.5–2.8
				P for trend: 0.6
		Intensity weighted lifetime days of exposure [5]		
		Unexposed	32	1.0, Referent
		1–20	6	0.9, 0.3–2.2
		>20	8	1.0, 0.4–2.5
				P for trend: 0.9
Eriksson 2008 [32] [3]	DDT	Days of exposure [4]		
		≤37 days	20 cases/19 controls	1.2, 0.6–2.2
		>37 days	30 cases/18 controls	1.8, 1.0–3.2
Purdue 2007 [51] [3]	Dieldrin			
		Lifetime days of exposure [5]		Rate ratio, 95% CI:
		Unexposed	46	1.0, Referent
		1–20	1	0.6, 0.1–4.2
		>20	1	0.9, 0.1–6.9
				P for trend: 0.8
		Intensity weighted lifetime days of exposure [5]		
		Unexposed	46	1.0, Referent
		1–20	1	0.7, 0.1–5.0
		>20	1	0.7, 0.1–5.5
				P for trend: 0.7

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Table 2. *Cont.*

Author, date	Pesticide	Category of exposure	N exposed	Effect estimate, 95% CI
Purdue 2007 [51] [3]	Heptachlor	Lifetime days of exposure		Rate ratio, 95% CI:
		Unexposed	38	1.0, Referent
		1–9	6	1.5, 0.6–4.1
		>9	4	1.1, 0.4–3.2
				P for trend: 0.8
		Intensity weighted lifetime days of exposure		
		Unexposed	38	1.0, Referent
		1–9	4	1.2, 0.4–3.6
		>9	6	1.4, 0.5–3.7
				P for trend:0.6
Blair 1998 [23] [3]	Lindane			OR, 95% CI:
		Nonfarmer	243 cases/775 controls	1.0, Referent
		Years since first use		
		≥20	59 cases/83 controls	1.7, 1.1–2.5
		<20	18 cases/30 controls	1.3, 0.7–2.4
		Days/ year of use		
		≤4	8 cases/16 controls	1.6, 0.6–4.0
		≥5	5 cases/8 controls	2.0, 0.6–6.4
Rafnsson 2006 [52] [3]	Lindane	Number of sheep owned		OR, 95% CI:
		100–199 sheep	22 cases/71 controls	3.8, 1.6–9.3
		200–683 sheep	15 cases/62 controls	3.4, 1.3–9.0
Purdue 2007 [51] [3]	Lindane	Lifetime days exposed [5]		Rate ratio, 95% CI:
		Unexposed	34	1.0, Referent
		1–22 days	6	1.9, 0.8–4.7
		>22 days	7	2.1, 0.8–5.5
				P for trend: 0.1

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Table 2. *Cont.*

Author, date	Pesticide	Category of exposure	N exposed	Effect estimate, 95% CI
		Intensity-weighted lifetime days of exposure [5]		
		Unexposed	34	1.0, Referent
		1–22	5	0.9, 0.3–3.0
		>22	8	2.6, 1.1–6.4
				P for trend: 0.04
Purdue 2007 [51] [3]	Toxaphene	Lifetime days exposed [5]		Rate ratio, 95% CI:
		Unexposed	35	1.0, Referent
		1–25 days	10	2.3, 1.1–5.0
		>25 days	2	1.3, 0.3–5.5
				P for trend: 0.8
		Intensity-weighted lifetime days of exposure [5]		
		Unexposed	35	1.0, Referent
		1–25	7	2.3, 1.0–5.4
		>25	5	1.6, 0.5–4.8
				P for trend:0.4
Pyrethroid insecticides				
Rusiecki 2009 [53]	Permethrin	Lifetime days of exposure [5]		Relative rate, 95% CI:
		Nonexposed	94	1.0, Referent
		Tertile 1, ≤8.74	8	0.8, 0.4–1.7
		Tertile 2, 8.75–50.75	5	0.6, 0.3–1.7
		Tertile 3, >50.75	5	0.7, 0.3–1.7
				P for trend: 0.2
		Intensity-weighted lifetime days of exposure [5]		
		Nonexposed	94	1.0, Referent
		Tertile 1, ≤8.74	7	0.8, 0.4–1.8
		Tertile 2, 8.75–50.75	7	0.9, 0.4–2.0
		Tertile 3, >50.75	4	0.5, 0.2–1.3
				P for trend: 0.2

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Table 2. *Cont.*

Author, date	Pesticide	Category of exposure	N exposed	Effect estimate, 95% CI
Other insecticides				
Eriksson 2008 [32] [3]	Pyretrine	Days of exposure [4]		OR, 95% CI:
		≤25	8 cases/5 controls	1.9, 0.6–5.8
		>25	6 cases/5 controls	1.4, 0.4–4.5
	Mercurial seed dressing	Days of exposure [4]		
		≤12	7 cases/6 controls	1.3, 0.4–3.8
		>12	14 cases/5 controls	2.9, 1.0–8.3
	Fumigant fungicides			
Barry 2012 [19]	Methyl Bromide	Intensity weighted lifetime days of exposure [5]		Rate ratio, 95% CI:
		Nonexposed	166	1.0, Referent
		Tertile 1, >0–310	21	2.3, 1.4–3.9
		Tertile 2, 311–1519	8	0.7, 0.3–1.6
		Tertile 3, >1519	6	0.6, 0.3–1.5
				P for trend: 0.1
		Intensity weighted lifetime days of exposure, 15 year lag [5]		
		Nonexposed	174	1.0, Referent
		Tertile 1, >0–310	13	1.7, 0.9–3.1
		Tertile 2, 311–1519	6	0.6, 0.3–1.5
		Tertile 3, >1519	8	1.0, 0.5–2.1
				P for trend: 0.7

Notes: CI, confidence interval; EPTC, s-ethyl dipropylthiocarbamate; MCPA, 2-methyl-4-chlorophenoxyacetic acid; NHL, non-Hodgkin lymphoma; OR, odds ratio; CI, confidence interval; [1] Categories based on mid-points of the questionnaire category; [2] Categories based on distribution among users; [3] Effect estimates in association with dichotomous exposure were also reported; [4] Categories based on the number of days of exposure among controls; [5] Categories based on the distribution of exposure among cancer cases; [6] Substantial indicates the person was exposed to the substance at a medium or high level for more than five 8-hour days per year for a combined total of more than 5 years. Non-substantial indicates any other combination of exposures; estimates derive from a case-control study.

Table 3. Associations of subtypes of non-Hodgkin lymphoma with herbicides and insecticides.

	Chemical	Number of exposed cases	Risk ratio, 95% CI
B cell lymphoma			
HERBICIDES			
Organophosphorus herbicides			
Eriksson 2008 [32]	Glyphosate (OP herbicide)	NR	1.9, 1.0–3.5
Phenoxy herbicides			
Cocco 2012 [28]	Phenoxy herbicides	12 cases	1.4, 0.6–3.1
Eriksson 2008 [32]	Phenoxy herbicides	NR	2.0, 1.2–3.3
Fritschi 2005 [62] [1]	Phenoxy herbicides	NR	No exposure: 1.0, Referent
			Non-substantial exposure: 0.6, 0.3–1.5
			Substantial exposure: 1.5, 0.3–6.6
Eriksson 2008 [32]	2,4,5-T and/or 2,4-D (Phenoxy herbicide)	NR	1.7, 0.9–3.0
Cocco 2012 [28]	2,4-D (Phenoxy herbicide)	2 cases	0.6, 0.1–3.5
Cocco 2012 [28]	MCPA (Phenoxy herbicide)	4 cases	Infinity (zero exposed controls)
Eriksson 2008 [32]	MCPA (Phenoxy herbicide)	NR	2.6, 1.1–5.9
Thiocarbamate herbicides			
Zheng 2001 [60]	Butylate (Thiocarbamate herbicides)	4 cases (small lymphocytic)	1.1, 0.3–3.4
Zheng 2001 [60]	EPTC + Protectant (Thiocarbamate herbicides)	2 cases (small lymphocytic)	1.5, 0.3–7.1
Cocco 2012 [28]	Triazines and triazoles	6 cases	0.7, 0.2–1.7
INSECTICIDES			
Carbamate insecticides			
Zheng 2001 [60]	Carbaryl (Carbamate insecticide)	9 cases(small lymphocytic)	2.9, 1.2–7.0
Zheng 2001 [60]	Carbofuran (Carbamate insecticide)	7 cases (small lymphocytic)	1.5, 0.6–3.8
Cocco 2012 [28]	Methomyl (Carbamate insecticide)	0 cases	NR(zero exposed cases)
Cocco 2012 [28]	Mancozeb (Dithiocarbate fungicide)	2 cases	0.6, 0.1–3.5
Cocco 2012 [28]	Glyphosate (OP herbicide)	4 cases	3.1, 0.6–17.1

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Table 3. *Cont.*

Author, date	Chemical	Number of exposed cases	Risk ratio, 95% CI
Organochlorine (OC) insecticides			
Cocco 2012 [28]	Organochlorines	27 cases	0.9, 0.5–1.4
Fritschi 2005 [62] [1]	Organochlorines	NR	No exposure: 1.0, Referent
			Nonsubstantial: 1.1, 0.5–2.5
			Substantial: 3.5, 0.7–17.3
Baris 1998 [20] [2]	DDT (OC insecticides)	22 cases	1.6, 0.8–2.9
Eriksson 2008 [32]	DDT (OC insecticide)	NR	1.3, 0.8–2.1
Cocco 2012 [28]	DDT (OC insecticide)	3 cases	1.2, 0.2–5.9
Cocco 2012 [28]	Endosulfan (OC insecticide)	0 cases	NR, zero exposed cases
Organophosphorus insecticides			
Cocco 2012 [28]	Organophosphates	23 cases	1.4, 0.8, 2.6
Zheng 2001 [60] [2]	Organophosphates	18 cases	1.6, 0.8–3.2
Fritschi 2005 [62] [1]	Organophosphates	NR	No exposure [1]: 1.0, Referent
			Non-substantial: 0.6, 0.3–1.2
			Substantial: 2.1, 0.8–5.7
Cocco 2012 [28]	Dimethoate (OP insecticide)	3 cases	1.8, 0.3–10.6
Waddell 2001 [56] [2]	Fonofos (OP insecticide)	5 cases	2.6, 0.8–8.5
Waddell 2001 [56] [2]	Malathion (OP insecticide)	10 cases	1.9, 0.8–4.7
Waddell 2001 [56] [2]	Diazinon (OP insecticide)	9 cases	2.8, 1.1–7.3
Waddell 2001 [56] [2]	Phorate (OP insecticides)	8 cases	2.3, 0.9–6.0
Waddell 2001 [56] [2]	Terbufos (OP insecticides)	5 cases	2.2, 0.7–7.4
Other insecticides			
Eriksson 2008 [32]	Pyrethrine (Botanical insecticide)	NR	1.7, 0.7–3.9
Eriksson 2008 [32]	Mercurial seed dressing	NR	1.8, 0.8–3.9

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Table 3. *Cont.*

Author, date	Chemical	Number of exposed cases	Risk ratio, 95% CI
Mature B cell lymphoma			
Beane Freeman 2011 [22]	Atrazine (Triazine herbicide)	Lifetime days of exposure:	
		Quartile 1, >0–20: 36	1.0, Referent
		Quartile 2, 21–56: 34	1.0, 0.7–1.7
		Quartile 3, >56–178.5: 31	0.9, 0.5–1.4
		Quartile 4, >178.5: 28	0.9, 0.6–1.6
			P for trend: 0.8
		Intensity weighted lifetime days of exposure:	
		Quartile 1, >0–20: 34	1.0, Referent
		Quartile 2, 21–56: 38	1.1, 0.7–1.8
		Quartile 3, >56–178.5: 25	0.8, 0.5–1.3
		Quartile 4, >178.5: 31	0.9, 0.6, 1.5
			P for trend: 0.7
Diffuse large B cell lymphoma			
HERBICIDES			
Organophosphorus herbicides			
Eriksson 2008 [32]	Glyphosate (OP herbicides)	NR	1.2, 0.4–3.4
Phenoxy herbicides			
Cocco 2012 [28]	Phenoxy herbicides	4 cases	1.7, 0.5–5.2
Eriksson 2008 [32]	Phenoxy herbicides	NR	2.2, 1.1–4.3
Fritschi 2005 [62] [1]	Phenoxy herbicides	NR	No exposure [1]: 1.0, Referent
			Nonsubstantial exposure: 0.5, 0.1–2.0
			Substantial exposure: 2.2, 0.4–13.1
Eriksson 2008 [32]	MCPA (Phenoxy herbicide)	NR	3.9, 1.5–10.5
Eriksson 2008 [32]	2,4,5-T and/or 2,4-D (Phenoxy herbicide)	NR	1.7, 0.7–3.8

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Table 3. *Cont.*

Author, date	Chemical	Number of exposed cases	Risk ratio, 95% CI
Thiocarbamate herbicides			
Zheng 2001 [60]	Butylate (Thiocarbamate herbicides)	15 cases	1.6, 0.9–3.1
Zheng 2001 [60]	EPTC + Protectant (Thiocarbamate herbicides)	10 cases	1.8, 0.8–3.7
Triazine herbicides			
Cocco 2012 [28]	Triazines and triazoles	2 cases	0.8, 0.2–3.4
Beane Freeman 2011 [22]	Atrazine (Triazine herbicides)	Lifetime exposure days:	
		Quartile 1, >0–20: 20	1.0, Referent
		Quartile 2, 21–56: 14	0.8, 0.4–1.6
		Quartile 3, >56–178.5: 14	0.7, 0.4–1.5
		Quartile 4, >178.5: 11	0.7, 0.3–1.6
			p for trend:0.5
		Intensity-weighted lifetime exposure days:	
		Quartile 1, >0–20: 15	1.0, Referent
		Quartile 2, 21–56: 18	1.2, 0.6–2.5
		Quartile 3, >56–178.5: 11	0.8, 0.4–1.7
		Quartile 4, >178.5: 15	1.1, 0.5–2.3
			p for trend:0.96
Zahm 1993 [59]	Atrazine (Triazine herbicides)	66 cases	1.6, 1.1–2.2
INSECTICIDES			
Carbamate insecticides			
Zheng 2001 [60]	Carbaryl (Carbamate insecticides)	15 cases	1.5, 0.8–2.8
Zheng 2001 [60]	Carbofuran (Carbamate insecticides)	24 cases	1.6, 1.0–2.7

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Table 3. *Cont.*

Author, date	Chemical	Number of exposed cases	Risk ratio, 95% CI
Organochlorine insecticides			
Cocco 2012 [28]	Organochlorines	5 cases	0.6, 0.2–1.6
	Organochlorines	NR	No exposure [1]: 1.0, Referent
Fritschi 2005 [62] [1]			Non-substantial exposure: 1.2, 0.4–3.4
			Substantial exposure: 1.6, 0.2–18.1
Eriksson 2008 [32]	DDT (OC insecticide)	NR	1.2, 0.6–2.5
Baris 1998 [20]	DDT (OC insecticide)	53 cases	1.2, 0.8–1.7
Organophosphorus insecticides			
Cocco 2012 [28]	Organophosphates	5 cases	1.1, 0.4–2.9
Waddell 2001 [56]	Organophosphates	63 cases	1.8, 1.2–2.6
Fritschi 2005 [62]	Organophosphates	NR	No exposure [1]: 1.0, Referent
			Non-substantial exposure: 0.6, 0.3–1.6
			Substantial exposure: 2.1, 0.6–7.7
Waddell 2001 [56]	Fonofos (OP insecticide)	10 cases	1.3, 0.6–2.7
Waddell 2001 [56]	Malathion (OP insecticide)	19 cases	1.1, 0.6–1.9
Waddell 2001 [56]	Diazinon (OP insecticide)	13 cases	1.2, 0.6–2.4
Waddell 2001 [56]	Phorate (OP insecticide)	10 cases	0.8, 0.4–1.8
Waddell 2001 [56]	Terbufos (OP insecticide)	7 cases	0.8, 0.4–2.0
Other insecticides			
Cocco 2012 [28]	Arsenicals	2 cases	0.4, 0.1–1.6
Eriksson 2008 [32]	Pyrethrine (Botanical insecticide)	NR	1.3, 0.3–4.6
Eriksson 2008 [32]	Mercurial seed dressing	NR	2.2, 0.8–6.1
Chronic lymphocytic leukemia			
HERBICIDES			
Cocco 2012 [28]	Phenoxy acids	Ever *vs.* never exposed	
		2 cases ever exposed	0.9, 0.2–4.1
		Intensity of exposure	
		Unexposed: 362 cases	1.0, Referent

Table 3. *Cont.*

Author, date	Chemical	Number of exposed cases	Risk ratio, 95% CI
		Low: 0 cases	
		Medium/high: 2 cases	2.4, 0.4–13.8
Cocco 2012 [28]	Triazines and triazoles	2 cases	0.9, 0.2–4.1
INSECTICIDES			
Cocco 2012 [28]	Arsenicals	15 cases	1.6, 0.8–2.9
Cocco 2012 [28]	Carbamates		
Cocco 2012 [28]	Organochlorines	Ever *vs* never exposed	
		10 cases ever exposed	1.2, 0.6–2.5
		Intensity of exposure	
		Unexposed: 362 cases	1.0, Referent
		Low: 5 cases	1.8, 0.6–5.0
		Medium/high: 5 cases	1.0, 0.4–2.8
Cocco 2012 [28]	Organophosphates	Ever *vs* never exposed	
		9 cases ever exposed	2.7, 1.2–6.0
		Intensity of exposure	
		Unexposed: 362 cases	1.0, Referent
		Low: 5 cases	2.7, 0.9–7.8
		Medium/high: 4 cases	2.6, 0.7–9.2
Lymphocytic lymphoma			
HERBICIDES			
Organophosphorus herbicides			
Eriksson 2008 [32]	Glyphosate (OP herbicide)	NR	3.4, 1.4–7.9
Phenoxy herbicides			
Eriksson 2008 [32]	Phenoxy herbicides	NR	2.1, 1.0–4.5
Cocco 2013 [28]	Phenoxy herbicides	NR	0.9, 0.2–4.1

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Table 3. *Cont.*

Author, date	Chemical	Number of exposed cases	Risk ratio, 95% CI
Eriksson 2008 [32]	2,4,5-T and/or 2,4-D (Phenoxy herbicides)	NR	1.9, 0.9–4.4
Eriksson 2008 [32]	MCPA (Phenoxy herbicides)	NR	2.6, 0.7–9.0
INSECTICIDES			
Organochlorine insecticides			
Eriksson 2008 [32]	DDT (OC insecticides)	NR	1.4, 0.7–2.8
Organophosphorus insecticides			
Fritschi 2005 [62] [1]	Organophosphates	NR	No exposure: 1.0, Referent Non-substantial exposure: 1.1, 0.5–2.3 Substantial exposure: 4.3, 1.4–13.0
Other insecticides			
Eriksson 2008 [32]	Pyrethrine (Botanical insecticide)	NR	2.4, 0.7–7.9
Eriksson 2008 [32]	Mercurial seed dressing	NR	2.9, 1.0–8.3
Follicular lymphoma			
HERBICIDES			
Organophosphorus herbicides			
Eriksson 2008 [32]	Glyphosate (OP herbicide)	NR	1.9, 0.6–5.8
Phenoxy herbicides			
Eriksson 2008 [32]	Phenoxy herbicides	NR	1.3, 0.4–3.8
Fritschi 2005 [62] [1]	Phenoxy herbicides	NR	No exposure: 1.0, Referent Non-substantial exposure: 0.5, 0.1–2.0 Substantial exposure: 1.2, 0.1–11.2
Eriksson 2008 [32]	2,4,5-T and/or 2,4-D (Phenoxy herbicide)	NR	1.2, 0.4–4.2
Eriksson 2008 [32]	MCPA (Phenoxy herbicide)	NR	No exposed cases
Thiocarbamate herbicides			
Zheng 2001 [60]	Butylate (Thiocarbamate herbicides)	17 cases	1.5, 0.8–2.8
Zheng 2001 [60]	EPTC + Protectant use (Thiocarbamate herbicides)	10 cases	1.7, 0.8–3.8

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Table 3. *Cont.*

Author, date	Chemical	Number of exposed cases	Risk ratio, 95% CI
Triazine herbicides			
Zahm 1993 [59]	Atrazine (Triazine herbicide)	40 cases	1.3, 0.9–1.9
Beane Freeman 2011 [22]	Atrazine (Triazine herbicide)	Lifetime exposure days, by quartile:	
		Quartile 1, >0–20: 10	1.0, Referent
		Quartile 2, 21–56: 8	0.9, 0.3–2.2
		Quartile 3, >56–178.5: 6	0.6, 0.2–1.7
		Quartile 4, >178.5: 8	1.0, 0.4–2.6
			p for trend: 0.9
		Intensity-weighted exposure days:	
		Quartile 1, >0–20: 10	1.0, Referent
		Quartile 2, 21–56: 10	1.0, 0.4–2.4
		Quartile 3, >56–178.5: 8	0.8, 0.3–2.1
		Quartile 4, >178.5: 4	0.4, 0.1–1.3
			p for trend: 0.07
INSECTICIDES			
Carbamate insecticides			
Zheng 2001 [60]	Carbaryl (Carbamate insecticides)	14 cases	1.3, 0.6–2.4
Zheng 2001 [60]	Carbofuran (Carbamate insecticides)	22 cases	1.4, 0.8–2.4
Organochlorine insecticides			
Fritschi 2005 [62] [1]	Organochlorines	NR	No exposure: 1.0, Referent
			Non-substantial exposure: 1.8, 0.7–4.8
			Substantial exposure: 3.5, 0.5–25.2
Eriksson 2008 [32]	DDT (OC insecticide)	NR	2.1, 1.1–4.4
Baris 1998 [20]	DDT (OC insecticide)	47 cases	1.3, 0.8–1.9
Organophosphorus insecticides			
Waddell 2001 [56]	OP pesticides, group	50 cases	1.3, 0.9–2.0
Waddell 2001 [56]	Fonofos (OP insecticide)	14 cases	1.2, 0.6–2.4
Waddell 2001 [56]	Malathion (OP insecticide)	29 cases	1.3, 0.8–2.2

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Table 3. *Cont.*

Author, date	Chemical	Number of exposed cases	Risk ratio, 95% CI
Waddell 2001 [56]	Diazinon (OP insecticide)	17 cases	1.3, 0.7–2.3
Waddell 2001 [56]	Phorate (OP insecticide)	10 cases	0.7, 0.3–1.4
Waddell 2001 [56]	Terbufos (OP insecticide)	9 cases	0.7, 0.3–1.6
Eriksson 2008 [32]	Mercurial seed dressing	NR	3.6, 1.2–10.9
Eriksson 2008 [32]	Pyrethrine (Botanical insecticide)	NR	2.6, 0.8–8.5
T cell lymphoma			
HERBICIDES			
Organophosphorus herbicides			
Eriksson 2008 [32]	Glyphosate (OP insecticide)	NR	2.3, 0.5–10.4
Phenoxy herbicides			
Eriksson 2008 [32]	Phenoxy herbicides	NR	1.6, 0.4–7.3
Eriksson 2008 [32]	2,4,5-T and/or 2,4-D (Phenoxy herbicides)	NR	1.0, 0.1–8.0
Eriksson 2008 [32]	MCPA (Phenoxy herbicides)	NR	2.4, 0.3–20.0
INSECTICIDES			
Eriksson 2008 [32]	DDT (OC insecticide)	NR	2.9, 1.1–8.0
Eriksson 2008 [32]	Mercurial seed dressing	NR	2.1, 0.3–17.1
Eriksson 2008 [32]	Pyrethrine (Botanical insecticide)	NR	2.2, 0.3–17.8
Unspecified NHL			
HERBICIDES			
Organophosphorus herbicides			
Eriksson 2008 [32]	Glyphosate (OP insecticide)	NR	5.6, 1.4–22.0
Phenoxy herbicides			
Eriksson 2009 [32]	Phenoxy herbicides	NR	3.8, 1.2–12.1
Eriksson 2008 [32]	2,4,5-T and/or 2,4-D (Phenoxy herbicide)	NR	3.2, 0.9–12.1
Eriksson 2008 [32]	MCPA (Phenoxy herbicide)	NR	9.3, 2.1–41.2
INSECTICIDES			
Eriksson 2008 [32]	DDT (OC insecticide)	NR	2.4, 0.8–7.4
Eriksson 2008 [32]	Mercurial seed dressing	NR	5.4, 1.3–22.0

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Table 3. *Cont.*

Author, date	Chemical	Number of exposed cases	Risk ratio, 95% CI
Eriksson 2008 [32]	Pyrethrine (Botanical insecticide)	NR	3.1, 0.4–26.3
Other specified B cell lymphoma			
HERBICIDES			
Organophosphorus herbicides			
Eriksson 2008 [32]	Glyphosate (OP herbicide)	NR	1.6, 0.5–5.0
Phenoxy herbicides			
Eriksson 2008 [32]	Phenoxy herbicides	NR	2.6, 1.2–5.6
Eriksson 2008 [32]	2,4,5-T and/or 2,4-D (Phenoxy herbicide)	NR	2.2, 0.9–5.4
Eriksson 2008 [32]	MCPA (Phenoxy herbicide)	NR	3.2, 1.0–10.7
INSECTICIDES			
Eriksson 2008 [32]	DDT (OC insecticide)	NR	1.3, 0.6–3.1
Eriksson 2008 [32]	Mercurial seed dressing	NR	2.4, 0.7–7.8
Eriksson 2008 [32]	Pyretrine	NR	1.5, 0.3–6.9
Unspecified B cell lymphoma			
HERBICIDES			
Organophosphorus herbicides			
Eriksson 2008 [32]	Glyphosate (OP herbicide)	NR	1.5, 0.3–6.6
Phenoxy herbicides			
Eriksson 2008 [32]	Phenoxy herbicides	NR	1.1, 0.3–4.0
Eriksson 2008 [32]	2,4,5-T and/or 2,4-D (Phenoxy herbicide)	NR	0.9, 0.2–3.9
Eriksson 2008 [32]	MCPA (Phenoxy herbicide)	NR	1.4, 0.2–11.2
INSECTICIDES			
Eriksson 2008 [32]	DDT (OC insecticide)	NR	0.2, 0.0–1.8
Eriksson 2008 [32]	Mercurial seed dressing	NR	No exposed cases

Notes: 2,4-D, 2,4-Dichlorophenoxyacetic acid; 2,4,5-T, 2,4,5-Trichlorophenoxyacetic acid; DDT, dichlorodiphenyltrichloroethane; EPTC, s-ethyl dipropylthiocarbamate; MCPA, 2-methyl-4-chlorophenoxyacetic acid; NHL, non-Hodgkin lymphoma; NR, Not reported; OC, Organochlorine; OP, Organophosphorus; [1] Substantial indicates the person was exposed to the substance at a medium or high level for more than five 8-hour days per year for a combined total of more than 5 years. Nonsubstantial indicates any other combination of exposures; estimates derive from a case-control study; [2] NHL subtype is labeled small lymphocytic in the paper.

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In the Agricultural Health Study, Delancey *et al.* [29] observed a fairly strong dose response relationship between exposure to metribuzin, a triazinone herbicide, and NHL (P for trend: 0.13). Waddell *et al.* [56] observed a dose-response relationship between years of use of the organophosphorus insecticide fonofos and NHL. These authors also observed a strong positive relationship between days/year of exposure to another organophosphorus insecticide, terbufos, and NHL (OR, 95% CI for ≥5 days *vs.* non-farmers: 4.0, 1.1–14.5).

Table 3 shows estimates of association between subtypes of NHL and chemical groups or active ingredients. Table 4 shows the individual effect estimates of associations with herbicides, fungicides, and insecticides, coded dichotomously.

Table 4. Effect estimates from papers that investigated associations between non-Hodgkin lymphoma and herbicide, fungicide, and insecticide exposures, categorized dichotomously.

Author, date	N exposed	Risk ratio, 95% CI
HERBICIDES		
Amide herbicides		
Amide herbicides, group		
Hoar 1986 [34]	8 cases/22 controls	2.9, 1.1–7.6
Cantor 1992 [27]	58 cases/114 controls	1.2, 0.8–1.7
Zahm 1993 [18] [1]	8 cases/34 controls	0.9, 0.4–2.2
Orsi 2009 [46]	5 cases/12 controls	0.9, 0.3–2.8
Alachlor		
De Roos 2003 [30]	68 cases/152 controls	1.1, 0.7–1.7
Lee 2004 [39] [2]	29 cases	0.7, 0.5–1.1
Metolachlor		
De Roos 2003 [30]	13 cases/37 controls	0.7, 0.3–1.6
Propachlor		
De Roos 2003 [30]	20 cases/50 controls	1.0, 0.5–2.0
Propyzamide		
Mills 2005 [45]	NR	0.7, 0.3–1.4
Organophosphorus herbicides		
Glyphosate		
McDuffie 2001 [43]	51 cases/133 controls	1.2, 0.8–1.7
Hardell 2002 [33]	8 cases/8 controls	3.0, 1.1–8.5
De Roos 2003 [30]	36 cases/61 controls	2.1, 1.1–4.0
De Roos 2005 [31] [2]	71 cases	1.1, 0.7–1.9
Eriksson 2008 [32]	29 cases/18 controls	2.0, 1.1–3.7
Orsi 2009 [46]	12 cases/24controls	1.0, 0.5–2.2
Phosphonic acid		
McDuffie 2001 [43]	63 cases/147 controls	1.4, 0.9–1.9
Phenoxy herbicides		
Phenoxy herbicides, group		
Hoar 1986 [34]	24 cases/78 controls	2.2, 1.2–4.1
Pearce 1987 [48]	81 cases/143 controls	1.0, 0.8–1.4
Woods 1987 [57]	NR	1.3, 0.9–2.0
Persson 1989 [49]	6 cases/6 controls	4.9, 1.0–23.5

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Table 4. *Cont.*

Author, date	N exposed	Risk ratio, 95% CI
Cantor 1992 [27]	118 cases/231 controls	1.2, 0.9–1.6
Persson 1993 [50]	10 cases/14 controls	2.3, 0.2–2.8
Zahm 1993 [18] [1]	14 cases/63 controls	0.9, 0.4–1.7
Hardell 2002 [33]	64 cases/90 controls	1.7, 1.2–2.3
Miligi 2006 [44]	32 cases/28 controls	1.1, 0.6–1.8
Eriksson 2008 [32]	47 cases/26 controls	2.0, 1.2–3.4
Orsi 2009 [46]	11 cases/25 controls	0.9, 0.4–1.9
Pahwa 2012 [47]	129 cases/138 controls	1.5, 1.1–1.9
2,4-D		
Zahm 1990 [58]	43 cases/98 controls	1.5, 0.9–2.5
Cantor 1992 [27]	Ever handled: 115 cases/227 controls	1.2, 0.9–1.6
Cantor 1992 [27] [3]	Handled prior to 1965: 86 cases/153 controls	1.3, 0.9–1.8
Mills 2005 [45]	NR	3.8, 1.9–7.8
Miligi 2006 [44]	17 cases/18 controls	0.9, 0.5–1.8
Pahwa 2012 [47]	110 cases/293 controls	1.3, 1.0–1.7
2,4,5-T		
De Roos 2003 [30]	Ever handled: 25 cases/63 controls	1.0, 0.5–1.9
Cantor 1992 [27] [3]	Handled prior to 1965: 13 cases/18 controls	1.7, 0.8–3.6
2,4,5-T and/or 2,4-D		
Eriksson 2008 [32]	33 cases/21 controls	1.6, 0.9–3.0
Diclofop-methyl		
McDuffie 2001 [43]	9 cases/25 controls	1.0, 0.4–2.2
MCPA		
Hardell 2002 [33]	21 cases/23 controls	2.6, 1.4–4.9
De Roos 2003 [30] [1]	8 cases/16 controls	1.0, 0.4–2.6
Miligi 2006 [44]	18 cases/19 controls	0.9, 0.4–1.8
Eriksson 2008 [32]	21 cases/9 controls	2.8, 1.3–6.2
Pahwa 2012 [47]	17 cases/46 controls	1.1, 0.6–2.0
Carbamate/Thiocarbamate herbicides		
Carbamate/Thiocarbamate herbicides, group		
Zahm 1993 [18] [1]	2 cases/14 controls	0.6, 0.1–2.8
McDuffie 2001 [43]	21 cases/49 controls	1.5, 0.8–2.6
Zheng 2001 [60]	60 cases/108 controls	1.5, 1.1–2.3
Butylate		
Cantor 1992 [27] [3]	Handled prior to 1965: 1 case/6 controls	0.5, 0.1–4.3
Zheng 2001 [60]	45 cases/76 controls	1.6, 1.0–2.4
Diallate		
McDuffie 2001 [43]	11 cases/29 controls	1.5, 0.7–3.1
EPTC + Protectant		
Zheng 2001 [60]	23 cases/49 controls	1.6, 0.9–2.7

Table 4. *Cont.*

Author, date	N exposed	Risk ratio, 95% CI
Aromatic acid herbicides		
Benzoic acid herbicides		
Hoar 1986 [34]	1 case/2 controls	4.0, 0.1–62.6
Cantor 1992 [27]	53 cases/98 controls	1.3, 0.9–1.9
Zahm 1993 [18] [1]	4 cases/12 controls	1.2, 0.3–4.4
Chloramben		
Cantor 1992 [27] [3]	Handled prior to 1965: 16 cases/19 controls	2.0, 1.0–4.0
De Roos 2003 [30]	34 cases/81 controls	0.9, 0.5–1.6
Dicamba		
Cantor 1992 [27] [3]	Handled prior to 1965: 7 cases/7 controls	2.8, 1.0–8.1
McDuffie 2001 [43]	26 cases/50 controls	1.6, 1.0–2.6
De Roos 2003 [30]	39 cases/79 controls	1.2, 0.6–2.3
Dinitroaniline herbicides		
Dinitroanilines, group		
Cantor 1992 [27]	46 cases/88 controls	1.2, 0.8–1.8
McDuffie 2001 [43]	11 cases/31 controls	1.2, 0.6–2.4
Trifluralin		
Cantor 1992 [27] [3]	Handled prior to 1965: 14 cases/23 controls	1.5, 0.8–3.1
Zahm 1993 [18] [1]	3 cases/24 controls	0.5, 0.1–1.7
McDuffie 2001 [43]	11 cases/31 controls	1.1, 0.5–2.2
De Roos 2003 [30]	52 cases/120 controls	0.9, 0.5–1.6
Mills 2005 [43,45]	NR	0.9, 0.4–1.8
Triazine herbicides		
Triazine herbicides, group		
Hoar 1986 [34]	14 cases/43 controls	2.5, 1.2–5.4
Cantor 1992 [27]	64 cases/133 controls	1.1, 0.8–1.6
Zahm 1993 [18] [1]	12 cases/38 controls	1.2, 0.6–2.6
Orsi 2009 [46]	17 cases /20 controls	1.9, 0.9–3.8
Atrazine		
Zahm 1993 [59]	130 cases/249 controls	1.4, 1.1–1.8
Cyanazine		
De Roos 2003 [30]	37 cases/96 controls	0.6, 0.3–1.0
Metribuzin		
De Roos 2003 [30]	20 cases/53 controls	0.8, 0.4–1.7
Simazine		
Mills 2005 [45]	NR	1.7, 0.9–3.0
Urea herbicides		
Urea herbicides		
Cantor 1992 [27]	5 cases/18 controls	0.6, 0.2–1.6
Orsi 2009 [46]	5 cases/7 controls	1.8, 0.5–6.0
Linuron		
De Roos 2003 [30]	5 cases/22 controls	0.3, 0.1–1.2

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Table 4. *Cont.*

Author, date	N exposed	Risk ratio, 95% CI
Other herbicides		
Bentazon		
Cantor 1992 [27]	22 cases/58 controls	0.7, 0.3–1.5
Nitrofen		
Mills 2005 [45]	NR	1.2, 0.6–2.5
Paraquat		
De Roos 2003 [30]	2 cases/15 controls	0.1, 0.2–0.7
Quaternary ammonium compounds, group		
Orsi 2009 [46]	4 cases/12 controls	0.7, 0.2–2.3
Sodium chlorate		
De Roos 2003 [30]	8 cases/7 controls	4.1, 1.3–13.6
Uracil herbicides		
Hoar 1986 [34]	19 cases/114 controls	1.3, 0.7–2.5
FUNGICIDES		
Aldehyde fungicides		
Aldehyde fungicides, group		
McDuffie 2001 [43]	7 cases/25 controls	0.9, 0.4–2.3
Formaldehyde		
McDuffie 2001 [43]	7 cases/25 controls	0.9, 0.4–2.3
Amide fungicides		
Amide fungicides, group		
McDuffie 2001 [43]	30 cases/58 controls	1.7, 1.0–2.8
Captan		
McDuffie 2001 [43]	20 cases/24 controls	2.5, 1.3–4.8
Mills 2005 [45]	NR	0.9, 0.5–1.6
Vitavax		
McDuffie 2001 [43]	10 cases/39 controls	0.8, 0.4–1.9
Carbamate and dithiocarbamate fungicides		
Carbamate fungicides		
Orsi 2009 [46]	15 cases/17 controls	1.8, 0.9–3.7
Maneb		
Mills 2005 [45]	NR	1.1, 0.6–2.1
Mancozeb		
Mills 2005 [45]	NR	0.9, 0.5–1.9
Triazole fungicides		
Triazole fungicides, group		
Orsi 2009 [46]	8 cases/9 controls	1.9, 0.7–5.3
Mecoprop		
Pahwa 2012 [47]	51 cases/81 controls	2.3, 1.5–3.3
Mercury containing fungicides		
Mercury fungicides, group		
McDuffie 2001 [43]	18 cases/48 controls	1.3, 0.7–2.3
Mercury dust		
McDuffie 2001 [43]	15 cases/39 controls	1.2, 0.6–2.4

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Table 4. *Cont.*

Author, date	N exposed	Risk ratio, 95% CI
Mercury liquid		
McDuffie 2001 [43]	8 cases/22 controls	1.4, 0.7–3.2
Fumigant fungicides		
Methyl bromide		
Mills 2005 [45]	NR	1.5, 0.8–2.7
Dichloro-propane		
Mills 2005 [45]	NR	0.9, 0.5–1.7
Other fungicides		
Chlorothalonil		
Mills 2005 [45]	NR	1.2, 0.6–2.2
Sulfur compounds		
McDuffie 2001 [43]	17 cases/21 controls	2.8, 1.4–5.6
INSECTICIDES		
Arsenicals		
Acetoarcenate		
De Roos 2003 [30]	41 cases/68 controls	1.4, 0.9–2.3
Arsenic		
Hardell 2002 [33]	8 cases/10 controls	1.8, 0.7–4.5
Eriksson 2008 [32]	7 cases/5 controls	1.6, 0.5–5.2
Lead arsenate		
De Roos 2003 [30]	9 cases/25 controls	0.5, 0.2–1.2
Botanical insecticides		
Nicotine		
Cantor 1992 [27]	31 cases/47 controls	1.5, 0.9–2.5
Cantor 1992 [27] [3]	Handled prior to 1965: 28 cases/36 controls	1.8, 1.0–3.0
Pyrethrine		
De Roos 2003 [30]	6 cases/12 controls	1.0, 0.3–3.2
Eriksson 2008 [32]	15 cases/10 controls	1.7, 0.8–3.9
Rotenone		
Cantor 1992 [27]	12 cases/23 controls	0.5, 2.2–1.0
Carbamate insecticides		
Carbamate insecticides, group		
McDuffie 2001 [43]	37 cases/60 controls	1.9, 1.2–3.0
Zahm 1993 [18] [1]	7 cases/17 controls	1.6, 0.6–4.4
Zheng 2001 [60]	89 cases/172 controls	1.6, 1.0–2.4
Bufencarb		
De Roos 2003 [30]	6 cases/12 controls	1.1, 0.3–3.7
Carbaryl		
Cantor 1992 [27] [3]	Handled prior to 1965: 7 cases/4 controls	3.8, 1.1–13.6
De Roos 2003 [30]	30 cases/57 controls	1.0, 0.5–1.9
McDuffie 2001 [43]	25 cases/34 controls	2.1, 1.2–3.7
Carbofuran		
Cantor 1992 [27] [3]	Handled prior to 1965: 28 cases/63 controls	1.0, 0.6–1.7
McDuffie 2001 [43]	9 cases/18 controls	1.6, 0.7–3.9
Zheng 2001 [60]	66 cases/131 controls	1.6, 1.1–2.3

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Table 4. *Cont.*

Author, date	N exposed	Risk ratio, 95% CI
Methomyl		
McDuffie 2001 [43]	37 cases/60 controls	2.1, 1.2–3.7
Fly spray		
Cantor 1992 [27]	185 cases/394 controls	1.1, 0.9–1.4
Cantor 1992 [27] [3]	Handled prior to 1965: 173 cases/368 controls	1.1, 0.9–1.4
Organochlorine insecticides		
Organochlorine insecticides, group		
Cantor 1992 [27]	150 cases/162 controls	1.3, 1.0–1.7
Zahm 1993 [18] [1]	20 cases/46 controls	1.6, 0.8–3.1
Orsi 2009 [46]	15 cases/17 controls	1.8, 0.9–3.8
Purdue 2007 [51]	58 cases/44 non cases	0.8, 0.5–1.3
Pahwa 2012 [47]	106 cases/276 controls	1.3, 1.0–1.7
Aldrin		
Cantor 1992 [27] [3]	Handled prior to 1965: 34 cases/59 controls	1.3, 0.8–2.1
McDuffie 2001 [43]	10 cases/6 controls	4.2, 1.5–12.0
De Roos 2003 [30]	47 cases/97 controls	1.1, 0.7–1.7
Purdue 2007 [51]	21 cases/79 non-cases	0.6, 0.3–1.0
Chlordane		
Woods 1987 [57]	NR	1.6, 0.7–3.8
Cantor 1992 [27] [3]	Handled prior to 1965: 22 cases/22 controls	2.2, 1.2–4.2
McDuffie 2001 [43]	36 cases/105 controls	1.1, 0.7–1.7
De Roos 2003 [30]	21 cases/26 controls	1.7, 0.9–3.2
Purdue 2007 [51]	27 cases/73 non-cases	0.7, 0.4–1.2
DDT		
Woods 1987 [57]	Not reported	1.8, 1.0–3.2
Cantor 1992 [27] [3]	Handled prior to 1965: 68 cases/123 controls	1.3, 0.9–1.8
Persson 1993 [50]	4 case/3 controls	2.0, 0.2–18.9
Baris 1998 [20]	161 cases/340 controls	1.2, 1.0–1.6
Hardell 2002 [33]	77 cases/138controls	1.2, 0.9–1.7
De Roos 2003 [30]	98 cases/226 controls	1.0, 0.7–1.3
Purdue 2007 [51]	37 cases/63 noncases	0.9, 0.6–1.5
Eriksson 2008 [32]	50 cases/37 controls	1.5, 0.9–2.3
Pahwa 2012 [47]	33 cases/59 controls	1.7, 1.1–2.7
Dieldrin		
Cantor 1992 [27] [3]	Handled prior to 1965: 10 cases/13 controls	1.9, 0.8–4.4
De Roos 2003 [30]	21 cases/39 controls	1.8, 0.8–3.9
Purdue 2007 [51]	7 cases/92 controls	0.6, 0.2–1.3
Heptachlor		
Cantor 1992 [27] [3]	Handled prior to 1965: 14 cases/25 controls	1.3, 0.6–2.6
De Roos 2003 [30]	25 cases/43 controls	1.3, 0.7–2.2
Purdue 2007 [51] [2]	18 cases/82 noncases	0.8, 0.4–1.4
Lindane		
Cantor 1992 [27] [3]	Handled prior to 1965: 14 cases/25 controls	2.2, 1.0–4.7
Blair 1998 [23]	93 cases/151 controls	1.5, 1.1–2.0

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Table 4. *Cont.*

Author, date	N exposed	Risk ratio, 95% CI
McDuffie 2001 [43]	15 cases/23 controls	2.1, 1.0–4.2
Rafnsson 2006 [52]	37 cases/133 controls	3.5, 1.4–9.0
Purdue 2007 [51] [2]	24 cases/76 controls	1.3, 0.8–2.1
Methoxychlor		
McDuffie 2001 [43]	65 cases/201 controls	1.0, 0.7–1.4
De Roos 2003 [30]	9 cases/16 controls	1.2, 0.5–2.7
Toxaphene		
Cantor 1992 [27] [3]	Handled prior to 1965: 6 cases/5 controls	2.4, 0.7–8.2
De Roos 2003 [30]	10 cases/13 controls	1.5, 0.6–3.5
Purdue 2007 [51] [2]	24 cases/75 controls	1.5, 0.9–2.5
Organophosphorus insecticides		
Organophosphorus insecticides		
Zahm 1993 [18] [1]	14 cases/43 controls	1.2, 0.6–2.5
Waddell 2001 [56]	158 cases/279 controls	1.5, 1.2–1.9
Orsi 2009 [46]	20 cases/24 controls	1.7, 0.9–3.3
Pahwa 2012 [47]	92 cases/169 controls	1.9, 1.4–2.6
Chlorpyrifos		
Waddell 2001 [56]	7 cases/8 controls	3.2, 1.1–9.2
Lee 2004 [38] [2]	37 participants	1.0, 0.6–1.7
Coumaphos		
Cantor 1992 [27] [3]	Handled prior to 1965: 3 cases/5 controls	1.5, 0.3–6.3
Waddell 2001 [56]	23 cases/37 controls	1.7, 1.0–2.9
Crufomate		
Waddell 2001 [56]	5 cases/8 controls	1.6, 0.5–4.9
Diazinon		
Cantor 1992 [27] [3]	Handled prior to 1965: 14 cases/12 controls	2.6, 1.2–5.9
McDuffie 2001 [43]	18 cases/28 controls	1.7, 0.9–3.2
Waddell 2001 [56]	60 cases/93 controls	1.7, 1.2–2.5
Mills 2005 [45]	NR	1.4, 0.8–2.5
Dichlorvos		
Cantor 1992 [27] [3]	Handled prior to 1965: 12 cases/17 controls	1.8, 0.8–3.9
Waddell 2001 [56]	23 cases/51 controls	1.0, 0.6–1.7
Koutros 2008 [37] [2]	6 exposed cases	NR
Dimethoate		
McDuffie 2001 [43]	22 cases/50 controls	1.2, 0.7–2.1
Waddell 2001 [56]	12 cases/22 controls	1.8, 0.9–3.8
Disulfoton		
Waddell 2001 [56]	7 cases/13 controls	2.0, 0.8–5.3
Ethoprop		
Waddell 2001 [56]	7 cases/17 controls	0.9, 0.4–2.3
Famphur		
Waddell 2001[56]	18 cases/47 controls	1.0, 0.5–1.8
Fensulfothion		
Waddell 2001 [56]	4 cases/4 controls	2.0, 0.5–8.2

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Table 4. *Cont.*

Author, date	N exposed	Risk ratio, 95% CI
Fonofos		
Waddell 2001 [56]	43 cases/67 controls	1.7, 1.1–2.6
Malathion		
Cantor 1992 [27] [3]	Handled prior to 1965: 11 cases/9 controls	2.9, 1.1–7.4
Waddell 2001 [56]	91 cases/147 controls	1.6, 1.2–2.2
Mills 2005 [45]	NR	1.8, 1.0–3.2
Pahwa 2012 [47]	72 cases/127 controls	2.0, 1.4–2.7
Methyl parathion		
Mills 2005 [45]	NR	0.6, 0.3–1.2
Parathion		
Waddell 2001 [56]	5 cases/8 controls	2.9, 0.9–9.7
Phorate		
Cantor 1992 [27] [3]	Handled prior to 1965: 9 cases/12 controls	1.8, 0.7–4.5
Waddell 2001 [56]	44 cases/97 controls	1.1, 0.8–1.7
Ronnel		
Waddell 2001 [56]	6 cases/11 controls	1.3, 0.5–3.6
Terbufos		
Waddell 2001 [56]	32 cases/97 controls	1.1, 0.7–1.8
Tetrachlorvinphos		
Waddell 2001 [56]	9 cases/17 controls	1.8, 0.7–4.7
Toxaphene		
Mills 2005 [45]	NR	0.9, 0.5–1.9
Trichlorfon		
Cantor 1992 [27] [3]	Handled prior to 1965: 6 cases/5 controls	2.4, 0.7–8.2
Waddell 2001 [56]	7 cases/11 controls	1.8, 0.7–4.7

Notes: 2,4-D, 2,4-Dichlorophenoxyacetic acid; 2,4,5-T, 2,4,5-Trichlorophenoxyacetic acid; EPTC, S-Ethyl dipropylthiocarbamate; MCPA, 2-methyl-4-chlorophenoxyacetic acid; DDT, dichlorodiphenyltrichloroethane; NHL, non-Hodgkin lymphoma; NR, Not reported; [1] Only women included in analysis; [2] Cohort study; [3] Effect estimate not included in the meta-analysis; another estimate from the same paper with a larger number of exposed cases was used..

3.4. Meta Analyses

When there was more than one effect estimate for a chemical group or active ingredient, the estimates shown in Tables 3 and 4 were combined to produce meta-analytic summary estimates and 95% CIs (Table 5).

The strongest meta RR estimates were associated with subtypes of NHL. There was a positive association between exposure to organophosphorus herbicide, glyphosate, and B cell lymphoma (2.0, 95% CI: 1.1–3.6, CLR: 3.2). Phenoxy herbicide exposures were associated with B cell lymphoma (1.8, 95% CI: 1.2–2.8, CLR: 2.4), lymphocytic lymphoma (1.8, 95% CI: 0.9–3.5, CLR: 3.8), and diffuse large B-cell lymphoma (DLBCL; 2.0, 95% CI: 1.1–3.7, CLR: 3.3). All these effect estimates were relatively precise, with CLRs < 4.

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Table 5. Meta analytic summary estimates of association between herbicides and insecticides with non-Hodgkin lymphoma.

Chemical group or active ingredient	Meta Risk Ratio estimate, 95% CI	I^2	Papers contributing
HERBICIDES			
Amide herbicides			
Amide herbicides	1.3, 0.8–1.9	22.2%	[18,27,34,46]
Alachlor	0.9, 0.6–1.3	43.0%	[30,39]
Aromatic acid herbicides			
Benzoic acid herbicides	1.3, 0.9–1.9	0.0%	[18,27,34,46]
Dicamba	1.4, 1.0-2.1	0.0%	[30,43]
Carbamate/thiocarbamate herbicides			
Carbamate/thiocarbamate herbicides	1.4, 1.1–2.0	0.0%	[18,43,60]
Dinitroanilines			
Dinitroanilines	1.2, 0.8–1.7	0.0%	[27,43]
Trifluralin	0.9, 0.6–1.3	0.0%	[18,30,43,45]
Organophosphorus herbicides			
Glyphosate	1.5, 1.1–2.0	32.7%	[30–33,43,46]
Glyphosate-association with B cell lymphoma	2.0, 1.1–3.6	0.0%	[32,63]
Phenoxy herbicides			
Phenoxy herbicides	1.4, 1.2–1.6	37.7%	[27,32–34,44, 46–50,57,59]
Phenoxy herbicides, association with B cell lymphoma	1.8, 1.2–2.8	0.0%	[32,63]
Phenoxy herbicides, association with DLBCL	2.0, 1.1–3.7	0.0%	[32,63]
Phenoxy herbicides, association with lymphocytic lymphoma	1.8, 0.9–3.5	0.0%	[32,63]
2,4-D	1.4, 1.0–1.9	61.5%	[27,44,45,47,58]
MCPA	1.5, 0.9–2.5	54.4%	[30,32,33,44,47]
Triazine herbicides			
Triazine herbicides	1.5, 1.0, 2.1	38.5%	[18,27,34,46]
Urea herbicides			
Urea herbicides, group	1.0, 0.3–2.9	43.4%	[27,46]
INSECTICIDES			
Arsenicals			
Arsenic	1.7, 0.8–3.6	0.0%	[32,33]
Botanical insecticides			
Pyrethrine	1.4, 0.8–2.8	0.0%	[30,32]
Carbamate insecticides			
Carbamate insecticides, group	1.7, 1.3–2.3	0.0%	[18,43,60]
Carbaryl	1.7, 1.3–2.3	0.0%	[43,60]
Carbofuran	1.6, 1.2–2.3	0.0%	[43,60]
Organophosphorus insecticides			
Organophosphorus insecticides, group	1.6, 1.4–1.9	0.0%	[18,46,47,56]
Chlorpyrifos	1.6, 0.6–4.9	72.0%	[38,56]
Diazinon	1.6, 1.2–2.2	0.0%	[43,45,56]
Dimethoate	1.4, 0.9–2.1	0.0%	[43,56]
Malathion	1.8, 1.4–2.2	0.0%	[45,47,56]

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Table 5. *Cont.*

Chemical group or active ingredient	Meta Risk Ratio estimate, 95% CI	I^2	Papers contributing
Organochlorine insecticides			
Organochlorine insecticides, group	1.3, 1.0–1.5	19.6%	[18,27,46,47,51]
DDT	1.3, 1.1–1.5	0.0%	[20,32,33,47,50,51,57]
DDT-association with B cell lymphoma	1.4, 1.0–2.0	0.0%	[20,32,63]
DDT-association with DLBCL	1.2, 0.9–1.7	0.0%	[20,32]
DDT-association with follicular lymphoma	1.5, 1.0–2.4	26.6%	[20,32]
Methoxychlor	1.0, 0.7–1.4	0.0%	[30,43]
Aldrin	1.0, 0.4–2.7	84.6%	[30,43,51]
Chlordane	1.1, 0.8–1.6	32.5%	[30,43,51,57]
Dieldrin	1.1, 0.4–3.1	67.6%	[30,51]
Heptachlor	0.9, 0.6–1.5	0.0%	[30,51]
Lindane	1.6, 1.2–2.2	26.0%	[23,43,51,52]
Toxaphene	1.4, 0.9–2.1	0.0%	[30,45,51]
Amide fungicides			
Captan	1.5, 0.5–4.2	82.5%	[43,45]

Notes: 2,4-D, 2,4-Dichlorophenoxyacetic acid; 2,4,5-T, 2,4,5-Trichlorophenoxyacetic acid; DDT, dichlorodiphenyltrichloroethane; EPTC, s-ethyl dipropylthiocarbamate; MCPA, 2-methyl-4-chlorophenoxyacetic acid; NHL, non-Hodgkin lymphoma; DLBCL, diffuse large B cell lymphoma; OC, Organochlorine; OP; Organophosphorus.

The meta RR estimates (95% CI) of association between phenoxy herbicide exposure and NHL subtypes were more positive than those for NHL overall, although the estimate of association with NHL overall was more precise (meta RR, 95% CI: 1.4, 1.2–1.6, CLR: 1.4). Only two papers contributed to each of the estimates of association between phenoxy herbicide exposures and NHL subtypes, and 12 papers contributed to the meta RR estimates for the relationship between phenoxy herbicide exposure and NHL overall.

There was a positive and relatively precise association between NHL and the phenoxy herbicide 2-methyl-4-chlorophenoxyacetic acid (MCPA) (meta RR, 95% CI: 1.5, 0.9–2.5, CLR: 2.6). Five estimates contributed to this summary estimate; an I^2 value of 54.4% indicates some inconsistency in the effect estimates. The forest plot for the meta-analysis of MCPA, along with plots for meta-analyses of phenoxy herbicicides as a group, the phenoxy herbicide 2,4-D, glyphosate, organochlorine insecticides as a group, and the organochlorine insecticide DDT, are presented in Supplementary Figure S1.

In addition to assessing the association of ever exposure to MCPA with NHL, Hardell *et al.* [33] investigated dose-response relationships between number of days of exposure; they observed increasing odds in association with increased number of days of MCPA exposure (Table 2). In similar analyses, Eriksson *et al.* [32] and Mcduffie *et al.* [43] did not observe dose-response relationship between days/year of MCPA exposure and NHL.

There was a positive but less precise estimate of association between arsenic and NHL (meta RR, 95% CI: 1.7, 0.8–3.6, CLR: 4.4). Meta estimates of association between NHL and carbamate insecticides and carbaryl, a carbamate insecticide, were nearly identical (meta RR, 95% CI: 1.7, 1.3–2.3,

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CLR: 1.8) and both were positive and precise. Estimates from three papers contributed to the meta analysis of carbamate insecticides. The I^2 value was 0%, indicating consistency in effect estimates. Carbofuran, another carabamate insecticide, was positively associated with NHL (meta RR, 95% CI: 1.6, 1.2–2.3, CLR: 2.0). However, in two investigations from the Agricultural Health Study that reported estimates of association with tertiles of lifetime days of exposure to carbofuran [25] and carbaryl [42], the relationships were imprecise and there was a lack of a dose-response relationship (Table 2).

There were positive and precise estimates of association between NHL and organophosphorus insecticides (meta RR, 95% CI: 1.6, 1.4–1.9, CLR: 1.4), and the organophosphorus insecticides diazinon (meta RR, 95% CI: 1.6, 1.2–2.2, CLR: 1.8), and malathion (meta RR, 95% CI: 1.8, 1.4–2.2, CLR: 1.5). Although Fritschi *et al.* [62] studied the relationship between organophosphorus insecticides and NHL, we did not include the estimate from their paper in the meta analysis because they investigated the association with exposure in three categories (no exposure, non-substantial exposure, substantial exposure). Fritschi *et al.* [62] reported a positive but imprecise estimate for substantial exposure *versus* no exposure (odds ratio, 95% CI: 2.1, 0.8–5.7, CLR: 7.3). The meta RR estimate of association between NHL and the organophosphorus insecticide chlorpyrifos was positive but imprecise (meta RR, 95% CI: 1.6, 0.6–4.9, CLR: 8.9). There was a positive and precise association with lindane, an organochlorine insecticide (meta RR, 95% CI: 1.6, 1.2–2.2, CLR: 1.8); estimates of association with other organochlorine insecticides were closer to the null.

3.5. Sensitivity Analyses

We conducted sensitivity analyses to examine the effect of gender (Supplementary Table S1), study design (Supplementary Table S2), diagnosis period (Supplementary Table S3), geographic region (Supplementary Table S4), source for controls in case-control studies (Supplementary Table S5) and/or the effect of using alternative papers that represent the same study population (Supplementary Table S6). For the most part, meta-estimates were robust.

3.5.1. Gender

When we subset the analyses of associations between NHL and amide herbicides to the two studies that included men only, the association became more positive but less precise (meta RR, 95% CI: moved from 1.3, 0.8–1.9, CLR: 2.3 to 1.7, 0.7–3.8, CLR: 5.3). Restricting to all male studies moved the summary estimate of the relationship with aldrin up and across the null; however, the estimate in the sensitivity analysis was too unstable to interpret (meta RR, 95% CI: moved from 1.0, 0.4–2.7, CLR: 7.8 to 1.4, 0.2–11.1, CLR: 65.0). Restricting the analysis to studies that included men and women caused the meta RR estimate of association between NHL and 2,4-D to become more positive but less precise; it moved from 1.4, 1.0–1.9, CLR: 1.9 to 1.8, 0.5–7.5, CLR: 16.7. We were not able to conduct sensitivity analyses for female only studies, since only one paper reported results for women only [18].

3.5.2. Study Design

Nearly all of the studies that contribute to the meta estimates were case control in design. The only cohort study was the Agricultural Health Study. In nearly all of the analyses of data from the

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Agricultural Health Study, exposure was defined using multiple categories. However, in the papers on glyphosate [31], chlorpyrifos [38], organochlorine insecticides, aldrin, chlordane, dieldrin, lindane, and toxaphene [51], the association with ever/never use of exposure was analyzed. For the most part, restricting analyses to case control studies did not cause the meta estimate to change substantially (Supplementary Table S2). However, the magnitude of the meta RR for aldrin moved up and away from the null, but became more imprecise (it moved from 1.0, 0.4–2.7, CLR: 6.8 to 1.4, 0.2–11.1, CLR: 55.5). For lindane it changed from 1.6, 1.2–2.2, CLR: 1.8 to 1.9, 1.2–2.9, CLR: 2.4.

3.5.3. Diagnosis Period

We also investigated the sensitivity of the meta-analytic estimates to decade of cancer diagnosis (Supplementary Table S3). For the most part, estimates were robust. However, when we subset the meta-analysis of glyphosate to the two papers in which cases were diagnosed from 1975–1989, the meta RR, 95% CI changed from 1.5, 1.1–2.0, CLR: 1.8 to 2.3, 1.4–4.0, CLR: 3.0. Similarly, for the phenoxy herbicide 2,4-D, when we included estimates from the three papers with diagnosis periods from 1975 to 1989, the summary estimate was more positive but less precise (meta RR, 95% CI: 1.8, 1.0–3.1, CLR: 3.2) compared to the full meta-analysis estimate (1.4, 95% CI: 1.0–1.9; CLR: 1.9).

3.5.4. Geographic Area

We investigated the impact of geographic area on the meta-analytic RR estimates (Supplementary Table S4). For glyphosate exposure, including estimates from papers that reported results from Swedish studies caused the estimate to become more positive; it moved from 1.5, 95% CI: 1.1–2.0, CLR: 1.8 to 2.2, 95% CI: 1.3–3.8, CLR: 2.9. Similarly, restricting estimates of the relationship between NHL and phenoxy herbicide exposure to Sweden caused the estimate to become more positive; it changed from 1.4, 95% CI: 1.2–1.6, CLR: 1.4 to 1.9, 1.4–2.4, CLR: 1.7. When we restricted estimates of association with MCPA to those that came from North American studies, the meta RR moved towards the null, from 1.5, 0.9–2.5, CLR: 2.6 to 1.1, 0.7–1.8, CLR: 2.7. In contrast, restricting to European and Swedish studies caused the estimate of association with MCPA to become more positive (meta RR, 95% CI: 1.9, 0.9–3.8, CLR: 4.1 and 2.7, 1.6–4.4, CLR: 2.7 respectively). When we included estimates of association with aldrin that came from studies conducted in the USA, the estimate became more precise but moved down and away from the null (meta RR, 95% CI: 1.0, 95% CI: 0.4–2.7, CLR: 7.8 changed to 0.5, 95% CI: 0.4–0.8, CLR: 2.3).

3.5.5. Source of Controls in Case Control Studies

Only two papers reported results from case control studies in which controls were selected from the hospital [46,48]. The meta-analytic RR estimates remained robust when we restricted the estimates to those resulting from population-based case-control studies (Supplementary Table S5).

3.5.6. Alternative Papers

In several cases, analyses of the same study populations were represented in multiple papers. For the meta-analyses, we included the result(s) that represented the largest number of participants.

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In some cases, we selected the result from a pooled analysis instead of the individual, original studies. In other cases, use of effect estimates from the individual studies was preferable because it represented more people. We performed sensitivity analyses to evaluate the impact of replacing results from pooled analyses of multiple studies [23,30,59,60] with the original ones [27,34,58], or the original ones with the pooled analyses (Supplementary Table S6).

When we replaced the estimate of a relationship between carbofuran exposure and NHL reported in Zheng *et al.* [60] by that reported in Cantor *et al.* [27] the relationship became weaker and less precise; the meta RR and 95% CI changed from 1.6, 1.2–2.3, CLR: 2.0 to 1.1, 0.7–1.8, CLR: 2.4. Using the estimate reported in De Roos *et al.* [30] yielded a similar result (meta RR, 95% CI changed to 1.1, 0.6–2.0, CLR: 3.1). For the relationship between aldrin and NHL, we replaced the estimate reported in De Roos *et al.* [30] by that reported by Cantor *et al.* [27]; the estimate moved from a null relationship to a positive one (meta RR, 95% CI changed from 1.0, 0.4–2.7 to 1.3, 0.5–2.9).

4. Discussion

This systematic review and series of meta-analyses show that there is consistent evidence of positive associations between NHL and carbamate insecticides, organophosphorus insecticides, lindane, an organochlorine insecticide, and MCPA, a phenoxy herbicide. Our results represent an important contribution to a growing body of literature on agricultural exposures associated with cancer. Past review papers and meta-analyses have identified positive associations between NHL and farming related exposures, including fertilizers, chemicals, and animals [5], and occupational exposures to pesticides [6].

We extracted estimates of association of NHL with individual pesticide chemical groups or active ingredients from 44 papers that reported analyses of results from 17 independent studies. The studies represented data collected in 12 countries, the majority of which were located in either Europe or North America. Several of the papers that we identified were related to one another; many used data from the same cohort study, the Agricultural Health Study, and several others pooled the same data from individual studies. Thus, although this review identified 44 papers, it also highlights the need for additional epidemiologic studies in a larger variety of geographic locations.

In the papers from which we extracted information, estimates of associations with NHL were reported with 13 herbicide chemical groups and 28 herbicide active ingredients, five fungicide groups and 12 fungicide active ingredients, and three insecticide groups and 40 insecticide active ingredients. More than 1,700 active ingredients are listed in Alan Wood's compendium of pesticide common names, although not all of these are necessarily used in agriculture or currently registered for use in any or all countries [13]. Many chemicals remain for consideration in future epidemiologic analyses of associations between NHL and pesticides. It would be useful to identify pesticides to investigate by ranking, by country, the most commonly used chemicals.

The positive and precise estimate of associations of NHL with carbamate insecticides, organophosphorus insecticides, and lindane were robust to sensitivity analyses of gender, geographic area, and cancer diagnosis period. The positive association between MCPA and NHL was robust to a sensitivity analysis of diagnosis period, but when we restricted the meta-analysis to estimates from studies conducted in North America, the estimate moved to the null.

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Consistent with the results from the meta-analysis of lindane exposure, analyses of data from the American cohort, the Agricultural Health Study, revealed a positive dose-response relationship between NHL and intensity weighted lifetime days of lindane exposure, where the referent group consisted of applicators never exposed to pesticide products containing the active ingredient [51]. In this same paper, however, the estimate of association with dichotomously coded exposure to lindane was close to the null and imprecise. This difference in results within the Agricultural Health Study suggests that dichotomous classification of exposure might be too crude; the binary categories could lead to exposure misclassification and attenuated effect estimates. Because of variability in definitions and cut-points across papers, we were unable to conduct formal meta-analyses of exposures classified using multiple categories. When they were available, we reviewed estimates of dose-response relationships from the individual papers. We found that, in most of the papers in which dose-response relationships were investigated, effect estimates were imprecise due to small numbers of exposed cases within categories.

There were positive meta RR estimates of association of NHL with two carbamate insecticides, carbaryl and carbofuran, and the organophosphorus insecticide active ingredients diazinon and malathion. However, results from analyses of Agricultural Health Study data, which were not included in the meta-analyses, did not show dose response relationships between NHL and lifetime days of exposure to carbofuran [25], carbaryl [42], diazinon [29] or malathion [21,26].

Some discrepancies in findings from the Agricultural Health Study compared to the other studies could be due to differences in design (cohort *versus* case-control). Differences could also be the result of different referent category compositions. All participants of the Agricultural Health Study were pesticide applicators; therefore, the referent group generally consisted of applicators who were not exposed to the pesticide active ingredient of interest. In contrast, in the papers contributing to the meta-RR estimate for carbaryl [30,43] and carbofuran [43,60], the referent groups consisted of farmers and non-farmers [30,43], or only of non-farmers [60]. In the papers contributing to the meta-analyses of malathion and diazinon, the referent categories consisted of non-farmers [56], farmers and non-farmers [43,47], and only farm-workers [45]. It is possible that, in studies that included non-farmers in the referent group, confounding by other agricultural exposures, not adjusted for in analysis, caused estimates of association to be higher than results from Agricultural Health Study analyses.

Only a handful of papers reported associations of pesticides with NHL subtypes; this is probably due to small sample sizes. Our meta-analyses of these relationships suggested the need for further studies of this kind, especially since some of the strongest relationships were seen with the most common subtype of NHL, B cell lymphoma and, more specifically, with DLBCL. NHL are a heterogeneous group of malignancies that include multiple subtypes with varied characteristics and possibly diverse etiologies [4]. Consequently, the overall group of neoplasms represented by NHL might be too diverse as a study endpoint to adequately detect associations with pesticide exposures in epidemiologic analyses. Some but not all specific subtypes of lymphoma might be associated with pesticides, and these relationships would only be revealed by analyses of the subtypes. Pooling projects that include cases of the NHL subtypes that have been classified according to the more recent and etiologically specific definitions (B-cell, T-cell, and within these, more refined subtypes of T- and B-cell neoplasms) [65] present the opportunity to perform more sensitive

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epidemiologic analyses and identify important relationships that may have been undetected if the cancer outcome was defined broadly as NHL overall. Such projects are particularly attractive for studying rarer subtypes (*i.e.*, T-cell). To this end, a pooling project within the AGRICOH consortium [64] is currently underway to investigate these associations.

There are various sources of heterogeneity across the studies that contributed to these meta-analyses; these include gender, region, cancer diagnosis period, exposure assessment methods, exposure definitions, referent groups, study populations, and/or analysis adjustment sets. Different activity patterns, which might cause differences in exposure, combined with different biological mechanisms, could result in between-gender differences in chemical exposure and disease risk associations. Pesticide use, application, and handling patterns, regulations and legislation, demographics and genetics differ by region, which could contribute to area-specific differences in associations. In the papers that contributed to the meta analyses, a variety of exposure assessment methods were used; these included self-reported chemical exposures, exposure matrices, and approximations based on number of animals raised. Differences in exposure assessment methods could influence the magnitude of effects observed, especially since some methods might be superior to others in terms of reducing the potential for exposure misclassification. Study design (case-control *versus* cohort) and source of controls in case-control studies (hospital *versus* population) could also influence the magnitude of the exposure estimates observed. In case-control studies, exposure is assessed retrospectively, which could lead to recall bias. In contrast, in the Agricultural Health Study, the only cohort included in this review, exposure was assessed when participants were cancer-free. Finally, NHL classification systems have changed over time, reflecting changes in disease definitions [1]. Recently (after year 2000), the definition of NHL has become more comprehensive. The definition now includes disease entities that were excluded from earlier definitions, such as plasma cell neoplasms (*i.e.*, multiple myeloma) and chronic lymphocytic leukemia. These malignancies are also among the most frequently reported sub-types within NHL [65]. Thus, estimates of association between pesticides and overall NHL from studies conducted in earlier periods may not be entirely comparable to estimates from research conducted since the year 2000 that used the updated NHL definition.

We did not conduct a formal test of publication bias; it is unclear if asymmetry tests with funnel plots are useful in meta-analyses of observational studies, and it has been recommended that these tests not be used when fewer than 10 studies contribute to a meta-analysis [66]. For the most part, we believe that our review was systematic and comprehensive.

Nevertheless, we did not identify papers that published results of studies conducted in middle- and low-income countries. It is possible that, in such regions where cancer-follow and exposure ascertainment may be particularly challenging, no studies have investigated the relationship of NHL with pesticide exposures. Restricting our literature search to articles published in English could be another reason that we did not identify studies in lower-income countries. A lack of studies in these areas is potentially alarming, since these regions are responsible for much of the world's agricultural production [67]. Also, lympho-hematopoetic malignancies represent a substantial proportion of cancers in low- and middle-income countries. For example, based on estimates from the World Health Organization's GLOBOCAN 2012, NHL accounted for 37.7% of the estimated prevalent cancer cases diagnosed in the past 5 years, among adults in less-developed regions (Africa, Asia excluding Japan, Latin America and the Caribbean, Melanesia, Micronesia, and Polynesia) [68]. Nevertheless, research results

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from higher-income countries could be transferable and have important implications for pesticide regulation and legislation world-wide, especially in low-income countries where protective equipment may be less available and/or used.

There are several mechanisms by which pesticide exposure might be associated with NHL. First, pesticides might cause chromosomal aberrations and genetic mutations. An often studied chromosomal abnormality is the t(14;18) translocation, which is particularly common among cases of follicular lymphoma and diffuse large B-cell lymphoma [69]. In a paper that used data from the Iowa/Minnesota case-control study that contributed to several of the pooled and individual analyses that we reviewed [23,30,59], Schroeder *et al.* [70] investigated the relationship between pesticide exposures and the t(14;18) translocation. Compared with controls, t(14;18) positive NHL cases but not t(14;18) negative cases had a higher odds of exposure to dieldrin, toxaphene, lindane, and atrazine. Chiu *et al.* [69,71] performed a similar analysis using data from the Nebraska-based case-control study and reported positive associations between t(14;18) positive NHL and dieldrin, toxapehen, and lindane. A second mechanism by which pesticide exposure may cause NHL is by altering cell mediated immune function. Indeed, immunological changes have been observed following short-term exposure to phenoxy herbicides (2,4-D and MCPA) among farmers [72].

The IARC Monographs have evaluated the carcinogenicity of a handful of pesticides. Of these, only arsenic and inorganic arsenic compounds have been given a Group 1 rating (carcinogenic to humans) [73]. The fumigant insecticide ethylene dibromide was classified as a group 2A carcinogen based on inadequate evidence for carcinogenicity in humans but sufficient evidence in experimental animals; the overall evaluation was upgraded to 2A (probably carcinogenic to humans) with supporting evidence from other relevant data [74]. In Volume 53 (1991) [75], the fungicide captafol was also classified as a group 2A carcinogen based on sufficient evidence in experimental animals but no available data from human studies. In this same volume, several other pesticides were classified as either group 2B (possibly carcinogenic to humans) or group 3 carcinogens (not classifiable as to its carcinogenicity)—aldicarb chlordane/heptachlor, DDT, deltamethrin, dichlorvos, fenvalerate, permethrin, thiram, ziram, atrazine, monuron, picloram, simazine, and trifluralin. The IARC monographs have classified other pesticides, including heptachlor, chlordane, and toxaphene [76], as group 2B carcinogens; in each of these cases, the 2B classification was based on inadequate evidence in humans but sufficient evidence in experimental animals. Chlorophenoxy herbicides were classified as group 2B carcinogens based on limited evidence for carcinogenicity in humans, and inadequate evidence for carcinogenicity of 2,4-D and 2,4,5-T in animals [77].Similarly, hexachlorocyclohexanes were evaluated as group 2B carcinogens due to inadequate evidence for carcinogenicity to humans, sufficient evidence for carcinogenicity to animals for the technical-grade and the alpha isomers but limited for the beta and gamma (lindane) isomers [77]. Several other pesticides, including malathion and maneb [77] have been classified as group 3 carcinogens. These evaluations took place several decades ago and there is now more epidemiologic literature that can provide information. There also remains a need for further epidemiologic research of certain chemicals, which could help to inform future evaluations. In the current systematic review, we did not observe entirely consistent trends in association for all of the active ingredients within chemical groups. Furthermore, classification of active ingredients into groups is subjective and there is not a consistent and established scheme for doing so. Therefore, evaluations of individual active ingredients rather than chemical groups might be more useful.

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Limitations and Strengths

Because of variability in definitions and metrics that were used in published papers, we were not able to consider additional exposure definitions, such as exposure lags, duration of exposure (e.g., number of days/year exposed), or routes of exposure (e.g., application *versus* mixing of pesticides). In an effort to use similar exposure definitions from the various papers, we only included dichotomous definitions in the meta-analyses. Since dose-response relationships could not be summarized, this restricted the strength of our conclusions from an etiologic perspective. Furthermore, we were not able to conduct analyses of certain active ingredients or chemical groups due to a lack of published literature. In other cases, very few papers contributed to the meta-analyses. The largest number of papers contributing to any meta-analysis was 12 for phenoxy herbicides, followed by eight for DDT. Most meta-analyses included estimates from only two to three studies. In most papers, associations with NHL overall, rather than with subtypes of NHL, were investigated. Thus, most of our meta-analyses were of associations with NHL rather than with its subtypes, which are probably more homogeneous disease entities for assessing the relationship with pesticides. It is possible that this led to a dilution of effects, since the various NHL subtypes have diverse etiologies and some might be more strongly associated with certain pesticides than others.

Nevertheless, this systematic review represents a novel contribution to the literature on NHL and pesticide exposure. We identified trends in the relationship of NHL and NHL subtypes with chemical groups and active ingredient groups. To our knowledge, this is the most comprehensive systematic review and meta-analysis to investigate associations with specific agricultural pesticide active ingredients. We observed fairly consistent results for certain pesticide groups and active ingredients. We evaluated the robustness of our meta-analyses by examining the sensitivity of the estimates to gender, study design, region, diagnosis period, control source in case-control studies, and paper that provided the effect estimate.

5. Conclusions

We systematically reviewed more than 25 years' worth of epidemiologic literature on the relationship between pesticide chemical groups and active ingredients with NHL. This review indicated positive associations between NHL and carbamate insecticides, OP insecticides, the phenoxy herbicide MCPA, and lindane. Few papers reported associations with subtypes of NHL; however, based on the few that did, there were strong associations between certain chemicals and B cell lymphomas. Our results show that there is consistent evidence that pesticide exposures experienced in occupational agricultural settings may be important determinants of NHL. This review also revealed clear research needs, including further investigation of some already studied pesticide active ingredients, of additional pesticides that have not yet been investigated in epidemiologic analyses, of the strength of association of pesticide exposures with subtypes of NHL, and of the relationship between NHL and pesticides in middle- and low- income areas.

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Author Contributions

Leah Schinasi conducted the literature search, screened the papers from the search, abstracted data from the papers, conducted the meta-analyses, and led the writing of the manuscript. Maria E. Leon co-defined the scope of the review, the search strategy for the literature search and contributed to the writing of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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Message

From: Spire, Paul [PSpire@aap.org]
Sent: 12/19/2017 11:15:20 PM
To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Balk, Sophie [sbalk@montefiore.org]
Subject: Green Book - Endocrine Disrupting Chemicals chapter - editor review
Attachments: 29 - Endocrine Disrupting - editor review.docx; new version with changes tracked.docx; Ari's comments and older history.docx

Dear Ruth and Sophie,

I am writing to convey the attached "Endocrine Disrupting Chemicals" chapter for editor review. Maida Galvez and Michele La Merrill were the lead authors for this chapter.

Ari Bernstein served as the primary reviewer. The COEH review comments were conveyed to Drs. Galvez and La Merrill embedded in the document as track changes and comments.

Please note that Maida returned a clean draft, which is attached. I have also used Word's "compare documents" feature to create a version that shows Maida and Michelle's last round of edits in track changes, so you can see what they've updated. I've also attached a document labeled "Ari's comments," which shows Ari's comments and the earlier track changes history of this document.

The next step for this chapter will be stakeholder review. We will need to distribute "clean" chapters for review, so at this point we will need to "accept" track changes. I would be happy to do this, or feel free to return a clean chapter to me.

Many thanks,

Paul

From: Galvez, Maida [mailto:maida.galvez@mssm.edu]
Sent: Tuesday, December 19, 2017 4:32 PM
To: Spire, Paul <PSpire@aap.org>
Cc: Etzel, Ruth <etzel.ruth@epa.gov>; Balk, Sophie <sbalk@montefiore.org>; Jennifer Lowry <jlowry@cmh.edu>; 'Michele Andrea La Merrill' <mlamerrill@ucdavis.edu>
Subject: RE: Green Book - Endocrine Disrupting Chemicals chapter - response requested by December 15

Hello all,

Sincere thanks for the COEH's careful review (and your collective patience!).

I addressed all the comments, amended the FAQs and added a ref to BPA analogs as requested.

Please see attached revision.

Cheers,

Maida and Michele

From: Spire, Paul [mailto:PSpire@aap.org]
Sent: Friday, November 17, 2017 5:04 PM

To: Galvez, Maida
Cc: Etzel, Ruth; Balk, Sophie; Jennifer Lowry
Subject: Green Book - Endocrine Disrupting Chemicals chapter - response requested by December 15

Dear Dr. Galvez,

I am writing on behalf of the Green Book editorial team to follow-up on the development of the "Endocrine Disrupting Chemicals" chapter for the *Pediatric Environmental Health, 4th Edition* manual (Green Book).

Attached please find a copy of the draft chapter as it was reviewed by the AAP's Council on Environmental Health (COEH), with comments from the committee embedded in the document in track changes. We are requesting that you review these comments and adjust the chapter to address these issues. If there are any items that you will not be addressing or that you disagree with, it would be helpful to receive a short explanation of these issues for the committee's consideration.

We also wanted to share one new request and additional guidance that has emerged as this project has progressed:

- Please write 3 - 5 bullet points for your chapter that summarize key issues and take-home messages. (A temple space for this has been added to the chapter.) These are being added at the start of each chapter.
- Please pay special attention to providing citations wherever it would be appropriate to do so, ensuring that all sources are cited and acknowledged.
- If you are using information from another AAP policy statement (or other Academy document), please modify the content so that it is not worded exactly like the existing policy document.
- Please continue to make all adjustments utilizing Word's "Track Changes" feature.

We are hoping to receive all updated chapters within one month, by Friday, December 15.

Thanks again for your ongoing support. If you have any questions or need anything more, please do not hesitate to let me know.

Many thanks,

Paul

Message

From: Environmental Law360 [news-q2@law360.com]
Sent: 4/23/2018 7:28:44 AM
To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]
Subject: Exxon Takes AG Climate Probe Fight To 2nd Circ.

ENVIRONMENTAL

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TOP NEWS

Exxon Takes AG Climate Probe Fight To 2nd Circ.

Oil giant ExxonMobil said Friday it will appeal to the Second Circuit a New York federal judge's dismissal of its suit claiming the attorneys general of New York and Massachusetts conspired to violate its free speech rights on climate change issues by investigating the company. Read more »

Monsanto Appeal Can't Keep Herbicide Off Calif. Cancer List

A California appeals court on Thursday refused to revive Monsanto Co.'s lawsuit challenging a state agency's inclusion of the herbicide glyphosate on a list of carcinogens, which could require the company to put warning labels on its popular Roundup weed killing products because glyphosate is an active ingredient. Read more »

Fed. Circ. Says Taking Claim Fails In Katrina Flooding Fight

The federal government can't be held liable for damage caused by Hurricane Katrina-related flooding under the Fifth Amendment based on lackluster maintenance of a navigation channel, the Federal Circuit ruled Friday, reversing a U.S. Court of Federal Claims decision. Read more »

GOP State AGs Back Big Oil In Calif. Climate Suits

Republican attorneys general from 15 states urged a California federal judge Thursday to dump Oakland's and San Francisco's suits seeking to hold oil giants liable for climate change-related infrastructure damage, accusing the Golden State municipalities of unlawfully trying to regulate national fossil fuel use through the courts. Read more »

HSBC Halts Coal Power Plant Funding To Honor Paris Accord

HSBC Holdings PLC said Friday it is turning its back on funding high-carbon energy projects as the bank looks to ease pressure from activists

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and regulators who want financial services firms to step up their response to climate change. Read more »

POLICY & REGULATION

NJ Gov. Signs Law Banning Offshore Drilling

Newly minted New Jersey Gov. Phil Murphy signed into law a bipartisan bill on Friday that bans offshore oil and gas drilling in the state's waters and beyond, a move that comes as a rebuke to the Trump administration's efforts to undo Obama-era restrictions on the activity in the Atlantic and Pacific oceans. Read more »

Dems Look To Shield Offshore Rules From Trump Rollback

Eight years after the Deepwater Horizon disaster that killed 11 and sent plumes of oil spraying into the Gulf of Mexico for months, a group of Democratic senators Thursday proposed codifying two Obama-era rules aimed at tightening regulations for offshore drilling after the Trump administration moved to reconsider them. Read more »

NY Beefs Up Energy Efficiency Targets To Drive GHG Cuts

New York Gov. Andrew Cuomo on Friday unveiled a new energy efficiency target that aims to significantly slash buildings' energy use by 2025, saying the reductions will help the Empire State reach the goal of cutting its greenhouse gas emissions by 40 percent from 1990 levels by 2030. Read more »

Senate Dems Press For Info On Koch Ties To Trump Policies

Senate Democrats have demanded information from President Donald Trump and several federal agencies including the EPA and the U.S. Department of Labor concerning the alleged "sweeping infiltration" of the current administration by the Koch brothers and their affiliates, Sen. Sheldon Whitehouse, D-R.I., announced Friday. Read more »

LITIGATION

11th Circ. Affirms Sewage Not Pollution In Insurance Row

The Eleventh Circuit upheld an Alabama federal court's ruling that a pollution exclusion in an insurance policy doesn't apply to property damage and injuries from a sewage leak, saying Friday the lower court rightly drew comparisons to a past case that reached the same conclusion. Read more »

Jamaican Investor Hits Dominican Republic With $300M Claim

A Jamaican national has hit the Dominican Republic with a more than $300 million arbitration claim after the landfill he invested in was improperly seized by the government for alleged environmental misdeeds, his law firm confirmed on Friday. Read more »

Mining Co. Asks DC Circ. To Revisit EPA Superfund Ruling

Sunnyside Gold Corp. urged the D.C. Circuit on Thursday to rethink a panel decision backing the U.S. Environmental Protection Agency's addition of the entire Bonita Peak Mining District in Colorado to the federal Superfund list, saying the opinion conflicts with the court's precedent and is "inviting agency abuse and overreach in listing decisions." Read more »

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FactSet Research Systems Inc.
Garden City Group Inc.

EXPERT ANALYSIS

Rule 23 Changes: Avoid Delays In Class Settlement Approval

Among the proposed amendments to Rule 23 of the Federal Rules of Civil Procedure, which are scheduled to take effect Dec. 1, are specific requirements related to “front-loading.” They outline the process for seeking preliminary court approval of class action settlements and related notice plans, say Shandarese Garr and Niki Mendoza of Garden City Group LLC. Read more »

LEGAL INDUSTRY

Dentons Under Scrutiny After UK Maternity Leave Spat

The Solicitors Regulation Authority is looking into the conduct of some Dentons UKMEA LLP human resources managers that came to light during a gender discrimination dispute last year, a spokesperson for the U.K. legal regulatory body confirmed on Friday. Read mor e »

Analysis

Why More BigLaw Firms May Start Ditching Annual Reviews

At least two global law firms are doing away with their annual associate reviews in favor of ongoing, associate-initiated performance evaluations, a new approach that may be the wave of the future for law firms. Read more »

Federal Judge’s Killer Executed After High Court Flurry

A man who killed an Eleventh Circuit judge and a black civil rights lawyer in 1989 using mail bombs was executed Thursday night in Alabama, following an eleventh-hour stay issued by the U.S. Supreme Court earlier in the day that was later vacated. Read more »

Alston & Bird Settles $35M Ga. Malpractice Suit

A former confidant and employee of a widowed Coca-Cola executive’s wife and Atlanta-based Alston & Bird LLP have agreed to end that woman's $35 million Georgia state malpractice suit in a settlement, the plaintiff’s lawyer said Friday. Read more »

DNC Sues Trump Campaign, Russia Over 2016 Election Hacks

The Democratic National Committee filed suit Friday in New York federal court accusing the Russian government, the Trump campaign and WikiLeaks of conspiring to hack the Democratic Party and doom Hillary Clinton’s chances at the 2016 presidential election. Read more &raq uo;

GC Cheat Sheet: The Hottest Corporate News Of The Week

Taking the measure of President Trump's "Buy America, Hire America" mandate after one year, the general counsel of FactSet weighs in on the European Union’s upcoming General Data Protection Regulation, and a settlement between Uber and regulators could change the way companies think about data breaches. These are some of the stories in corporate legal news you may have missed in the past week. Read more »

Podcast

Law360's Pro Say: The Michael Cohen Saga, Explained

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Royal Dutch Shell PLC
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Sierra Club
SuccessFactors, Inc.
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Wayfair LLC

GOVERNMENT AGENCIES

Army Corps of Engineers
Bank of England
Bureau of Citizenship and Immigration Services
California Attorney General's Office
California Environmental Protection Agency
Consumer Financial Protection Bureau
European Commission
European Union
Executive Office of the President
Federal Bureau of Investigation
Federal Judicial Center
Federal Trade Commission
National Institutes of Health
National Labor Relations Board
Native Village of Kivalina
Navajo Nation
New Jersey Department of Environmental Protection
New York Attorney General's Office
New York State Department of Public Service
Permanent Court of Arbitration

On the latest episode of Law360's Pro Say podcast, we dig in to some intriguing aspects of the raid on the offices of President Trump's personal lawyer, including the impact on attorney-client privilege and Michael Cohen's high-dollar BigLaw connection. Also this week, we discuss a big Supreme Court case that could have a huge impact on how online retailers pay sales tax and a case that could turn courtroom theater into actual Broadway theater. Read more »

In Case You Missed It: Hottest Firms And Stories On Law360

For those who missed out, here's a look back at the law firms, stories and expert analyses that generated the most buzz on Law360 last week. Read more »

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Message

From: Lynn Goldman [goldmanl@gwu.edu]
Sent: 4/30/2017 9:23:20 PM
To: Spire, Paul [PSpire@aap.org]
CC: Lindemann, Heidi [hlindemann@email.gwu.edu]; Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Jennifer Lowry [jlowry@cmh.edu]
Subject: Re: Green Book - Water chapter - requested by May 15
Attachments: 17 Water 2017.docx

Here is it. Note that there are a number of updates to references and also unfortunately a couple of places where the EPA links no longer are operative. I suggest that you cross check this throughout the book since they recently have been taking down quite a lot of information.

Best,
Lynn

On Thu, Apr 27, 2017 at 2:11 PM, Spire, Paul <PSpire@aap.org> wrote:

> Thanks for your follow-up and ongoing support.
>
> Will look forward to receiving the chapter when available.
>
> Best,
>
> Paul
>
> **From:** Lynn Goldman [mailto:goldmanl@gwu.edu]
> **Sent:** Wednesday, April 26, 2017 4:00 PM
> **To:** Spire, Paul <PSpire@aap.org>
> **Cc:** Lindemann, Heidi <hlindemann@email.gwu.edu>; Etzel, Ruth <etzel.ruth@epa.gov>; Jennifer Lowry <jlowry@cmh.edu>
> **Subject:** Re: Green Book - Water chapter - requested by May 15
>
> Sorry for the delayed response. I have been working on it and I think I can get you a draft on FRIDAY.
>
> Lynn
>
> On Mon, Apr 24, 2017 at 7:27 PM, Spire, Paul <PSpire@aap.org> wrote:
>
> > Hi Dr. Goldman and Heidi.

I am writing to follow-up regarding the revision of the "Water" chapter for the ***Pediatric Environmental Health, 4th Edition*** manual. The Council on Environmental Health will be meeting and reviewing draft chapters on May 23. We are hoping to receive all remaining draft chapters in advance of this date for review at the meeting. Our hope is to wrap-up primary development of the chapters soon, in order to meet our goal of releasing the new edition during the AAP's 2018 National Conference and Exhibition.

We very much appreciate your support and are hoping you can help us meet our publication timeline. The previous, 3rd edition chapter is again attached for your convenience. Will you be able to return your revisions by May 15?

Many thanks,

Paul

--

Lynn R. Goldman, MD, MS, MPH
Michael and Lori Milken Dean, Milken Institute School of Public Health,

George Washington University

goldmanl@email.gwu.edu

--

Lynn R. Goldman, MD, MS, MPH
Michael and Lori Milken Dean, Milken Institute School of Public Health,
George Washington University
goldmanl@email.gwu.edu

Message

From: Spire, Paul [PSpire@aap.org]
Sent: 11/17/2017 10:03:35 PM
To: Galvez, Maida [maida.galvez@mssm.edu]
CC: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Balk, Sophie [sbalk@montefiore.org]; Jennifer Lowry [jlowry@cmh.edu]
Subject: Green Book - Endocrine Disrupting Chemicals chapter - response requested by December 15
Attachments: 29 - Endocrine Disrupting - COEH comments.docx

Dear Dr. Galvez,

I am writing on behalf of the Green Book editorial team to follow-up on the development of the "Endocrine Disrupting Chemicals" chapter for the *Pediatric Environmental Health, 4th Edition* manual (Green Book).

Attached please find a copy of the draft chapter as it was reviewed by the AAP's Council on Environmental Health (COEH), with comments from the committee embedded in the document in track changes. We are requesting that you review these comments and adjust the chapter to address these issues. If there are any items that you will not be addressing or that you disagree with, it would be helpful to receive a short explanation of these issues for the committee's consideration.

We also wanted to share one new request and additional guidance that has emerged as this project has progressed:

- Please write 3 - 5 bullet points for your chapter that summarize key issues and take-home messages. (A temple space for this has been added to the chapter.) These are being added at the start of each chapter.
- Please pay special attention to providing citations wherever it would be appropriate to do so, ensuring that all sources are cited and acknowledged.
- If you are using information from another AAP policy statement (or other Academy document), please modify the content so that it is not worded exactly like the existing policy document.
- Please continue to make all adjustments utilizing Word's "Track Changes" feature.

We are hoping to receive all updated chapters within one month, by Friday, December 15.

Thanks again for your ongoing support. If you have any questions or need anything more, please do not hesitate to let me know.

Many thanks,

Paul

Message

From: Stilp, Mark [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=EB174399B2084A7C87D4D584E6F7FBCA-STILP, MARK]
Sent: 3/16/2017 9:42:45 PM
To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]
Subject: RE: Litigation Hold, EELI v. EPA, FOIA re Ramazzini, glyphosate, risk assessments
Attachments: First_Last_Date_Custodian_Search_Checklist_EELI_FOIA_Litigation.xlsx

Ex. 5 - Attorney Work Product

Ex. 5 - Attorney Work Product

Mark Stilp | Attorney-Adviser | Office of General Counsel | U.S. Environmental Protection Agency | 1200 Pennsylvania Ave. NW | Washington, DC 20460 | mail code: 2377A | office: 202.564.4845 | cell: Ex. 6

From: Etzel, Ruth
Sent: Thursday, March 09, 2017 4:36 PM
To: Stilp, Mark <Stilp.Mark@epa.gov>
Subject: RE: Litigation Hold, EELI v. EPA, FOIA re Ramazzini, glyphosate, risk assessments

Hi Mark,

Sure, I am here now. 202-566-1530

Best,

Ruth

From: Stilp, Mark
Sent: Thursday, March 09, 2017 4:36 PM
To: Etzel, Ruth <Etzel.Ruth@epa.gov>
Subject: RE: Litigation Hold, EELI v. EPA, FOIA re Ramazzini, glyphosate, risk assessments

Hi Dr. Etzel-

Thanks for reaching out to me. The plaintiff in the above referenced Freedom of Information Act (FOIA) litigation asked that you be included as a potential custodian of records responsive to their FOIA request.

Do you have a few minutes to chat yet today or sometime on Friday? Early next week would be OK too. I'd like to explain a few things and it's often easiest to do by phone.

Thanks.

-Mark Stilp

Mark Stilp | Attorney-Adviser | Office of General Counsel | U.S. Environmental Protection Agency | 1200 Pennsylvania Ave. NW | Washington, DC 20460 | mail code: 2377A | office: 202.564.4845 | cell: Ex. 6

From: Etzel, Ruth
Sent: Thursday, March 09, 2017 1:45 PM
To: Stilp, Mark <Stilp.Mark@epa.gov>
Subject: RE: Litigation Hold, EELI v. EPA, FOIA re Ramazzini, glyphosate, risk assessments

Hi Mark,

I have received the message below and reviewed it; I am writing to let you know that I believe it may have been sent to me in error. I am not in EPA's Office of Research and Development, nor am I in the Office of Air and Radiation or the Office of Chemical Safety and Pollution Prevention's Office of Science Coordination. I do not know of anything that I have that is relevant to this.

Sincerely,

Ruth A. Etzel, MD, PhD
Director
Office of Children's Health Protection
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460
Phone: 202-564-2188

From: stilp.mark@epa.gov [mailto:stilp.mark@epa.gov]
Sent: Thursday, March 02, 2017 5:20 PM
To: Etzel, Ruth <Etzel.Ruth@epa.gov>
Subject: Litigation Hold, EELI v. EPA, FOIA re Ramazzini, glyphosate, risk assessments

Ex. 5 - Attorney Work Product

Ex. 5 - Attorney Work Product

Message

From: retzel [Ex. 6

Sent: 10/2/2017 10:28:05 PM

To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]

Attachments: 52 - Emerging Technologies - editor review SJB 073017RAE082417.docx

Ex. 6

Message

From: Maaike Jansen [jansen@un.org]
Sent: 12/6/2017 3:42:56 PM
Subject: Murky business: A hunt for answers as children fall sick ...

Murky business: A hunt for answers as children fall sick around Mexico lake

by Stephen Woodman | Thomson Reuters Foundation

Monday, 4 December 2017 10:00 GMT

From the smog-coated capital to polluted lakeside villages, agricultural and industrial pollution and poor regulation have sickened communities across Mexico

By Stephen Woodman

AGUA CALIENTE, Mexico, Dec 4 (Thomson Reuters Foundation) - E duardo Baltazar is the youngest person in the tiny Mexican village of Agua Caliente to have a kidney transplant, undergoing the life-saving surgery a month shy of his 13th birthday.

The boy is one of many victims of a health crisis in the western state of Jalisco that environmental experts are linking to water and air pollution, despite denials by the government.

A University of Guadalajara investigation into the 950 residents of Agua Caliente on the shores of Lake Chapala has confirmed what locals have known for years - chronic kidney disease has reached epidemic levels and is hitting children hardest.

From the smog-coated capital to polluted lakeside villages, agricultural and industrial pollution and poor regulation have sickened communities across Mexico, say campaigners.

Before his transplant in June, Baltazar suffered terrible pain and plugged himself into a home dialysis machine four times a day, a treatment paid for by charity and health insurance.

With his diminutive frame, the boy looks much younger than his age. When the disease caused his cheeks to bulge with fluids, his classmates taunted him and he stopped going to school.

"I saw him in great suffering and I just thought, 'That's enough,'" said his aunt, Brenda Baltazar, who donated her kidney to her nephew.

The university researchers say toxic contaminants caused by agricultural pesticides that flow into Mexico's largest freshwater lake have compounded the miseries of Agua Caliente residents already battling malnutrition and poverty.

But the state government blames a range of other factors for the epidemic of sickness - from diet to pollution from cooking with firewood and even inbreeding.

Eduardo Baltazar, 13, poses for a photo in Agua Caliente, Mexico, July 8, 2017. Thomson Reuters Foundation/Stephen Woodman

DAMAGED KIDNEYS, MEMORY DEFICITS

More than half of schoolchildren in the village have damaged kidneys, and only one in six demonstrates healthy cognitive development, university investigators say.

The research has found significant attention and memory deficits among local children, according to leading investigator Aarón Peregrina. Many also struggle with fine motor skills, used for drawing, writing and eating.

"The preschool teacher tells the children not to draw beyond the lines when they color an image," Peregrina told the Thomson Reuters Foundation.

"But many children simply can't perform these movements."

Guadalajara's Civilian Hospital documented 70 cases of birth defects from 2009 to 2016 in Poncitlán municipality, which includes Agua Caliente and a handful of other villages on the shores of Lake Chapala.

The abnormalities include heart defects, club feet and malformed hands, according to the Guadalajara Socio-Environmental Forum, an activist group.

The Baltazar family has been devastated. Eduardo's 17-year-old cousin, who grew up in the same cinder-block home, is battling end-stage renal disease. His sister Estrella died from kidney failure at age 10 last year.

THE CONTAMINATED LAKE

Nestled between steep green hills on one side and Lake Chapala on the other, the crowded village of Agua Caliente takes its name, which translates as "Hot Water", from its thermal springs that villagers use for washing and drinking.

Activists say the spring water is bursting with dangerous toxic contaminants. But university investigators think dangerous levels of local exposure to agricultural pesticides are also behind the health crisis.

"It's more complicated than the springs," said Felipe Lozano who leads the investigation.

All of the 451 inhabitants who participated in a urine study tested positive for pesticides including the insecticide dimethoate and the popular weed killer glyphosate.

The exposure was across the board, not linked directly to farm work, the researchers found, and they determined the only way everyone could have the same level of pesticides in their systems was through the air.

"We detected the same levels of glyphosate in 2-year-old girls as 50-year-old men," Lozano said.

"There are pesticides in the lake. When the water heats, it evaporates, and the air currents pass from the lake to the population," Lozano said.

A hair analysis of nine pregnant women in Agua Caliente detected high doses of arsenic, which is known to cause kidney disease and birth defects, Lozano said.

VULNERABLE

The Lerma River, which feeds Lake Chapala, brings agricultural and industrial contaminants collected along its more than 470-mile (750 km) route through the country's heavily-populated heartland.

"The water was clear before, and we used it to cook beans," said Adriana Gutierrez, 28, a lifelong resident of Agua Caliente. "Now it's too polluted."

Juan Díaz Flores, president of Agua Caliente's Water Committee, a local advocacy group, organizes demonstrations and makes regular trips to the state capital of Guadalajara to appeal for government help.

"We are bringing people out to protest," Diaz said. "That's the only way to make things happen."
Under pressure from the Guadalajara Socio-Environmental Forum, the state government has nearly completed work on an artesian water well it promised the community last year.
But to hold down costs, the government of Poncitlán provides Agua Caliente with running tap water for just six hours a week, leaving locals to bathe and wash dishes in the polluted lake.
The village has no essential services such as drainage and waste collection. Fecal matter has been found in the thermal springs and residents burn rubbish, releasing even more toxins.
The University of Guadalajara has also looked at a link between malnutrition and vulnerability to contaminants.
More than 70 percent of villagers are not consuming enough calories, with the young at greatest risk of chronic malnutrition. That could explain why the children are particularly vulnerable to kidney disease, researchers said.
Jorge Sánchez, director general of public health in Jalisco, denies contaminants in the lake are causing the health crisis - blaming poor diet, smoke from firewood stoves and inbreeding.
"Cousin marriage is a factor in the population," Sánchez said. "Genetic deficiencies are easily transmitted."
Enrique Lira, coordinator of the Guadalajara Socio-Environmental Forum, said first-cousin marriages are practiced but are more common in other rural communities that do not have such serious health problems.
"What is genetic is the disinterest of the authorities," Lira said. "They deny the problem as their predecessors did. It's like avoiding responsibility is in their genes."
(Reporting by Stephen Woodman, Editing by Ellen Wulfhorst and Ros Russell. Please credit the Thomson Reuters Foundation, the charitable arm of Thomson Reuters, that covers humanitarian news, women's rights, trafficking, property rights, climate change and resilience. Visit http://news.trust.org)
Our Standards: The Thomson Reuters Trust Principles.

http://news.trust.org/item/20171204100908-3y3t9/

Sent from my iPhone

Message

From: Sophie Balk [SBALK@montefiore.org]
Sent: 1/15/2018 3:28:03 PM
To: goldmanl@gwu.edu; Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]
CC: Spire, Paul [PSpire@aap.org]; Jennifer Lowry [jlowry@cmh.edu]; Sophie Balk [SBALK@montefiore.org]
Subject: Re: FW: Green Book - Water chapter - response requested by September 18
Attachments: 17 - Water - revisions LG sjb011318 lrg01152018_1.docx

Thank you, Lynn.

The clarification about the six-year time frame and addition about Flint are very helpful.
I made the section on the Lead and Copper Rule into a new paragraph.

Ruth, please see attached and let me know if you agree with changes.

Thanks,
Sophie

Sophie J Balk MD
Attending Pediatrician
Children's Hospital at Montefiore
Professor of Pediatrics
Albert Einstein College of Medicine
Ex. 6
718 405-8091 (fax)

From: Lynn Goldman <goldmanl@gwu.edu>
Sent: Monday, January 15, 2018 9:34:33 AM
To: Sophie Balk
Cc: Spire, Paul; Etzel, Ruth; Jennifer Lowry
Subject: Re: FW: Green Book - Water chapter - response requested by September 18

CAUTION: This email comes from an external source; the attachments and/or links may compromise our secure environment. Do not open or click on suspicious emails. Please click on the "Phish Alert" button on the top right of the Outlook dashboard to report any suspicious emails.

Dear Sophie and company,

Attached, with a few more revisions and more on Flint (which I mentioned in the intro but added to the Lead section.)

In terms of the EPA standards, it is very sad that EPA is not actively producing new ones. I testified about this for the APHA in 2011 and sadly can't see that anything transpired in the last six years to change that testimony. We probably need to focus on this as a next target for legislative reform.

Best,

Lynn

On Sat, Jan 13, 2018 at 11:50 AM, Sophie Balk <SBALK@montefiore.org> wrote:

> Dear Lynn,
> Thank you for revising the Water chapter. I made some edits.

I would like you to clarify the information on lines 145-148, as more than 6 years have elapsed.

Also, kindly add a few sentences about the Flint MI water crisis to the section on Lead. This is discussed in the Lead chapter but the information should also be added here as readers are likely to look for it in this chapter.

Thank you,
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Attending Pediatrician
Children's Hospital at Montefiore
Professor of Pediatrics
Albert Einstein College of Medicine
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718 405-8091 (fax)

From: Lynn Goldman <goldmanl@gwu.edu>
Sent: Wednesday, January 10, 2018 4:02:21 PM
To: Spire, Paul
Cc: Etzel, Ruth; Sophie Balk; Jennifer Lowry
Subject: Re: FW: Green Book - Water chapter - response requested by September 18

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At long last, the water chapter. I think I have addressed all of the reviewer comments.

The least believable aspect is that the EPA standards haven't changed much, if at all, from the last edition.

I checked per the reviewer's comments.

Best,
Lynn

On Wed, Jan 10, 2018 at 2:03 PM, Lynn Goldman <goldmanl@gwu.edu> wrote:
Yes!

On Sat, Jan 6, 2018 at 11:51 AM, Spire, Paul <PSpire@aap.org> wrote:
Hi Dr. Goldman.

I'm sorry to pester you, but it appears that we have not yet received your chapter and we are really down to the wire on publication deadlines. Do you think you would be able to get this to us within 2 weeks, by Friday, Jan 19?

Many thanks,

Paul

From: Spire, Paul
Sent: Friday, November 17, 2017 6:04 PM
To: Goldman, Lynn <goldmanl@gwu.edu>
Cc: Etzel, Ruth <etzel.ruth@epa.gov>; Balk, Sophie <sbalk@montefiore.org>; Jennifer Lowry <jlowry@cmh.edu>
Subject: RE: Green Book - Water chapter - response requested by September 18
Importance: High

Hi Dr. Goldman.

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Thanks much for your continued support,

Paul

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To: Goldman, Lynn <goldmanl@gwu.edu>
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Many thanks for considering and for your continued support.

Best,

Paul

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Sent: Thursday, September 28, 2017 12:19 PM
To: Goldman, Lynn <goldmanl@gwu.edu>
Cc: Etzel, Ruth <etzel.ruth@epa.gov>; Balk, Sophie <sbalk@montefiore.org>; Jennifer Lowry <jlowry@cmh.edu>
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Many thanks,

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Importance: High

Dear Dr. Goldman,

I am writing on behalf of the Green Book editorial team to follow-up on the development of the "Water" chapter for the *Pediatric Environmental Health, 4th Edition* manual (Green Book).

Attached please find a copy of the draft chapter as it was reviewed by the AAP's Council on Environmental Health (COEH), as well as comments from the committee members that emanated from this review. We are requesting that you review these comments and adjust the chapter to address these issues. If there are any items that you will not be addressing or that you disagree with, it would be helpful to receive a short explanation of these issues for the committee's consideration.

We also wanted to share one new request and additional guidance that has emerged as this project has progressed:

- Please write 3 - 5 bullet points for your chapter that summarize key issues and take-home messages. These are being added at the start of each chapter.
- Please pay special attention to providing citations wherever it would be appropriate to do so, ensuring that all sources are cited and acknowledged.
- If you are using information from another AAP policy statement (or other Academy document), please modify the content so that it is not worded exactly like the existing policy document.
- Please continue to make all adjustments utilizing Word's "Track Changes" feature.

We are hoping to receive all updated chapters within one month, by Monday, September 18.

Thanks again for your ongoing support. If you have any questions or need anything more, please do not hesitate to let me know.

Many thanks,

Paul

--
Lynn R. Goldman, MD, MS, MPH
Michael and Lori Milken Dean, Milken Institute School of Public Health,
George Washington University
goldmanl@email.gwu.edu

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Michael and Lori Milken Dean, Milken Institute School of Public Health,
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Message

From: Landrigan, Philip [philip.landrigan@mssm.edu]
Sent: 5/31/2017 2:30:27 PM
To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]
CC: Paul Spire [PSpire@aap.org]
Subject: RE: Suggested edits to Mary Ward's revision of Cancer chapter for Green Book
Attachments: 47 - Cancer - COEH review.PJL edits.docx

Ruth,

It was great to see you. Stay strong in the face of Trump. This too shall pass.

The following is the text of the email that I sent to Paul in regard to the cancer chapter a few days before the COEH meeting:

> ***Attached please find my comments and edits on the Cancer chapter. It is not well written and your editors have some work ahead of them, but with a couple of exceptions, I have stayed away from word editing.***
>
> ***More important is the fact that the author completely misses the point that there has been a cumulative increase in incidence of pediatric cancer in the USA since 1970 of about 35% and an increase in incidence of testicular cancer among adolescents in the same time period of 55+%. These are key points that require emphasis.***

My marked up version of the chapter that I sent to Paul with the above email is attached.

Phil

Philip J. Landrigan, MD, MSc, FAAP
Dean for Global Health
Professor of Preventive Medicine and Pediatrics
Arnhold Institute for Global Health
Icahn School of Medicine at Mount Sinai
One Gustave L. Levy Place, Box 1057
New York, NY 10029
Tel: Ex. 6

phil.landrigan@mssm.edu

WHO Collaborating Centre in Children's Environmental Health

From: Etzel, Ruth [mailto:Etzel.Ruth@epa.gov]
Sent: Thursday, May 25, 2017 3:45 PM
To: Landrigan, Philip
Cc: Paul Spire
Subject: Suggested edits to Mary Ward's revision of Cancer chapter for Green Book

Hi Phil,

Great to see you at the COEH meeting. I wanted to clarify that I will be glad to contact Mary Ward about the requested revisions to her chapter on *Cancer*, but I hope to have your suggested edits when I talk to her. She is likely to want to see the proposed edits before making her decision.

Would you please send a copy of the edits to me when you send them to Paul?

Many thanks! Have a relaxing weekend.

Best,

Ruth

Message

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To: Sophie Balk [SBALK@montefiore.org]
CC: Spire, Paul [PSpire@aap.org]; Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Jennifer Lowry [jlowry@cmh.edu]
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Paul

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Lynn R. Goldman, MD, MS, MPH
Michael and Lori Milken Dean, Milken Institute School of Public Health,
George Washington University
goldmanl@email.gwu.edu

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Lynn R. Goldman, MD, MS, MPH
Michael and Lori Milken Dean, Milken Institute School of Public Health,
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goldmanl@email.gwu.edu

--
Lynn R. Goldman, MD, MS, MPH
Michael and Lori Milken Dean, Milken Institute School of Public Health,
George Washington University
goldmanl@email.gwu.edu

Message

From: Spire, Paul [PSpire@aap.org]
Sent: 10/31/2017 4:21:09 PM
To: Ahdoot, Samantha [Ex. 6] John.Balbus@nih.gov [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=2c555339753d4bedb1a7a321779b25f6-John.Balbus@nih.gov]; Carl Baum [carl.baum@yale.edu]; Bernstein, Aaron [Aaron.Bernstein@childrens.harvard.edu]; Bole, Aparna [Aparna.Bole@UHhospitals.org]; Byron, Lori [Ex. 6] DeNicola, Nate [Ex. 6] Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Foos, Brenda [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=18b24f2f79414190852a748bf650d2b9-Bperkovi]; Gadhia, Ami [agadhia@aap.org]; Hindman, Diane [Ex. 6] Landrigan, Philip [philip.landrigan@mssm.edu]; Laris, Zachary [zlaris@aap.org]; Jennifer Lowry [jlowry@cmh.edu]; Marcus, Steven [Ex. 6] Mortensen, Mary [zeo4@CDC.GOV]; Pacheco, Susan [Susan.E.Pacheco@uth.tmc.edu]; Spanier, Adam [aspanier@peds.umaryland.edu]; Ward, Mary [wardm@mail.nih.gov]; Woolf, Alan [alan.woolf@childrens.harvard.edu]
Subject: FW: Draft chapters and primary reviewer assignments for COEH Green Book call - Tuesday, Oct 31 @ 2 pm Eastern / 1 pm Central
Attachments: 05 - Env History Taking - COEH review.docx; 29 - Endocrine Disrupting Chemicals - COEH review.docx; 38 - Persistent Toxic Substances - COEH review.docx; 60 - Antibiotics - COEH review.docx
Importance: High

Dear COEH,

Just a quick reminder, for those who are able to make it, we have green book call scheduled at 2 Eastern/1 Central this afternoon.

Toll-free dial-in number: Ex. 6
Access code: Ex. 6

Best,

Paul

From: Spire, Paul
Sent: Tuesday, October 24, 2017 7:02 PM
To: Ahdoot, Samantha <[Ex. 6] Balbus, John <John.Balbus@nih.gov>; Baum, Carl <carl.baum@yale.edu>; Bernstein, Aaron <Aaron.Bernstein@childrens.harvard.edu>; Bole, Aparna <Aparna.Bole@UHhospitals.org>; Byron, Lori <[Ex. 6] DeNicola, Nate <[Ex. 6]>; Etzel, Ruth <etzel.ruth@epa.gov>; Foos, Brenda <Foos.Brenda@epa.gov>; Gadhia, Ami <agadhia@aap.org>; Hindman, Diane <[Ex. 6] Landrigan, Philip <philip.landrigan@mssm.edu>; Laris, Zachary <zlaris@aap.org>; Lowry, Jennifer <jlowry@cmh.edu>; Marcus, Steven <[Ex. 6] Mortensen, Mary <zeo4@CDC.GOV>; Pacheco, Susan <Susan.E.Pacheco@uth.tmc.edu>; Spanier, Adam <aspanier@peds.umaryland.edu>; Ward, Mary <wardm@mail.nih.gov>; Woolf, Alan <alan.woolf@childrens.harvard.edu>
Cc: Balk, Sophie <sbalk@montefiore.org>
Subject: Draft chapters and primary reviewer assignments for COEH Green Book call - Tuesday, Oct 31 @ 2 pm Eastern / 1 pm Central
Importance: High

Dear COEH,

Thanks for your participation in the Doodle poll to set-up a late-October Green Book call. The call will be scheduled as follows:

Date: Tuesday, October 31
Time: 2 pm Eastern / 1 pm Central
Toll-free dial-in number: Ex. 6
Access code: Ex. 6

I will also send around a separate meeting invite to help get this on your calendars.

The primary reviewer assignments:

Primary reviewer	chapter #	Chapter	Lead author
Lori Byron	05	Taking an Environmental History and Giving Anticipatory Guidance	Balk, Sophie
Ari Bernstein	29	Endocrine Disrupting Chemicals	Galvez, Maida and Michele La Merrill
Alan Woolf	38	Persistent Toxic Substances	Birnbaum, Linda
Sam Ahdoot	60	Nontherapeutic Use of Antibiotics in Animal Agriculture	Wallinga, David

The "Antibiotics in Animal Ag" chapter may look familiar. It was distributed for the spring meeting, but we ran out of time and did not get to it.

Please note that all committee members are asked to review all chapters. Primary reviewer assignments were based upon those who expressed availability. If you are assigned as Primary Reviewer on one of the chapters but are no longer available, please let me know ASAP.

Primary reviewers are asked to lead discussion of their assigned chapter during the conference call, record and collate all input offered by others, and convey all comments/edits to me within 1 week after the call. Please focus on content-related issues, as medical copy editors will review for grammar and readability at a later stage. The input collected/submitted by the primary reviewers will be conveyed to the original chapter authors as guidance to adjust their chapter.

For those not able to join the call, you are still asked to review the chapters and submit any comments to the primary reviewer (or me) in advance of the call. Although no liaisons have been assigned as primary reviewers, liaisons are very much encouraged to participate in the review and discussion process.

Many thanks,

Paul

Message

From: Spire, Paul [PSpire@aap.org]
Sent: 7/26/2017 3:40:42 PM
To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Balk, Sophie [sbalk@montefiore.org]
CC: Jennifer Lowry [jlowry@cmh.edu]
Subject: Green Book - Emerging Technologies - for editor review
Attachments: 52 - Emerging Technologies - editor review.docx; 52 - Emerging Technologies - COEH comments.docx

Dear Ruth and Sophie,

I am writing to convey the attached "Emerging Technologies" chapter for editor review. Phil Landrigan was the lead author for this chapter.

The chapter was reviewed by the COEH with Sam Ahdoot serving as the primary reviewer. Sam's comments are attached.

When returning the chapter, Phil provided brief responses to the suggestions, which I will copy below.

Please be reminded that the next step for this chapter will be stakeholder review. We will need to distribute "clean" chapters for review, so at this point we will need to "accept" track changes. I would be happy to do this, or feel free to return a clean chapter to me.

Many thanks,

Paul

- - - - - - - - - - - - - - - - -

Phil's responses to the review comments:

Attached please find my edited version of Chapter 52 on Emerging Technologies and my responses to your excellent suggestions:

- Please write 3 - 5 bullet points for your chapter that summarize key issues and take-home messages. These are being added at the start of each chapter. **DONE**
- Please pay special attention to providing citations wherever it would be appropriate to do so, ensuring that all sources are cited and acknowledged. **DONE**
- If you are using information from another AAP policy statement (or other Academy document), please modify the content so that it is not worded exactly like the existing policy document. **NOT RELEVANT**
- Please continue to make all adjustments utilizing Word's "Track Changes" feature. **DONE**
- We do not feel that Glyphosate is an example of emerging technology. Rather, we would recommend incorporating this discussion into the overview sections. We would then recommend continued focus on nanoparticles, and consider adding a discussion of genetically modified foods instead. **DONE**
- A separate chapter on TSCA is being drafted. Therefore, this chapter could be shortened, the "chemical policy" section removed and discussion of TSCA reform minimized. **The discussion about TSCA has been greatly**

shortened and the discussion of the European REACH legislation that had been a part of the Conclusion has now been deleted.

- The images need references. **DONE**

COEH Review
Green Book
Chapter 52 – Emerging Technologies

Thank you very much for this excellent submission.

We have a few comments as below:

1. We do not feel that Glyphosate is an example of emerging technology. Rather, we would recommend incorporating this discussion into the overview sections. We would then recommend continued focus on nanoparticles, and consider adding a discussion of genetically modified foods instead.

2. A separate chapter on TSCA is being drafted. Therefore, this chapter could be shortened, the "chemical policy" section removed and discussion of TSCA reform minimized.

3. The images need references.

Message

From: Buchanan, Susan [sbucha3@uic.edu]
Sent: 4/13/2018 8:24:31 PM
To: pehsu@pehsu.net
Subject: glyphosate

Hello everyone,
I was invited to moderate two community lectures given by a Canadian scientist this past week on glyphosate and it's use on GMO "Roundup-Ready" crops. I learned a lot preparing for it! There were hecklers at one of the lectures, which caught us off guard a bit. In response to their specific charges, I did even more reading on the topic.

Is anyone out there familiar with the details of the controversies surrounding glyphosate: the mouse tumor study, the breastmilk studies, the carcinogenicity disagreement between IARC, EPA, and the Europeans? If so, I'd love to talk!

Susan
R5 PEHSU

Susan Buchanan, MD, MPH
Occupational and Environmental Medicine
University of Illinois at Chicago School of Public Health
835 S. Wolcott, MC 684, Suite E-144
Chicago, Illinois 60612
312-996-0806
Fax 312-413-8485

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--
You received this message because you are subscribed to the Google Groups "pehsu" group.
To unsubscribe from this group and stop receiving emails from it, send an email to pehsu+unsubscribe@pehsu.net.

Message

From: Sophie Balk [SBALK@montefiore.org]
Sent: 1/13/2018 4:50:21 PM
To: Spire, Paul [PSpire@aap.org]; goldmanl@gwu.edu
CC: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Jennifer Lowry [jlowry@cmh.edu]; Sophie Balk [SBALK@montefiore.org]
Subject: Re: FW: Green Book - Water chapter - response requested by September 18
Attachments: 17 - Water - revisions LG sjb011318.docx

Dear Lynn,
Thank you for revising the Water chapter. I made some edits.

I would like you to clarify the information on lines 145-148, as more than 6 years have elapsed.

Also, kindly add a few sentences about the Flint MI water crisis to the section on Lead. This is discussed in the Lead chapter but the information should also be added here as readers are likely to look for it in this chapter.

Thank you,
Sophie

Sophie J Balk MD
Attending Pediatrician
Children's Hospital at Montefiore
Professor of Pediatrics
Albert Einstein College of Medicine
Ex. 6
718 405-8091 (fax)

From: Lynn Goldman <goldmanl@gwu.edu>
Sent: Wednesday, January 10, 2018 4:02:21 PM
To: Spire, Paul
Cc: Etzel, Ruth; Sophie Balk; Jennifer Lowry
Subject: Re: FW: Green Book - Water chapter - response requested by September 18

CAUTION: This email comes from an external source; the attachments and/or links may compromise our secure environment. Do not open or click on suspicious emails. Please click on the "Phish Alert" button on the top right of the Outlook dashboard to report any suspicious emails.

At long last, the water chapter. I think I have addressed all of the reviewer comments.

The least believable aspect is that the EPA standards haven't changed much, if at all, from the last edition.

I checked per the reviewer's comments.

Best,
Lynn

On Wed, Jan 10, 2018 at 2:03 PM, Lynn Goldman <goldmanl@gwu.edu> wrote:
Yes!

On Sat, Jan 6, 2018 at 11:51 AM, Spire, Paul <PSpire@aap.org> wrote:

Hi Dr. Goldman.

I'm sorry to pester you, but it appears that we have not yet received your chapter and we are really down to the wire on publication deadlines. Do you think you would be able to get this to us within 2 weeks, by Friday, Jan 19?

Many thanks,

Paul

From: Spire, Paul
Sent: Friday, November 17, 2017 6:04 PM
To: Goldman, Lynn <goldmanl@gwu.edu>
Cc: Etzel, Ruth <etzel.ruth@epa.gov>; Balk, Sophie <sbalk@montefiore.org>; Jennifer Lowry <jlowry@cmh.edu>
Subject: RE: Green Book - Water chapter - response requested by September 18
Importance: High

Hi Dr. Goldman.

It appears that we have not yet received your chapter. Do you think it would be possible to receive by Nov 30?

Thanks much for your continued support,

Paul

From: Spire, Paul
Sent: Friday, October 27, 2017 5:20 PM
To: Goldman, Lynn <goldmanl@gwu.edu>
Cc: Etzel, Ruth <etzel.ruth@epa.gov>; Balk, Sophie <sbalk@montefiore.org>; Jennifer Lowry <jlowry@cmh.edu>
Subject: FW: Green Book - Water chapter - response requested by September 18

Hi Dr. Goldman.

It appears that we have not heard back from you yet regarding the requested adjustments to the "Water" chapter. We are unfortunately starting to push-up again some firm publication deadlines. Is there any chance you could respond within 2 weeks, by November 10?

Many thanks for considering and for your continued support.

Best,

Paul

From: Spire, Paul
Sent: Thursday, September 28, 2017 12:19 PM
To: Goldman, Lynn <goldmanl@gwu.edu>
Cc: Etzel, Ruth <etzel.ruth@epa.gov>; Balk, Sophie <sbalk@montefiore.org>; Jennifer Lowry <jlowry@cmh.edu>
Subject: FW: Green Book - Water chapter - response requested by September 18

Hi Dr. Goldman.

It appears that we have not yet received a response from you regarding the updated "Water" chapter. Any chance you get this to us by Friday, Oct 13?

Many thanks,

Paul

From: Spire, Paul
Sent: Thursday, August 17, 2017 6:59 PM
To: Goldman, Lynn <goldmanl@gwu.edu>
Cc: Etzel, Ruth <etzel.ruth@epa.gov>; Balk, Sophie <sbalk@montefiore.org>; Jennifer Lowry <jlowry@cmh.edu>
Subject: Green Book - Water chapter - response requested by September 18
Importance: High

Dear Dr. Goldman,

I am writing on behalf of the Green Book editorial team to follow-up on the development of the "Water" chapter for the *Pediatric Environmental Health, 4th Edition* manual (Green Book).

Attached please find a copy of the draft chapter as it was reviewed by the AAP's Council on Environmental Health (COEH), as well as comments from the committee members that emanated from this review. We are requesting that you review these comments and adjust the chapter to address these issues. If there are any items that you will not be addressing or that you disagree with, it would be helpful to receive a short explanation of these issues for the committee's consideration.

We also wanted to share one new request and additional guidance that has emerged as this project has progressed:

- Please write 3 - 5 bullet points for your chapter that summarize key issues and take-home messages. These are being added at the start of each chapter.
- Please pay special attention to providing citations wherever it would be appropriate to do so, ensuring that all sources are cited and acknowledged.
- If you are using information from another AAP policy statement (or other Academy document), please modify the content so that it is not worded exactly like the existing policy document.
- Please continue to make all adjustments utilizing Word's "Track Changes" feature.

We are hoping to receive all updated chapters within one month, by Monday, September 18.

Thanks again for your ongoing support. If you have any questions or need anything more, please do not hesitate to let me know.

Many thanks,

Paul

...
Lynn R. Goldman, MD, MS, MPH
Michael and Lori Milken Dean, Milken Institute School of Public Health,
George Washington University
goldmanl@email.gwu.edu

--
Lynn R. Goldman, MD, MS, MPH
Michael and Lori Milken Dean, Milken Institute School of Public Health,
George Washington University
goldmanl@email.gwu.edu

Message

From: Spire, Paul [PSpire@aap.org]
Sent: 4/24/2017 11:27:30 PM
To: Goldman, Lynn [goldmanl@gwu.edu]; Lindemann, Heidi [hlindemann@email.gwu.edu]
CC: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Jennifer Lowry [jlowry@cmh.edu]
Subject: Green Book - Water chapter - requested by May 15
Attachments: 17 Water.docx

Hi Dr. Goldman and Heidi.

I am writing to follow-up regarding the revision of the "Water" chapter for the ***Pediatric Environmental Health, 4th Edition*** manual. The Council on Environmental Health will be meeting and reviewing draft chapters on May 23. We are hoping to receive all remaining draft chapters in advance of this date for review at the meeting. Our hope is to wrap-up primary development of the chapters soon, in order to meet our goal of releasing the new edition during the AAP's 2018 National Conference and Exhibition.

We very much appreciate your support and are hoping you can help us meet our publication timeline. The previous, 3rd edition chapter is again attached for your convenience. Will you be able to return your revisions by May 15?

Many thanks,

Paul

Message

From: Ward, Mary (NIH/NCI) [E] [wardm@exchange.nih.gov]
Sent: 10/30/2017 8:36:14 PM
To: Spire, Paul [PSpire@aap.org]
CC: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Balk, Sophie [sbalk@montefiore.org]; Jennifer Lowry [jlowry@cmh.edu]
Subject: RE: Green Book - Cancer chapter - response requested by September 18
Attachments: 47 - Cancer - COEH comments.MHW_Edits_Response(10-30-17).docx

Dear Paul,

Attached is my revised Cancer Chapter and responses to Phil's comments (using the comments feature of Track Changes). I deleted his comments (using Track Changes) and removed his highlights, which were incorporated in the text of the chapter.

I believe that Martha Linet communicated with Ruth about the revisions to the EMF and ionizing radiation chapters – she is reviewing those chapters and promises her comments/revisions by Thanksgiving.

Best,
Mary

From: Spire, Paul [mailto:PSpire@aap.org]
Sent: Friday, October 27, 2017 6:20 PM
To: Ward, Mary (NIH/NCI) [E] <wardm@exchange.nih.gov>
Cc: Etzel, Ruth <etzel.ruth@epa.gov>; Balk, Sophie <sbalk@montefiore.org>; Jennifer Lowry <jlowry@cmh.edu>
Subject: RE: Green Book - Cancer chapter - response requested by September 18

Hi Mary.

It appears that we have not heard back from you yet regarding the requested adjustments to the "Cancer" chapter. We are unfortunately starting to push-up again some firm publication deadlines. Is there any chance you could respond within 2 weeks, by November 10?

Many thanks for considering and for your continued support.

Best,

Paul

From: Ward, Mary (NIH/NCI) [E] [mailto:wardm@exchange.nih.gov]
Sent: Thursday, September 28, 2017 5:04 PM
To: Spire, Pau >
Cc: Etzel, Ruth <etzel.ruth@epa.gov>; Balk, Sophie <sbalk@montefiore.org>; Jennifer Lowry <jlowry@cmh.edu>
Subject: Re: Green Book - Cancer chapter - response requested by September 18

Hi Paul,

I have been at the Environmental Epi meetings in Sydney and will be taking some vacation next week. I have

the chapter and will try to work on this while I am on the road - I think the end of the week of October 1th is a realistic date for an update.

Best,

Mary

From: Spire, Paul <PSpire@aap.org>
Sent: Thursday, September 28, 2017 1:19:43 PM
To: Ward, Mary (NIH/NCI) [E]
Cc: Etzel, Ruth; Balk, Sophie; Jennifer Lowry
Subject: FW: Green Book - Cancer chapter - response requested by September 18

Hi Mary.

It appears that we have not heard back from you yet regarding updates to the "Cancer" chapter. Any chance you could return this by Friday, Oct 13?

Many thanks,

Paul

From: Spire, Paul
Sent: Thursday, August 17, 2017 6:58 PM
To: Ward, Mary <wardm@mail.nih.gov>
Cc: Etzel, Ruth <etzel.ruth@epa.gov>; Balk, Sophie <sbalk@montefiore.org>; Jennifer Lowry <jlowry@cmh.edu>
Subject: Green Book - Cancer chapter - response requested by September 18
Importance: High

Dear Dr. Ward,

I am writing on behalf of the Green Book editorial team to follow-up on the development of the "Cancer" chapter for the *Pediatric Environmental Health, 4th Edition* manual (Green Book).

Attached please find a copy of the draft chapter as it was reviewed by the AAP's Council on Environmental Health (COEH). This version includes embedded comments and "track changes" suggestions that emanated from this review. (Please note that these comments were entered by the assigned lead reviewer but represent the input and discussion of the entire committee.)

The following comment was also offered:

> Importantly, the authors completely miss the point that there has been a cumulative increase in incidence of pediatric cancer in the USA since 1970 of about 35% and an increase in incidence of testicular cancer among adolescents in the same time period of 55+%. These are key points that require emphasis.

We are requesting that you review the provided comments and adjust the chapter to address these issues. If there are any items that you will not be addressing or that you disagree with, it would be helpful to receive a short explanation of these issues for the committee's consideration.

We also wanted to share one new request and additional guidance that has emerged as this project has progressed:

- Please write 3 - 5 bullet points for your chapter that summarize key issues and take-home messages. These are being added at the start of each chapter.
- Please pay special attention to providing citations wherever it would be appropriate to do so, ensuring that all sources are cited and acknowledged.
- If you are using information from another AAP policy statement (or other Academy document), please modify the content so that it is not worded exactly like the existing policy document.
- Please continue to make all adjustments utilizing Word's "Track Changes" feature.

We are hoping to receive all updated chapters within one month, by Monday, September 18.

Thanks again for your ongoing support. If you have any questions or need anything more, please do not hesitate to let me know.

Many thanks,

Paul

Message

From: Winchester Paul D [Paul.Winchester@Franciscanalliance.org]
Sent: 5/14/2017 7:09:30 PM
To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]
Subject: Thank you

Ruth, I have been slow to recognize the kindness you have shown me over the past months. Meeting you at the CEHN I was not aware of your career and impressive contributions to children's environmental health. I've worked more as a NICU doctor in the trenches than as an educator in a school of environmental health so everything from your books, to your adopting a dog from the Iditarod in Alaska were unknown to me. Just your smile, and your unflappable positive perspective seen from across the room were known to me. I am now back from my PAS 17 trip fresh with new energy but also remembering that I was for the first time a facilitator at a Poster Session (where my own poster was attended by my poor research coordinator Cathy Proctor). I loved the experience! Also remembering your question at the platform session and the other ways you have helped me I can only say... I feel as if I've found a kindred spirit. I'm not sure why but my own research suggests that we are linked through threads of nature that connect us in many ways...(my

Ex. 6

You have helped restore my hope that EPA and similar government agencies (CDC) are doing good (even if the process is painfully slow sometimes). Seeing you working where you do gives me inspiration to go on with my work. We are focused on creating evidence which will help answer really important questions: like whether 200 environmental chemicals in an average pregnancy could be harming the fetus.(by imprinting their DNA epigenetically) Our paper on atrazine will soon be published and we are hoping to obtain funding for a companion study of glyphosate. "Do environmental levels of exposure induce epigenetic changes in our babies?" Do these DNA methylations cause disease in their descendants (as they do in rodents)? Has all of this been happening while EPA was minding the store? That is what I hope to answer. I would love to have collaborators who care, like me, about the objective answers. (not to the political or fiduciary answers). The great thing about man-made chemicals is that they can theoretically be stopped. They aren't life forms like polio and Ebola virus and if they harm us we can stop making them. Or something like that.
Thanks for your acts of kindness. It makes all the difference.
Happy Mother's Day.

Paul Winchester MD
Director Neonatology, St. Francis Hospital
Clinical Professor, Pediatrics
Indiana University School of Medicine
Indianapolis, Indiana
Cell Ex. 6
E Mail; paul.winchester@ franciscanalliance.org

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Message

From: Bernstein, Aaron [Aaron.Bernstein@childrens.harvard.edu]
Sent: 7/24/2017 6:30:10 PM
To: Landrigan, Philip [philip.landrigan@mssm.edu]
CC: Spire, Paul [PSpire@aap.org]; Ahdoot, Samantha [Ex. 6] John.Balbus@nih.gov [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=2c555339753d4bedb1a7a321779b25f6-John.Balbus@nih.gov]; Carl Baum [carl.baum@yale.edu]; Bole, Aparna [Aparna.Bole@UHhospitals.org]; Byron, Lori [Ex. 6]; DeNicola, Nate [Ex. 6] Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Foos, Brenda [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=18b24f2f79414190852a748bf650d2b9-Bperkovi]; Gadhia, Ami [agadhia@aap.org]; Hindman, Diane [Ex. 6] Laris, Zachary [zlaris@aap.org]; Jennifer Lowry [jlowry@cmh.edu]; Marcus, Steven [Ex. 6] Mortensen, Mary [zeo4@CDC.GOV]; Pacheco, Susan [Susan.E.Pacheco@uth.tmc.edu]; Spanier, Adam [aspanier@peds.umaryland.edu]; Ward, Mary [wardm@mail.nih.gov]; Woolf, Alan [Alan.Woolf@childrens.harvard.edu]
Subject: Re: COEH Green Book Conference Call - Monday July 24 @ 3 pm Central / 4 pm Eastern - draft chapters and primary reviewer assignments [EXTERNAL]
Attachments: 40 - Plasticizers - COEH review - ab.docx; 39 - Pesticides - COEH review - ab.docx; ATT00001.txt

Dear AAP COEH colleagues:

Sorry that I'm unable to make the call this afternoon. I have added some comments to the chapters that Phil has commented on in the attached docs. I don't have comments on the others.

Thanks,
Ari

Message

From: Spire, Paul [PSpire@aap.org]
Sent: 7/10/2017 5:50:08 PM
To: Landrigan, Philip [philip.landrigan@mssm.edu]
CC: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Balk, Sophie [sbalk@montefiore.org]; Jennifer Lowry [jlowry@cmh.edu]
Subject: RE: Green Book - Emerging Technologies chapter - response requested by August 7

Received and thanks!
Best,
Paul

From: Landrigan, Philip [mailto:philip.landrigan@mssm.edu]
Sent: Sunday, July 09, 2017 1:08 PM
To: Spire, Paul <PSpire@aap.org>
Cc: Etzel, Ruth <etzel.ruth@epa.gov>; Balk, Sophie <sbalk@montefiore.org>; Jennifer Lowry <jlowry@cmh.edu>
Subject: RE: Green Book - Emerging Technologies chapter - response requested by August 7

Dear Colleagues,

Attached please find my edited version of Chapter 52 on Emerging Technologies and my responses to your excellent suggestions:

- Please write 3 - 5 bullet points for your chapter that summarize key issues and take-home messages. These are being added at the start of each chapter. **DONE**
- Please pay special attention to providing citations wherever it would be appropriate to do so, ensuring that all sources are cited and acknowledged. **DONE**
- If you are using information from another AAP policy statement (or other Academy document), please modify the content so that it is not worded exactly like the existing policy document. **NOT RELEVANT**
- Please continue to make all adjustments utilizing Word's "Track Changes" feature. **DONE**
- We do not feel that Glyphosate is an example of emerging technology. Rather, we would recommend incorporating this discussion into the overview sections. We would then recommend continued focus on nanoparticles, and consider adding a discussion of genetically modified foods instead. **DONE**
- A separate chapter on TSCA is being drafted. Therefore, this chapter could be shortened, the "chemical policy" section removed and discussion of TSCA reform minimized. **The discussion about TSCA has been greatly shortened and the discussion of the European REACH legislation that had been a part of the Conclusion has now been deleted.**
- The images need references. **DONE**
-

Thank you again for having invited me to be a part of this process.

Philip J. Landrigan, MD, MSc, FAAP
Dean for Global Health
Arnhold Institute for Global Health
Professor of Preventive Medicine & Pediatrics
Icahn School of Medicine at Mount Sinai
1216 Fifth Avenue, Room 556
New York, NY 10029

Tel: 1 212 824 7952

From: Spire, Paul [PSpire@aap.org]
Sent: Friday, July 07, 2017 6:13 PM
To: Landrigan, Philip
Cc: Etzel, Ruth; Balk, Sophie; Jennifer Lowry
Subject: Green Book - Emerging Technologies chapter - response requested by August 7

Dear Phil,

I am writing on behalf of the Green Book editorial team to follow-up on the development of the "Emerging Technologies" chapter for the *Pediatric Environmental Health, 4th Edition* manual (Green Book).

Attached please find a copy of the draft chapter as it was reviewed by the AAP's Council on Environmental Health (COEH), as well as comments from the committee members that emanated from this review. We are requesting that you review these comments and adjust the chapter to address these issues. If there are any items that you will not be addressing or that you disagree with, it would be helpful to receive a short explanation of these issues for the committee's consideration.

We also wanted to share one new request and additional guidance that has emerged as this project has progressed:

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- Please continue to make all adjustments utilizing Word's "Track Changes" feature.

We are hoping to receive all updated chapters within one month, by Monday, August 7.

Thanks again for your ongoing support. If you have any questions or need anything more, please do not hesitate to let me know.

Many thanks,

Paul

Message

From: Landrigan, Philip [philip.landrigan@mssm.edu]
Sent: 7/9/2017 6:08:07 PM
To: Spire, Paul [PSpire@aap.org]
CC: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Balk, Sophie [sbalk@montefiore.org]; Jennifer Lowry [jlowry@cmh.edu]
Subject: RE: Green Book - Emerging Technologies chapter - response requested by August 7
Attachments: 52 - Emerging Technologies.docx

Dear Colleagues,

Attached please find my edited version of Chapter 52 on Emerging Technologies and my responses to your excellent suggestions:

- Please write 3 - 5 bullet points for your chapter that summarize key issues and take-home messages. These are being added at the start of each chapter. **DONE**
- Please pay special attention to providing citations wherever it would be appropriate to do so, ensuring that all sources are cited and acknowledged. **DONE**
- If you are using information from another AAP policy statement (or other Academy document), please modify the content so that it is not worded exactly like the existing policy document. **NOT RELEVANT**
- Please continue to make all adjustments utilizing Word's "Track Changes" feature. **DONE**
- We do not feel that Glyphosate is an example of emerging technology. Rather, we would recommend incorporating this discussion into the overview sections. We would then recommend continued focus on nanoparticles, and consider adding a discussion of genetically modified foods instead. **DONE**
- A separate chapter on TSCA is being drafted. Therefore, this chapter could be shortened, the "chemical policy" section removed and discussion of TSCA reform minimized. **The discussion about TSCA has been greatly shortened and the discussion of the European REACH legislation that had been a part of the Conclusion has now been deleted.**
- The images need references. **DONE**
-

Thank you again for having invited me to be a part of this process.

Philip J. Landrigan, MD, MSc, FAAP
Dean for Global Health
Arnhold Institute for Global Health
Professor of Preventive Medicine & Pediatrics
Icahn School of Medicine at Mount Sinai
1216 Fifth Avenue, Room 556
New York, NY 10029

Tel: Ex. 6

From: Spire, Paul [PSpire@aap.org]
Sent: Friday, July 07, 2017 6:13 PM
To: Landrigan, Philip
Cc: Etzel, Ruth; Balk, Sophie; Jennifer Lowry
Subject: Green Book - Emerging Technologies chapter - response requested by August 7

Dear Phil,

I am writing on behalf of the Green Book editorial team to follow-up on the development of the "Emerging Technologies" chapter for the *Pediatric Environmental Health, 4th Edition* manual (Green Book).

Attached please find a copy of the draft chapter as it was reviewed by the AAP's Council on Environmental Health (COEH), as well as comments from the committee members that emanated from this review. We are requesting that you review these comments and adjust the chapter to address these issues. If there are any items that you will not be addressing or that you disagree with, it would be helpful to receive a short explanation of these issues for the committee's consideration.

We also wanted to share one new request and additional guidance that has emerged as this project has progressed:

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- If you are using information from another AAP policy statement (or other Academy document), please modify the content so that it is not worded exactly like the existing policy document.
- Please continue to make all adjustments utilizing Word's "Track Changes" feature.

We are hoping to receive all updated chapters within one month, by Monday, August 7.

Thanks again for your ongoing support. If you have any questions or need anything more, please do not hesitate to let me know.

Many thanks,

Paul

Message

From: Landrigan, Philip [philip.landrigan@mssm.edu]
Sent: 7/23/2017 10:38:45 PM
To: 'Spire, Paul' [PSpire@aap.org]; Ahdoot, Samantha [Ex. 6] John.Balbus@nih.gov [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=2c555339753d4bedb1a7a321779b25f6-John.Balbus@nih.gov]; Carl Baum [carl.baum@yale.edu]; Bernstein, Aaron [Aaron.Bernstein@childrens.harvard.edu]; Bole, Aparna [Aparna.Bole@UHhospitals.org]; Byron, Lori [Ex. 6] DeNicola, Nate [Ex. 6]; Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Foos, Brenda [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=18b24f2f79414190852a748bf650d2b9-Bperkovi]; Gadhia, Ami [agadhia@aap.org]; Hindman, Diane [Ex. 6]; Laris, Zachary [zlaris@aap.org]; Jennifer Lowry [jlowry@cmh.edu]; Marcus, Steven [Ex. 6]; Mortensen, Mary [zeo4@CDC.GOV]; Pacheco, Susan [Susan.E.Pacheco@uth.tmc.edu]; Spanier, Adam [aspanier@peds.umaryland.edu]; Ward, Mary [wardm@mail.nih.gov]; Woolf, Alan [alan.woolf@childrens.harvard.edu]
Subject: RE: COEH Green Book Conference Call - Monday July 24 @ 3 pm Central / 4 pm Eastern - draft chapters and primary reviewer assignments
Attachments: 39 - Pesticides - COEH review.docx; 40 - Plasticizers - COEH review.docx

Colleagues

Attached please find my comments on Chapters 39 and 40. I had nothing to add on any of the others.

Phil Landrigan

Philip J. Landrigan, MD, MSc, FAAP
Dean for Global Health
Professor of Preventive Medicine and Pediatrics
Arnhold Institute for Global Health
Icahn School of Medicine at Mount Sinai
One Gustave L. Levy Place, Box 1057
New York, NY 10029
Tel: [Ex. 6]

phil.landrigan@mssm.edu

WHO Collaborating Centre in Children's Environmental Health

From: Spire, Paul [mailto:PSpire@aap.org]
Sent: Tuesday, July 18, 2017 4:26 PM
To: Ahdoot, Samantha; Balbus, John; Carl Baum; Bernstein, Aaron; Bole, Aparna; Byron, Lori; DeNicola, Nate; Etzel, Ruth; Foos, Brenda; Gadhia, Ami; Hindman, Diane; Landrigan, Philip; Laris, Zachary; Jennifer Lowry; Marcus, Steven; Mortensen, Mary; Pacheco, Susan; Spanier, Adam; Ward, Mary; Woolf, Alan
Subject: COEH Green Book Conference Call - Monday July 24 @ 3 pm Central / 4 pm Eastern - draft chapters and primary reviewer assignments
Importance: High

Dear COEH Executive Committee,

I am writing to confirm the scheduling of a 1-hour conference call to review Green Book chapters as follows:

Date: Monday, July 24
Time: 3 pm Central / 4 pm Eastern
Toll-free dial-in number: Ex. 6
Access code: Ex. 6

I will separately send a calendar invite momentarily to help get this on your calendars.

Four draft chapters are attached. Please note that all committee members are asked to review all chapters. Primary reviewer assignments are below and were based upon those who expressed availability via the Doodle poll. If you are assigned as Primary Reviewer on one of the chapters but are no longer available, please let me know ASAP.

Primary reviewers are asked to lead discussion of their assigned chapter during the conference call, record and collate all input offered by others, and convey all comments/edits to me within 1 week after the call. Please focus on content-related issues, as medical copy editors will review for grammar and readability at a later stage. Our goal will be to spend approximately 15 minutes per chapter. The input collected/submitted by the primary reviewers will be conveyed to the original chapter authors as guidance to adjust their chapter.

Primary Reviewer	Chapter #	Chapter Name	Lead Author
Alan Woolf	40	Pesticides	Newman, Nicholas
Phil Landrigan	52	Drug (Methamphetamine) Laboratories	Lowry, Jennifer
Lori Byron	41	Plasticizers	Sandel, Megan
Steve Marcus	64	Precautionary Principle	Sandel, Megan

For those not able to join us next Monday, you are still asked to review the chapters and submit any comments to the primary reviewer (or me) in advance of the call. Although no liaisons have been assigned as primary reviewers, liaisons are very much encouraged to participate in the review and discussion process.

One final note: In addition to the 4 draft chapters, I have also attached an embargoed draft of the "Mosquitoborne Infections" chapter of the forthcoming Red Book, which will be released shortly. The DEET guidance in this document has been the product of much discussion, specifically related to guidance the AAP had previously offered related to not using in children under 2 years and/or 2 months of age. I think there will be a need to harmonize the Green Book "Pesticides" chapter guidance with this information. Jennifer was involved in these discussions and can address on the call as needed.

If you have any questions or need anything more, please let me know.

Best,

Paul

Message

From: Schroeder, Kathleen [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=0DB676B2FADE4B54BEBCC7B6E664FC94-SCHROEDER,]
Sent: 4/3/2015 1:31:19 PM
To: AO-OCHP-Everyone [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=222d03d48d634481af638d4892296469-AO-OCHP-Everyone]
Subject: Enlist Duo

Enlist Duo is 2,4-D and glyphosate.

Kathy

EPA OKs Enlist Duo in Nine States But Not Tennessee
U.S. Map
April 2 — The Environmental Protection Agency approved Dow AgroSciences' new herbicide Enlist Duo for use in nine additional states but declined to allow its use in Tennessee over endangered species concerns. The agency on Oct. 15 approved the use of Enlist, a mixture of the chemicals glyphosate and 2,4-D, in only six states (200 DEN A-14, 10/16/14). At that time, the EPA said it would approve the herbicide in more states upon the completion of endangered species assessments. Now, the agency has completed its assessments and determined the herbicide wouldn't affect any endangered species in the nine states: Arkansas, Kansas, Louisiana, Minnesota, Mississippi, Missouri, Nebraska, North Dakota and Oklahoma. The EPA found that Enlist might adversely affect a rare species of mustard plant found in only one county outside of Nashville. As a result, the agency did not grant approval to use Enlist in Tennessee. The herbicide is designed to be used on corn and soybean crops that have been genetically modified by Dow to tolerate exposure to large amounts of the chemical. A copy of the EPA's expansion of the Enlist Duo registration is available at http://op.bna.com/env.nsf/r?Open=dscz-9v7l4d

Kathleen Schroeder, MD, MSI
Senior Environmental Employee
US EPA
Office of Children's Health Protection

schroeder.kathleen@epa.gov
202-566-2279

Message

From: Spire, Paul [PSpire@aap.org]
Sent: 1/11/2018 5:29:50 PM
To: Sophie Balk [SBALK@montefiore.org]; Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]
CC: Jennifer Lowry [jlowry@cmh.edu]
Subject: RE: FW: Green Book - Water chapter - response requested by September 18
Attachments: 17 - Water - revisions.docx; 17 - Water - COEH comments.docx

Hi Sophie and all.

This chapter would move next to editor review, so I think yes, if you were willing and able to review first and then send to Ruth, that would follow the steps we've been taking. Two additional things I wanted to note:

1) For reference, attached are the COEH review comments that were provided to Dr. Goldman.
2) Dr. Goldman did not include key points. Would you be willing to draft these as you review the chapter? I've added a placeholder in the attached to add this.

Many thanks,

Paul

From: Sophie Balk [mailto:SBALK@montefiore.org]
Sent: Thursday, January 11, 2018 10:12 AM
To: Spire, Paul <PSpire@aap.org>; Etzel, Ruth <Etzel.Ruth@epa.gov>
Cc: Jennifer Lowry <jlowry@cmh.edu>; Sophie Balk <SBALK@montefiore.org>
Subject: Re: FW: Green Book - Water chapter - response requested by September 18

Ruth and Paul,

What is next for this chapter? Would you like me to review, then send to Ruth?

Sophie

Sophie J Balk MD
Attending Pediatrician
Children's Hospital at Montefiore
Professor of Pediatrics
Albert Einstein College of Medicine
Ex. 6
718 405-8091 (fax)

From: Lynn Goldman <goldmanl@gwu.edu>
Sent: Wednesday, January 10, 2018 4:02:21 PM
To: Spire, Paul
Cc: Etzel, Ruth; Sophie Balk; Jennifer Lowry
Subject: Re: FW: Green Book - Water chapter - response requested by September 18

CAUTION: This email comes from an external source; the attachments and/or links may compromise our secure environment. Do not open or click on suspicious emails. Please click on the "Phish Alert" button on the top right of the Outlook dashboard to report any suspicious emails.

At long last, the water chapter. I think I have addressed all of the reviewer comments.

The least believable aspect is that the EPA standards haven't changed much, if at all, from the last edition.

I checked per the reviewer's comments.

Best,
Lynn

On Wed, Jan 10, 2018 at 2:03 PM, Lynn Goldman <goldmanl@gwu.edu> wrote:

> Yes!
>
> On Sat, Jan 6, 2018 at 11:51 AM, Spire, Paul <PSpire@aap.org> wrote:
>
> > Hi Dr. Goldman.
> >
> > I'm sorry to pester you, but it appears that we have not yet received your chapter and we are really down to the wire on publication deadlines. Do you think you would be able to get this to us within 2 weeks, by Friday, Jan 19?
> >
> > Many thanks,
> >
> > Paul
> >
> > ---
> >
> > **From:** Spire, Paul
> > **Sent:** Friday, November 17, 2017 6:04 PM
> > **To:** Goldman, Lynn <goldmanl@gwu.edu>
> > **Cc:** Etzel, Ruth <etzel.ruth@epa.gov>; Balk, Sophie <sbalk@montefiore.org>; Jennifer Lowry <jlowry@cmh.edu>
> > **Subject:** RE: Green Book - Water chapter - response requested by September 18
> > **Importance:** High
> >
> > Hi Dr. Goldman.
> >
> > It appears that we have not yet received your chapter. Do you think it would be possible to receive by Nov 30?
> >
> > Thanks much for your continued support,
> >
> > Paul
> >
> > ---
> >
> > **From:** Spire, Paul
> > **Sent:** Friday, October 27, 2017 5:20 PM
> > **To:** Goldman, Lynn <goldmanl@gwu.edu>
> > **Cc:** Etzel, Ruth <etzel.ruth@epa.gov>; Balk, Sophie <sbalk@montefiore.org>; Jennifer Lowry <jlowry@cmh.edu>
> > **Subject:** FW: Green Book - Water chapter - response requested by September 18
> >
> > Hi Dr. Goldman.

It appears that we have not heard back from you yet regarding the requested adjustments to the "Water" chapter. We are unfortunately starting to push-up again some firm publication deadlines. Is there any chance you could respond within 2 weeks, by November 10?

Many thanks for considering and for your continued support.

Best,

Paul

From: Spire, Paul
Sent: Thursday, September 28, 2017 12:19 PM
To: Goldman, Lynn <goldmanl@gwu.edu>
Cc: Etzel, Ruth <etzel.ruth@epa.gov>; Balk, Sophie <sbalk@montefiore.org>; Jennifer Lowry <jlowry@cmh.edu>
Subject: FW: Green Book - Water chapter - response requested by September 18

Hi Dr. Goldman.

It appears that we have not yet received a response from you regarding the updated "Water" chapter. Any chance you get this to us by Friday, Oct 13?

Many thanks,

Paul

From: Spire, Paul
Sent: Thursday, August 17, 2017 6:59 PM
To: Goldman, Lynn <goldmanl@gwu.edu>
Cc: Etzel, Ruth <etzel.ruth@epa.gov>; Balk, Sophie <sbalk@montefiore.org>; Jennifer Lowry <jlowry@cmh.edu>
Subject: Green Book - Water chapter - response requested by September 18
Importance: High

Dear Dr. Goldman,

I am writing on behalf of the Green Book editorial team to follow-up on the development of the "Water" chapter for the *Pediatric Environmental Health, 4th Edition* manual (Green Book).

Attached please find a copy of the draft chapter as it was reviewed by the AAP's Council on Environmental Health (COEH), as well as comments from the committee members that emanated from this review. We are requesting that you review these comments and adjust the chapter to address these issues. If there are any items that you will not be addressing or that you disagree with, it would be helpful to receive a short explanation of these issues for the committee's consideration.

We also wanted to share one new request and additional guidance that has emerged as this project has progressed:

- Please write 3 - 5 bullet points for your chapter that summarize key issues and take-home messages. These are being added at the start of each chapter.
- Please pay special attention to providing citations wherever it would be appropriate to do so, ensuring that all sources are cited and acknowledged.

- If you are using information from another AAP policy statement (or other Academy document), please modify the content so that it is not worded exactly like the existing policy document.
- Please continue to make all adjustments utilizing Word's "Track Changes" feature.

We are hoping to receive all updated chapters within one month, by Monday, September 18.

Thanks again for your ongoing support. If you have any questions or need anything more, please do not hesitate to let me know.

Many thanks,

Paul

--
Lynn R. Goldman, MD, MS, MPH
Michael and Lori Milken Dean, Milken Institute School of Public Health,
George Washington University
goldmanl@email.gwu.edu

--
Lynn R. Goldman, MD, MS, MPH
Michael and Lori Milken Dean, Milken Institute School of Public Health,
George Washington University
goldmanl@email.gwu.edu

Message

From: Hackel, Angela [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=B2E0A52DBEBC4D8C84961F50C117334D-HACKEL, ANGELA]
Sent: 4/3/2018 1:35:30 PM
To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]
Subject: Review needed by COB Today
Attachments: April 2018 CHPAC Update Draft.docx

Hi Ruth,

Attached is the CHPAC update. I need your review by COB today, as we need to get it to OPA asap. Also, please note, that there may be a lead dust hazard entry that we will add in. We have not received it yet, as it is in OCSPP's review chain. I want to get what we have to OPA and then add in anything else that is needed—later.

Thanks,

Angela

Angela Hackel, M.A.
Director, Program Implementation and Coordination Division
Office of Children's Health Protection | Office of the Administrator
U.S. Environmental Protection Agency
Room 1131 EPA West Building
Washington, DC 20460
Office: 202.566.2977

Children's Health Protection Advisory Committee

Office of Children's Health Protection Updates

(as of 3/31/18)

EPA'S CHILDREN'S HEALTH NEWS & ANNOUNCEMENTS

- The EPA Schools website epa.gov/schools now has a Disaster Preparedness and Recovery Resources section. Kara Belle (OCHP), Martha Berger (OCHP), and April Nowak (R8) worked to gather materials and references. Kara Belle (OCHP) ensured that there is a highlighted area on the Healthy School's, Healthy Kids website.
- In response to Administrator Pruitt's vision for a collaborative multi-federal agency approach to reduce childhood lead exposure across the country, EPA Region 8 (R8) created a Lead Strategy that identifies specific areas for engagement with federal, state, tribal and local partners. Programmatic areas of focus include Drinking Water, Lead-Based Paint, Superfund, Brownfields, Response and the Resource Conservation and Recovery Act (RCRA). A R8 cross program lead strategy implementation team was recently formed and is meeting to finalize the Strategy, establish specific commitments and the communication plan.
- **EPA Settles with Amazon for Distributions of Illegal Pesticides:** In February 2018, EPA announced an agreement with Amazon to protect the public from the hazards posed by unregistered and misbranded pesticide products. In August 2015 and January 2016, EPA issued FIFRA Stop Sale, Use, or Removal Orders against Amazon Services LLC to prohibit the sale of illegal pesticide products that can easily be mistaken for black-board or side-walk chalk, especially by children. After receiving the stop sale orders, Amazon immediately removed the products from the marketplace, prohibited foreign sellers from selling pesticides, and cooperated with EPA during its subsequent investigation. The orders, as well as EPA's subsequent engagement with the company, prompted Amazon to more aggressively monitor its website for illegal pesticides. As a result, Amazon has created a robust compliance program comprised of a sophisticated computer-based screening system backed-up by numerous, trained staff. In October 2016, Amazon notified all customers who purchased the illegal pesticides between 2013 and 2016 to communicate safety concerns with these products and urge disposal. Amazon also refunded those customers the cost of the products, approximately $130,000. Under the terms of this recent agreement, Amazon will pay an administrative penalty of $1,215,700 and will develop an online training course on pesticide regulations and policies that will be mandatory for all entities planning to sell pesticides on Amazon.com. This settlement is intended to prevent children from being inadvertently exposed to illegal pesticides, particularly those mimicking chalk. For more information on this settlement or to read a copy of the consent agreement and final order, go to: https://www.epa.gov/enforcement/amazon-services-llc-fifra-settlement.

PUBLIC COMMENT OPPORTUNITIES

- **Draft Human Health Risk Assessments for Pesticide Registration Reviews for Public Comment by April 30, 2018.** Registration review is EPA's periodic review of pesticide registrations to ensure that each pesticide continues to satisfy the statutory standard for registration, that is, the pesticide can perform its intended function without unreasonable adverse effects on human health or the environment. As part of the registration review process, the Agency has completed comprehensive draft human health and/or ecological risk assessments for a number of pesticides. Please note that only children's health concerns are highlighted here. For more information, see: https://www.gpo.gov/fdsys/pkg/FR-2018-02-27/pdf/2018-03986.pdf.
    - Acetamiprid is a neonicotinoid insecticide registered for use on fruit and vegetable crops and in a number of residential sites, including indoor application as a crack/crevice/bedbug treatment, applications to gardens, and pet (i.e., dogs) spot-on treatment. The acute dietary analysis is just below the level of concern for children 1<2 years old, as is the aggregate risk assessment. Using developmental toxicological endpoints, certain occupational uses result in estimated risks of concern. For the Draft Human Health Risk Assessment for Acetamiprid, see: https://www.regulations.gov/document?D=EPA-HQ-OPP-2012-0329-0025.
    - Butralin is an herbicide used as a plant growth regulator on tobacco. There are no dietary or spray drift risks of concern for children. The Agency has considered the exposure to humans from residues in tobacco smoke by assessing the short-term inhalation exposure and risks for adults only. For the Draft Human Health Risk Assessment for Bifenthrin, see: https://www.regulations.gov/document?D=EPA-HQ-OPP-2010-0384-0247.
    - Cypermethrins are pyrethroid insecticides registered for use on a wide variety of agricultural food/feed crops, livestock, and sod farms; at recreational sites (i.e., golf courses, athletic fields); at indoor residential sites, on residential lawns; on gardens and trees; on mosquitoes and termites, and on pets. There are estimated risks of concern for children from certain uses on lawns, indoors, and pet collars. For the Draft Human Health Risk Assessment for the Cypermethrins, see: https://www.regulations.gov/document?D=EPA-HQ-OPP-2011-0720-0020.
    - Glyphosate is an herbicide used on fruit, vegetable, and field crops, turf, and aquatic application scenarios. There are no dietary, residential or spray drift risks of concern for children. In response to concern from segments of the general public related to the presence of glyphosate in human milk, the EPA analyzed human milk samples collected by the National Children's Study for residues of glyphosate and its metabolites; there were no detection in the 39 samples from 39 mothers. EPA has determined glyphosate to be "Not likely to be carcinogenic to humans." For the Draft Human Health Risk Assessment for Glyphosate, see: https://www.regulations.gov/document?D=EPA-HQ-OPP-2009-0361-0068. For the Analysis of Human Milk for Incurred Residues of Glyphosate and its Metabolites, see https://www.regulations.gov/document?D=EPA-HQ-OPP-2009-0361-0085.

- Prometon is an herbicide used in non-agricultural and non-residential locations, including parking lots, roadsides, and under pavement. When using modeling data, drinking water estimates are of concern for children; however, when using monitoring data there is no concern. Spray drift estimates require a 10-foot buffer from the field edge. For the Draft Human Health Risk Assessment for Prometon, see: https://www.regulations.gov/document?D=EPA-HQ-OPP-2013-0068-0019.
- Pymetrozine is an insecticide used in agricultural field and orchard/vineyard crops, on Christmas trees and ornamentals, and interior plantscapes. Acute and chronic dietary risk estimates, mainly from drinking water, are of concern for children. EPA has classified Pymetrozine as a "likely human carcinogen". For the Draft Human Health Risk Assessment for Pymetrozine, see: https://www.regulations.gov/document?D=EPA-HQ-OPP-2013-0368-0017.

PRESIDENT'S TASK FORCE ON ENVIRONMENTAL HEALTH RISKS AND SAFETY RISKS TO CHILDREN

- On February 15, 2018, EPA Administrator Pruitt held a Principals meeting with members of the *President's Task Force on Environmental Health Risks and Safety Risks to Children* to discuss the development of a "Federal Strategy to Reduce Childhood Lead Exposures and Eliminate Associated Health Impacts."
- Members of the Task Force agreed that addressing childhood lead exposure is a priority for their agencies/departments and agreed on the five goals within the Strategy.

UPCOMING EVENTS & WEBINARS

- The Region 8 Healthy Schools Coordinator is coordinating a session at the National Green Schools Conference and Expo May 4, 2018. The conference session is titled, "Extreme Weather and Natural Disasters: Supporting Schools Plan and Recover." Presenters from state, local, federal government and research organization will present on how schools play an important role during disasters. Presenters will provide lessons learned as well as consideration of emotional needs during and after disaster.
- R8 Healthy Schools, Children's Environmental Health and Environmental Education programs will have an exhibit table at the Green Schools Conference and Expo May 2 – 4, 2018. Outreach materials including environmental health, lead testing in schools, lead free homes, PEHSU, asthma prevention materials will be among some topics covered at the expo table.

Message

From: Jill Jennings-McElheney Ex. 6
Sent: 4/1/2017 2:01:49 PM
To: Grifo, Francesca [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=8c4870bfab004fa0ac47bc8659d9903b-Grifo, Fran]
CC: Tejada, Matthew [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=6559971c9dcd4c689ca6ec6b2a8cb0ee-Tejada, Matthew]; Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Neugeboren, Steven [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=cfd837ac503949a9820715b53ba921e6-SNEUGEBO]; Wehling, Carrie [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=e3e55f11fdc7489698be69849b301da6-CWEHLING]; Messier, Dawn [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a13a4cd15ec94fe181aa84e34ac0561a-DMESSIER]; Flaharty, Stephanie [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=cbb360b909e74aa7b46acd122822b9cb-sflahart]; Grevatt, Peter [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=d3caa0c39ebe44cb9d3ae44da7543733-Grevatt, Peter]; Burneson, Eric [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=2cacb9a8d49f49af80531e9e2ccb9018-eburneso]; Rodgers-Jenkins, Crystal [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=5621428d46854b01a50ddde7a1004f3a-Rodgers-Jenkins, Crystal]; Mccabe, Catherine [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=19975ce83c8348c3b33bcb2c656086b8-CMcCabe]; Barone, Stan [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a4f8618acbba418da24c110f3123a2af-Barone, Stan]; Cleland-Hamnett, Wendy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=b84439fcdf02426abd539d8bb6c9ef6f-Cleland-Hamnett, Wendy]; Sinks, Tom [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=001007b7d256453a8a19b91df704e22c-Sinks, Tom]; Larsen, Alan [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=f5c96e714c314c7aa36c27e3181c8fae-Larsen, Alan]; Elkins, Arthur [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=8e6cfef587834f388791a500a803e7b2-Elkins, Arthur]; Barnet, Henry [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=cb4045a7ca97475698cfce824ae664b1-Barnet, Henry]; William Dent [William_Dent@isakson.senate.gov]; <Amy_Turner@isakson.senate.gov> [Amy_Turner@isakson.senate.gov]; Betsy_Dietz@isakson.senate.gov; caroline_vanvick@perdue.senate.gov; Megan Whittemore [Megan_Whittemore@perdue.senate.gov]; <Rep.JodyHice@mail.house.gov> [Rep.JodyHice@mail.house.gov]; Keri Gardner [Keri.Gardner@mail.house.gov]; Joshua Findlay [joshua.findlay@mail.house.gov]
Subject: **TIME SENSITIVE** - Request to Expand Scientific Integrity Investigation of Scott Pruitt

Hello Dr. Grifo:

I am forwarding you the email below sent yesterday to EPA/Teresa Green. I am submitting it for review of your scientific integrity investigation of EPA Administrator, Scott Pruitt, as reported by Reuters:

https://www.google.com/amp/mobile.reuters.com/article/amp/idUSKBN1722SU

I understand also Scott Pruitt is being investigated by the Oklahoma Bar and could potentially lose his law license:

https://www.usnews.com/news/best-states/oklahoma/articles/2017-03-30/oklahoma-bar-association-opens-investigation-of-ex-ag-pruitt

I will be following up also with EPA spokesperson, Liz Bowman, who responded with sympathy to Scott Pruitt in the Reuters piece. Ms. Bowman evidently is unaware of envirovictims of climate change, also known as climate refugees.

Scott Pruitt and the current administration refused to meet with me and other envirovictims after several requests. Pruitt has denied equal time to us while moving forward in his hijacking mode of the justice system implementing an autogenocide agenda. His egregious assault on environmental health protections is an affront to human and civil rights.

Since your correspondence to me in May 2015, I have copied you to almost two years of emails making you privy to the plight of envirovictims. I will be following up with you on that soon.

I submit this email record and request an expansion of your current investigation into Scott Pruitt and his TSCA petition denial on water fluoridation that Wendy Cleland Hamnett signed in FEB 2017 riddled with scientific errors. Water fluoridation has scientifically and ethically collapsed as proven in the recorded meetings I organized with top federal agency personnel and a team of professional experts. The agency must move forward now in calling for an ethical end to this antiquated harm.

As an envirovictim of a green crime, I am seeking victim status as I move forward to asking EPA to investigate my criminal complaint and the ties that Scott Pruitt and the current administration have to my perpetrator. This criminal investigation will also involve scientific integrity of federal agencies including EPA and CDC/ATSDR.

Thank you,

Jill Jennings-McElheney
Envirovictim, EPA Region IV
Envirovictim Advocate

Begin forwarded message:

> **From:** Jill Jennings-McElheney <Ex. 6
> **Date:** March 31, 2017 at 12:44:09 PM EDT
> **To:** "Green, Teresa" <Green.Teresa@epa.gov>
> **Cc:** Stan Barone <Barone.Stan@epa.gov>, Wendy Cleland-Hamnett <Cleland-Hamnett.Wendy@epa.gov>, Tom Sinks <Sinks.Tom@epa.gov>, "barnet.henry@epa.gov" <barnet.henry@epa.gov>, Alan Larsen <Larsen.Alan@epa.gov>, Arthur Elkins <elkins.arthur@epa.gov>
> **Subject: Re: Freedom of Information Act Request No. EPA-HQ-2017-003713**
>
> Dear Teresa,
>
> I explained to Wendy & Stan back months ago in January my concern by the fact that Stuart Cagen was not cut from the TSCA SACC nomination due to his industry conflicts of interest.
>
> Stuart Cagen was heavily involved in The Shanghai Study. I first came to learn about The Shanghai Study in Dr. Carl Cranor's book, Legally Poisoned: How the Law Puts Us at Risk from Toxicants.
>
> You can read The Shanghai Study documents for yourself through a compiled database by The Center for Public Integrity linked in this article which documents my journey as an envirovictim of a green crime:
>
> https://www.publicintegrity.org/2014/12/08/16356/new-battlefront-petrochemical-industry-benzene-and-childhood-leukemia

Another of my concerns to Stan & Wendy involved Dr. Peter Infante who has long been considered a reputable epidemiologist associated with Collegium Ramazzini. His harsh treatment by EPA to step aside on glyphosate was questionable. I inquired. Stan responded to my concern saying, "Your previous question about Dr. Infante's role as an SGE of the Glyphosate SAP was a personnel decision and the agency's policy is to not discuss personnel matters."

While I understand you are not obligated to answer my questions, I do believe it is important for EPA to be transparent and have an equal playing field. I know personally of a highly qualified nominee who was cut from your TSCA SACC list while Stuart Cagen remained.

If nominees were evaluated for their conflicts of interest for the TSCA SACC, I would like to see those evaluations along with the internal communications of those narrowing the nominations of candidates. With regard to Dr. Infante, I assume redactions could be used.

I need this information as supplemental to report the green crime that occurred to me to Mr. Henry E. Barnet, Director, Office of Criminal Enforcement, Forensics & Training @ EPA. I am applying to be acknowledged as a victim of a green crime after reading about the plight of residents in Texas whose hard earned, rightful victim status of an environmental crime was unjustly stripped away on semantics:

http://www.dallasobserver.com/news/how-a-convicted-polluter-with-help-from-a-texas-judge-avoided-paying-back-its-victims-7145490

I had asked Wendy & Stan repeatedly to meet with me as an envirovictim and advocate under the new administration. I was not accommodated and given equal time nor informed why they denied me a meeting.

Given the envirodata report this month which documents the assault of environmental health protections @ EPA, the political hijacking of the justice system, and autogenocide, it is more important than ever to promptly receive this FOIA information:

https://envirodatagov.org/wp-content/uploads/2017/03/Public-Protections-under-Threat-at-the-EPA.pdf

Thank you,

Jill Jennings-McElheney
Envirovictim, EPA Region IV
Envirovictim Advocate

On Mar 30, 2017, at 6:00 PM, Green, Teresa <Green.Teresa@epa.gov> wrote:

> Good Evening Ms. Jennings-McElheney,
>
> I just wanted to remind you that I am hoping to hear back from you to clarify your FOIA request. Please contact me at your earliest convenience.

Respectfully,
Terry Green
U.S. Environmental Protection Agency
(202) 564-5230
green.teresa@epa.gov

From: Green, Teresa
Sent: Friday, March 24, 2017 5:13 PM
To: Ex. 6
Subject: Freedom of Information Act Request No. EPA-HQ-2017-003713

Hello Ms. Jennings-McElheney:

I am the EPA staffer working on drafting the Agency's response to your Freedom of Information Act (FOIA) request of February 7, 2017, regarding membership of EPA's Toxic Substance Control Act (TSCA) Science Advisory Committee on Chemicals (SACC) Science Advisory Panel (SAP). In your request you asked, "**Who made the selection for recent nominees chosen for the TSCA Science Advisory Committee on Chemicals**." (You also asked that the Agency disclose the "conflicts of interest forms each potential candidate submitted for vetting," but for the purpose of this email, I would like to focus only on the first part of your request.)

The Freedom of Information Act allows for the request of agency records. It does not require agencies to answer specific questions. Accordingly, the EPA will not be able to answer your specific question related to membership decisions. That said, I would like to provide you with the opportunity to clarify your request. **Instead, would you like the EPA policy that specifies who makes the selection for nominees chosen for the TSCA SACC**?

I apologize if this distinction seems bureaucratic, but the Agency does not wish to establish precedents that would lead us beyond the boundaries of the FOIA statute.

You may reply to me via email, or alternatively, you may call me if you wish to discuss your request.

Respectfully,
Terry Green
U.S. Environmental Protection Agency
(202) 564-5230
green.teresa@epa.gov

Message

From: Spire, Paul [PSpire@aap.org]
Sent: 7/7/2017 10:13:08 PM
To: Landrigan, Philip [philip.landrigan@mssm.edu]
CC: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Balk, Sophie [sbalk@montefiore.org]; Jennifer Lowry [jlowry@cmh.edu]
Subject: Green Book - Emerging Technologies chapter - response requested by August 7
Attachments: 52 - Emerging Technologies.docx; 52 - Emerging Technologies - COEH comments.docx
Importance: High

Dear Phil,

I am writing on behalf of the Green Book editorial team to follow-up on the development of the "Emerging Technologies" chapter for the *Pediatric Environmental Health, 4th Edition* manual (Green Book).

Attached please find a copy of the draft chapter as it was reviewed by the AAP's Council on Environmental Health (COEH), as well as comments from the committee members that emanated from this review. We are requesting that you review these comments and adjust the chapter to address these issues. If there are any items that you will not be addressing or that you disagree with, it would be helpful to receive a short explanation of these issues for the committee's consideration.

We also wanted to share one new request and additional guidance that has emerged as this project has progressed:

- Please write 3 - 5 bullet points for your chapter that summarize key issues and take-home messages. These are being added at the start of each chapter.
- Please pay special attention to providing citations wherever it would be appropriate to do so, ensuring that all sources are cited and acknowledged.
- If you are using information from another AAP policy statement (or other Academy document), please modify the content so that it is not worded exactly like the existing policy document.
- Please continue to make all adjustments utilizing Word's "Track Changes" feature.

We are hoping to receive all updated chapters within one month, by Monday, August 7.

Thanks again for your ongoing support. If you have any questions or need anything more, please do not hesitate to let me know.

Many thanks,

Paul

Message

From: CATHERINE KARR [ckarr@uw.edu]
Sent: 12/15/2017 1:22:20 AM
To: Spire, Paul [PSpire@aap.org]; Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]
Subject: RE: Green Book - "Children in Developing Countries" chapter - response requested
Attachments: 14 - Developing Countries - COEH comments & karr response.docx; 9789241565196_eng.pdf; Green Book 14 - Developing Nations[10286]12.10.17.docx

Hello you two.
See attached revised chapter with updated references. I left in the comment boxes from reviewer on the chapter document with my direct responses. I accepted other track changes from before and reviewed/updated references. I also wrote direct responses to each comment on the document from coeh. I provide the who document where the map came from. I have permission from who to use this. I will forward the email regarding this to you after I send this.

Thanks for your patience. I hope things are coming together for you in the end game of this very challenging wrangling you have so diligently kept moving!

Happy holiday time. catherine

From: Spire, Paul [mailto:PSpire@aap.org]
Sent: Wednesday, December 13, 2017 12:47 PM
To: Etzel, Ruth <Etzel.Ruth@epa.gov>; CATHERINE KARR <ckarr@uw.edu>
Subject: RE: Green Book - "Children in Developing Countries" chapter - response requested

Hi Catherine and Ruth.

Yes, we can assist with permissions, provided you can help us identify the publisher, source, and/or rights-holder. If you happen to receive permission in writing, that is fine and helpful and we'll use it, but if you don't have this, please don't let that be a hold-up for your chapter. You can submit the chapter without the permission issue resolved, and I or one of my staff colleagues will seek permissions clearance during the copy editing and board review phases.

Many thanks,

Paul

From: Etzel, Ruth [mailto:Etzel.Ruth@epa.gov]
Sent: Wednesday, December 13, 2017 1:17 PM
To: CATHERINE KARR <ckarr@uw.edu>
Cc: Spire, Paul <PSpire@aap.org>
Subject: RE: Green Book - "Children in Developing Countries" chapter - response requested

Wow! Thanks so much. I think the AAP can help with permissions (right, Paul?)
I suggest Mrs. Marie Noel Brune-Drisse at brunedrissem@who.int.

From: CATHERINE KARR [mailto:ckarr@uw.edu]
Sent: Wednesday, December 13, 2017 2:02 PM
To: Etzel, Ruth <Etzel.Ruth@epa.gov>
Cc: Spire, Paul <PSpire@aap.org>
Subject: RE: Green Book - "Children in Developing Countries" chapter - response requested

All comments addressed, main content edited in response and complete, now working on updating/cleaning up references, including replacements for those that were "old". I also need to get permission for the update who figure. Can you suggest a contact at WHO? Catherine

---

From: Etzel, Ruth [mailto:Etzel.Ruth@epa.gov]
Sent: Tuesday, December 12, 2017 6:09 AM
To: CATHERINE KARR <ckarr@uw.edu>
Cc: Spire, Paul <PSpire@aap.org>
Subject: RE: Green Book - "Children in Developing Countries" chapter - response requested

Hi Catherine,

Hope you are well and enjoying the holiday season. I'm circling back to see whether you will be able to turn around your chapter this week? It would be a great help because we are now almost ready to wrap up the remaining chapters and tie them with a bow!

Best,

Ruth

From: CATHERINE KARR [mailto:ckarr@uw.edu]
Sent: Friday, November 17, 2017 9:20 PM
To: Spire, Paul <PSpire@aap.org>
Cc: Etzel, Ruth <Etzel.Ruth@epa.gov>; Balk, Sophie <sbalk@montefiore.org>; Jennifer Lowry <jlowry@cmh.edu>
Subject: RE: Green Book - "Children in Developing Countries" chapter - response requested by October 9

Probably not but could do in early dec if you are open to negotiating. I am in travel mode until dec 4, could pick up after that. catherine

---

From: Spire, Paul [mailto:PSpire@aap.org]
Sent: Friday, November 17, 2017 4:04 PM
To: CATHERINE KARR <ckarr@uw.edu>
Cc: Etzel, Ruth <etzel.ruth@epa.gov>; Balk, Sophie <sbalk@montefiore.org>; Jennifer Lowry <jlowry@cmh.edu>
Subject: RE: Green Book - "Children in Developing Countries" chapter - response requested by October 9
Importance: High

Hi Catherine.

It appears that we have not yet received your chapter. Do you think it would be possible to receive by Nov 30?

Thanks much for your continued support,

Paul

From: Spire, Paul
Sent: Friday, October 27, 2017 5:20 PM
To: Karr, Catherine <ckarr@u.washington.edu>
Cc: Etzel, Ruth <etzel.ruth@epa.gov>; Balk, Sophie <sbalk@montefiore.org>; Jennifer Lowry <jlowry@cmh.edu>
Subject: FW: Green Book - "Children in Developing Countries" chapter - response requested by October 9

Hi Catherine.

It appears that we have not heard back from you yet regarding the requested adjustments to the "Children in Developing Countries" chapter. We are unfortunately starting to push-up again some firm publication deadlines. Is there any chance you could respond within 2 weeks, by November 10?

Many thanks for considering and for your continued support.

Best,

Paul

From: Spire, Paul
Sent: Thursday, September 07, 2017 4:35 PM
To: Karr, Catherine <ckarr@u.washington.edu>
Cc: Etzel, Ruth <etzel.ruth@epa.gov>; Balk, Sophie <sbalk@montefiore.org>; Jennifer Lowry <jlowry@cmh.edu>
Subject: Green Book - "Children in Developing Countries" chapter - response requested by October 9
Importance: High

Dear Catherine,

I am writing on behalf of the Green Book editorial team to follow-up on the development of the "Environmental Health Considerations for Children in Developing Nations" chapter for the *Pediatric Environmental Health, 4th Edition* manual (Green Book).

Attached please find a copy of the draft chapter as it was reviewed by the AAP's Council on Environmental Health (COEH). This version includes embedded comments and "track changes" suggestions that emanated from this review. (Please note that these comments were entered by the assigned lead reviewer but represent the input and discussion of the entire committee.) Also attached is a document which compiles additional comments from the committee's review.

We are requesting that you review the provided comments and adjust the chapter to address these issues. If there are any items that you will not be addressing or that you disagree with, it would be helpful to receive a short explanation of these issues for the committee's consideration.

We also wanted to share one new request and additional guidance that has emerged as this project has progressed:

- Please write 3 - 5 bullet points for your chapter that summarize key points and take-home messages. These are being added at the start of each chapter.
- It is important that the references in each chapter reflect the most updated information. Please review the references for the chapter carefully, and if the references have not been updated, please do a literature search to identify newer information. Please do not submit the chapter with only the identical references from the 3rd edition. It is okay to keep "classic" references when appropriate.
- Please pay special attention to providing citations wherever it would be appropriate to do so, ensuring that all sources are cited and acknowledged.
- If you are using information from another AAP policy statement (or other Academy document), please modify the content so that it is not worded exactly like the existing policy document.
- Please continue to make all adjustments utilizing Word's "Track Changes" feature.

We are hoping to receive your updated chapter within one month, by Monday, October 9.

Thanks again for your ongoing support. If you have any questions or need anything more, please do not hesitate to let me know.

Many thanks,

Paul

PREVENTING DISEASE THROUGH HEALTHY ENVIRONMENTS

A global assessment of the burden of disease from environmental risks

A Prüss-Ustün, J Wolf, C Corvalán, R Bos and M Neira

World Health Organization

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ACRONYMS AND ABBREVIATIONS

CI	confidence interval
COPD	chronic obstructive pulmonary disease
CRA	comparative risk assessment
DALY	disability-adjusted life year
HBV	hepatitis B
HCV	hepatitis C
HBsAg	hepatitis B surface antigen
HIA	health impact assessment
HIC	high-income countries
HIV/AIDS	human immunodeficiency virus/acquired immunodeficiency syndrome
IHD	ischaemic heart disease
IPM	integrated pest management
IVM	integrated vector management
JE	Japanese encephalitis
LMIC	low- and middle-income countries
PAF	population attributable fraction
PCB	polychlorinated biphenyls
SDGs	Sustainable Development Goals
STD	sexually transmitted disease
TB	tuberculosis
UV	ultraviolet
WASH	water, sanitation and hygiene
WHO	World Health Organization

REGIONS OF THE WORLD HEALTH ORGANIZATION

AFR	African Region
AMR	Region of the Americas
EMR	Eastern Mediterranean Region
EUR	European Region
SEAR	South-East Asia Region
WPR	Western Pacific Region

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PREFACE

DISEASE **CAN** BE PREVENTED THROUGH HEALTHIER ENVIRONMENTS — THIS IS THE CLEAR MESSAGE OF A MAJOR NEW GLOBAL REVIEW.

This report presents a wide-ranging assessment and detailed findings to show by how much and in what ways improving the environment can promote health and well-being.

The realization of just how much disease and ill health can be prevented by focusing on environmental risk factors should add impetus to global efforts to encourage preventive health measures through all available policies, strategies, interventions, technologies and knowledge. Armed with the evidence of what is achievable – and needed – health-care policy-makers and practitioners alike should be encouraged in their efforts to promote healthy environments. Our evolving knowledge about environment-health interactions will support the design of more effective preventive public health strategies and interventions, directed at eliminating health hazards and reducing corresponding risks to health.

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This second edition of *Preventing Disease through Healthy Environments*:

- Updates the 2006 publication and presents the latest evidence on environment-disease links and their devastating impact on global health.

- Systematically analyses and quantifies how different diseases are impacted by environmental risks, detailing the regions and populations most vulnerable to environmentally mediated death, disease and injury.

- Is exhaustive in its coverage – the health impacts of environmental risks across more than 100 diseases and injuries are covered. Some of these environmental factors are well known, such as unsafe drinking-water and sanitation, and air pollution and indoor stoves; others less so, such as climate change or the built environment.

- Highlights promising areas for immediate intervention and gaps where further research is needed to establish the linkages and quantify the burden of disease for various environmental risk factors.

The report's findings result from a systematic process: literature reviews for all the disease categories addressed; compilation of available risk factor-disease estimates; and surveys of more than 100 experts worldwide. The best available scientific evidence together with approximations and expert evaluations for knowledge gaps are combined to provide up-to-date estimates. The data and methods underlying the health statistics for the previous and current editions have, however, undergone major modifications, and thus the trend analysis is restricted to selected parameters.

Findings confirm that 23% of global deaths and 26% of deaths among children under five are due to modifiable environmental factors. Heading this list are stroke, ischaemic heart disease, diarrhoea and cancers. This environmentally mediated disease burden is much higher in lower income countries with the exception of certain noncommunicable diseases, such as cardiovascular diseases and cancers, where the per capita disease burden is greater in the developed world.

Crucially, the report strongly supports the notion that the environment is a sound platform for good public, community and individual health. Many measures can be taken immediately to reduce the disease burden attributable to environmental determinants. Examples include the promotion of safer household water storage and better hygiene measures, the use of cleaner fuels and safer, more judicious use and management of toxic substances at home and in the workplace, and occupational safety and health measures. At the same time, actions by sectors such as energy, transport, agriculture and industry are vital, in cooperation with the health sector, to address the root environmental causes of ill health. Thus, actions do not need to come from health alone, but rather from all sectors making decisions which impact on environmental determinants of health. Acting together on coordinated health, environment and development policies can strengthen and sustain improvements to human well-being and quality of life via multiple social and economic co-benefits. Repositioning the health sector to work more intersectorally on effective preventive health policies is the way forward to address environmental causes of disease and injury, and, ultimately, in transforming the global burden of disease.

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The Sustainable Development Goals (SDGs), agreed by heads of state at the UN General Assembly in September 2015, re-set the world's commitment to combating the world's pressing development issues over the next 15 years. Within the 17 goals there are clear health-related targets, but these sit alongside environmental and other sectoral areas that strongly influence determinants of health.

While the SDGs build on the achievements of the Millennium Development Goals (2000–2015), they also represent a departure from their principles. Critically, the new goals aim not to consider development issues in isolation, but their 169 targets are geared towards establishing relevant and effective links that can bring about the transformational change required, without leaving anyone behind. The SDG philosophy recognizes issues related to inequality and discrimination, the need for a cyclical, green economy, and the importance of building resilience to mitigate natural and man-made disasters.

Environment-health interventions are based exactly on these principles and, as evidenced in this report, can make a significant contribution towards achieving the SDGs and improving life and health for all.

Dr Flavia Bustreo
Assistant Director-General
Family, Women's and Children's Health
World Health Organization

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EXECUTIVE SUMMARY

In 2012, this present study estimates, 12.6 million deaths globally, representing 23% (95% CI: 13–34%) of all deaths, were attributable to the environment. When accounting for both death and disability, the fraction of the global burden of disease due to the environment is 22% (95% CI: 13–32%). In children under five years, up to 26% (95% CI: 16–38%) of all deaths could be prevented, if environmental risks were removed. Of the 12.6 million deaths attributable to the environment, 8.1 million (15%) were estimated using comparative risk assessment (CRA) methods, and the remaining 4.5 million using a combination of methods including expert opinion.

This study provides an approximate estimate of how much disease can be prevented by reducing the environmental risks to health. It includes a meta-synthesis of key evidence relating diseases and injuries to the environment. It brings together quantitative estimates of the disease burden attributable to the environment using a combination of approaches that includes CRA, epidemiological data, transmission pathways and expert opinion. The synthesis of evidence linking 133 diseases and injuries, or their groupings, to the environment has been reviewed to provide an overall picture of the disease burden that could be prevented through healthier environments.

Environmental risks to health are defined, in this study, as "all the physical, chemical and biological factors external to a person, and all related behaviours, but excluding those natural environments that cannot reasonably be modified." To increase the policy relevance of this study, its focus is on that part of the environment which can reasonably be modified (see Table ES1).

Table ES1. Summary of included and excluded environmental factors in this study

INCLUDED	EXCLUDED
Included factors are the modifiable parts of: • Pollution of air (including from second-hand tobacco smoke), water or soil with chemical or biological agents • Ultraviolet (in particular, protection from) and ionizing radiation • Noise, electromagnetic fields • Occupational risks, including physical, chemical, biological and psychosocial risks, and working conditions • Built environments, including housing, workplaces, land-use patterns, roads • Agricultural methods • Man-made climate and ecosystem change • Behaviour related to environmental factors, e.g. the availability of safe water for washing hands, physical activity fostered through improved urban design	Excluded factors are: • Alcohol and tobacco consumption • Diet (unless linked to environmental degradation) • The natural environments of vectors that cannot reasonably be modified (e.g. wetlands, lakes) • Insecticide impregnated mosquito nets (for this study they are considered to be non-environmental interventions) • Unemployment (provided it is not related to environmental degradation, occupational disease, etc.) • Natural biological agents, such as pollen • Person-to-person transmission that cannot reasonably be prevented through environmental interventions, such as improving housing, introducing sanitary hygiene or making improvements in the occupational environment

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Some social determinants of health are closely linked to and mediate exposure to environmental risk factors, but social determinants have not been included separately.

The population attributable fraction as used in this study is the proportional reduction in death or disease that would occur if exposure to a risk were removed or reduced to an alternative (or counterfactual) exposure distribution – the minimum exposure distribution currently achieved in certain population groups, or that which could be achieved by changes in the environment.

The following methods were used for estimating and summarizing the burden of disease attributable to the environment, informed by prior systematic reviews of the literature, in order of priority:

(1) Comparative risk assessment methods using detailed exposure and exposure-risk information for all populations; these methods are generally based on the highest levels of evidence and most comprehensive data.

(2) Calculations based on more limited epidemiological data, which require more assumptions for certain population groups or geographical regions.

(3) Certain diseases were entirely attributed to the environment according to the information about their transmission pathways.

(4) Expert surveys on population attributable fractions, based on a synthesis of the evidence of the environment-disease link or partial CRA results.

The systematic reviews and data retrievals were performed up to December 2014.

Out of 133 diseases or injuries, or their groupings, considered, 101 had significant links with the environment, 92 of which have been quantified, at least partially. Half of the environment-attributable disease burden was estimated using CRA methods. The main links between diseases and injuries and the environment, and potential areas for intervention, are summarized in Table ES2.

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Table ES2. Diseases and injuries and key environmental interventions

Disease or injury	Main intervention areas
Infectious and parasitic diseases	
Respiratory infections	Household and ambient air pollution, second-hand tobacco smoke, housing improvements.
Diarrhoeal diseases	Water, sanitation and hygiene, agricultural practices, climate change.
Intestinal nematode infections	Water, sanitation and hygiene, management of wastewater for irrigation.
Malaria	Environmental modification and environmental manipulation to reduce vector breeding sites and reduce contact between humans and disease vector, contextually mosquito-proof drinking-water storage, livestock distribution.
Trachoma	Access to domestic water supplies, latrines, fly control, personal hygiene.
Schistosomiasis	Excreta management, safe water supply, safe agricultural practices, worker protection.
Chagas disease	Management of peri-domestic areas.
Lymphatic filariasis	Modification of drainage and wastewater ponds, freshwater collection and irrigation schemes.
Onchocerciasis	Water resource management projects (particularly dams).
Leishmaniasis	Housing, cleanliness of the peri-domestic environment, worker protection.
Dengue	Management of water bodies around the house, removing standing water.
Japanese encephalitis	Management of irrigation areas and distribution of farm animals, personal protection.
HIV/AIDS and sexually transmitted diseases	Occupational transmission in sex workers and migrant workers.
Hepatitis B and C	Occupational transmission in sex workers and migrant workers for hepatitis B; accidental needlestick injuries in health-care workers for hepatitis B and C.
Tuberculosis	Exposure of miners and other occupational groups to airborne particles such as silica or coal dust; possibly exposure to household fuel combustion smoke and second-hand tobacco smoke; exposure in settings such as prisons, hospitals and overcrowded housing conditions.
Neonatal and nutritional conditions	
Neonatal conditions	Household air pollution, mothers' exposure to second-hand tobacco smoke, poor water and sanitation in birth settings.
Protein-energy malnutrition	Water, sanitation and hygiene, climate change acting on food insecurity.
Noncommunicable diseases	
Cancers	Household and ambient air pollution, second-hand tobacco smoke, ionizing radiation, UV radiation, chemicals, worker protection.
Mental, behavioural and neurological disorders	Occupational stress; disasters such as floods, earthquakes and fires (linked to housing, flood management, climate change); forced resettlements in the context of development projects; occupations in the entertainment or alcohol industry; head trauma (for epilepsy); chemicals (for certain neurological diseases); noise (for insomnia); bright lights, poor air quality and odours (for headaches). Physical activity fostered by supportive environments can reduce certain disorders.
Cataracts	UV radiation, household air pollution.
Hearing loss	Occupational exposure to high noise levels.
Cardiovascular diseases	Household and ambient air pollution, second-hand tobacco smoke, exposure to lead, stressful working conditions, shift work.
Chronic obstructive pulmonary disease	Household air pollution, ambient air pollution, exposure to dusts in the workplace.
Asthma	Air pollution, second-hand tobacco smoke, indoor exposure to mould and dampness, occupational exposure to allergens.
Musculoskeletal diseases	Occupational stressors, prolonged sitting at work and poor work postures; need to carry large quantities of water over significant distances for domestic use.
Congenital anomalies	Mothers' exposure to second-hand tobacco smoke, chemicals.
Risk factors for noncommunicable diseases in other areas but related to the environment	
Physical inactivity	Workplace activity, prolonged sitting at the workplace, travel modes, transport infrastructure and land-use patterns, availability of suitable parks and open spaces.
Obesity	Environmental factors favouring physical activity.

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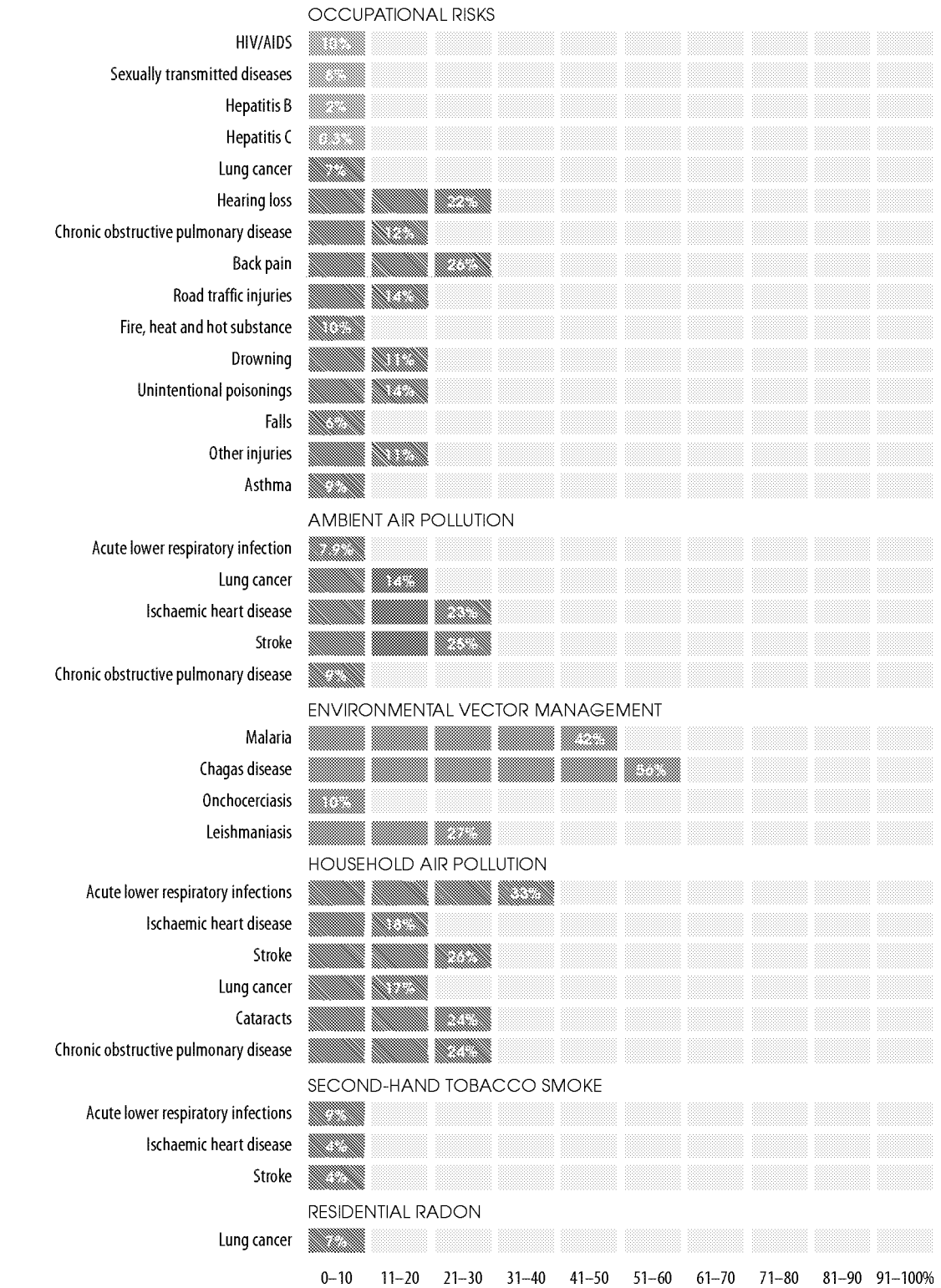
Disease or injury	Main intervention areas
Unintentional injuries	
Road traffic accidents	Design of roads, land-use planning; traffic intensification in development areas with big infrastructure projects.
Unintentional poisonings	Safe handling and storage of chemicals, adequate product information, adequate choice of chemicals, worker protection.
Falls	Safety of housing and work environment.
Fires, heat and hot substances	Safety of cooking, lighting and heating equipment, building fire codes, use of flammable materials in the home, safety of occupational environments and practices, climate change.
Drownings	Safety of water environments, public awareness, regulations, worker safety, climate change.
Other unintentional injuries	Protection from animal bites and contact with venomous plants, safety of mechanical equipment, ionizing radiation and currents.
Intentional injuries	
Self-harm	Access to toxic chemicals such as pesticides, access to firearms.
Interpersonal violence	Access to firearms, urban design (e.g. mobility, visibility), worker protection.

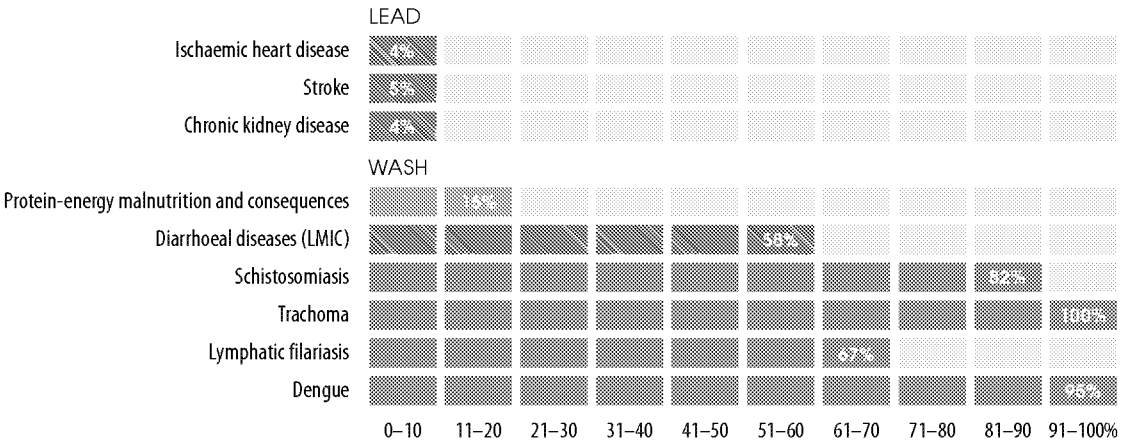
These prevention opportunities can also be mapped to sectors, and summarized by risk factor (see Tables ES3 and ES4).

Table ES3. Linking main sectors to primary prevention opportunities

Sectors	Selected risks/intervention areas
Agriculture	• Risk of infection by parasitic diseases: domestic and peri-domestic management of vectors. • Occupational exposure to chemicals: regulations, personal equipment. • Consumers' exposure to chemicals: regulations.
Industry/commercial	• Air pollution: industrial emission control; improved energy options; indoor tobacco smoke-free legislation. • Occupational exposure to chemicals, air pollutants, UV exposure, noise: workers' personal protection; education on protective behaviour; engineering approaches to reduce exposure, such as ventilation, dust suppression techniques, enclosure of pollution sources etc.; removal from sources of pollutants or other relevant exposures, regulations. • Exposure to industrial chemicals (workers, consumers): legislation, treaties. • Water pollution: industrial emission control. • Noise: noise control regulations.
Transport	• Air pollution; decreased physical activity: improved urban planning, improved and increased use of public transport; reduction of traffic congestion; replacement of older diesel vehicles, etc. • Risk of injury: traffic-calming measures and other traffic control solutions; separation of pedestrians from motorized traffic etc.
Housing/community	• Household air pollution: use of clean fuels; strategies to reduce exposure to smoke from solid fuels – implementation of WHO *Indoor Air Quality Guidelines* (WHO, 2014ee). • Contact with infected excreta: safe disposal of excreta. • Contact with malaria and other vectors: environmental manipulation and modification of human habitations. • Contact with Chagas vectors: wall plastering and improved household hygiene. • Contact with dengue vectors: management of water containers around the house. • Low physical activity, obesity: better urban planning, access to sports facilities, school and workplace based programmes. • Unsafe drinking-water: safe household water treatment. • Exposure to allergens: interventions to reduce house dust and moulds/dampness. • Exposure to radon: regulations, e.g. remediation measures. • Exposure to UV: community-based sun safety education. • Exposure to chemicals: safe management of chemicals in the home and community. • Risk of falls: improvement of home safety. • Risk of drownings: improve access and safety of water environments. • Risk of fire injuries: use of safe cooking and heating equipment and modern energy/fuels; building safety standards.
Water	• Inadequate water, sanitation and hygiene: provision of adequate drinking-water and sanitation facilities; implementation of sanitation and water safety plans; implementation of drinking-water guidelines.

Table ES4. Selected population attributable fractions (of DALYs) by risk factor and disease (non-additive)





Note: Other non-CRA = expert opinion + epidemiological estimates + pathway transmission attribution.

KEY RESULTS

Five key results can be identified from the study on the impact of environmental risk factors on death and disease globally.

1. Environmental risks account for a large fraction of the global burden of disease

A considerable number of deaths are attributable to modifiable environmental risks, with 23% (95% CI: 13–34%) of all deaths, and 22% (95% CI: 13–32%) of the disease burden in DALYs – a combined measure of years of life lost due to mortality and years of life lost due to disability (Figure ES1).

Figure ES1. Fraction of deaths and DALYs attributable to the environment globally, 2012

Attributable to the environment
Not attributable to the environment

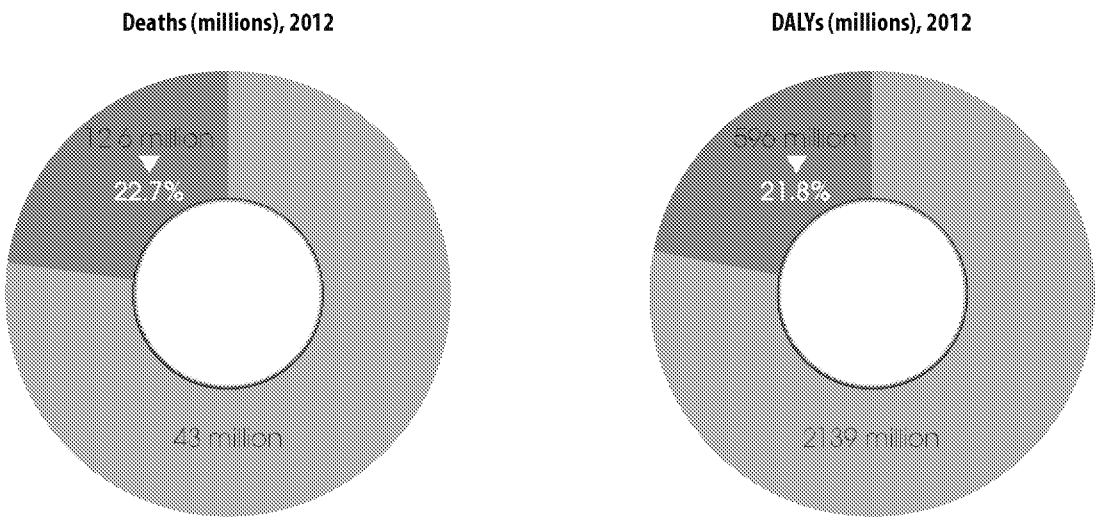


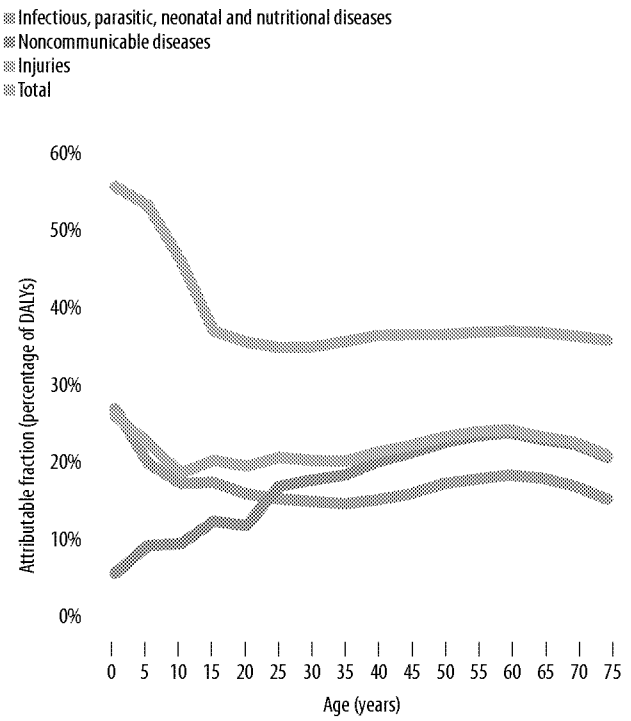
Figure ES2. Diseases with the highest preventable disease burden from environmental risks, in disability-adjusted life years (DALYs) – a combined measure of years of life lost due to mortality and years of life lived with disability, 2012

■ DALYs due to preventable environmental risks
▒ Proportion of disease attributable to the environment
▒ Main areas of environmental action to prevent disease

2. Environmental impacts on health are uneven across life course and gender

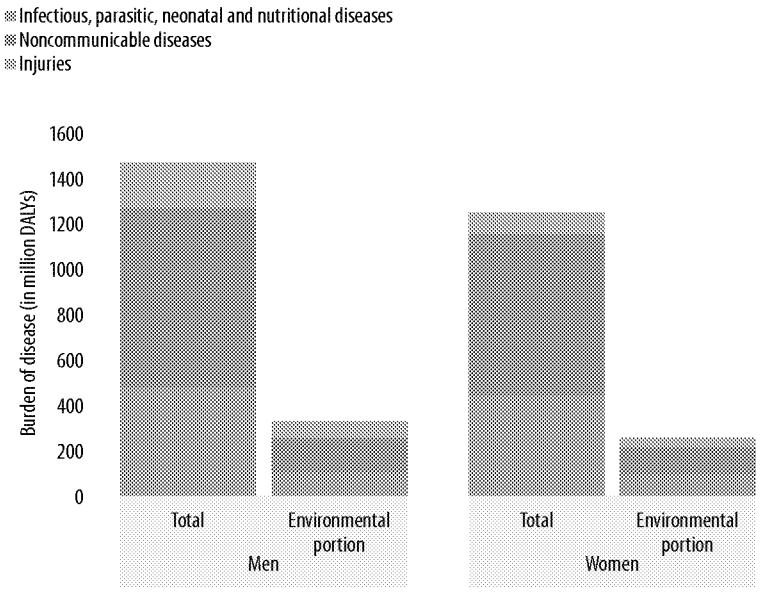
The health of children under five, and to a lesser extent up to 10, and that of adults between 50 and 75 years is most affected by the environment. In children, the environment's contribution to infectious and parasitic diseases, neonatal and nutritional diseases and injuries is very prominent. In older adults, the fraction of noncommunicable diseases (NCDs) caused by the environment becomes more important, and that for injuries remains constant but significant (Figure ES3).

Figure ES3. Environmental fraction of global burden of disease (in DALYs) by age and disease group, 2012



Men are slightly more affected by the environment than women, with 22.8% versus 20.6% of all DALYs being attributable to the environment, respectively (see Figure ES4). Women bear higher exposures to traditional environmental risks to health, such as exposure to smoke while cooking with solid fuels or carrying water from community sources. However, men are more exposed to occupational risks to health. Men may also be exposed to increased risks of injuries due to their patterns of occupational and recreational activities.

Figure ES4. Total burden of disease and environmental portion, by sex, 2012



3. Low- and middle-income countries bear the greatest share of environmental disease

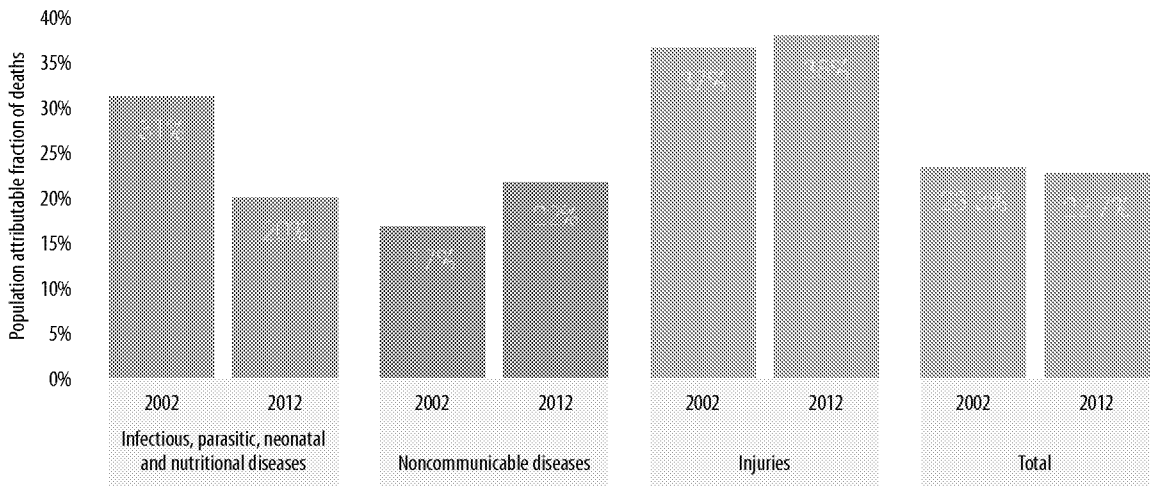
The highest fraction of deaths and disease that could be tackled through environmental improvements is in low- and middle-income countries (Figure ES5).

Figure ES5. Fraction of disease burden attributable to the environment by country, 2012

4. Total environmental deaths are unchanged since 2002, but show a strong shift to noncommunicable diseases

The last decade has seen a shift away from infectious, parasitic and nutritional diseases to NCDs, not only in terms of the environmental fraction but also the total burden. This shift is mainly due to a global decline of infectious disease rates, and a reduction in the environmental risks causing infectious diseases, i.e. a higher share of people having access to safe water and sanitation, and a lower share of households using solid fuels for cooking. In terms of the total disease burden, NCDs have increased globally. While the highest number of deaths per capita attributable to the environment occurs in sub-Saharan Africa, primarily from infectious diseases, other regions now have higher rates of NCDs attributable to the environment (see figures ES6 to ES11).

Figure ES6. Trend in the fraction of deaths attributable to the environment by disease group, 2002–2012



The main differences between this study (2012 data) and the previous edition (2002 data) are outlined in Box ES1.

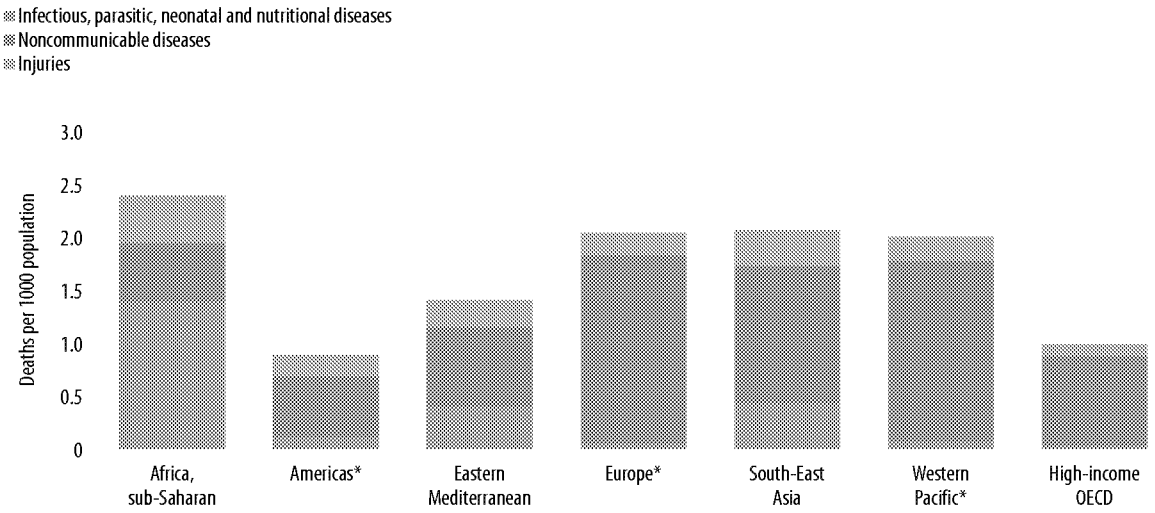
Box ES1. Main changes in methods between the 2002 and 2012 studies

- More robust methods were used for 2012 for a number of diseases, based on an improved evidence base (e.g. respiratory infections, cardiovascular diseases, lung cancer).
- For 2012, the effect of water and sanitation was only estimated for low- and middle-income countries, whereas in the 2002 all countries were covered.
- Only the effects of main risk factors were taken into account for 2012 in cases where CRA estimates were available for the main risks but not for the minor ones.
- Fewer infectious diseases were included in the 2012 estimation of the consequences of malnutrition (we did not re-evaluate the diseases linked to malnutrition, only the link between environment and malnutrition).
- Significant new evidence became available on certain exposure-disease links from expert evaluation of disease attribution, which led to significant revisions in 2012 (e.g. injuries from fire and hot substances).

The modifications that these changes introduced are important for some diseases, but they are relatively limited in terms of the total disease burden.

- DALYs are not directly comparable as no age-weighting and discounting were used in the 2012 estimates.
- Additional data on total mortality and disease burden have become available since 2002, which have allowed retroactive correction of the 2002 estimates.

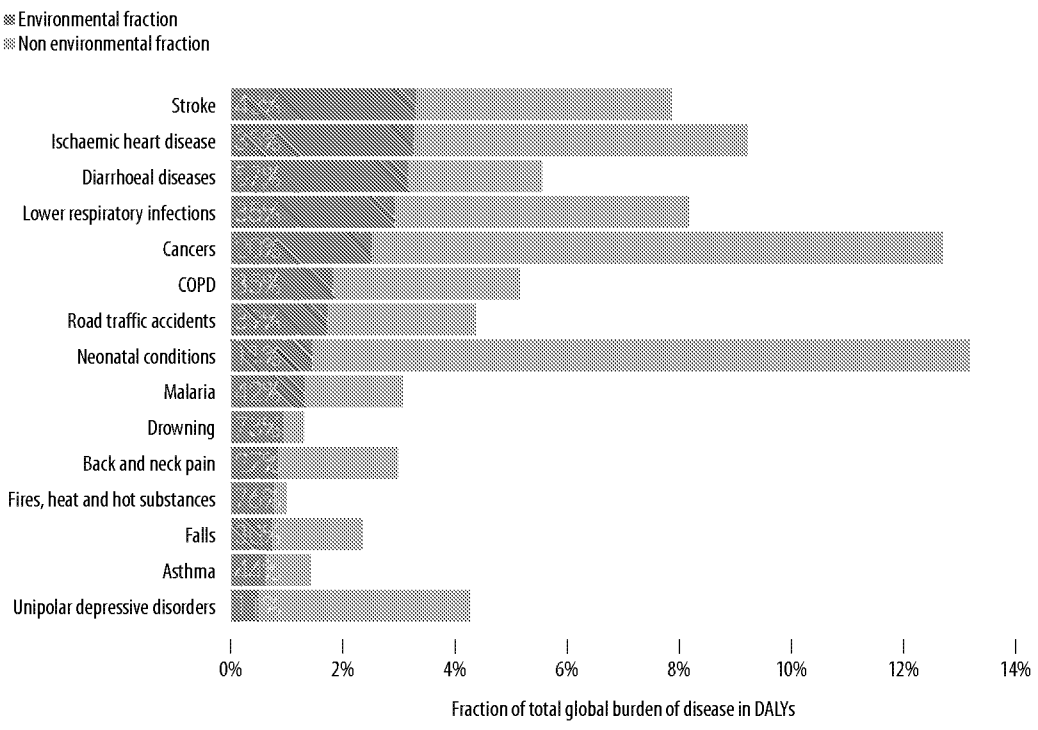
Figure ES7. Deaths per capita attributable to the environment, by region and disease group, 2012



Notes: * Non-OECD countries. See Annex 1 for country groupings.

The diseases with the largest environmental fraction (in DALYs, which combine years of life lost and years lived with disability for comparability of disease burden across diseases) include cardiovascular diseases, diarrhoeal diseases and lower respiratory infections. Ambient and household air pollution, and water, sanitation and hygiene are the main environmental drivers of those diseases.

Figure ES8. Diseases with the strongest environmental contributions globally, 2012



Note: Percentages within bars relate to the environmental share of the respective disease.

Figure ES9. Age-standardized infectious, parasitic, neonatal and nutritional disease deaths attributable to the environment, 2012

Figure ES10. Age-standardized noncommunicable disease deaths attributable to the environment, 2012

Figure ES11. Age-standardized injury deaths attributable to the environment, 2012

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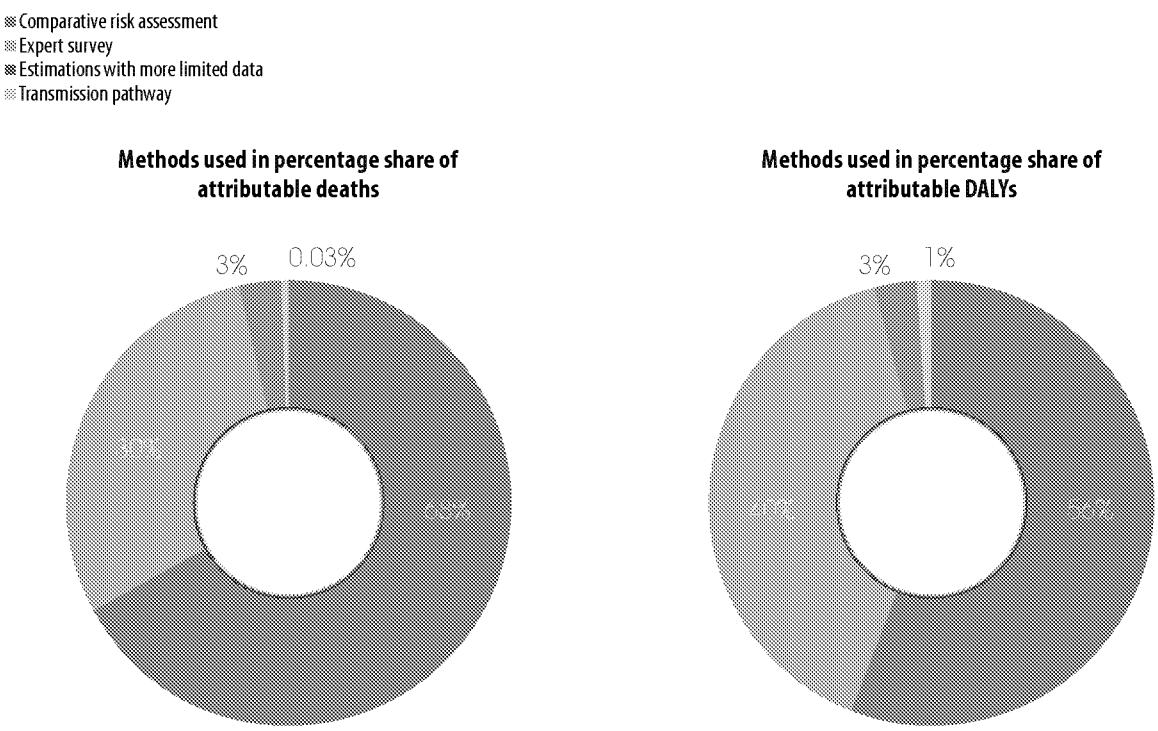
5. The evidence on quantitative links between health and environment has increased

A greater share of the estimates of the burden of disease attributable to the environment can now be determined using more robust methods than previously. Comparative risk assessment me thods, which are based on the best exposure and/or exposure-response data, now cover 68% of deaths attributable to the environment, and 56% of DALYs (Figure ES12). In other words, about 8.6 million out of the total 12.6 million environment-attributable deaths are estimated on the basis of CRA methods, and the remaining 4.1 million on epidemiological estimates using more limited data, transmission pathways, and expert opinion. It should be noted that many of the potential health implications of climate change, acting through food supply and migration, could unfortunately not be accounted for by the methods used in the report.

Figure ES12. Methods used for the estimation of burden of disease attributable to the environment



The way forward

In the decade since the last review the environment-attributable disease burden has remained virtually unchanged but a significant shift in the main disease categories involved is evident. It is clear that reducing the environmental burden of death and disease is entirely possible through cost-effective interventions. However, to be most effective and sustainable these measures need to be designed and implemented holistically.

The results of the study reinforce the public health principle that creating and maintaining healthy environments should be a priority of primary prevention. A change in perception to view the environment as an essential element of health protection, while adequately preserving it, would greatly benefit people's health. Coordinating and acting across sectors will be necessary, as many different sectors play a crucial role (e.g. energy, industry/manufacturing, water and sanitation, agriculture, housing, transport) in determining environmental risks and conditions.

In addition to this cross-sector dimension, there is a vertical dimension: action is needed at all levels of governance. Local action can be a key determinant in shaping the local use of resources and management of health determinants. Cities are a special example requiring thoughtful planning and management. By 2050, 66% of the world's population will live in urban areas, which are often characterized by heavy traffic, pollution, poor housing, limited access to water and sanitation services and other health risks. The workplace is another setting that influences health and provides opportunities for disease prevention. More than one half of the world's population is economically active and in a number of countries at least two thirds of workers are employed in the informal sector with dangerous, dirty and demeaning working conditions.

Finally, the direct and indirect impacts of emerging risks, such as climate change and ecosystem change, need to be tackled urgently, as they are set to become the most challenging risks populations will face in the coming decades.

The Sustainable Development Goals, with their underpinning holistic philosophy, offer opportunities to make a lasting contribution to reducing the global disease burden attributable to environmental factors, and help "ensure healthy lives and promote well-being for all at all ages".

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1

INTRODUCTION

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Estimating the burden of disease that can be reduced by taking measures to decrease environmental risks to health is a key step in identifying and evaluating the most important priorities for targeted environmental action. At the same time, such estimates support the idea that sound environmental management can play a crucial role in protecting people's health.

Ten years ago, the global burden of disease attributable to environmental factors was estimated at 24% (in DALYs, 2002) (Prüss-Ustün & Corvalan, 2006) – a figure which agreed with earlier global studies, for example 23% (WHO, 1997) and ranging between 25% and 33% (Smith et al, 1999).

This study is based on the best available evidence for the selected diseases and injuries and their links with the environment. Where feasible, the study uses comprehensive and the most accurate estimates available from comparative risk assessment (CRA) methods, which were developed by WHO and have been used by WHO, the Institute of Health Metrics and Evaluation and other research groups (Lim et al, 2012; WHO, 2004a). These methods apply detailed exposure and relative risk estimates assessing the burden of disease by region, country and age group. Many major environmental and occupational risks have been covered by such methods, provided that (a) there was clear causal evidence that could be applied globally; (b) global estimates of exposure could be obtained or estimated; and (c) they had considerable impact on people's health. However, these assessments remain limited in terms of the range of environmental risks assessed.

Compared with the 2006 study, the present analysis incorporates available estimates of the burden of disease from a much broader range of environmental risk factors and categories of diseases and health conditions affected. The analysis makes use of the results from CRAs, complemented by extensive literature reviews, approximate epidemiological estimates and standardized surveys of expert opinion, in an approach that applies full scientific rigour and transparency. Focusing on modifiable environmental risks, the current study examines "how much" such factors affect various diseases and injuries – both in terms of premature mortality and of overall disease burden as measured by disability-adjusted life years (DALYs), a weighted measure of death and disability.

The definition of "modifiable" environmental risk factors includes those reasonably amenable to management or change given current knowledge and technology, resources and social acceptability. Factors not readily modifiable were not considered. The analysis looked at most environmental risks and related burden of diseases that were quantifiable from available evidence. However, in some cases this is not known, for example certain diseases associated with changed, damaged or depleted ecosystems, and diseases associated with exposures to endocrine disrupting substances. The resulting analysis thus remains a conservative assessment of the estimate of the disease burden attributable to environmental factors.

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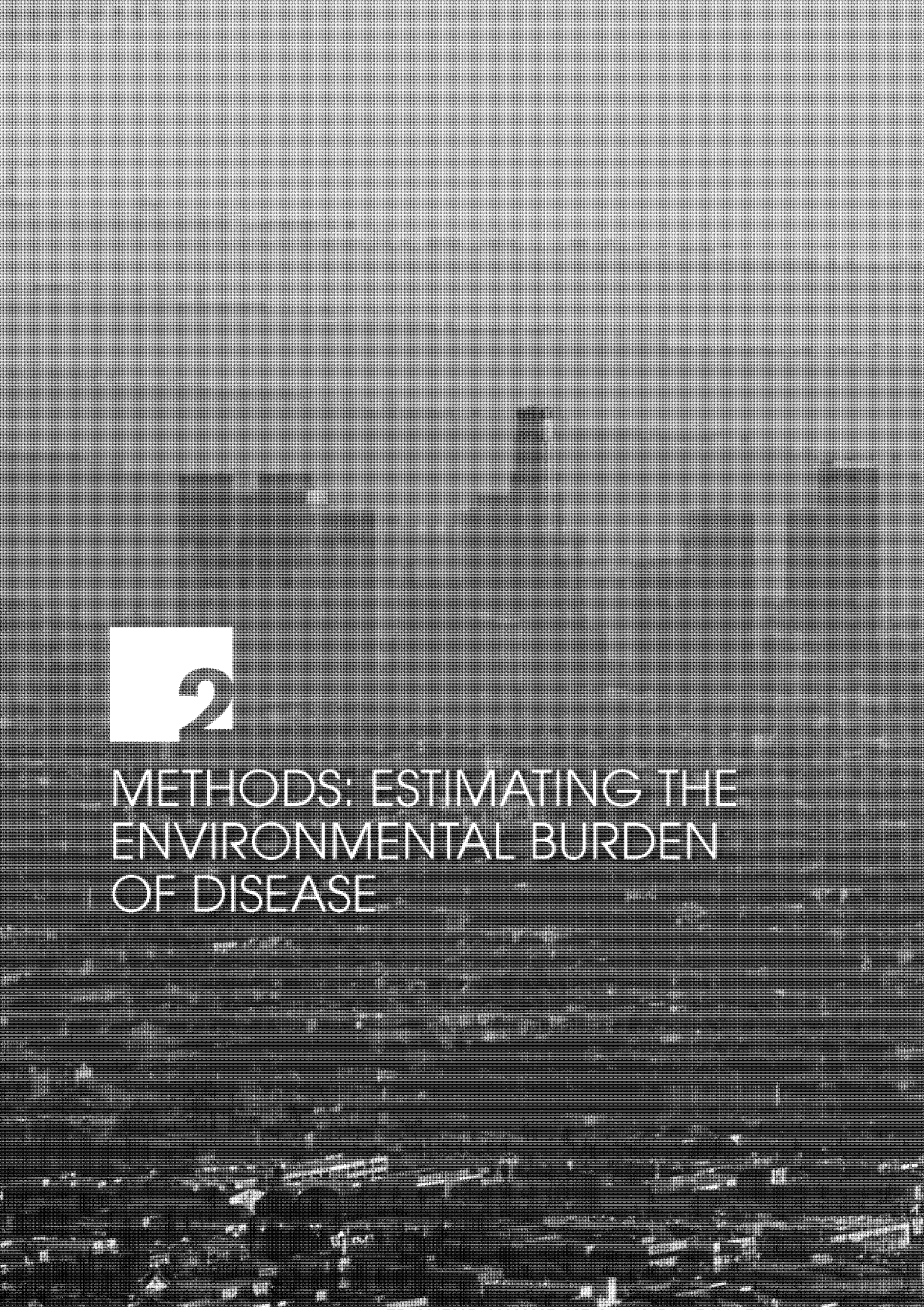

2

METHODS: ESTIMATING THE ENVIRONMENTAL BURDEN OF DISEASE

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The environment: A contextual determinant of health

Environmental health addresses the physical, chemical and biological factors external to a person, and all the related behaviours (WHO, 2015c). To be even more policy relevant, the focus is placed on the environments that can be modified in the short or longer term (Box 1).

Box 1. The definition of "environment" used in this study

The environment is the congregation of all the physical, chemical and biological factors external to a person, and all related behaviours, but excluding those natural environments that cannot reasonably be modified.

This definition excludes behaviour not related to the environment, as well as behaviour related to the social and cultural environment, genetics and parts of the natural environment.

This definition considers an environment which can be modified or manipulated with a view to removing a prevailing risk, without impairing other ecosystem functions. An illustration of inclusions and exclusions under this definition is provided in Box 2. This definition is compatible with the CRA approach, which uses a baseline scenario against which the current situation is assessed.

Occupational health risks are mostly directly related to physical, chemical and biological factors in the environment and related behaviour and are included in the definition of environment. For instance, infections acquired by health-care workers from needlestick injuries, as well as sexually transmitted diseases acquired in other occupational contexts, e.g. among sex workers, refer to contact with infectious agents in the work environment, and related behaviour. Occupational health

Box 2. Inclusions and exclusions to the definition of "environment" used in this study

Included environmental factors are the modifiable parts (or impacts) of:

- Pollution of air, water or soil by chemical or biological agents
- Ultraviolet (UV)* and ionizing radiation
- Noise, electromagnetic fields
- Occupational risks
- Built environments, including housing; land-use patterns, roads
- Major infrastructural and engineering works such as roads, dams, railways, airports
- Man-made vector breeding places or breeding places catering to the specific ecological requirements of vectors, such as old tyres or water containers
- Agricultural methods, irrigation schemes
- Man-made climate change, ecosystem change
- Behaviour related to environmental factors, e.g. the availability of safe water for washing hands or physical activity fostered through improved urban design

Excluded factors are:

- Alcohol and tobacco consumption, drug abuse
- Diet (although it could be argued that food availability influences diet)
- The natural environments of vectors that cannot reasonably be modified (e.g. rivers, lakes, wetlands)
- Insecticide impregnated mosquito nets (for this study they are considered to be non-environmental interventions)
- Unemployment (provided that it is not related to environmental degradation, occupational disease, etc.)
- Natural biological agents, such as pollen
- Person-to-person transmission that cannot reasonably be prevented through environmental interventions, such as improving housing, introducing sanitary hygiene or making improvements in the occupational environment

* Although natural UV radiation from space is not modifiable (or only in a limited way, such as by reducing substances that destroy the ozone layer), individual behaviour to protect oneself against UV radiation is modifiable. UV are therefore included in our assessment of the environmental disease burden.

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risks may also include the more general economic and social determinants of occupational conditions, such as job insecurity. Occupational health services can be instrumental in the prevention of selected diseases and conditions. Occupational health risks will, in this document, be considered as included in what we call the "environment".

The working definition thus aims to include those parts of the environment that can be modified by environmental management and environmental hazards against which people can be protected. For onchocerciasis (river blindness), for example, the definition of environment would include only that part of the environment that was affected by man-made interventions (in this case, dams), and which could be modified by further interventions (for example by designs with two spillways which can be used alternately).

Estimates of the environmental health impacts would not include diseases caused by vectors living in natural environments such as rivers, if those vectors could not be controlled by reasonable environmental interventions. Similarly, deaths and injuries of soldiers during war are not included here, even though they could be considered occupational, because no intervention could possibly provide a safe working environment.

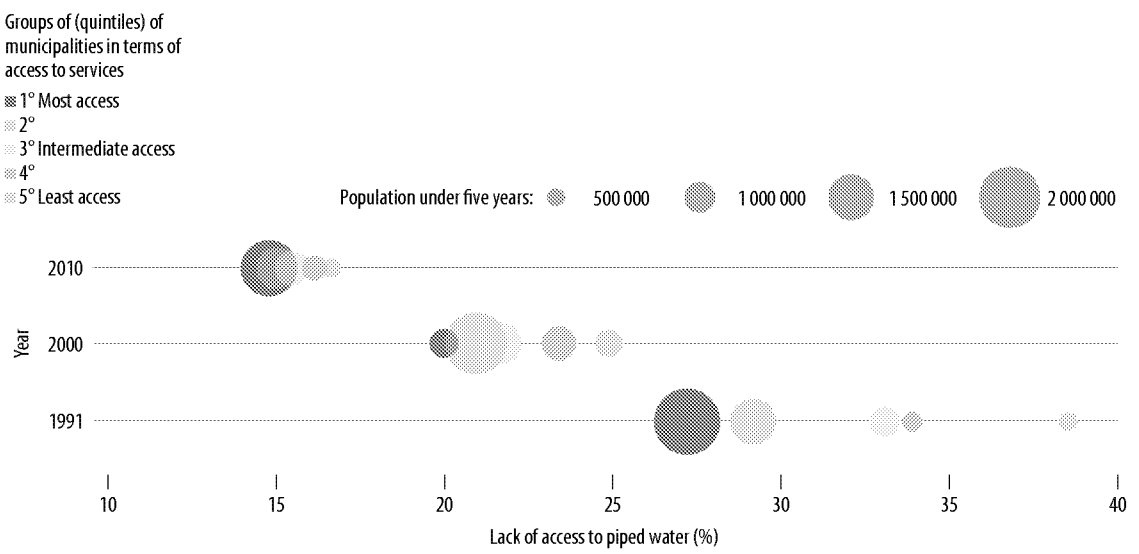
The link with social determinants of health

Environmental and social determinants of health are closely interlinked. Social determinants are functions of the circumstances in which people live, work and grow; largely shaped by the distribution of resources and power. These determinants are closely linked to and mediate exposure to environmental risk factors such as working conditions, housing, water and sanitation or healthy lifestyles (Commission of Social Determinants of Health, 2008). There follow four examples on how social determinants of health modify exposure to environmental risks and, by consequence, related health outcomes.

Figure 1 shows progress in the reduction of under-five mortality rates for 645 municipalities of São Paulo, by quintiles of the indicator "lack of piped water".

Figure 1. Under-five mortality rate and access to water by income, São Paulo, Brazil

Under-five mortality rate by quintiles of the indicator "lack of piped water" for the 645 municipalities (1991, 2000 and 2010).



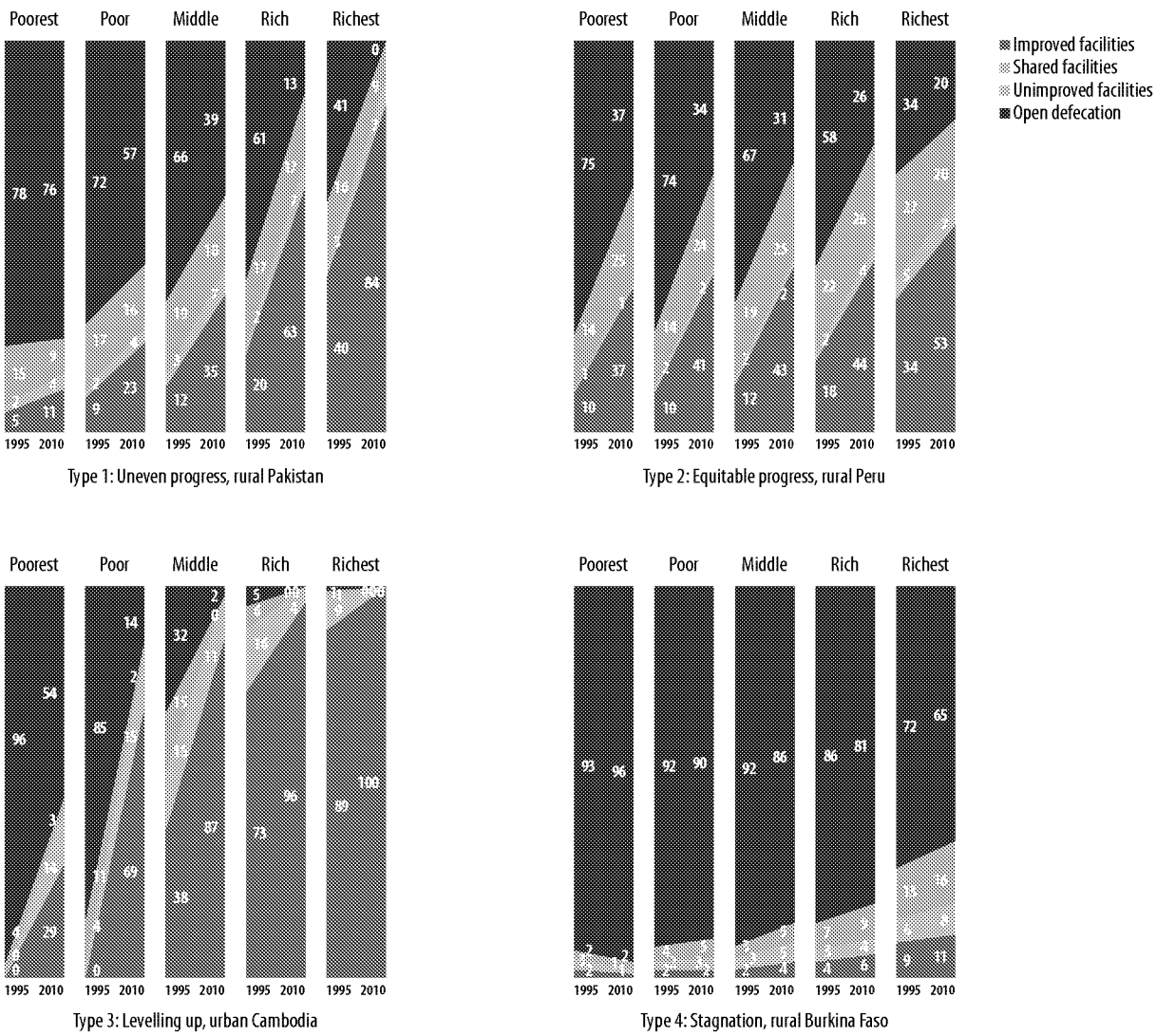
Source: Adapted from Corvalán et al, 2015.

In 1991 a large mortality difference by quintile was observed; since then there has been a reduction in mortality (move to the left) and a narrowing of the inter-quintile gaps (increasing equality). This shows the close interconnections between the socioeconomic and environmental determinants of health outcomes, in this case, of the under-five mortality rate.

Damp housing is another example of exposure difference by socioeconomic status. Damp housing may contain increased levels of bacteria, moulds and mycotoxins, which have been associated with respiratory symptoms in several epidemiological studies. Survey data from Norway have shown that reported exposure to dampness is highest in single parent households. Also, housing below relative poverty levels is reportedly about 50% more frequently damp compared with households above the poverty level (National Survey of Living Conditions Statistics Norway 2007, see WHO Regional Office for Europe, 2012).

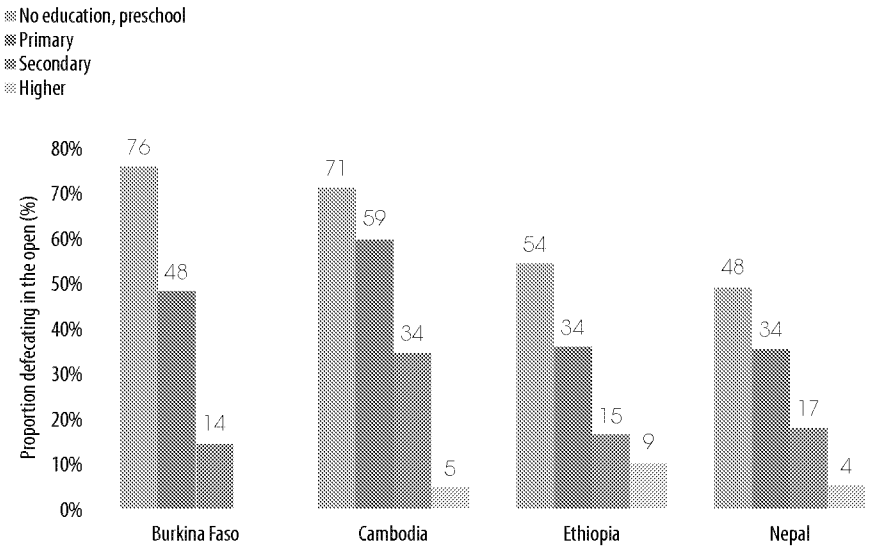
Sanitation coverage, which relates to the risk of diarrhoeal diseases, is linked to socioeconomic conditions. The pattern of progress in sanitation coverage may advance disproportionately benefiting the highest wealth quintiles, be equitable across wealth quintiles, level up in the lowest wealth quintiles, or stagnate across wealth quintiles (Figure 2).

Figure 2. Progress in sanitation coverage by typology (percentage, 1995–2010)



Source: WHO & UNICEF, 2014.

Figure 3. Open defecation practices according to level of education, 2012



Source: WHO & UNICEF, 2014.

Open defecation, similarly, shows disparities according to the level of education (Figure 3).

What is meant by the population attributable fraction of a risk factor?

The population attributable fraction is the proportional reduction in death or disease that would occur if exposure to a risk were removed or reduced to an alternative (or counterfactual) exposure distribution. In this study, the environmental risks were considered to be reduced to minimum exposure distributions that are currently achieved in certain population groups or that could be achieved by changes in the environment.

A first issue is the establishment of a realistic minimum exposure level. The simplest case of an alternative distribution of exposure to the risk factor is that where the exposure can be reduced to zero, but this is not always achievable in practice. For example, ambient air pollution from particulate matter cannot be reduced to zero, because along with the particulates emitted by fossil fuel combustion, airborne particulate matter also occurs from dust (albeit at low levels). For this reason, this analysis considers how much disease burden would decrease if exposure to a risk factor were reduced, not to zero, but to some achievable level (the counterfactual or baseline level).

A second issue is to define "reasonably modifiable" environmental factors. Transport policy trade-offs illustrate the difficulties implicit in such determinations. Banning cars entirely from cities as an air pollution reduction measure, for example, is unlikely to be practical or feasible, at least at present. However, the adoption of clean motor vehicle technologies and alternative modes of transport (rail, bus, cycling and walking) are widely considered by policy-makers, and increasingly becoming more accepted. Such strategies would thus be considered as part of the modifiable environment, in the context of measures that could reduce urban air pollution and related diseases.

The disease burden is often the result of diverse environmental, social and behavioural risk factors. The sum of the population attributable fractions of these separate risk factors, as estimated in many CRAs, may add up to more than 100% – meaning that the disease burden could

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be potentially reduced or eliminated by tackling different risk factors.

Estimating the population attributable fraction

This report acknowledges that the root causes of ill health are multifactorial and that social determinants can modify the impact of environmental risks in complex ways and to different degrees. A holistic approach, which addresses all types of risk factors, is highly valuable in our understanding of the modifying role social determinants play in the health status of populations, as well as in the design and implementation of overarching interventions. Such a holistic approach is, however, not useful for the quantification of the specific contributions of diverse environmental risk factors, which is the aim of this study.

To estimate comprehensive health impacts of environmental risks worldwide, available CRAs for specific environmental factors were combined for each disease, and were complemented with approximate epidemiological estimates and surveys of expert opinion. For each of the 133 diseases and injuries listed in the WHO Global Health Observatory for 2012 (WHO, 2015d), representing the entire disease burden, the literature was systematically searched to identify the best available evidence of population health impacts from environmental risks. The search strategy included each of the diseases or injuries, combined with the term "environment", relevant environmental risks or any of the occupational groups at risk, up to the end of 2014. Older literature was included from the earlier search made for the 2006 edition of this publication. In addition, major projects of risk assessments were reviewed for relevant data. Diseases, injuries and their groupings were classified according to the International Classification of Diseases (WHO, 2015g).

The results of the literature review were used to compile quantitative estimates and summaries of links between diseases and injuries and the environment, using the following order of priority for each disease:

1. Global estimates (such as CRAs) of population impacts for selected environmental risks;
2. National or regional estimates of population impacts;
3. Results of systematic reviews and meta-analyses on disease reduction from interventions or on environmental determinants; and
4. Individual studies on interventions and environmental determinants.

Four different approaches were used to arrive at estimates of the fractions of disease attributable to environmental risks, according to available estimates, the type and amount of evidence available on exposure and exposure-risk relationships, and knowledge of disease transmission pathways. The various approaches are briefly outlined below, and presented in more detail in the respective disease sections and technical annexes.

In order of priority, the following approaches were applied to each disease:

- Comparative risk assessment: estimates resulting from this approach were used if available. CRA methods generally provide estimates based on the strongest evidence and most comprehensive data.
- Calculation based on limited exposure and/or epidemiological data.
- Certain diseases were entirely attributed to the environment according to knowledge of their transmission pathways.
- Expert survey: expert surveys were used when CRAs were not available, and exposure information and/or exposure-risk relations from limited epidemiological data were insufficient.

Comparative risk assessment

Whenever available, CRA methods were used. These methods use: (a) detailed population exposure data; (b) an alternative (counterfactual) exposure distribution to

which environmental risks could be reduced; and (c) matching exposure-risk relationships for the global population. For each disease, these data are combined into population attributable fractions (see Table A2.1). Furthermore, a set of basic criteria was used for selection of exposure-disease pairings, for the definition of alternative (counterfactual) exposure distribution, as well as the selection of exposure and exposure-risk data used. Detailed methods are described elsewhere (Ezzati et al, 2002; Lim et al, 2012; Prüss-Ustün & Mathers, 2003; WHO, 2009a).

Calculations based on limited epidemiological data

In cases where (a) limited exposure information was available; (b) data on prevalence of disease in high-risk population were available; or (c) outcomes could in part be attributed to certain environmental conditions; then population attributable fractions could also be estimated, but were generally based more on assumption and extrapolation and, presumably, weaker evidence. Additional details on certain disease outcomes are provided in Annex 3.

Disease transmission pathway

In certain cases, the transmission of a disease is dependent on a pathway involving specific environmental conditions, which are modifiable. An example is intestinal nematode infections, which require the presence of inadequately disposed human excreta in the environment, and are therefore entirely attributed to the environment.

Expert survey

Where neither CRA at the global level, nor sufficient data to perform approximate calculations of population attributable fractions based on more limited evidence were available, then a survey of experts was performed. Three or more experts were consulted to provide their estimates of the population attributable fraction for one or more disease or injury.

These experts were selected on the basis of their publication record, preferably international in scope, in the area of the disease or the relevant environmental risk factor. A geographical balance was sought in their selection, in particular for diseases involving environmental risks with strong regional variation. The experts were provided with abstracts of search results from the systematic reviews, as well as an initial estimate that was based on pooled estimates from the literature. CRA results also often provided partial results for a disease and a corresponding attributable risk.

Experts were asked to provide a best estimate of the fraction of disease in the global population attributable to the reasonably modifiable environment, as well as the 95% confidence interval (CI). Experts were free to provide different estimates by age, sex and region. Each expert reply was assumed to have a triangular probability distribution. The probability distributions of all expert replies for each disease were summed to determine a pooled probability distribution:

$$P_{PAF} = \frac{\sum_{E=1}^{n} p_{PAF}}{n}$$

where *PAF* = population attributable fraction, *P* = resulting probability at attributable fraction *PAF*, *p* = probability of individual expert at attributable fraction *AF*, and *E* = expert.

The resulting mean population attributable fraction was defined as the overall best estimate. A new 95% CI was defined as ranging from the 2.5 to the 97.5 percentiles of the pooled probability distribution of all the experts. This method can lead to relatively large CIs. Therefore, if an expert estimate did not overlap with any of the other expert estimates, this outlying best estimate was used to define the boundary of the pooled estimate, rather than the CI from the expert. Pooled estimates were calculated by generating 2000 draws of each distribution, and 95% intervals were defined by the 2.5 and the 97.5 percentiles.

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Where the body of evidence resulting from the updated literature review did not substantially differ or was unlikely to justify a change in expert estimation of population attributable fraction, the results of the expert survey of the 2006 edition were used. Certain diseases or environmental risk factors were not included in the analysis, either because there was insufficient evidence at the global level or because the risk factor resulted in a relatively small disease burden.

Combining risk factors for individual diseases

When several estimates of a disease burden from relevant risk factors were available for a single disease, they were combined using the following assumptions:

- Exposures to the same pollutant but from different sources were considered as additive (e.g. from ambient air pollution, household air pollution and second-hand tobacco smoke). The population was thereby distributed into an exposure "profile" by country, sex and age group, for each exposure level.

- Exposures to different pollutants or affecting very specific population subgroups (e.g. certain occupations) were combined using the product of complements for the attributable fractions:

$$PAF = 1 - \prod_{r=1}^{R}(1 - PAF_r)$$

where *PAF* = population attributable fraction and *r* = the individual risk factor (Lim et al, 2012).

This method was applied for major noncommunicable diseases (NCDs). Further details are provided in Annex 2.

For diseases with estimates of attributable burden via CRA for at least one major risk factor (e.g. air pollution or water and sanitation) no additional risk factor using any other assessment method was considered for estimating the overall population attributable fraction.

Estimating the burden of disease attributable to the environment

To calculate the fraction of disease attributable to a risk factor for any defined population, compiled or estimated population attributable fractions were multiplied by the corresponding WHO disease statistics (WHO, 2015d), by disease or injury, country, sex and age group, for deaths and DALYs. The following equations were used:

$$AM = PAF \times M$$

and

$$AB(DALYs) = PAF \times B(DALYs)$$

where *AM* = attributable mortality, *PAF* = population attributable fraction, *M* = mortality, *AB (DALYs)* = attributable burden in DALYs and *B (DALYs)* = burden of disease in DALYs, for each disease or injury, country, sex and age group, where relevant.

Estimating uncertainties

Every estimate of a population attributable fraction was characterized by a best estimate and a CI, whether based on CRA, limited epidemiological evidence or on expert surveys. The upper and lower estimates of the attributable disease burden were defined as the 2.5 and 97.5 percentiles of 2000 draws using those distributions.

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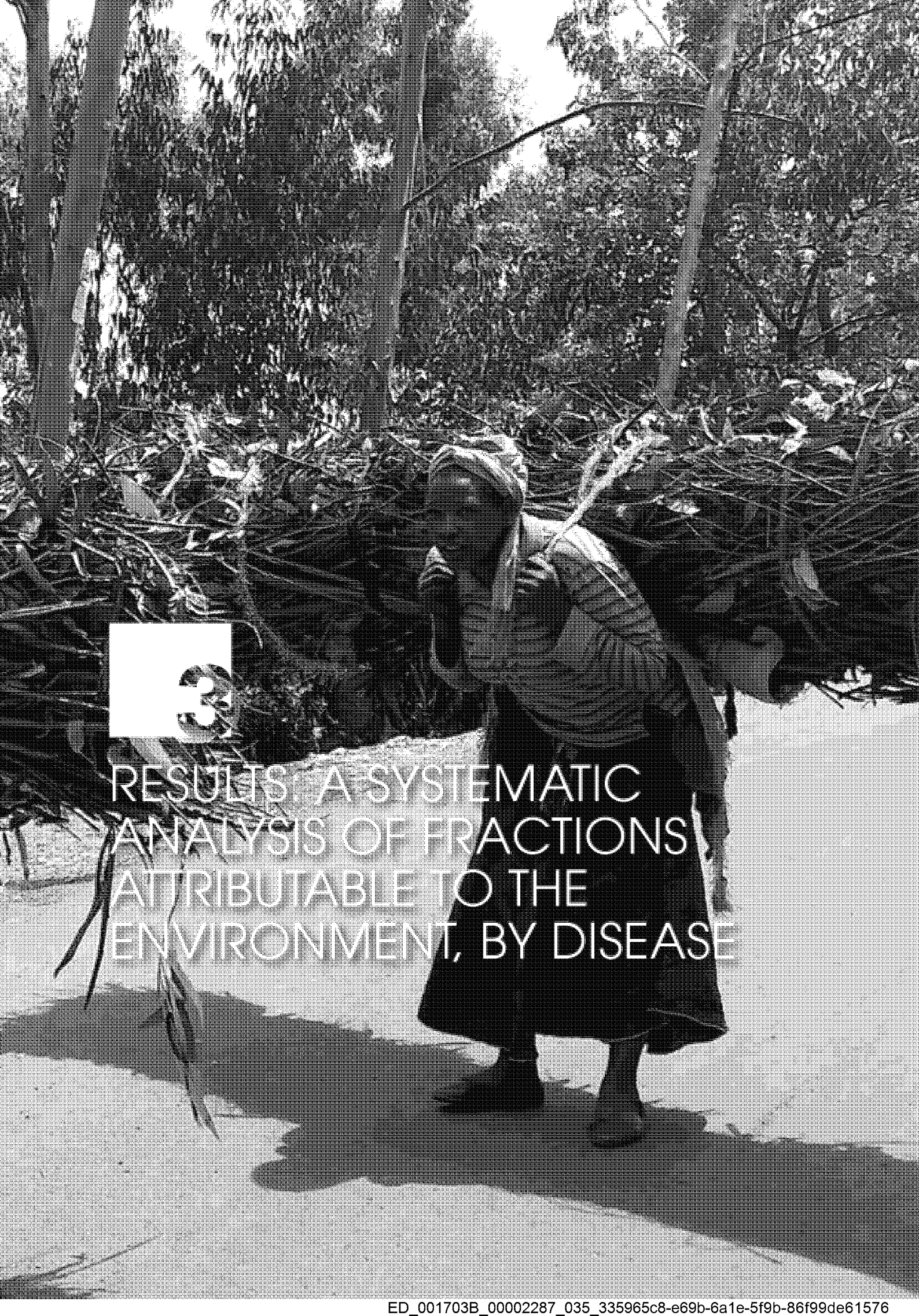

3

RESULTS: A SYSTEMATIC ANALYSIS OF FRACTIONS ATTRIBUTABLE TO THE ENVIRONMENT, BY DISEASE

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Out of the 133 diseases or disease groups listed in the Global Health Observatory (WHO, 2015d), 101 had significant links with the environment, with 92 at least partially quantified in this study. These have been grouped in 68 main disease and injury groups (Table 1). Global CRAs were available for 21 diseases, 13 of which used the main environmental risk factors exclusive to those diseases and eight of which required completion by expert survey. For another eight diseases, approximate estimates of population attributable fraction were established based exclusively on the more limited epidemiological data available, and for an additional four diseases on their transmission pathways.

The population attributable fractions for 43 diseases were estimated through expert surveys (2015 and 2005), including eight which were supported by CRAs for some of their relevant environmental risks. More than 100 experts participated in the survey and provided over 250 quantitative replies (some experts provided environmental attributable fractions for a number of diseases or injuries). The results for each disease or disease group follow in this section. Estimates of the population attributable fractions for the environment are provided at the end of the discussion on each disease (with 95% confidence intervals in brackets).

Table 1. Methods used for estimating the population attributable fraction of the disease burden for main disease groups

Disease or disease group	Comparative risk assessment type	Calculation based on limited epidemiological data	Disease transmission pathway	Expert survey 2015	Expert survey 2005
Infectious and parasitic diseases					
Respiratory infections					
Lower respiratory infections	● [a]				
Upper respiratory infections and otitis					●
Diarrhoeal diseases	● [b]				
Intestinal nematode infections					
Ascariasis			●		
Trichuriasis			●		
Hookworm disease			●		
Parasitic and vector diseases					
Malaria					●
Trachoma			●		
Schistosomiasis				●	
Chagas disease					●
Lymphatic filariasis					●
Onchocerciasis					●
Leishmaniasis					●
Dengue					●
Japanese encephalitis					●
HIV/AIDS		●			
Sexually transmitted diseases excluding HIV/AIDS		●			
Syphilis		●			
Chlamydia		●			
Gonorrhoea		●			
Trichomoniasis		●			
Hepatitis B and C		●			
Tuberculosis		●			●
Other infectious diseases					●

Disease or disease group	Comparative risk assessment type	Calculation based on limited epidemiological data	Disease transmission pathway	Expert survey 2015	Expert survey 2005
Neonatal and nutritional conditions					
Neonatal conditions					●
Protein-energy malnutrition		●			
Noncommunicable diseases					
Lung cancer	●[a]				
Other cancers	(●)				●
Mental, behavioural and neurological disorders					
Unipolar depressive disorders				●	
Bipolar disorder				●	
Schizophrenia				●	
Alcohol use disorders				●	
Drug use disorders				●	
Anxiety disorders				●	
Eating disorders				●	
Pervasive developmental disorders				●	
Childhood behavioural disorders				●	
Idiopathic intellectual disability				●	
Alzheimer's disease and other dementias				●	
Parkinson's disease				●	
Epilepsy				●	
Multiple sclerosis				●	
Migraine				●	
Non-migraine headache				●	
Other mental, behavioural and neurological conditions				●	
Sense organ diseases					
Cataracts	●[b]			●	
Hearing loss	●[c]				
Cardiovascular diseases					
Rheumatic heart disease	●[c]				
Hypertensive heart disease	●[c]				
Ischaemic heart disease	●[a]				
Stroke	●[a]				
Other circulatory diseases	●[c]				
Respiratory diseases					
Chronic obstructive pulmonary disease	●[a]				
Asthma	(●)				●
Kidney diseases	●[c]				
Musculoskeletal diseases					
Rheumatoid arthritis					●
Osteoarthritis					●
Back pain	●[c]				
Neck pain				●	
Other musculoskeletal diseases					●
Congenital anomalies					●

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Disease or disease group	Comparative risk assessment type	Calculation based on limited epidemiological data	Disease transmission pathway	Expert survey 2015	Expert survey 2005
Unintentional injuries					
Road traffic injuries	(●)				●
Unintentional poisonings	(●)				●
Falls	(●)				●
Fires, heat and hot substances	(●)	●		●	
Drownings	(●)				●
Other unintentional injuries	(●)				●
Intentional injuries					
Self-harm		●			
Interpersonal violence					●

Notes: ● Estimates/method used; (●) Estimates available, but completion by expert survey as main risk factor disease pairing not assessed; [a] Source is a combination of various risk factors developed for this analysis by WHO, based on IHME, 2014; WHO, 2014b; WHO, 2014d; [b] Source is WHO (Prüss-Ustün et al, 2014; WHO, 2014d); [c] Source: (IHME, 2014); see disease-specific sections and Annex 3 for further information.

The following section reviews the evidence by disease or injury group. An estimate of the fraction of disease or injury attributable to the environment is provided in each case. This fraction refers to the disease burden in DALYs.

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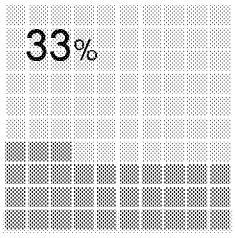
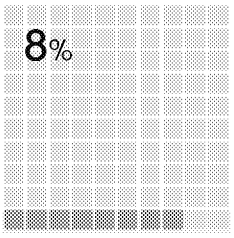
INFECTIOUS AND PARASITIC DISEASES

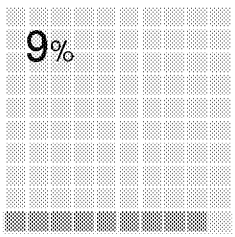
RESPIRATORY INFECTIONS



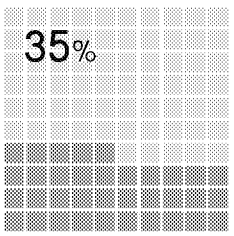
Household air pollution
Method: CRA



Ambient air pollution
Method: CRA

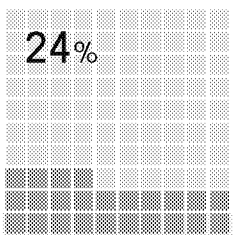


Second-hand tobacco smoke
Method: CRA



Total environmental risks
Method: combination of data from CRAs

UPPER RESPIRATORY INFECTIONS AND OTITIS



Various forms of air pollution
Method: expert survey

Lower respiratory infections include pneumonia, bronchitis and bronchiolitis, causing 935 000 deaths per year (in 2013). These infections are the most important cause of mortality in children, accounting for 18% of deaths in children under five (WHO, 2014x; WHO, 2015d). Pneumonia is an infection of the lung which can be caused by exposure to a number of infectious agents, including viruses, bacteria and fungi (WHO, 2014x). Main risk factors for susceptibility to the disease include a compromised immune system, malnutrition and environmental risk factors such as smoke from heating or cooking with biomass, living in crowded homes and exposure to second-hand tobacco smoke.

The most important environmental risk factor is exposure to smoke from cookstoves, which was responsible for 33% of the disease burden of lower respiratory infections (in DALYs) in 2012 (WHO, 2015d). Exposure to ambient air pollution is responsible for 7.9% of the disease burden (in DALYs) in 2012 (WHO, 2015d). Second-hand tobacco smoke also causes pneumonia in children and 9.3% of lower respiratory infections have been attributed to it (Lim et al, 2012). Living in crowded homes has also been associated with a higher risk of developing pneumonia (Jackson et al, 2013; WHO, 2014x), as has inadequate hand hygiene (Aiello et al, 2008).

Lower respiratory infections are likely to be sensitive to climate change, as their incidence varies with different weather patterns such as fluctuations in rainfall. Climate change may also indirectly impact on respiratory infections through undernutrition due to food shortages that may result from climate change, and through crowding due to large-scale population displacement (Paynter et al, 2010).

Environmental measures to prevent pneumonia include reducing ambient and household air pollution, e.g. by providing affordable options for clean home energy solutions for cooking, heating and lighting, and encouraging good hygiene practices

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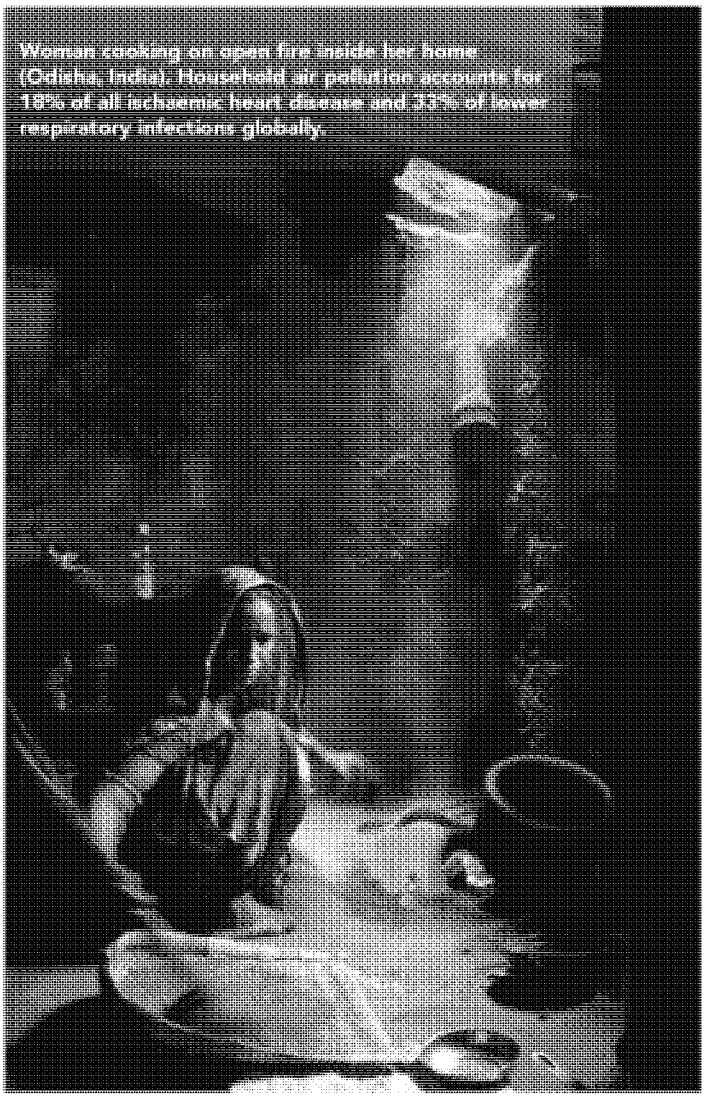
in crowded households (WHO, 2014x). Protective equipment for health-care workers is also recommended (WHO, 2014q).

Adding the effects of household air pollution from the use of solid fuels for cooking, together with ambient air pollution, at least 35% (27–41%), and more than 50% in children under five years, of lower respiratory infections were estimated to be attributable to the environment in low- and middle-income countries (LMIC). In high-income countries (HIC), this rate was negligible. These estimates were based on a combination of data from CRA type assessments (see Section 2 and Annex 3.2). However, when considering children under five years only, it reached 13% (9–16%). Additional influences from other environmental factors (e.g. other indoor air pollutants, chilling, crowding), and the co-morbidities with other diseases that are partly attributable to the environment (e.g. malaria and diarrhoea) could not be quantified, but they may further add to the environmental burden of lower respiratory infections.

Environmental risks for upper respiratory infections, such as pharyngitis, laryngitis or sinusitis have been less well documented. They may include air pollution, second-hand tobacco smoke and housing-related risks such as exposure to ventilators or moulds, and crowding (Agrafiotis et al, 2012; Bush et al, 2006; Duse et al, 2007; Fisk et al, 2010; Reh et al, 2012). Exposure to second-hand tobacco smoke caused 2.3% of the burden of otitis media in 2010 (IHME, 2014; Jones et al, 2012).

The fraction of upper respiratory infections and otitis attributable to environmental risks was estimated at 24% (6–45%) in low- and middle-income countries, and 12% (5–18%) in high-income countries (based on expert survey 2005, see Section 2). Globally, more than 500 000 deaths annually from respiratory infections are attributable to the environment.



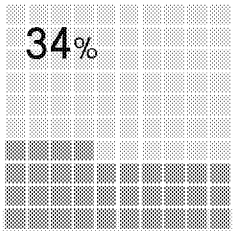
Woman cooking on open fire inside her home (Odisha, India). Household air pollution accounts for 18% of all ischaemic heart disease and 33% of lower respiratory infections globally.

SELECTED INTERVENTIONS

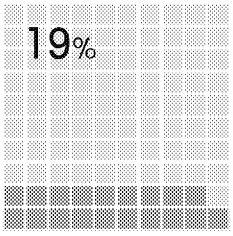
- Reduction of cookstove smoke led to as much as a 75% reduction in pneumonia incidence in specific settings, and one study found that increased handwashing saw a reduction of pneumonia by 50% (Cohen et al, 2012).
- Interventions and strategies to reduce exposure to smoke from solid fuels are further provided in the *WHO Guidelines for Indoor Air Quality* (WHO, 2014ee).

See box in the section on stroke for additional interventions for reducing exposure to air pollution.

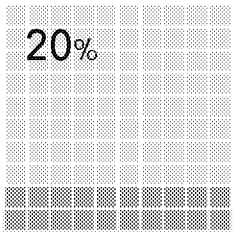
DIARRHOEAL DISEASES



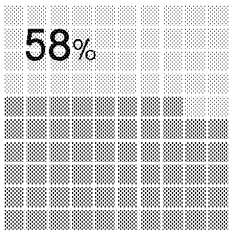
Drinking-water
Method: CRA



Sanitation
Method: CRA



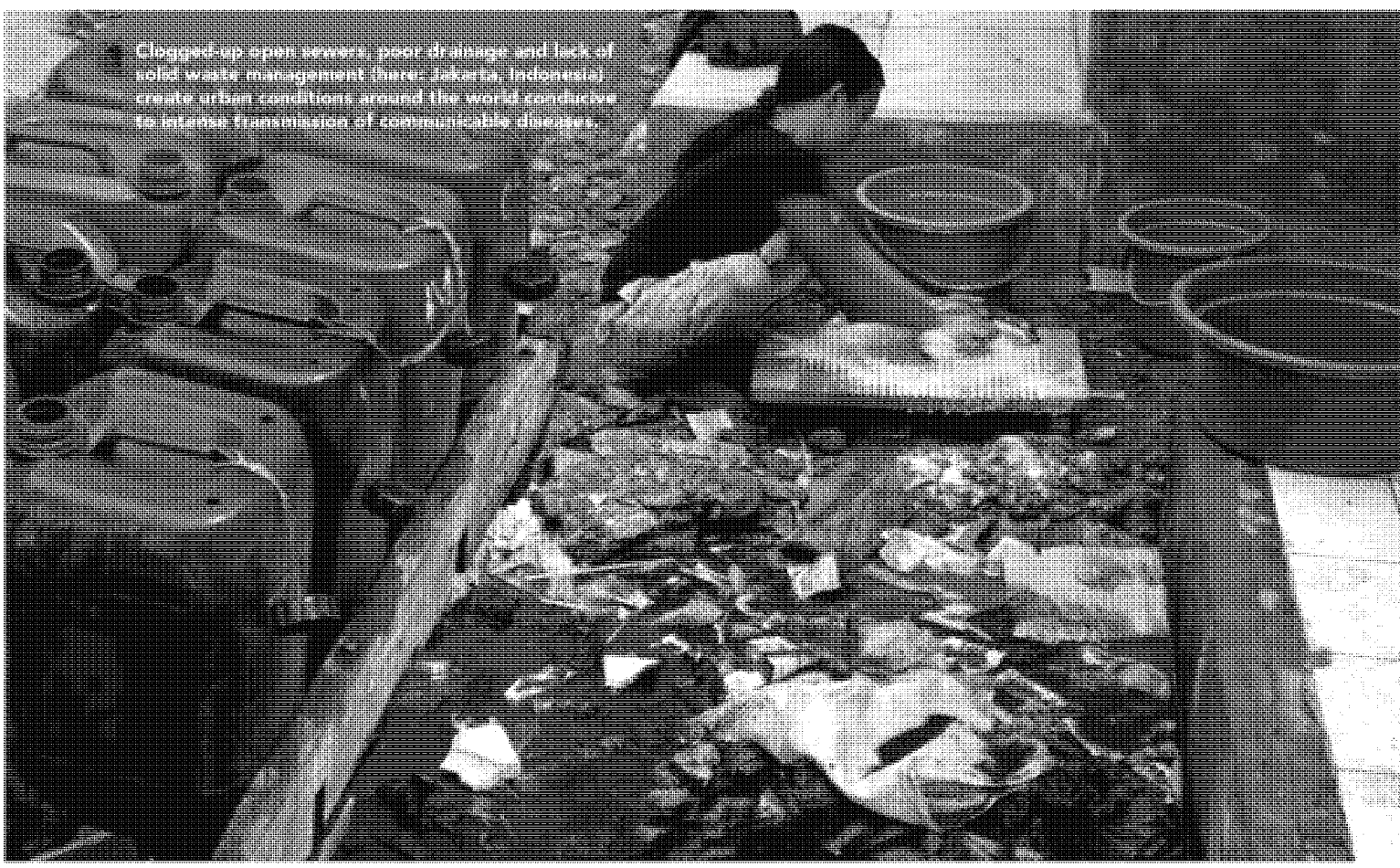
Handwashing
Method: CRA



Total environmental risks (LMIC)

Diarrhoeal diseases are one of the main contributors to global child mortality, causing 20% of all deaths in children under five years (WHO, 2015d). A large proportion of diarrhoeal diseases are caused by faecal-oral pathogens.

The predominant route of transmission depends on the pathogen, local infrastructure (e.g. whether the population has access to appropriate sanitation and safe water) and human behaviour. If sanitation or related hygiene is poor, e.g. when handwashing facilities are inadequate or when faeces are disposed of improperly, excreta may contaminate hands, which can then contaminate food or other humans (person-to-person transmission). Additionally, faecal pathogens transferred to sewage systems that are not linked to treatment plants may subsequently contaminate surface and ground water. Human excreta can also directly contaminate the soil and surface water, e.g. through open defecation and come in contact with people – flies may carry pathogens from excreta to food, for example. Through these pathways, drinking-water, recreational water or food may be contaminated and cause diarrhoeal disease following ingestion (Prüss et al, 2002). Furthermore, pathogens in animal excreta may also contaminate drinking-water sources (Dufour et al, 2012).



Clogged-up open sewers, poor drainage and lack of solid waste management (here: Jakarta, Indonesia) create urban conditions around the world conducive to intense transmission of communicable diseases.

Rotavirus is an important pathogen for childhood diarrhoea (Kotloff et al, 2013; Tate et al, 2012), and the main pathway is the faecal-oral route, often via contact with contaminated hands, surfaces and objects, and waterborne infections (Ansari et al, 1991). Changes in climate also affect the transmission of infectious diarrhoea predicting a future increase in diarrhoea incidence, highlighting yet an additional link of diarrhoea with the environment (Levy et al, 2009; Singh et al, 2001; WHO, 2014z).

Improvements in access to water and sanitation facilities, water quality and personal hygiene are effectively reducing diarrhoea morbidity (Freeman et al, 2014; Wolf et al, 2014). Today, although 89% of the world's population benefit from access to improved (though not necessarily safe) drinking-water sources, only 64% have access to an improved sanitation facility, and 14% still practise open defecation (Bain et al, 2014; WHO & UNICEF, 2014). Only 19% of the world's population wash hands with soap after defecation (Freeman et al, 2014).

WHO recently estimated that 58% of all cases of diarrhoea in LMIC could be attributed to inadequate drinking-water (34%), sanitation (19%) and hygiene (20%) (Prüss-Ustün et al, 2014). This estimate only took into account the benefits of well-documented interventions, and did not factor in additional benefits such as from continuous rather than intermittent availability of drinking-water. An additional diarrhoea burden occurs through aspects of food safety that are related to water, sanitation and hygiene (i.e. food contamination by unsafe water or the lack of domestic hygiene). For high-income countries, only the fraction of diarrhoea attributable to hygiene has been estimated, amounting to 13% (0–45%) (Freeman et al, 2014).

In total, it was estimated that around 58% (34–72%) of all cases of diarrhoea in low- and middle-income countries, or 57% worldwide, were attributable to the environment, resulting in 842 000 deaths annually (CRA, Prüss-Ustün et al, 2014). Water, sanitation and hygiene also play an important role in malnutrition (covered in the subsection, Protein-energy malnutrition).

SELECTED INTERVENTIONS

- Interventions that improved drinking-water, access to sanitation and hygiene effectively reduced diarrhoeal morbidity (by 45%, 28% and 23% respectively) (Freeman et al, 2014; Wolf et al, 2014).
- A reduction of 45% of diarrhoea morbidity could be obtained by filtering and safe storage of water from an unimproved source in the household; a reduction of 38% of diarrhoea morbidity could be obtained by doing the same with water from an improved water source (Wolf et al, 2014).
- For people living with HIV/AIDS, interventions that improved water quality reduced diarrhoea morbidity by 43% (Peletz et al, 2013).
- Implementation of the following guidelines and plans:
  - *Guidelines for drinking-water quality* (WHO, 2011b);
  - *Guidelines for recreational water environments* (WHO, 2003a; 2006a);
  - *Guidelines for the safe use of wastewater, excreta and greywater* (WHO, 2006b);
  - *Sanitation safety planning and water safety planning* (WHO, 2009c; 2015j).

ECONOMIC EVALUATIONS

- Interventions that improved water supply, water quality and access to sanitation were cost-effective in most regions and were all cost-beneficial in low-income regions. An investment of US$ 1 in such programmes led to a return of between US$ 5 and US$ 6 (Haller et al, 2007).
- Hygiene in six different low-income countries was promoted at costs ranging from US$ 1.05 to US$ 1.74 per person per year. These interventions were highly effective in reducing open defecation and improving personal hygiene (Sijbesma & Christoffers, 2009).

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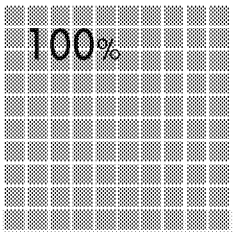
INTESTINAL NEMATODE INFECTIONS

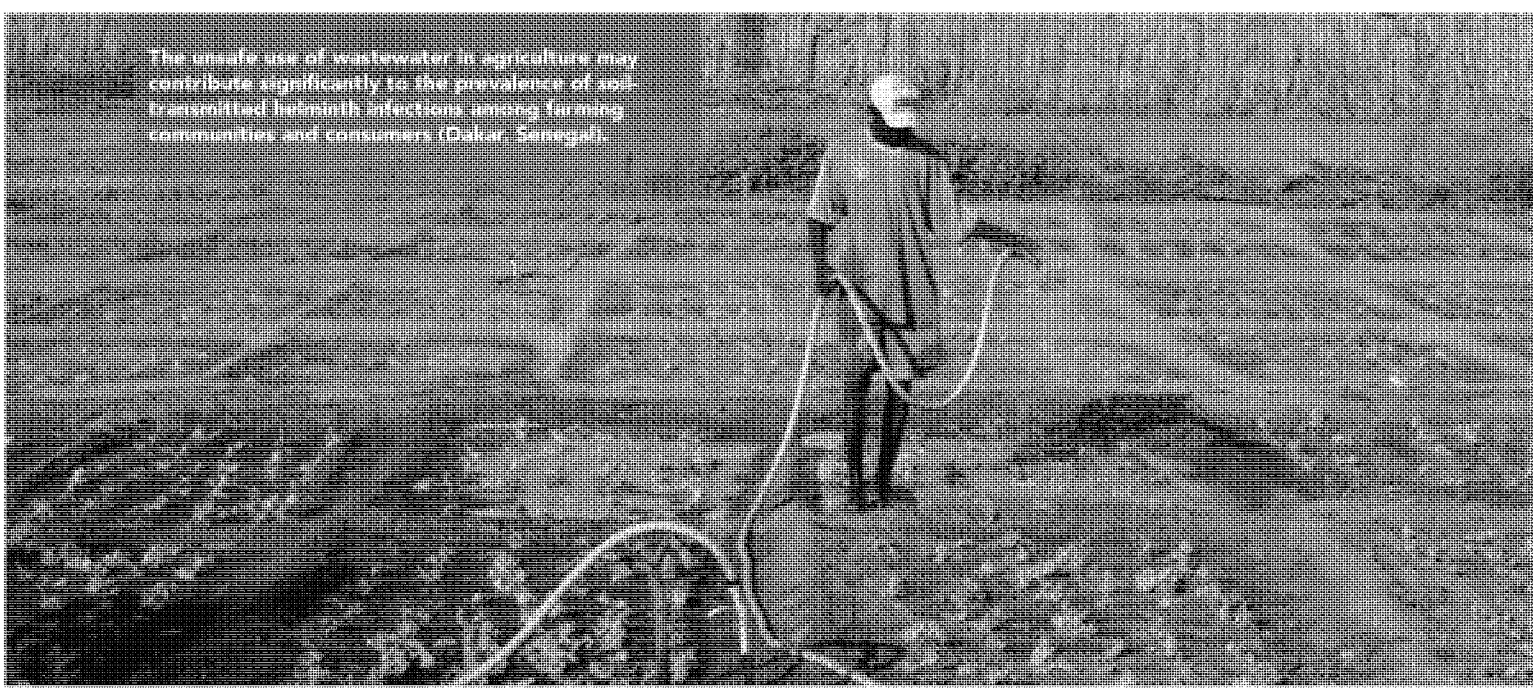


Sanitation
Method: transmission pathway

Ascariasis, trichuriasis and ancylostomiasis/necatoriasis (roundworm, whipworm and hookworm disease, respectively) are intestinal infections caused by soil-transmitted helminths. They affect more than two billion people worldwide (WHO, 2012h). Infections of heavy intensity affect the physical growth and cognitive development of children, and are a cause of micronutrient deficiencies including iron-deficiency anaemia. In countries of high endemicity, preventive administration of anti-helminthic drugs has been the main strategy to control morbidity, especially among school children. However, reinfection occurs rapidly after treatment (Jia et al, 2012) as long as the environment continues to be conducive to maintaining the transmission cycle.

Transmission does not occur from person-to-person or from fresh faeces but via soil contaminated with human excreta containing infectious eggs or larvae. Open defecation, a daily practice of over one billion people globally (WHO & UNICEF, 2014), mainly in South Asia and Africa south of the Sahara, is the main cause. Even with access to some form of sanitation facilities, however, the subsequent poor management of human waste may still contribute to transmission risks. This includes the use of wastewater and excreta in agriculture without adequate risk management measures (WHO, 2006c). Transmission may take place near the home, in communal defecation fields or further afield in pastures or cropping areas. Transmission of *Ascaris lumbricoides* and *Trichuris trichiura* occurs when infective eggs are ingested with uncooked, unwashed or unpeeled food products contaminated with soil containing worm eggs, or grown using excreta or wastewater. In the case of hookworm, infective larvae penetrate the skin (Heymann, 2008).

Current recommendations to reduce morbidity due to intestinal nematode infections consist of combining drug administration with improved sanitation and hygiene (including the supply of enough domestic water to perform basic hygiene practices), backed up by appropriate health education (Strunz et al, 2014; WHO, 2012h; Ziegelbauer et al, 2012).



The unsafe use of wastewater in agriculture may contribute significantly to the prevalence of soil-transmitted helminth infections among farming communities and consumers (Dakar, Senegal).

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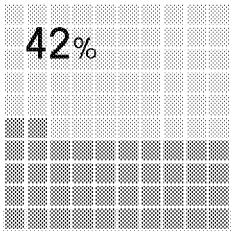
The rapidly expanding practice of wastewater use in agriculture, particularly in peri-urban areas, contributes increasingly to the transmission of soil-transmitted helminths among agricultural workers, communities practising this form of agriculture and consumers of the resulting produce. Little is currently known about the relative importance of this pathway. WHO has published guidelines proposing a method of integrated risk assessment and management to prevent transmission and the associated adverse health impacts (WHO, 2006c). Between 4 and 20 million hectares of land were estimated to be under wastewater irrigation in 2010 (Drechsel et al, 2010).

The global mean fraction of the disease burden due to soil-transmitted helminth infections attributable to manageable environmental conditions is estimated to be 100%, based on information available on the transmission pathways (Prüss-Ustün et al, 2004).

SELECTED INTERVENTIONS

- Access to and use of facilities for the safe disposal of human excreta have shown a mean reduced likelihood of 34% in soil-transmitted nematode infections; use of treated water reduced the likelihood of soil-transmitted nematode infections by 54%, and soap use by 47%, and handwashing before eating and after defecation also reduced the likelihood (Strunz et al, 2014).
- A comprehensive control programme in Chinese villages – a combination of environmental management, provision of domestic water supply and sanitation facilities, and health education – targeted at schistosomiasis reduced *A. lumbricoides* and *T. trichuria* infection rates in humans from 27.6% and 62.0% to 3.8% and 7.5%, respectively, as compared with a baseline situation relying on chemotherapy alone (Wang et al, 2009), in addition to reducing the prevalence of schistosomiasis.

MALARIA

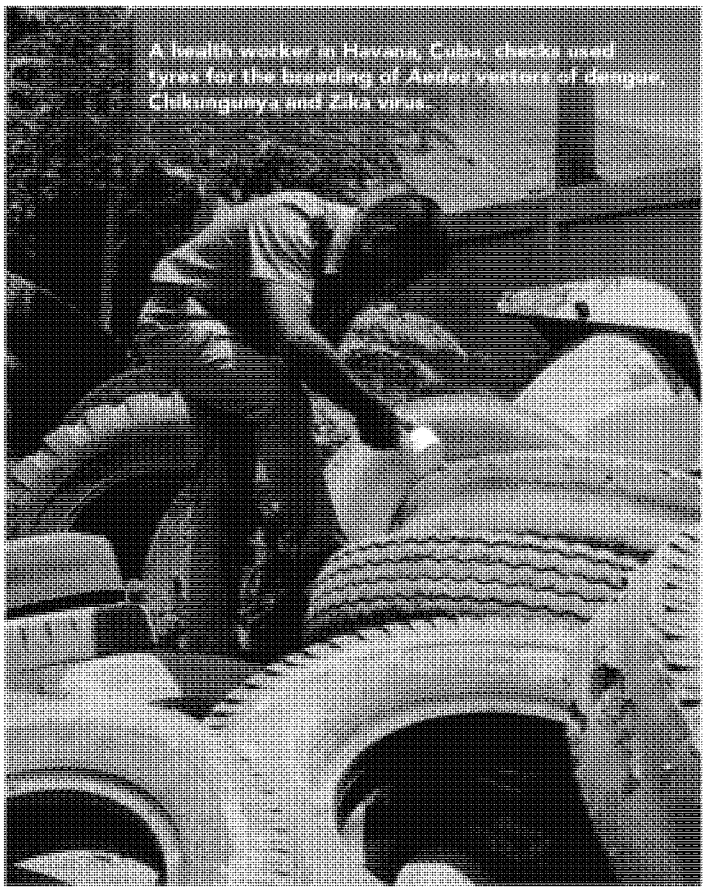


Environmental vector management
Method: expert survey

Malaria is the most important vector-borne disease globally, causing many deaths in children under five. It is caused by species of protozoan parasites belonging to the genus *Plasmodium*, which are transmitted by the bites of infected *Anopheles* mosquitoes. Malaria is a life-threatening disease: in 2013, it caused an estimated 584 000 deaths, mostly among African children.

The larval stages of anopheline mosquitoes occur in a wide range of habitats, but most species share a preference for clean, unpolluted, stagnant or slowly moving fresh water (Muir, 1988). For local populations (rather than incidental visitors to malarial areas) clinical prevention options are limited and with respect to cure there is concern over growing drug resistance. Vector control is therefore an important component of sustainable disease reduction strategies (Karunamoorthi, 2011).

Among the arsenal of preventive measures is environmental management for malaria vector control. An array of environmental modification and manipulation methods are available for vector control in general, and malaria vector control in particular (WHO, 1982). These are specific to the ecology of local vectors. There are, however, also settings where vectors are so entrenched in the local ecology that environmental management is not an option – such is the case in large parts of Africa where perennial transmission by *A. gambiae* and *A. funestus* occurs.



A health worker in Havana, Cuba, checks used tyres for the breeding of Aedes vectors of dengue, Chikungunya and Zika virus.

Environmental management strategies for malaria transmission interruption can be defined according to eco-epidemiological settings, which include the following:

- Rural malaria attributable to water resource development and management (e.g. irrigation systems, large dams, series of small dams (Ghebreyesus et al, 1999), wetlands, rivers, streams and coastal lagoons;
- Urban and peri-urban malaria; and
- Malaria of deep forests and hills, with a focus on forest-fringe malaria.

Details of environmental determinants of malaria have been reviewed for the various regions (Beljaev, 2002; Cox et al, 2002; Roberts et al, 2002; Sabatinelli, 2002; Schapira, 2002; Sharma, 2002). Environmental modification or manipulation to reduce vector densities or management of the human habitat (housing, distribution of domestic animals) to reduce human-vector contact can be designed for all eco-epidemiological settings except forest areas.

Environmental modification for vector control includes introducing permanent changes to the landscape (drainage, land levelling, filling depressions, borrow pits, pools and ponds, modifying river beds and lake shores) and design features and hydraulic structures in water resources development (self-draining weirs, canal lining to prevent seepage, contouring reservoirs and mosquito-proofing overhead drinking-water tanks).

In the urban environment, environmental modification options also include building drains and storm-drains, modifying house design (including gutters and roof drains) and adapting building regulations, and installing wastewater management facilities.

Environmental manipulation for vector control includes water management (e.g. intermittent or alternate wet and dry, irrigation, and introduction of sprinkler, drip or central pivot irrigation); maintenance of canals and other waterways to prevent seepage, and clearance of aquatic vegetation; conserving mangroves and stopping the expansion of prawn cultivation in areas where the brackish water breeding *A. sundaicus* occurs (Trung et al, 2004); safe practices for storing domestic water; management of solid waste in and around human settlements; and the proper maintenance of water supply and sanitation infrastructure in urban areas. The majority of resurging malaria events have been linked to the weakening of malaria control programmes, but also to increases in intrinsic malaria potential due to land-use changes (43% of events), climate and weather (25%), worsening of socioeconomic conditions (11%) and vector and drug resistance (32%) (Cohen et al, 2012). Climate change alone is estimated to increase the number of people at risk by 2030 (60 000 additional deaths as compared with a future without climate change). This is, however, likely to be outweighed by a reduction in the number of people at risk due to improved socioeconomic conditions (WHO, 2014z).

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The potential of environmental management to reduce the malaria burden differs according to the type of environment (i.e. forest fringe/deep forests and hills, rural settings, and urban and peri-urban settings). This can be explained by local differences in the ecology and behaviour of *Anopheles* species (e.g. breeding sites, biting and resting behaviour). For the estimates presented here the use of insecticide-treated mosquito nets was not considered to be environmental management. See also Box 3 on integrated vector management (IVM).

It is estimated, through expert survey (see Section 2), that 42% (28–55%) of the global malaria burden could be prevented by environmental management, although the fraction amenable to environmental management varies by WHO region: 36% (25–47%) in the Eastern Mediterranean Region; 40% (34–46%) in the Western Pacific Region; 42% (28–55%) in the African Region; 42% (30–54%) in the South-East Asia Region; 50% (38–63%) in the European Region; and 64% (51–77%) in the Region of the Americas.

SELECTED INTERVENTIONS

- A meta-analysis of environmental management interventions to reduce malaria showed that environmental manipulation and modification of the human habitation reduced the risk of malaria by 88.0% (81.7–92.1%) and 79.5% (67.4–87.2%), respectively (Keiser et al, 2005). Results are consistent, although the number of rigorously conducted studies is low (Tusting et al, 2013).

ECONOMIC EVALUATIONS

- A review with a focus on Africa south of the Sahara estimated the costs per death and malaria attack averted were US$ 858 and US$ 22.20, respectively, reducing malaria-related morbidity, mortality and incidence by 70–95% within three to five years. The strategy would become more cost-effective in the longer term, as maintenance costs were much lower, with an estimated US$ 22–92 per DALY averted (Utzinger et al, 2001).

Box 3. Integrated vector management (IVM)

The transmission of vector-borne diseases can be interrupted by reducing the population density of disease-transmitting insects or by limiting their average life expectancy. The applicability of these two fundamentally different approaches depends on the local epidemiological situation – in areas with high transmission levels vector population density is no longer a determining factor. To reduce population densities environmental management and larviciding with chemical insecticides, with biopesticides (e.g. *Bacillus thuringiensis*) or with predators (e.g. larvivorous fish) can be applied. To shorten the lifespan of adult mosquitoes, indoor house spraying with residual insecticides is used (on condition that local vector species display indoor resting behaviour). Personal protection can be achieved sleeping under insecticide treated mosquito nets and by mosquito-proofing housing. The use of chemicals raises issues of human and animal toxicity, environmental pollution and sustainability as resistance remains a constant threat (WHO, 1995). A larval source management operational manual (WHO, 2013b) presents criteria for the selection of implementing specific measures and guidance on their economic value.

Important features of environmental management are its non-toxicity, relative ease of application, cost-effectiveness and sustainability (Ault, 1994; Bos & Mills, 1987; Utzinger et al, 2001). Unlike indoor residual spraying, environmental management measures must be tailor-made based on evidence of local vector ecology and biology. Different categories of environmental management are described in *Environmental Management for Vector Control* (WHO, 1980).

Environmental management is part of an IVM framework, which is a rational decision-making process for the optimal use of resources for vector control. Integrated vector management considers five key elements: (a) advocacy, social mobilization and legislation; (b) collaboration within the health sector and with other sectors; (c) integrated approaches to disease control; (d) evidence-based decision making; and (e) capacity-building (WHO, 2012f; WHO & TDR, 2009).

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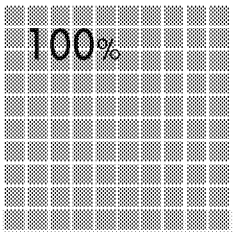
TRACHOMA

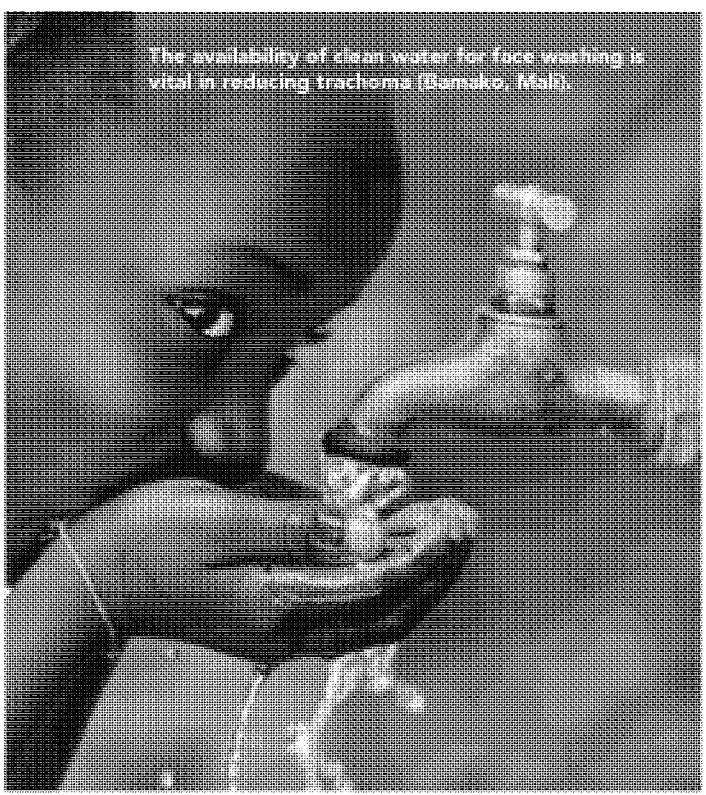


Water, sanitation and hygiene, housing
Method: transmission pathway

Trachoma is a chronic contagious eye disease caused by *Chlamydia trachomatis* and is the main infectious cause of global blindness. Trachoma is a significant public health problem in rural communities in many low-income countries (Hu et al, 2010). Worldwide, there are around 2.2 million people irreversibly visually impaired by trachoma (Pascolini & Mariotti, 2012); and an estimated 21 million cases of active disease. Some 232 million people worldwide live in affected areas (WHO, 2014dd).

Transmission routes are closely hygiene related (e.g. mechanical transmission by eye-seeking flies, and probably by person-to-person contact and via fomites, particularly clothing used to wipe children's faces) (Heymann, 2008). Risk factors for trachoma include poor access to domestic water supplies, limited access to and use of latrines/toilets, crowding and a high number of flies (Hu et al, 2010). Trachoma-transmitting flies can be controlled by removing human faeces (the medium on to which the females oviposit) from the environment. Transmission control is also attempted through interventions to improve access to and use of sanitation, especially ending open defecation, and hygiene, especially facial cleanliness. Available evidence, although of limited quality, supports the hypothesis that several environmental control measures are effective (Emerson et al, 2000; Emerson et al, 1999; Esrey et al, 1991; Prüss & Mariotti, 2000; Stocks et al, 2014; Sutter & Ballard, 1983; West et al, 1995).

Globally, the mean fraction of the disease burden due to trachoma attributable to environmental conditions that can be managed is estimated to be 100%, based on information available on the transmission pathways.



The availability of clean water for face washing is vital in reducing trachoma (Bamako, Mali).

SELECTED INTERVENTIONS

- A randomized controlled trial in the Republic of the Gambia showed that latrine provision significantly reduced populations of the main fly vector (*Musca sorbens*) for trachoma transmission by 30%, and subsequently reduced trachoma prevalence by 30% as well (although the latter change was not statistically significant) (Emerson et al, 2004).
- In a community randomized trial in the United Republic of Tanzania an intensive face washing intervention reduced the odds of severe trachoma by 38% compared with control villages (West et al, 1995).
- In a randomized controlled trial in the Gambia, fly control decreased the number of flies by around 75% in intervention villages as compared with controls. After three months of fly control, there were also 75% fewer cases of trachoma in the intervention villages (Emerson et al, 1999).

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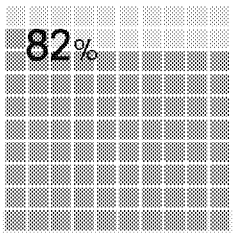
SCHISTOSOMIASIS



Water, sanitation and hygiene
Method: expert survey

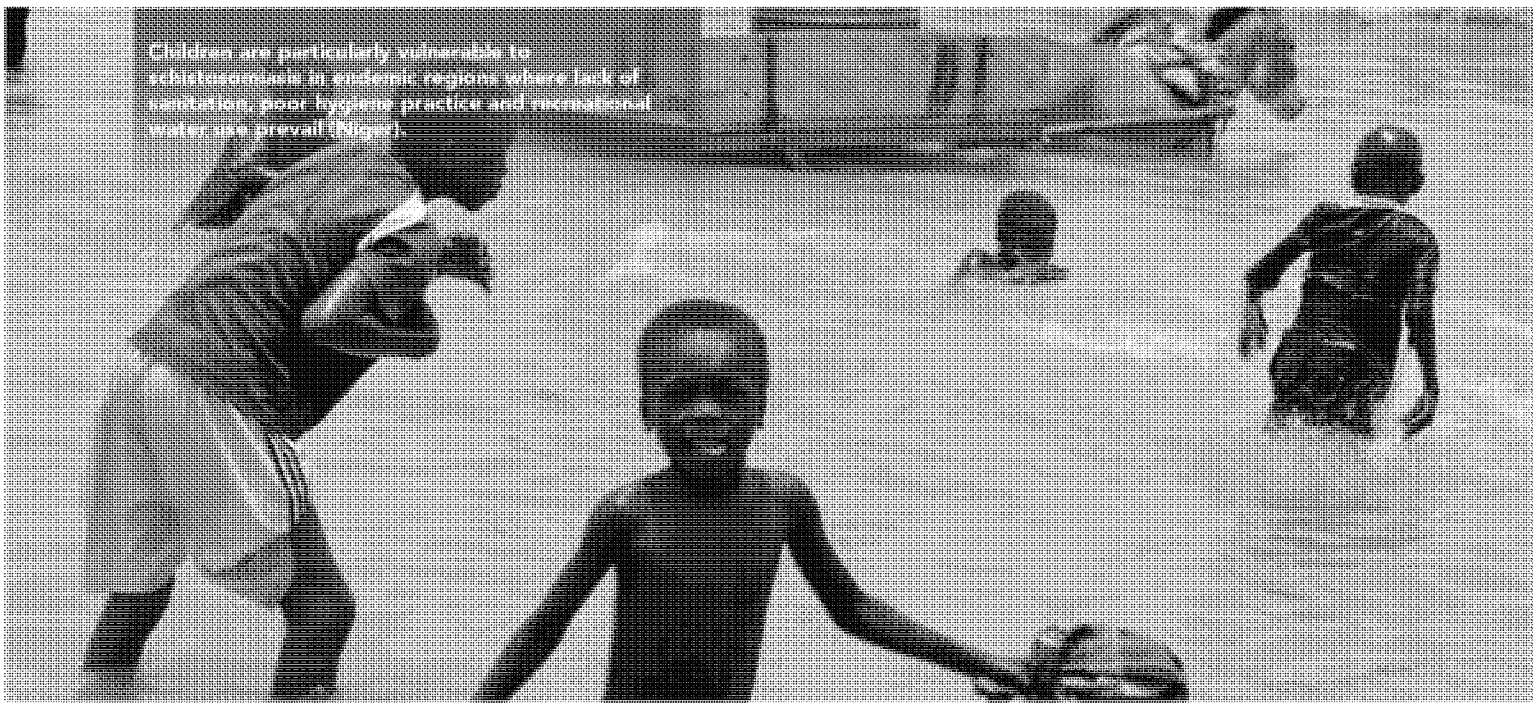
Schistosomiasis is a disease caused by infection with trematodes (blood flukes), parasitic worms of the genus *Schistosoma*, living in the veins that drain the intestines or the urinary tract. The damage caused to the intestinal (by *Schistosoma mansoni*, *Schistosoma japonicum*) or urogenital tissues (by *S. haematobium*) results from the large quantities of eggs produced by the flukes which work their way through these tissues and from the associated immune reaction of the host. Left untreated, the disease can lead to long-term, irreversible health effects, including liver and kidney damage, infertility or bladder cancer (Heymann, 2008; WHO, 2014bb). Between 200 and 250 million people are infected in endemic regions of the world, and the disease results in an estimated 200 000 deaths each year (WHO, 2014bb).

Schistosoma flukes have a complex lifecycle which includes the obligatory passage through species of aquatic or amphibious snails. Most intermediate hosts of human *Schistosoma* parasites belong to three genera of snails: *Biomphalaria* (*S. mansoni* in Africa and coastal Latin America), *Bulinus* (*S. haematobium* in Africa) and *Oncomelania* (*S. japonicum* in East Asia). Transmission occurs through direct human contact with water containing free-swimming larval forms, which have been shedded by the intermediate host snails and penetrate the human skin. Water is contaminated by the excreta (faeces or urine) of infected humans, which contain schistosome eggs (WHO, 2014bb). These eggs hatch in water and the larvae seek refuge inside their intermediate host snails to transform into their infectious stage. Some parasite species, e.g. *S. japonicum*, can also infect cattle and other mammals, which become a reservoir host contributing to the contamination of water sources (Heymann, 2008).

Our current understanding of schistosomiasis transmission indicates that the associated disease burden is 100% attributable to risk factors associated with the environment (Heymann, 2008). The main environmental determinants are: lack of adequate sanitation and ecological conditions favouring the propagation of intermediate host snails. The impact of these determinants is amplified by water contact behaviour, linked to poor hygiene (urinating or defecating in or close to water bodies), recreation (children and adolescents swimming in contaminated water), and domestic (washing laundry in contaminated water) or occupational activities (fishermen, farmworkers in irrigated agricultural production systems). A systematic review found that safe water supplies were associated with 47% lower odds of infection with schistosomes, and adequate sanitation with 41% lower odds of infection with *S. mansoni* and 31% of *S. haematobium*, respectively (Grimes et al, 2014).

People living close to irrigation areas and in the vicinity of man-made reservoirs were also shown to be at increased risk of infection (Steinmann et al, 2006).

Environmental management integrated in agricultural activities, in water resources development and in forestry projects has been shown to be effective in snail control (Liu et al, 2008; Zhou et al, 2011). Environmental management has successfully achieved the interruption of transmission in most counties in China, and led to eradication of the disease in Japan (Ebisawa, 1998; Zhou et al, 2005b). Health impact assessment (HIA) of water resources development projects may provide a convenient tool for safeguarding health among vulnerable communities in



Children are particularly vulnerable to schistosomiasis in endemic regions where lack of sanitation, poor hygiene practice and recreational water use prevails (Niger).

schistosomiasis endemic areas (Bos et al, 2003; Konradsen et al, 2008). Global climate change might alter the distribution and transmission of schistosomiasis (Yang et al, 2010).

The global mean fraction of the disease burden due to schistosomiasis attributable to environmental conditions that can be managed is estimated to be 82% (71–92%) (estimate based on expert survey 2015, see Section 2).

SELECTED INTERVENTIONS

- In China, a comprehensive *S. japonicum* control programme combined environmental modification for the management of water resources, health education to reduce human contact with infected water and installation of water supply and sanitation facilities, alongside chemotherapy. In eight villages prevalence decreased over three years from 9% to 3%, infections in livestock were completely eliminated and the area infested with infected snails was reduced by over 90% (Hong et al, 2011).

- Another comprehensive schistosomiasis control programme in Chinese villages – removing cattle from snail-infested grasslands, providing farmers with mechanized equipment, providing domestic water supply and sanitation facilities and health education – reduced *Schistosoma* infection rates in humans from 11.3% and 4.0% to 0.7% and 0.9% in village 1 and 2, respectively. Additionally, the percentage of sites with infected snails dropped from 2.2% and 0.3% to 0.1% and 0% respectively. The rate of infection in mice after exposure to lake water decreased from 79% to no infection (Wang et al, 2009).

- The rehabilitation of the Mushandike irrigation scheme in Zimbabwe in the 1980s included a comprehensive environmental management component aimed at interrupting schistosomiasis transmission. Hydraulics Research, Wallingford, UK and the Blair Research Laboratory in Harare, Zimbabwe collaborated in the design of a number of measures, including self-draining hydraulic structures and carefully sloped irrigation and drainage canals to prevent snail infestation, the elimination of high-risk infrastructure such as duckbill weirs, the improved management of night storage ponds and the deployment of latrines in a grid pattern in the fields to avoid contamination of water bodies. An evaluation of the schistosomiasis situation 10 years after the scheme became operational showed consistently low prevalence rates, while control schemes without the environmental measures maintained consistently higher rates (Chimbari, 2012).

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ECONOMIC EVALUATIONS

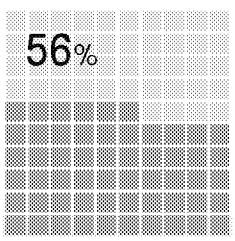
- While the price of the most effective drug, Praziquantl, has come down considerably since its introduction 30 years ago (to US$ 0.08/600 mg tablet or US$ 0.20–0.30 per average cure), successful administration of the drug will lead to a dilemma between two economically poor options: to continue mass drug administration for communities where prevalence has become very low, or to deploy a labour-intensive case detection and treatment scheme. At this point, environmental management will effectively reduce or eliminate receptivity to the infection, ensure sustainable results for the investments made in the drugs programme and guarantee an important level of resilience as conditions change (e.g. climate change, breakdown of services) (WHO, 1986).

- In the Chinese setting, a comprehensive, intersectoral control programme (removing cattle from snail-infested grasslands, providing farm machinery, improving water supply and sanitation and intensive health education) was shown to be more cost-beneficial than a health sector-confined programme based on diagnosis and treatment of humans and cattle, health education and focal mollusciciding (Lin et al, 2009; Yu et al, 2013).

- An evaluation of the integrated Chinese national schistosomiasis control programme over eight years, emphasizing amongst other interventions environmental management for snail control and health education, concluded that US$ 6.20 were gained for every US$ 1 spent (Zhou et al, 2005a).

- In the Dez irrigation scheme in Kuzestan, Islamic Republic of Iran, environmental modification to eliminate snail habitats was initiated in the 1960s and went in parallel with a reduction in urinary schistosomiasis prevalence from 3% at its peak to 0% in 1973. Annual investments in environmental engineering works ranged from US$ 150 to US$ 670/hectare; agricultural benefits ranged from US$ 900 to US$ 1250/hectare (crop-dependent) and annual savings from the elimination of chemical mollusciciding amounted to over US$ 2000/hectare – altogether resulting in a benefit/cost ratio of over 7:1. A modelling exercise demonstrated the resilience of these environmental modifications in comparison with traditional recurrent interventions (drug administration and mollusciciding). Interruption of traditional services saw a return to peak-prevalence in two years, while in areas with environmental modifications it would take 22 years to complete regression to peak prevalence. This was corroborated when services broke down during the Iran-Iraq War in the 1980s (Jobin, 1986; Oomen et al, 1994).

CHAGAS DISEASE



Environmental vector management, occupational risks, deforestation
Method: expert survey

Between 7 and 8 million people are estimated to be infected with *Trypanosoma cruzi*, the protozoan parasite which causes Chagas disease. Around 30–40% of people with chronic Chagas infections develop chronic, potentially life-threatening alterations of the heart, the nervous system or the gastrointestinal system (WHO, 2014g). The parasite is transmitted by various species of Mexican and Central and South American triatomine bugs (Moncayo & Silveira, 2009), which have a range of resting and breeding places in and around houses.

Three main species illustrate the ecological diversity which is linked to different environmental management approaches.

Triatoma infestans is distributed throughout the Southern Cone countries of South America: the Plurinational State of Bolivia, Argentina, Uruguay, Paraguay, Chile, Brazil and Peru. In all these countries *T. infestans* is almost an exclusively domestic species, except in the Plurinational State of Bolivia where sylvatic forms have been recorded. *T. infestans* lives in cracks, eaves and other

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spaces in poorly constructed housing, and housing improvements provide the basis for sustainable transmission interruption (Schofield , 1994).

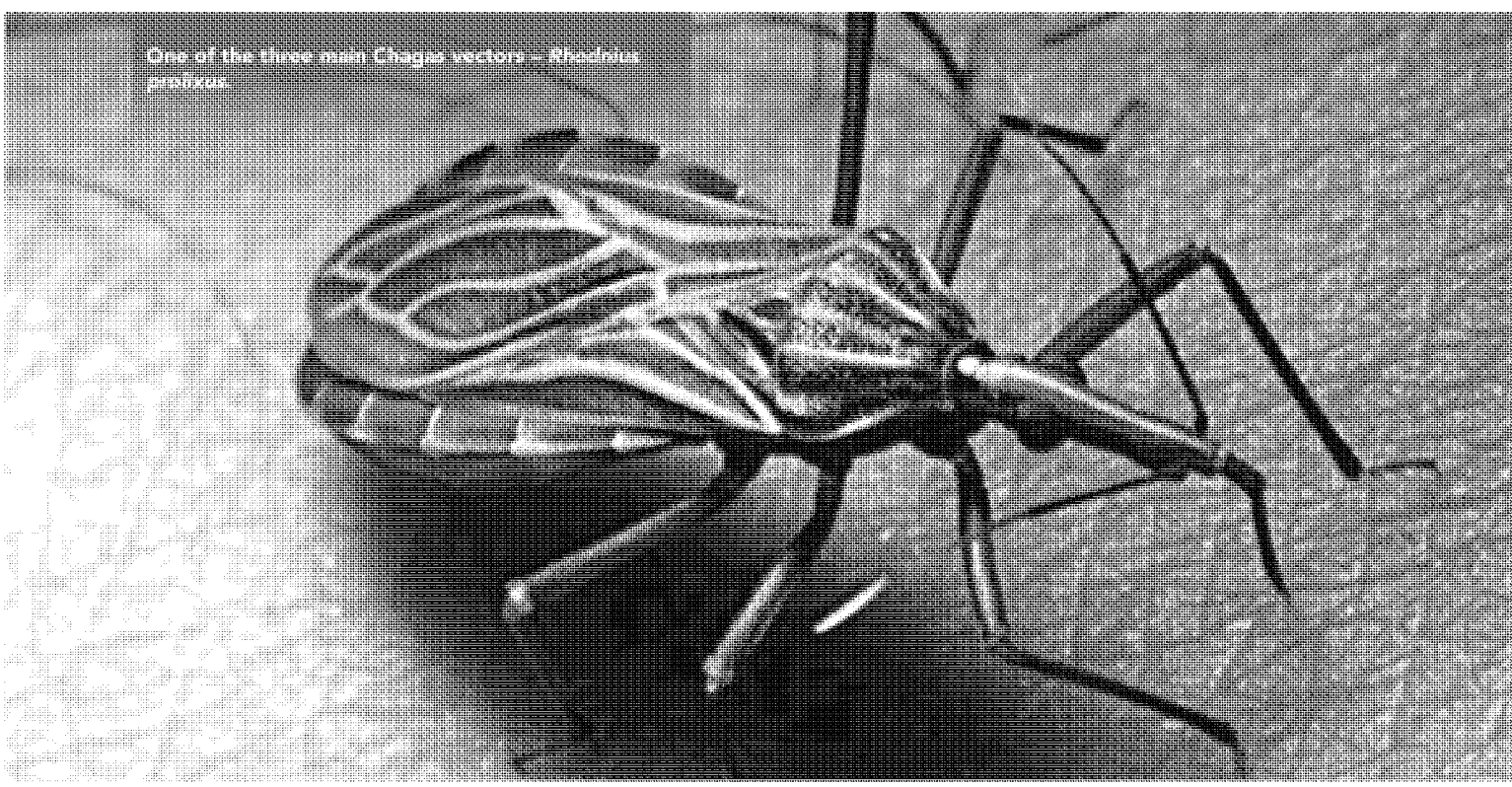
Rhodnius prolixus is the second most important triatomine vector species, with a distribution primarily in the palm tree habitats in northern South America. In Central America the exclusively (originally invasive) domestic populations have been eliminated (Hashimoto & Schofield, 2012). Palm leaf- or thatch-roofed housing provides the main domestic habitat. Replacement with corrugated iron roofing is an important vector control intervention.

Triatoma dimidiata has a distribution ranging from northern South America to southern Mexico. Its main habitat is in the peri-domestic environment (firewood piles, chicken dens and goat corrals), and environmental management should focus on this habitat (Bos, 1988; Zeledon et al, 2008).

There is a growing concern that Chagas disease may become a public health issue in non-endemic countries as a result of intensified global human mobility and migration, if parasite carriers from endemic countries come into touch with local potential vectors – for example *Triatoma rubrofasciata* in South-East Asia. In 2015, there is no evidence yet of a measurable Chagas disease burden in non-endemic countries. Studies of the ecology and biology of local potential vector species are an important measure of preparedness for such public health eventualities (WHO, 2011e).

No vaccine to protect against *T. cruzi* exists. Drugs exist to treat Chagas disease effectively at the earliest onset and acute phase. For lack of distinct clinical symptoms, this phase often passes unnoticed. Successful treatment in the chronic phase remains extremely limited.

Environmental management strategies to reduce or eliminate vector populations or human-vector contact include housing improvements to prevent vector infestation, such as plastered walls, cement floors and corrugated-iron roofs, and peri-domestic environmental management including improved management of animals (poultry, goats and other sources of blood meals), removing organic debris and wood piles (Abad-Franch et al, 2005; Bos, 1988; Coutinho et al, 2014; Rojas-De-Arias, 2001; Rozendaal,



One of the three main Chagas vectors – *Rhodnius prolixus*

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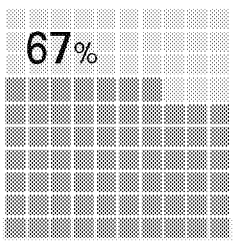
1997; WHO, 2014g). Chagas transmission has also been associated with extensive deforestation and the displacement of wild animals which are the normal source of blood for the triatomines (Coura & Junqueira, 2012), and as an occupational hazard of work in plant extraction (Coura, 2013). Information on IVM is provided in Box 3 (malaria).

The global mean fraction of the Chagas disease burden attributable to environmental conditions that can be managed is estimated to be 56% (28–80%) (estimate based on expert survey 2005, see Section 2).

SELECTED INTERVENTIONS

- In Guatemala, wall plastering and improved household hygiene effectively reduced the Chagas vector population densities (Monroy et al, 2009).
- In Costa Rica, housing interventions showed long-term effectiveness in Chagas vector control (Zeledon & Rojas, 2006; Zeledon et al, 2008).

LYMPHATIC FILARIASIS



Water, sanitation and hygiene
Method: expert survey

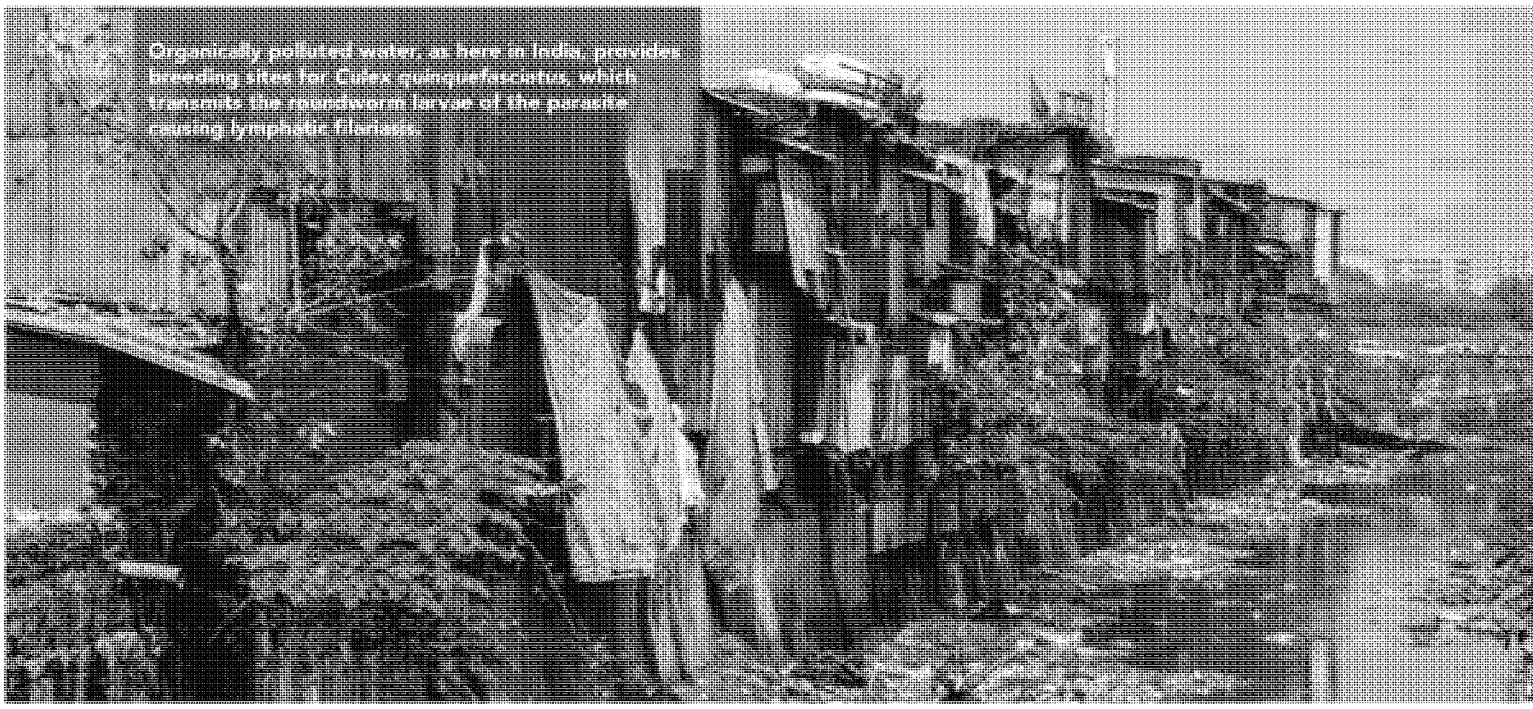
Lymphatic filariasis is caused by infection with one of three species of parasitic roundworms of the family Filarioidea: *Wuchereria bancrofti* (responsible for 90% of the cases), *Brugia malayi* (responsible for most of the remainder of the cases) and *B. timori* (with a distribution limited to the Lesser Sunda Islands of Indonesia and Timor Leste). Over 120 million people are currently infected with lymphatic filariasis, mainly in South-East Asia and Africa, but also in other tropical areas (WHO, 2014t). The adult worms lodge in lymphatic vessels where they cause damage and disrupt the immune system, later in life leading to lymphedema, abnormal swelling of extremities or, in men, of the scrotum. The infection can be at the root of severe disability in later life.

Adult worms shed large quantities of microfilariae into their human host's blood, which are then picked up by mosquitoes. Transmission occurs by the bite of mosquitoes harbouring the worms' larvae. Favourable conditions for transmission depend on the ecological requirements of the different mosquito vector species involved (Rozendaal, 1997). These also determine suitable approaches of environmental management for transmission interruption. A number of general habitat types can be distinguished.

In urban settings of South and South-East Asia and in the Americas, the predominant parasitic worm (*Wuchereria bancrofti*) is transmitted by *Culex quinquefasciatus* which breeds in organically polluted water (open sewage drains and wastewater treatment ponds) (Erlanger et al, 2005; Gazzinelli et al, 2012; Meyrowitsch et al, 1998; Prichard et al, 2012).

In Africa, both *Culex quinquefasciatus* and *Anopheles gambiae* are key vectors in coastal areas, whereas inland *A. gambiae* complex and *A. funestus* are the main vectors. As a result, lymphatic filariasis is associated with organically polluted water in coastal cities, coastal freshwater collections and inland irrigation schemes (Appawu et al, 2001; Erlanger et al, 2005).

In parts of the WHO Western Pacific Region, bancroftian filariasis is transmitted by *Aedes* species, including *A. polynesiensis* which breeds in crab holes and other containers, both natural and artificial, that hold water temporarily.



Organically polluted water, as here in India, provides breeding sites for Culex quinquefasciatus, which transmits the roundworm larvae of the parasite causing lymphatic filariasis.

Brugia malayi is endemic mainly in South-East Asia, where it is transmitted by mosquitoes belonging to the genera *Mansonia* and *Anopheles*. *Mansonia* propagate in the presence of aquatic weeds, linking them to man-made reservoirs. In Indonesia, Malaysia and Thailand *Anopheles* species have also been confirmed as vectors.

The vector of *B. timori* is *Anopheles barbirostris* which breeds in irrigated rice fields (Fisher et al, 2004).

The primary strategy recommended by WHO for transmission interruption of lymphatic filariasis is annual mass drug distribution to entire populations living in endemic areas for at least five years. This strategy has worked effectively in several settings. It is acknowledged, however, that long-term sustainability of the benefits of mass drug administration may depend on altering the environmental conditions facilitating transmission (Prichard et al, 2012).

Vector control is recommended to facilitate and sustain interruption of transmission (WHO, 2013d). It may, for example, be difficult to sustain sufficiently adequate coverage of mass drug administration to achieve elimination of lymphatic filariasis. In particular, where *Aedes* species are the vectors, integrating vector management with drug administration will ensure the sustainability of transmission suppression and thereby better ensure the success of national filariasis elimination programmes (Burkot et al, 2006). Experience in the USA from the 1930s points to long-term effects of sewerage systems on the elimination of filariasis by reducing polluted water for breeding of *Culex quinquefasciatus* in South Carolina (Chernin, 1987). General information on IVM is provided in a dedicated guide for lymphatic filariasis (WHO, 2013d), and more generally in Box 3 (malaria). Finally, availability of sufficient clean water also plays an important role in managing morbidity of lymphatic filariasis and preventing further disability (WHO, 2013c).

The variety of locations and vector ecologies involved in this disease was reflected in the large variations in estimates for the population attributable fraction for the disease. In the South-East Asia and Western Pacific regions the population attributable fraction is estimated to be 82% (50–98%), while in the Region of the Americas it is 70%

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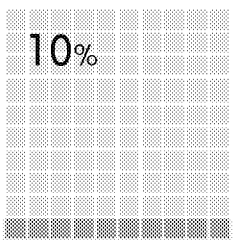
(60–80%), derived mainly from considering urban environmental management. In the African Region, the population attributable fraction is estimated at 40% (20–68%). Globally, the mean fraction of the disease burden due to lymphatic filariasis attributable to environmental conditions that can be managed is estimated to be 67% (39–89%) (estimate based on expert survey 2005, see Section 2).

SELECTED INTERVENTIONS

- In Zanzibar, United Republic of Tanzania, and in Tirukoilur, Tamil Nadu, India, interventions using drug treatment alone and those combined with applying floating layers of polystyrene beads on water containers show that the combined intervention markedly prevented resurgence of filarial infection (Curtis et al, 2002; Sunish et al, 2007).

ONCHOCERCIASIS



Water resource projects, deforestation
Method: expert survey

Onchocerciasis is a disease caused by the parasitic filarial worm *Onchocerca volvulus*. It is the second most important cause of blindness due to infection, after trachoma. More than 99% of people infected live in 31 West and Central African countries; some foci of the disease also exist in Latin America and the Republic of Yemen. Its distribution is closely linked to the distribution of its vectors – blackflies of the genus *Similium*. Repeated exposure to infective bites in endemic areas lead to high parasite loads, and symptoms including severe itching, disfiguring skin conditions and visual impairment, which may lead to permanent blindness (WHO, 2014v).

Simuliid blackflies breed in fast-flowing rivers and streams – in these highly oxygenated waters the larvae are attached to rocks (Rozendaal, 1997). The adult flies take blood meals from animals and humans. High densities of blackflies make fertile river valleys practically uninhabitable due to biting nuisance. The WHO/World Bank/UNDP Onchocerciasis Control Programme successfully eliminated the disease from a number of West African countries (1974–2002) through the systematic aerial application of insecticides in rivers upstream from breeding places, followed by ivermectin mass administration. To date, the Republic of Colombia and Ecuador have eliminated the disease in 2013 and 2014, respectively (WHO, 2013h, 2014j), and a few countries in Africa (Burundi, Malawi and Niger) are very close to the elimination phase of the disease (WHO, 2014a).

In the present analysis, the focus is only on those breeding places that can be eliminated through environmental management. In river systems influenced by water resource projects, particularly dams, proper planning can help reduce vector breeding by:

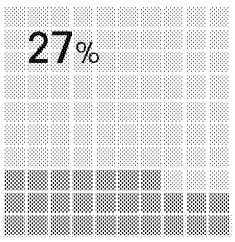
- Building dams with a double-spillway design;
- "Drowning" breeding places in the reservoir area; and
- Changing the hydrology downstream of the dam (Jobin, 1986).

Natural waters have limited opportunities for environmental management and were not considered. Insecticide spraying of streams and rivers was not considered to be an environmental health action. The option of constructing small barrages upstream of breeding places to eliminate favourable ecological conditions has been considered, but for economic reasons never been put into practice. Evidence suggests that disease transmission can be increased by forest degradation related to human activity,

as deforested areas provide a favourable habitat for the vector of the more severe strain of the pathogen (Adjami et al, 2004; Wilson et al, 2002).

Globally, the mean fraction of the disease burden due to onchocerciasis, attributable to environmental conditions that can be managed is estimated to be 10% (7–13%) (estimate based on expert survey 2005, see Section 2).

LEISHMANIASIS



Housing, environmental vector management, sanitation
Method: expert survey

Leishmaniasis is an infectious parasitic disease caused by protozoans of the genus *Leishmania*. It comes to expression in a continuum of species-related clinical manifestations ranging from muco-cutaneous and cutaneous (affecting mucus membranes and the skin) to visceral (affecting internal organs). WHO estimates there are 0.2 to 0.4 million cases of visceral leishmaniasis and 0.7 to 1.3 million cases of cutaneous leishmaniasis each year (WHO, 2014s).

Both cutaneous and visceral leishmaniasis can be classified as either zoonotic or anthroponotic, depending on the main reservoir host. The parasite is transmitted by different species of phlebotomine sandflies. Left untreated, the visceral form of the disease is fatal. Proven vector species for disease transmission are *Phlebotomus* ssp. in Africa and Asia and *Lutzomya* ssp. in Central and South America. In the case of anthroponotic leishmaniasis humans are the main reservoir for visceral leishmaniasis in eastern Africa and the Indian sub-continent, and in the case of cutaneous leishmaniasis in parts of North Africa, and West and Central Asia. For zoonotic leishmaniasis, dogs are the main reservoir for visceral leishmaniasis in the Americas, the Mediterranean basin and parts of Asia, and rodents and other wild animals (sloths, opossums) are the main reservoir for cutaneous leishmaniasis in Africa, Asia and Europe and the Americas. Only a small fraction of those infected by *Leishmania* spp. will develop clinical symptoms.

As a zoonosis, the presence of a large population of parasites in animal reservoir hosts is key to the epidemiology and control of leishmaniasis. In this case, humans are merely incidental hosts, maintaining a small fraction of the parasite population (Ashford, 1996). Control activities usually consist of elimination of rodent reservoirs (e.g. Shaw's jird gerbil – *Meriones shawi*) through poisoning or through environmental modification (destroying burrows of rodents such as the fat sand rat (*Psammomys obesus*). Parasite reservoir-vector human relations are setting specific, and environmental control measures focusing on reservoir and vector control will, as a consequence, always have to be tailor-made. The case example from Tunisia, in the selected interventions box, illustrates this.

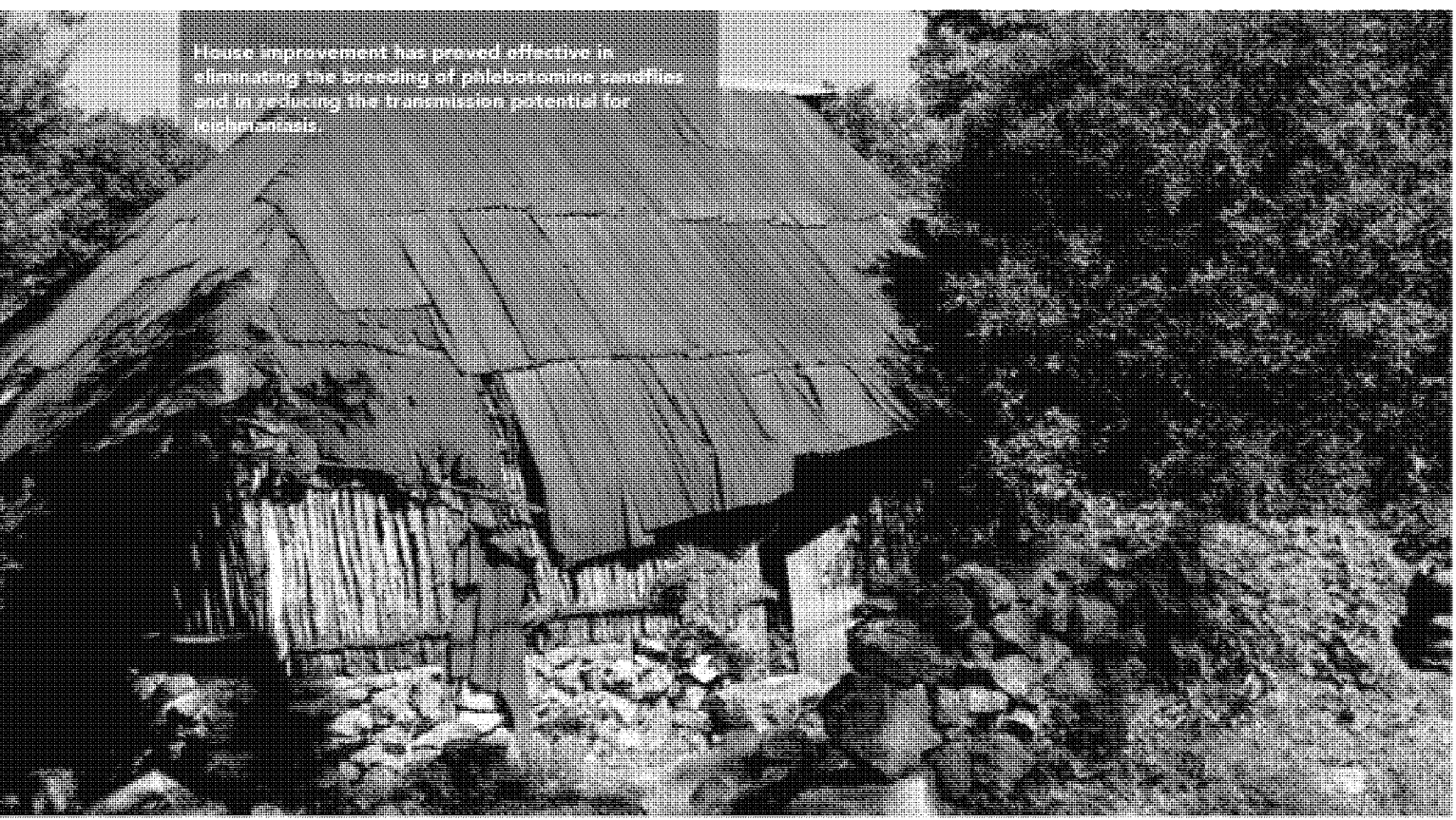
Control of *Phlebotomus* ssp. remains challenging for the lack of definitive, complete knowledge about the breeding places and larval habitats, and about the relative importance of different breeding places. Eggs and larvae have been found most often, however, in moist and dark places. As sandflies usually do not fly more than several hundred metres during their lifetime, breeding options close to the human habitat are critical for disease transmission (Warburg & Faiman, 2011). Sandflies often live in the peri-domestic environment using wall cracks and crevices to lay their eggs, and in compounds where cattle are kept close to living quarters (Bucheton et al, 2002; Desjeux, 2001; Warburg & Faiman, 2011). To

a large extent, leishmaniasis can therefore be prevented by housing improvements, eliminating soil and wall cracks, and removing organic material in the peri-domestic environment (Joshi et al, 2009). In brief, vector control has to rely on sustained environmental sanitation efforts. Information on IVM is provided in Box 3 (malaria).

Blood meal analyses have shown sandflies to be opportunistic, taking blood meals from a range of vertebrates; domestic animals kept close to or in the house will contribute to maintaining a higher population density of vectors, for example in Tunisia (Jaouadi et al, 2013). Moving domestic animals away from human habitation may, in the short term, lead to increased biting of humans, but may, in the longer term, result in transmission reduction. This may be especially important for Africa and Asia where, in the main, the vector is thought to breed close to houses. Migrant agricultural labourers without proper housing are particularly at risk and should rely on personal protection measures, such as sleeping under mosquito nets (Argaw et al, 2013). In Central and South America, *Lutzomya* ssp. are traditionally found most frequently in natural environments (e.g. forests), but due to deforestation, migration and urbanization, leishmaniasis vectors have spread to other environments (e.g. cities) and transmission to humans also occurs increasingly in and around houses (Campbell-Lendrum et al, 2001; Desjeux, 2001; Yadon et al, 2003). Leishmaniasis is climate-sensitive and climate change and land degradation can have strong effects on vectors and reservoir hosts (WHO, 2014s).

In Africa and Asia, where the peri-domestic environment and reservoir habitats play a major role in disease transmission, the disease fraction attributable to the environment is estimated to be 27% (11–40%). The fraction attributable to the environment in Central and South America, where the vector is more prevalent in natural environments, is estimated to be 12% (1–30%).

Globally, the mean fraction of the leishmaniasis burden attributable to environmental conditions that can be managed is estimated to be 27% (9–40%) (estimate based on expert survey 2005, see Section 2).



House improvement has proved effective in eliminating the breeding of phlebotomine sandflies and in reducing the transmission potential for leishmaniasis.

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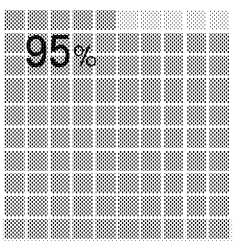
SELECTED INTERVENTIONS

- **Leishmaniasis Reservoir Control in Tunisia:** In 1982, the stable transmission focus of cutaneous leishmaniasis in the Gafsa/El Guettar oases of Tunisia extended to a new focus in the Sidi Saad area following the construction of a dam. Distribution of the main reservoir host, the fat sand rat, is directly linked to the abundance of vegetation on which it specifically feeds: plants of the family of Chenopodiaceae, occurring in saline environments. A control strategy based on eliminating the rodents' food plants and destroying its habitat by deep ploughing and the planting of trees proved successful. But the feasibility of this type of intervention depends on the density of the human population – in scarcely populated areas this preventive approach is not cost-effective when calculated on the basis of cost per case prevented. Monitoring flood regimes in river basins provides a predictive tool for outbreaks caused by explosive vegetation growth and its impact on the reservoir population (Fichet-Calvet et al, 2000).

DENGUE



Water and waste management
Method: expert survey

Dengue fever is the most rapidly spreading mosquito-borne viral disease in the world. There is considerable underreporting and misclassification in the surveillance of dengue cases. One recent estimate indicates 390 million dengue infections per year (95% CI: 284–528 million), of which 96 million (95% CI: 67–136 million) with clinical manifestations (Bhatt et al, 2013). Another prevalence study estimates that 3 900 million people, in 128 countries, are at risk of infection with dengue viruses (Brady et al, 2012). Member States in three WHO regions reported nearly 2.4 million cases in 2010 (WHO, 2015b). The initiative to record all dengue cases partly explains the sharp increase in the number of cases reported in recent years. Other features of the disease include its epidemiological patterns, including hyper-endemicity of multiple dengue virus serotypes in many countries and the alarming impact on the global and national economies.

The dengue virus, a flavivirus, is related to West Nile, Japanese encephalitis and yellow fever viruses. Infected persons develop flu-like symptoms, especially painful joints; severe dengue has potentially deadly complications, particularly in children.

Rapid urbanization, unreliable drinking-water supply services, increased population mobility and global trade are important determinants of the resurgence of the disease (WHO, 2012e). There is no specific treatment for dengue fever. Developing a vaccine has been challenging, but there has been significant progress recently. Three tetravalent live-attenuated vaccines are in phase 2 and phase 3 clinical trials, and three other vaccine candidates are at earlier stages of clinical development.

Strategies to prevent dengue fever therefore focus on bringing down population densities of mosquito vectors (*Aedes aegypti* and *Aedes albopictus*) through source reduction and/or minimizing human/vector contact. The latter is a challenge as these mosquitoes are daytime biters, limiting the practical use of mosquito nets to babies and small toddlers.

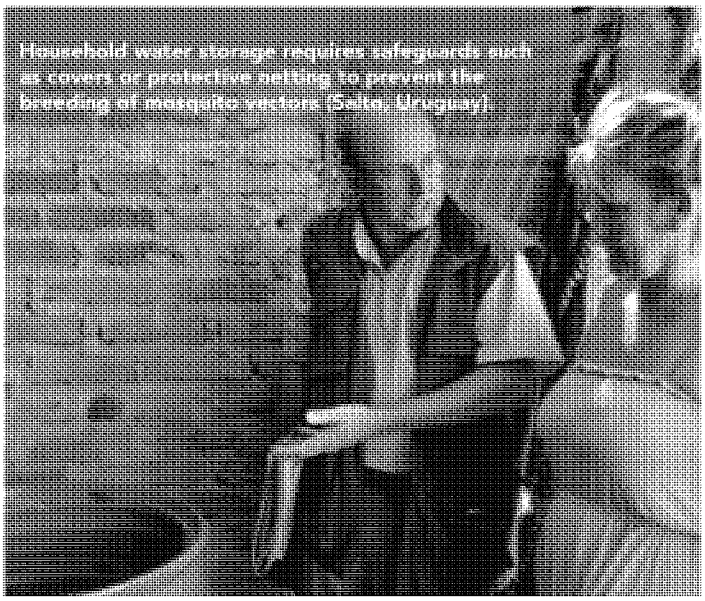
The vector breeds in clean, man-made and sometimes natural (axils of bromeliad plants, their natural habitat) water collections close to human dwellings. Various types of man-made dengue breeding places can be distinguished:

- Drinking-water containers, particularly in areas where rainwater collection is common. These can be anything from small barrels to the large (200-litre) traditional water jars found in South-East Asia;

- Other water containers in and around the house (ant traps, flower vases, potted plant trays, air-conditioning trays); flower vases at cemeteries have also been shown to be productive breeding places;
- Standing water in urban infrastructure (roof gutters, manholes and wells); and
- Solid waste (car tyres and fast food containers are notorious, but basically any waste that can serve as a container for rainwater collection).

It has been shown that the extension of piped drinking-water to rural communities without due attention to the reliability of services has been conducive to the spread of dengue transmission from urban to rural zones. Unreliable piped water services lead households to increase water storage in containers for longer periods of time (Kumar et al, 2001). Global trade and mobility have contributed to the spread of dengue, in particular the trade in used car tyres with *Aedes* larvae in water collections they may contain (WHO, 2015b). Climate and other environmental factors are crucial determinants of the distribution of the vector species and of dengue fever prevalence (Raheel et al, 2011). Global climate change may have a significant impact on this geographical distribution through changes in temperature, rainfall and humidity (Barclay, 2008; WHO, 2015b).

A range of environmental management measures, delivered as part of an IVM approach (see Box 3 – malaria) have been shown to be cost-effective in specific settings (WHO & TDR, 2009). The provision of reliable piped water supplies eliminates the need for household water storage. Mosquito-proofing of water containers, through netting or by design, can be effective but requires ongoing advocacy. Viable biological control methods include the use of larvivorous species (fish or tiny crustaceans known as copepods) in drinking-water containers for example (Kay et al, 2002). Their effectiveness and sustainability depends largely on community engagement and social acceptability. Solid waste management and well-enforced urban building design regulations can also play a significant role in source reduction.


Household water storage requires safeguards such as covers or protective netting to prevent the breeding of mosquito vectors (Salto, Uruguay).

The global mean fraction of the disease burden due to dengue fever attributable to environmental conditions that can be managed is estimated to be 95% (89–100%) (estimate based on expert survey 2005, see Section 2).

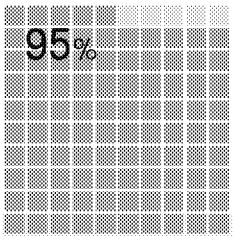
SELECTED INTERVENTIONS

- Integrated vector management was shown to be the most effective dengue vector control measure and showed in meta-analysis a mean reduction of 83% of infested houses, of 88% reduction of infested water containers and of 67% reduction of infested containers per 100 houses inspected (Erlanger et al, 2008).

ECONOMIC EVALUATIONS

- Integrated vector management in Santiago de Cuba was more efficient and effective than routine (mainly chemical) dengue vector control. The average cost-effectiveness ratio was US$ 831 per focus for IVM and US$ 2466 for routine vector control (Baly et al, 2009).

JAPANESE ENCEPHALITIS

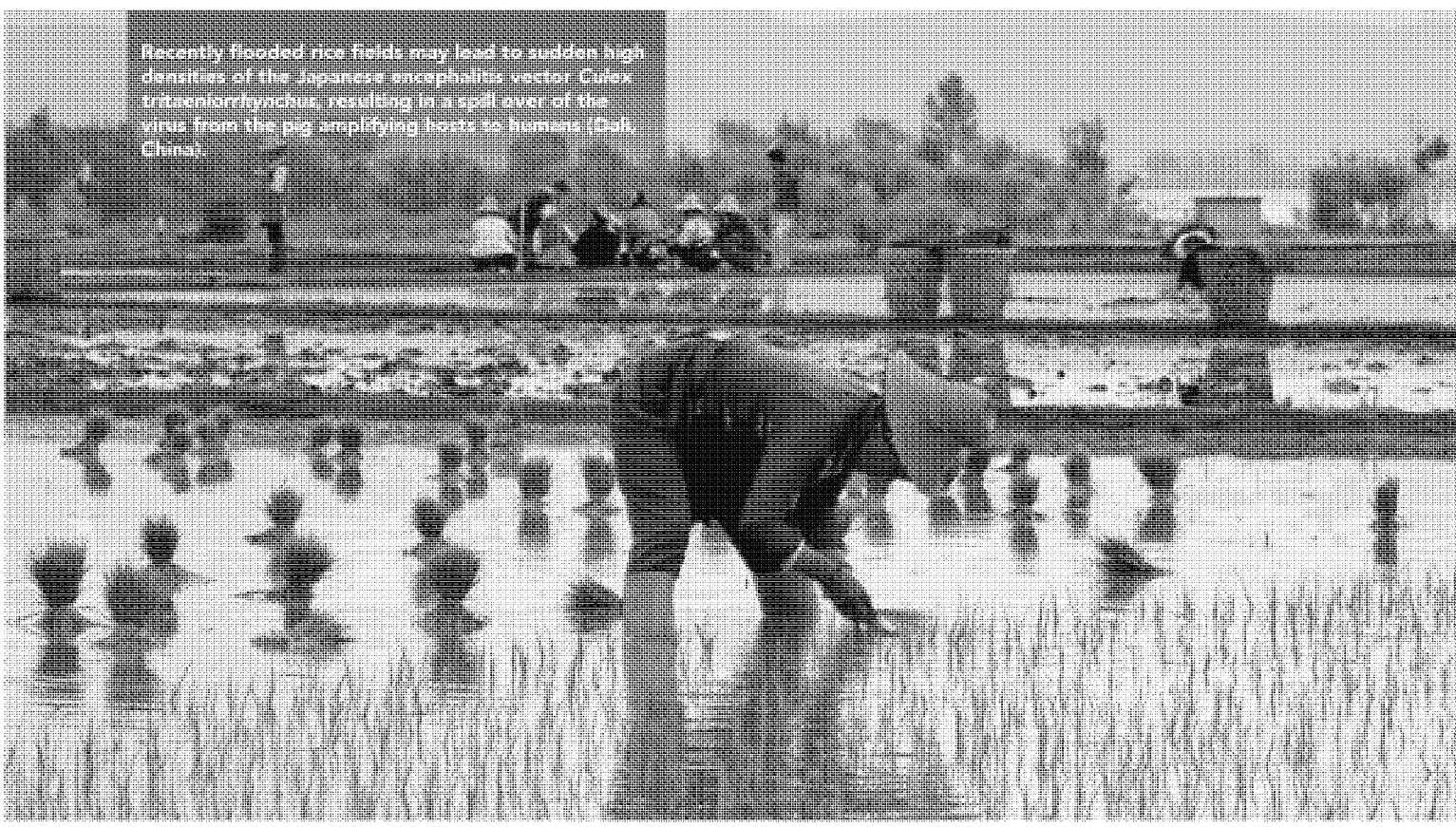


Agricultural practices, personal protection
Method: expert survey

Japanese encephalitis (JE) virus, a flavivirus related to West Nile virus and Saint Louis encephalitis virus, is the leading cause of viral encephalitis in South, South-East and East Asia. The annual incidence of clinical disease varies both across and within countries, ranging from <10 to >100 per 100 000 population. A recent literature review estimates nearly 68 000 clinical cases of JE globally each year, with up to 20 400 deaths due to JE (Campbell et al, 2011). JE primarily affects children. Most adults in endemic countries have natural immunity after childhood infection, but individuals of any age may be affected.

Although symptomatic JE is rare, the case-fatality rate among those with encephalitis can be as high as 30% (WHO, 2014r). Of those who survive, 30–50% suffer important long-term neurological sequelae (conditions resulting from having had the disease). There is considerable misdiagnosis and under reporting, and the number of real cases is assumed to be significantly higher. The annual number of cases fluctuates importantly, with peak outbreaks occurring every 2 to 15 years. In 2011, reporting from 19 out of 24 endemic countries added up to 10 426 cases, 95% of which were reported from India and China (mainly Yunnan Province) (Tarantola et al, 2014).

The JE virus has well-defined links to specific ecologies, mainly irrigated rice production systems. The natural hosts of the virus are ardeid birds (herons and egrets living in an aquatic environment). Pigs are the main amplifying host. The mosquito vectors of the JE virus (*Culex tritaenorhynchus, C. vishnui* and the suspected vector *C. gelidus*) breed by preference in irrigated rice fields and in natural wetland areas; these *Culex* species are zoophilic (i.e. they prefer taking their



Recently flooded rice fields may lead to sudden high densities of the Japanese encephalitis vector *Culex tritaeniorrhynchus*, resulting in a spill over of the virus from the pig amplifying hosts to humans (Dali, China).

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blood meals from animals rather than humans). In special conditions, however, mosquito populations may build up so rapidly that the virus transmission spills over into the human community. Such situations include the flooding of large areas of rice fields at the time of transplantation of the rice plants, or when there is a heavy on-set of the rainy season.

By and large, the distribution of JE is limited mainly to rural or peri-urban areas and has been associated with climate, agricultural development and rice cultivation (WHO, 2014r). As the demand for rice and pork is likely to grow substantially in the future, there is concern that the frequency and intensity of JE outbreaks will increase. Furthermore, climate change might impact on the geographical distribution of the disease, directly by changing patterns in precipitation (Gould et al, 2006) or because it may affect the migration routes and patterns of ardeid birds.

JE is a vaccine-preventable disease. The effectiveness of vaccines has greatly improved since the 1990s. The drawback of earlier vaccines, which required two boosts, six and twelve weeks after the initial vaccination to offer full protection for three years, has been eliminated with the arrival of new vaccines. Recently, the live attenuated SA14-14-2 vaccine, manufactured in China, has become the most widely used vaccine in endemic countries, and it was prequalified by WHO in October 2013. In many countries, the capacity to deliver costly vaccination programmes in rural areas remains limited. From the perspective of each individual at risk, vaccination is the only intervention ensuring 100% protection. Yet, from the public health perspective there are situations and conditions where environmental health interventions can make significant contributions to a reduction in JE transmission (Erlanger et al, 2009; Keiser et al, 2005; Rozendaal, 1997). These include:

- Improved pig husbandry, providing pigs with mosquito-proof pigsties where they can be housed during peak mosquito biting times. Vaccinating pigs against the virus has been a successful approach in Japan, but in most countries implementing such vaccination campaigns would run into the same logistical challenges as human vaccination campaigns, and moreover, pig populations have a high turnover. Physically separating pig rearing and rice production may be a feasible option in some countries. Rural development programmes should never promote pig rearing as a secondary source of income for farmers in rice-growing areas in Asia.
- Managing irrigated rice production systems to reduce JE vector populations is a tall order in most places in Asia, but in areas where water scarcity is increasing, farmers may be forced to engage in a regime of intermittent irrigation (alternate wetting and drying of rice fields). Where this is the case, such a regime may be designed to take the larval part of the mosquito life cycle into account, ensuring larvae are stranded and killed before they reach adulthood. There are also options to coordinate integrated pest management (IPM) efforts in rice production systems with IVM methods (see Box 3 – malaria).
- Personal protection methods, particularly for the most vulnerable groups (children under 15), include the proper use of mosquito nets, impregnated or not, the use of repellents and the mosquito-proofing of houses (window screens, netting around the eaves).

The mean fraction of the disease burden due to Japanese encephalitis attributable to environmental conditions that can be managed is estimated to be 95% (90–99%) (estimate based on expert survey 2005, see Section 2).

There is a dearth of evidence on the economic aspects of JE control, but clearly measures based on improved pig husbandry, irrigation water management and housing improvements would alleviate the burden health sector budgets.

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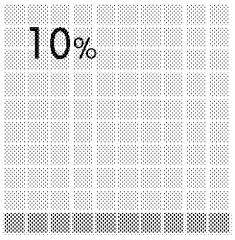
HIV/AIDS



Occupational risks
Method: epidemiological estimates

In 2013, around 35 million people were living with the human immunodeficiency virus (HIV). Large regional differences remain. Sub-Saharan Africa is the most affected region (with approximately 68% of adults infected globally) but other significant infected percentages are found in Caribbean, Eastern Europe and Asia. Sexual transmission accounts for the great majority of HIV infections but in some regions, i.e. in Eastern Europe and Central Asia, injecting drugs is the main risk factor (UNAIDS, 2013).

Certain occupational groups are at increased risk of acquiring or transmitting HIV. These include commercial sex workers, health-care workers who may be infected by needlestick injuries or other exposures, and workers who spend part of the year away from their families (referred to as workers at "intermediate risk"). Female sex workers are 13.5 times more likely to be HIV infected than the general female adult population (Baral et al, 2012; Kerrigan et al, 2013). Worldwide, a significant percentage of the female population is involved in the commercial sex industry. A global review estimated that female sex workers present 0.4–4.3% of the female population in urban areas in sub-Saharan Africa, 0.2–2.6% in Asia and 0.2–7.4% in Latin America (Vandepitte et al, 2006). The global proportion of health-care workers in the general population is estimated to be 0.6% and the overall fraction of HIV infection acquired through a needlestick injury among this occupational group is 4.4% (Prüss-Ustün et al, 2005).

Workers at intermediate risk mainly include the uniformed workforce (e.g. policemen), the military, miners, truck drivers, migrant construction workers, seafarers and fishermen. Because many in these sectors live away from their families part of the year, they are more likely to have sex with sex workers and other occasional partners, and thus be at increased risk of infecting themselves and their partners on return home (UNAIDS & WHO, 2009). It was shown that these occupational groups are generally more vulnerable to HIV infections compared with the general population (Fraser, 2008; Kissling et al, 2005). Thus many prevention interventions have been set up to target specific occupational groups (Kerrigan et al, 2013; Ojo et al, 2011) (see box on selected interventions). The intermediate risk group is around 3% of the total population, but its risk is relatively lower than that of commercial sex workers.

The fraction of HIV/AIDS attributable to occupation can be roughly estimated by comparing the adult prevalence rate in the general population with that of commercial sex workers (Prüss-Ustün et al, 2013), or workers at intermediate risk (after accounting for competing risks, such as intravenous drug use). In adults, for example, the prevalence of HIV in female sex workers was estimated to be 12–29 times higher than in the general female population, depending on the region (Baral et al, 2012). Around 15% of HIV in the general female adult population is thought to be attributable to female sex work (Prüss-Ustün et al, 2013). Information on male sex workers was too scarce to make an estimate. In 2005 it was estimated that about 0.02% of the global HIV/AIDS burden was caused by percutaneous injuries to health-care workers (Prüss-Ustün et al, 2005).

Based on an approximate estimation using available epidemiological data (see Annex 2 for details), the occupation-related population attributable fraction for HIV/AIDS in adults was estimated to be 1–5% (0–11%) in most regions. In regions such as

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sub-Saharan Africa – which has higher rates of sex workers or very high rates of HIV in commercial sex workers as compared with the general population – the population attributable fraction was estimated to be as high as 10% (8–13%). Globally, occupational causes accounted for about 10% (8–13%) of HIV transmissions in adults, causing 140 000 deaths annually (calculations based on epidemiological data, see Annex 3.3). This estimate only covers HIV transmission to sex workers and workers at intermediate risk (truck drivers, fishermen, the military etc.), but infected workers may in turn infect members of the general population. In certain countries, the HIV epidemic may even be largely driven by commercial sex activities or spread predominantly by truck drivers and other clients. The impact of prevention that is targeted to certain occupational groups may therefore be more far-reaching than simply improving workers' health (the parameter used in this study to simplify quantification).

SELECTED INTERVENTIONS

- Behavioural interventions were shown to effectively reduce HIV and the incidence of other sexually transmitted diseases (STDs) (Wariki et al, 2012) and increased knowledge about HIV-transmission in sex workers and their clients (Ota et al, 2011).
- Cambodia and Thailand, countries with an early and rapid rise of the HIV epidemic, implemented highly successful prevention programmes that were associated with an increase in condom use in the commercial sex sector to around 90% (Rojanapithayakorn & Hanenberg, 1996; Ruxrungtham et al, 2004).
- Several forms of empowerment-based comprehensive HIV prevention among sex workers have proved successful, for example in Brazil, the Dominican Republic and India (Kerrigan et al, 2013).
- The *Joint WHO-ILO-UNAIDS policy guidelines on improving health workers' access to HIV and TB prevention, treatment, care and support services* recommend the development or strengthening of existing infection control programmes, especially with respect to TB and HIV infection control, and collaboration with workplace health and safety programmes to ensure a safer work environment (WHO, UNAIDS & ILO, 2010).
- Effective measures to prevent infections from occupational exposure of health-care workers to blood include eliminating unnecessary injections, implementing universal precautions, eliminating needle recapping and disposing needles into a sharps container immediately after use, use of safer devices such as needles that sheath or retract after use, provision and use of personal protective equipment, and training workers in the risks and prevention of transmission (Wilburn & Eijkemans, 2004).

ECONOMIC EVALUATIONS

- The cost per HIV infection averted for community empowerment-based comprehensive HIV prevention depends on the HIV prevalence. It amounts to US$ 1 990 in the Ukraine, US$ 3 813 in Kenya, US$ 66 128 in Thailand and US$ 32 773 in Brazil (Kerrigan et al, 2013).
- The cost per client for the community-based, comprehensive HIV prevention intervention among sex workers ranges from US$ 102 to US$ 184. When removing the averted HIV-related medical costs, those costs are significantly reduced (Kerrigan et al, 2013).

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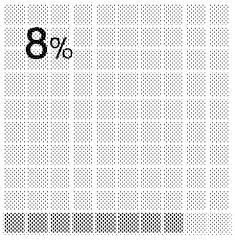
SEXUALLY TRANSMITTED DISEASES



Occupational risks
Method: epidemiological estimates

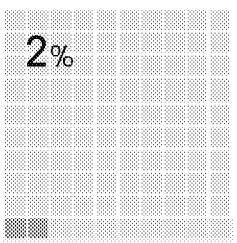
Each year, an estimated 500 million people acquire chlamydia, gonorrhoea, syphilis or trichomoniasis (WHO, 2013i). Hepatitis B, hepatitis C and HIV/AIDS are covered in separate sections.

Workers in several occupations are at increased risk of infection. Sex workers, in particular, are at high risk for STDs compared with the general population (Cwikel et al, 2008; Zoni et al, 2013). Other groups of workers, including truck drivers, military, fishermen, miners, certain construction workers and migrant agricultural workers are also at increased risk of infection because their work takes them away from home for extended periods of time and they are more likely to seek casual partners, particularly from among commercial sex workers (Goyal et al, 2012; Kwena et al, 2010; Zhang et al, 2010; X. Zhang et al, 2013). Interventions for preventing infections, or screening and treatment programmes, have been successful in certain occupational groups (MacDonald, 2013; Ross et al, 2006).

Although the transmission rates of STDs to sex workers and other workers at increased risk may be significant within the occupational group, such worker categories represent a relatively small fraction of the general population (typically 0.2–4% of female sex workers among female adults, depending on the region), and only about 3% of workers globally are at increased risk. The total population attributable fraction for the occupational disease burden, based on the main STDs except HIV/AIDS (syphilis, chlamydia, gonorrhoea etc.) was estimated to be 8% (4–17%) in adults, varying significantly by type of infection and region. These estimates are based on epidemiological data (see Annex 3.3 for additional information). For certain STDs in certain regions this fraction can reach as much as 25%.

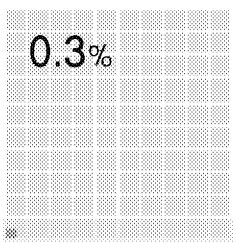
This estimate covers the transmission to workers, rather than infections to the general population by infected workers. Transmission to the general population from workers is potentially a major consequence of occupational transmission, and in some countries may even fuel the ongoing epidemic, but it is not considered here.

HEPATITIS B



Occupational risks
Method: epidemiological estimates

HEPATITIS C



Occupational risks
Method: epidemiological estimates

Hepatitis B and C are viral liver infections that can become chronic which can lead to cirrhosis or liver cancer (WHO, 2014n). The infections can be transmitted by exposure to infected blood or body fluids. More than one million people die every year from hepatitis B- and C-related liver diseases (WHO, 2014o, 2014p).

Certain occupational groups are at increased risk of infection with the hepatitis B virus (HBV) or C virus (HCV) at work, or because of their working and living conditions. Many of the occupational groups at risk are the same as those at risk for occupational HIV infection and STDs. The groups include commercial sex workers (Atkins & Nolan, 2005), workers exposed to percutaneous injuries with contaminated sharp objects

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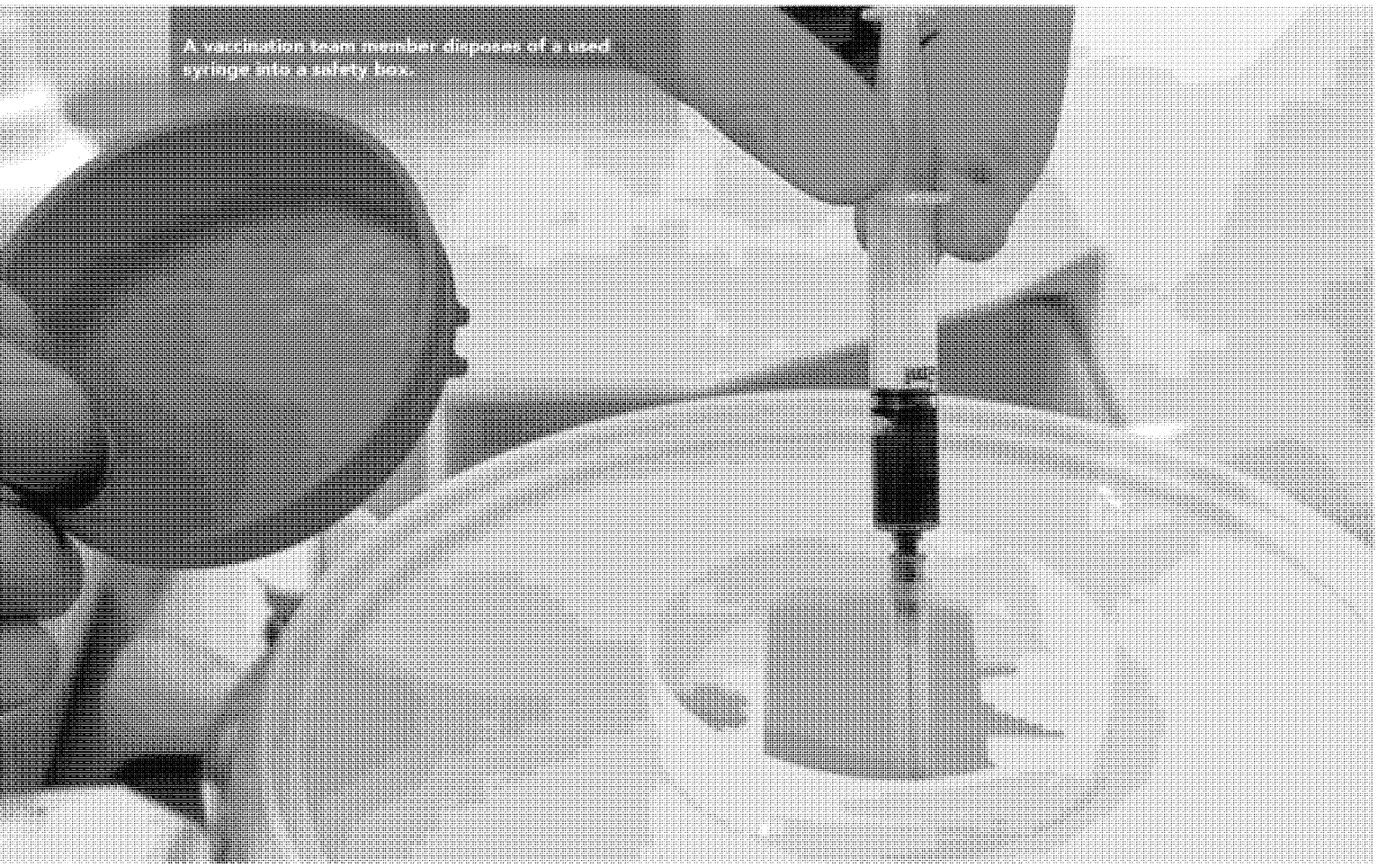

A vaccination team member disposes of a used syringe into a safety box.

(e.g. nurses, doctors, laboratory staff, waste workers) (Corrao et al, 2013; Singh, 2009; WHO, 2014n) and workers at intermediate risk (e.g. migrant workers, members of the uniformed workforce, miners, truck drivers, fishermen) who spend time away from home and are more likely to seek out the services of sex workers (Government of Kiribati & Secretariat of the Pacific Community, 2008; Manjunath et al , 2002; Pinho et al, 2011).

Although HBV is highly sexually transmissible, it is not always possible to dissociate this route of transmission from other means, for example injecting drug use, as studies of commercial sex workers have shown. Nevertheless, hepatitis B is generally more prevalent in commercial sex workers than in the general population in LMIC (Camejo et al, 2003; Forbi et al, 2008; Zhang et al, 2014). The risk of sexual transmission of HCV between monogamous partners is extremely low, but is higher among men who have sex with men, especially in case of concomitant infection (Tohme & Holmberg, 2010; WHO, 2014p).

It was estimated that the population attributable fractions for occupational HBV and HCV infections in health-care workers are 0.3% of the global hepatitis C burden, corresponding to 16 400 HCV infections per year; and 0.3% of the global hepatitis B burden, corresponding to 65 600 HBV infections per year (Prüss-Ustün et al, 2005). Based on comparisons of prevalence in commercial female sex workers, workers at intermediate risk and the general population, it was estimated that the total population attributable fraction for occupational HBV infections in adults was 2% (1–4%). These estimates are based on epidemiological data (see Annex 3.3 for additional information). In high-income countries, only infections of health-care workers from sharps injuries were considered.

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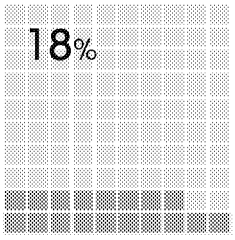
TUBERCULOSIS

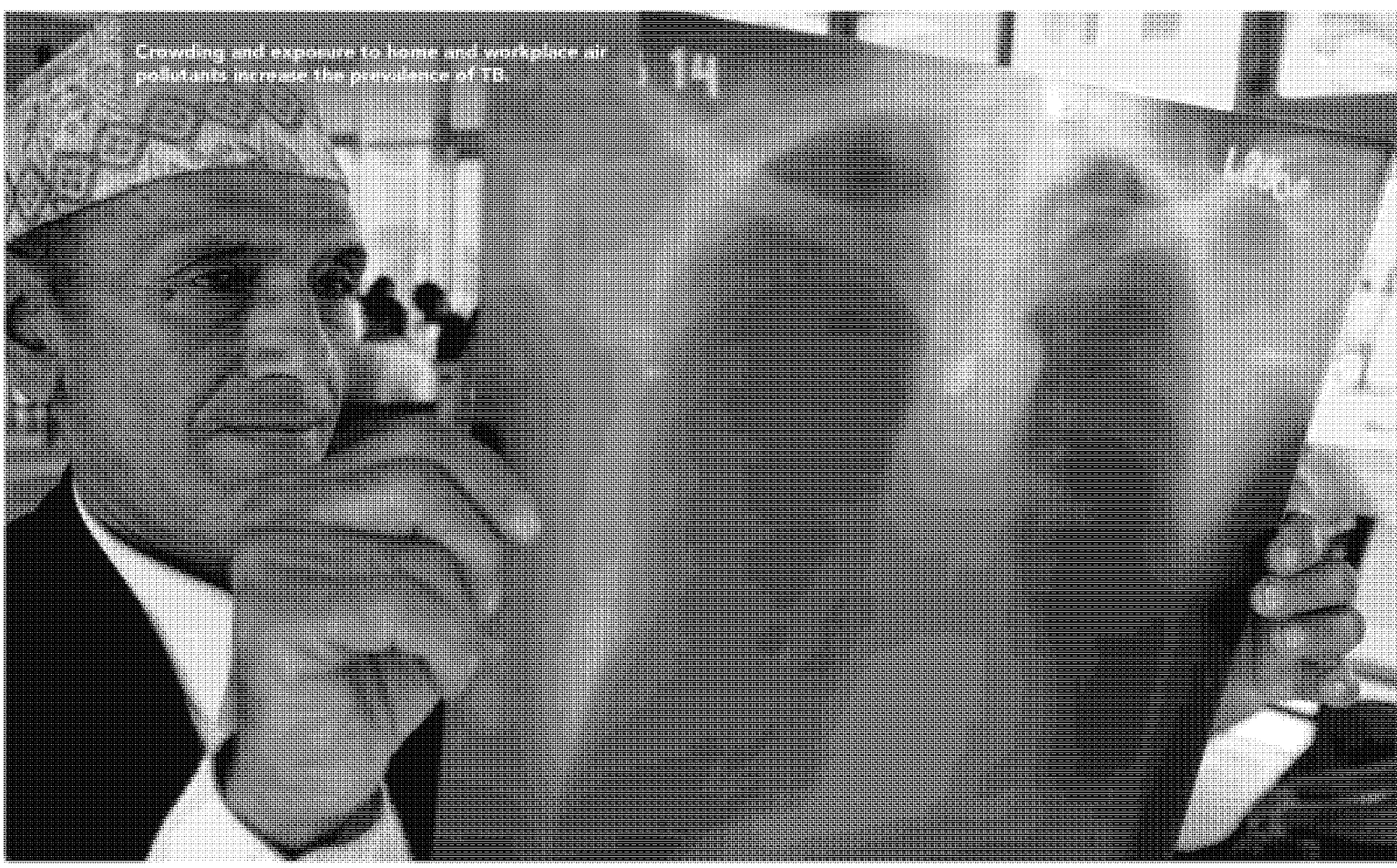


Occupational risks, housing, exposure to smoke
Method: expert survey

Tuberculosis (TB) is an infectious bacterial disease caused by *Mycobacterium tuberculosis*. The disease kills 1.5 million people per year, and 95% of them occur in LMIC (in 2013) (WHO, 2014m). About one third of the world's population is infected with the latent TB bacteria, but only in a small fraction (up to 10%) will the disease progress to the active state. Certain risk factors influence exposure to tuberculosis, risk of acquiring the infection or progression from latent tuberculosis infection to disease (Lönnroth et al, 2009).

For instance, crowding in households or other settings may favour transmission of the causal pathogen, increasing the likelihood of prolonged close contact between susceptible people and infectious tuberculosis cases (Baker et al, 2011; Canadian Tuberculosis Committee, 2007; Lienhardt, 2001). Malnutrition increases the risk of progression to tuberculosis, and worsens the prognosis, because it compromises the immune system (Jaganath & Mupere, 2012; Schaible & Kaufmann, 2007). Exposure to both indoor smoke from solid fuels (Sumpter & Chandramohan, 2013) and second-hand tobacco smoke (Leung et al, 2010) have been associated with increased tuberculosis rates, but the nature of this association is not well understood.

Certain occupational groups are at increased risk of tuberculosis. Exposure of miners to silica dust has been associated with increased risk of developing tuberculosis and could be reduced through protective measures such as dust control (Gottesfeld et al, 2011; NIOSH, 2002; Rees & Murray, 2007;



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Stuckler et al, 2013). Health-care workers who come into contact with tuberculosis patients are also at increased risk of infection, and the fraction of tuberculosis in the population due to this occupational exposure was estimated at about 0.4% (Baussano et al, 2011). Among detained populations (prisons, refugee camps etc.), tuberculosis rates are particularly high. The fraction of TB attributable to exposure in prisons alone was estimated to amount to more than 6% of the total TB burden (Baussano et al, 2010). The epidemiological impact of focusing on diagnosis and treatment alone has been less than expected, for example due to challenges posed by multidrug resistance and weak health systems. Additional interventions sustainably addressing living and working conditions, as well as specific risk factors are required to meet long-term targets (Lönnroth et al, 2009).

For most of the world, it was estimated that about 19% (5–46%) of the total tuberculosis burden was attributable to the environment, although in areas where the HIV epidemic had a large impact on tuberculosis incidence it was likely that environmental factors had a smaller relative effect (estimate based on expert survey 2005, see Section 2). In parts of Africa that are strongly affected by HIV/AIDS, for example, the population attributable fraction for tuberculosis associated with the environment was estimated to be only 14% (4–24%). Although tuberculosis may have a strong environmental component, this does not mean that environmental management alone will control the epidemic. It is clear, however, that managing environmental risk factors could significantly reduce the disease burden of tuberculosis.

OTHER INFECTIOUS AND PARASITIC DISEASES

Several smaller diseases are not considered separately in terms of health statistics, but may still have an environmental component. Examples include leptospirosis – through environmental or occupational exposure to infected animal urine or water containing animal urine; typhus fever, transmitted through rat fleas; Q fever through occupational contact while processing infected animals; rabies, through contact with infected stray dogs or other domestic or wild animals; Chikungunya, transmitted through the same mosquitoes as dengue, and which can therefore be prevented in similar ways; other vector-borne encephalitides or fevers; hepatitis A and E, linked to poor sanitation and faecally contaminated water; coccidioidomycosis or histoplasmosis, through inhaling infective dust; dracunculiasis, through drinking-water; and Lyme's disease or Crimean-Congo haemorrhagic fever, which can be addressed through environmental management (Heymann, 2008; WHO, 2015a).

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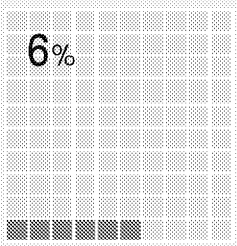
NEONATAL AND NUTRITIONAL CONDITIONS

NEONATAL CONDITIONS



Occupational risks, chemicals, air pollution, water, sanitation and hygiene
Method: expert survey

Neonatal conditions include adverse pregnancy outcomes like low birth weight, prematurity, intrauterine growth restriction, stillbirth and neonatal sepsis and infections. Congenital malformations are included in the section on congenital anomalies.

Around 15 million preterm births occurred in 2010 (Blencowe et al, 2012) and resulted in 869 000 deaths (Lozano et al, 2012). Preterm birth is the main risk factor for neonatal mortality and is associated with many chronic diseases in later life. Additionally, 3 million stillbirths are thought to occur each year, the great majority in low-income countries (Lawn et al, 2010). The percentage of low birth weight babies ranged broadly between 5–9% in the years 2007–2012 but can be much higher in low-income countries (World Bank, 2014).

Higher rates of adverse pregnancy outcomes were observed for mothers exposed to different environmental or occupational risks. It should, however, be noted that evidence linking environmental exposures and adverse pregnancy outcomes is limited and shows different methodological shortcomings (Ferguson et al, 2013; Nieuwenhuijsen et al, 2013; Slama et al, 2008).

Exposure to ambient air pollution (PM2.5, PM10, NO_2, traffic density) is believed to significantly increase preterm birth, low birth weight and infant mortality (Ferguson et al, 2013; Nieuwenhuijsen et al, 2013; Pedersen et al, 2013; Proietti et al, 2013; Stieb et al, 2012). Household air pollution from solid fuel combustion was a significant determinant for low birth weight in several reviews (Misra et al, 2012; Patelarou & Kelly, 2014; Pope et al, 2010) and also for stillbirth (Pope et al, 2010). Furthermore, there is some evidence that other indoor exposures, e.g. polycyclic aromatic hydrocarbons or benzene, are associated with adverse pregnancy outcomes (Patelarou & Kelly, 2014). It was estimated that a reduction in PM2.5 exposure to 10µg/m³ during pregnancy would decrease low birth weight at term by 22% (Pedersen et al, 2013). The population attributable fraction of low birth weight related to PM10 exposure in seven cities in the Republic of Korea was estimated between 5% and 19% (Seo et al, 2010).

Second-hand smoking here means second-hand tobacco smoke exposure of the mother and does not include exposure of the foetus from maternal smoking. Second-hand tobacco smoke exposure in non-smoking pregnant women was estimated to increase the risk for stillbirth by around 23% (Leonardi-Bee et al, 2011) and also the risk for low birth weight (Nieuwenhuijsen et al, 2013). The percentage of low birth weight in Japan attributable to second-hand tobacco smoke exposure at home and the workplace was estimated at 16% and 1% respectively (Ojima et al, 2004).

Small increases in risk for preterm birth might exist for long working hours and high physical workload (Palmer, Bonzini, Harris et al, 2013),

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though overall little to no negative effect on pregnancy outcomes was found for normal job-related activities (Salihu et al, 2012) and it was judged that associations might be due to confounding factors, chance or bias (Palmer, Bonzini, Bonde et al, 2013). Increased risk for other adverse pregnancy outcomes due to occupational risks is even more controversial (MacDonald et al, 2013; Palmer, Bonzini, Harris et al, 2013) and evidence is often lacking. Pregnancy might place women in the workplace under significant psychosocial stress, e.g. from pregnancy-related discrimination, and the association with adverse pregnancy outcomes is still unclear (Mutambudzi et al, 2011; Salihu et al, 2012). However, certain workgroups that predominantly include women of reproductive age are heavily exposed to different chemicals that are suspected to be associated with adverse pregnancy outcome (Pak et al, 2013).

There is accumulating, though still controversial evidence (El Majidi et al, 2012), for a link between exposure to some endocrine disrupting chemicals, e.g. polychlorinated biphenyls (PCBs) and dioxins, and low birth weight and preterm birth (Chen Zee et al, 2013; DiVall, 2013; Govarts et al, 2012; Kishi et al, 2013; Meeker, 2012; Nieuwenhuijsen et al, 2013). There is also some evidence for a link between disinfection by-products in water, exposure to e-waste, arsenic and extreme weather events and different adverse pregnancy outcomes (Beltran et al, 2014; Grant et al, 2013; Nieuwenhuijsen et al, 2013; Quansah et al, 2015).

Poor water, sanitation and hygiene (WASH) is an established risk factor for many infectious diseases, like salmonella, listeria, yersinia or influenza infections, which if occur during pregnancy increase the risk for different adverse pregnancy outcomes (Campbell et al, 2015). A large survey on health-care facilities in 54 LMIC, representing 66 000 facilities, showed that water was not readily available in about 40% of them, over a third lacked soap for handwashing, and a fifth lacked toilets; this lack of services compromises the provision of routine services such as child delivery, and the ability to prevent and control infections, including in the neonatal period (Bartram et al, 2015; WHO & UNICEF, 2015). Poor WASH also favours undernutrition with a resulting higher

Various environmental risks are linked to adverse pregnancy outcomes such as low birth weight and prematurity.

susceptibility for different infectious diseases associated with poor fetal development and other pregnancy complications (Campbell et al, 2015).

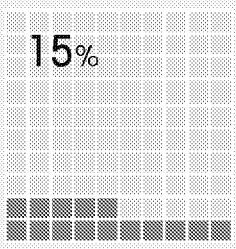
It was estimated that environmental causes accounted for 6% (1–11%) of all adverse perinatal conditions in high-income countries, and for 11% (2–27%) in low-income countries (where exposures to environmental risks were estimated to be higher) (estimate based on expert survey 2005, see Section 2).

SELECTED INTERVENTIONS

- A phased introduction of indoor tobacco smoke-free legislation in Belgium was associated with significant reductions in the risk of preterm birth after the introduction of each phase. The changes corresponded to a reduction of six preterm deliveries per 1 000 deliveries over the five-year study period (B Cox et al, 2013). Similar results were seen after an introduction of a citywide smoke-free policy in the USA (Page II et al, 2012).

Exposure to ambient air pollution is thought to increase the risk of premature birth, low birth weight and infant mortality.

PROTEIN-ENERGY MALNUTRITION



Water, sanitation and hygiene, climate change

Method: calculation based on limited epidemiological data

Protein-energy malnutrition occurs when the body's requirements for energy or proteins are unmet as a result of underconsumption or impaired absorption and use of nutrients (WHO, UNICEF, USAID, 2015). Nutritional status can be measured in terms of underweight (low weight-for-age), wasting (low weight-for-height), stunting (low height-for-age) and micronutrient deficiencies. Globally, 162 million children under five years old were stunted in 2012 and 52 million were wasted (UNICEF, WHO & World Bank, 2013). Globally, 56% of stunted children live in Asia and 36% in Africa. Stunted, wasted and underweight children have an increased risk of death from acute respiratory illnesses, diarrhoea, measles and other infectious diseases. More than one million deaths can be attributed to stunting alone, representing 17% of all child deaths in 2011 (Black et al, 2013). Stunting has significant long-term consequences on health and functional outcomes, showing associations with motor and cognitive development and with poorer educational outcomes (Black et al, 2013).

Individual nutritional status depends on food intake, general health and the physical environment. In all three aspects, poor water, sanitation and hygiene play an important role. Recurrent infectious diseases, for example diarrhoea, can impair nutritional status (Checkley et al, 2008; Dewey & Mayers, 2011; Kotloff et al, 2013; Ngure et al, 2014). Giardiasis, for example, commonly transmitted through water or food contaminated with water or

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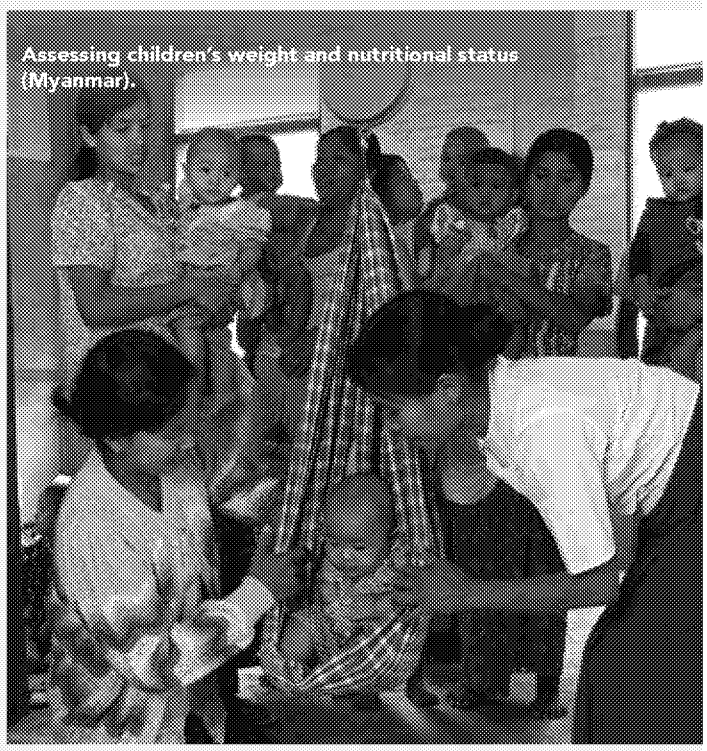
waste, furthermore leads to malabsorption and therefore to higher risk of malnutrition (Escobedo et al, 2010; Halliez & Buret, 2013). Beyond specific enteric infections, evidence is also growing to support a hypothesized link between living in unhygienic conditions and an intestinal disorder referred to as environmental enteric dysfunction, which has been associated with stunting (Keusch et al, 2014; Lin et al, 2013; Ngure et al, 2014; Prendergast & Kelly, 2012). As discussed in detail in the respective sections, many infectious diseases are related to environmental factors, for example as diarrhoeal diseases are to unsafe drinking-water, poor sanitation and personal hygiene; with a population attributable fraction of 58% globally (Prüss-Ustün et al, 2014). Limited direct evidence on water, sanitation, hygiene and nutritional status is also available (Dangour et al, 2013; Ikeda et al, 2013).

As indirect impacts, high proportions of household income spent on water from vendors where adequate services are not available, such as in informal settlements, may lead to the food budget being sacrificed, which may contribute to malnutrition (Cairncross & Kinnear, 1992). Fetching water from distant sources may use up a significant proportion of a person's energy (Chikava & Annegarn, 2013), and may therefore also contribute to undernutrition. Country programmes of nutrition-sensitive agriculture have been developed to maximize agriculture's contribution to nutrition and health (FAO, 2014).

Climate change is likely to have significant effects on crop productivity of major cereals, and thus potentially increase the risk of undernutrition (IPCC, 2013; WHO, 2014z) as agriculture is climate sensitive. Furthermore, increases in water scarcity, population growth, meat consumption and land degradation are likely to additionally reduce food security and possibly to aggravate malnutrition (Wheeler & von Braun, 2013; World Food Programme, 2009).



Assessing children's weight and nutritional status (Myanmar).

Combining the fraction of diarrhoeal disease burden of 58% attributed to water, sanitation and hygiene (Prüss-Ustün et al, 2014) with the estimate that about 25% (8–38%) of stunting is attributed to frequent diarrhoea episodes (Checkley et al, 2008) would result in the attribution of 15% (10–19%) of malnutrition to inadequate water, sanitation and hygiene. This estimate relies on a number of assumptions, and therefore constitutes only a rough estimate. Also, it does not take into account the other potential impacts of the environment on malnutrition outlined in this section, and may therefore be an underestimate of the impact of the environment on malnutrition.

SELECTED INTERVENTIONS

- A systematic review and meta-analysis on interventions to improve water quality, water supply, sanitation and hygiene practices found suggestive evidence that they can improve nutritional status in children. None of the studies included in the analysis was graded as high quality which increases the uncertainty of the estimate (Dangour et al, 2013).

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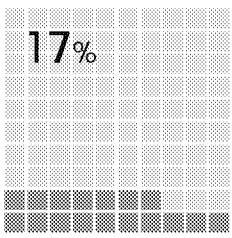
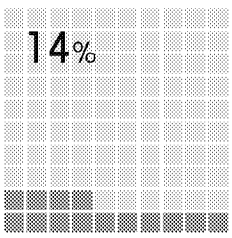
NONCOMMUNICABLE DISEASES

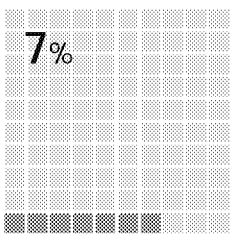
LUNG CANCER



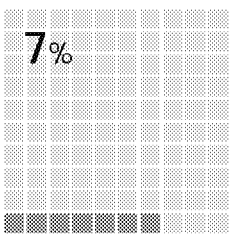
Household air pollution
Method: CRA



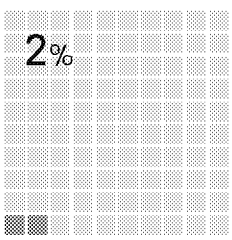
Ambient air pollution
Method: CRA



Residential Radon
Method: CRA

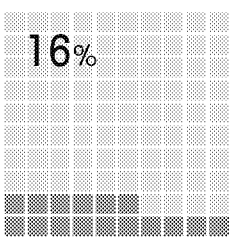


Occupational risks
Method: combination of data from CRAs



Second-hand tobacco smoke
Method: CRA

OTHER CANCERS



Chemicals, occupational risks, UV and ionizing radiation, physical activity, water, sanitation and hygiene
Method: expert survey

Cancers are characterized by abnormal cell development beyond their normal boundaries and infiltration in surrounding or remote tissue, in any part of the body (WHO, 2011d). About one fifth of people worldwide and one third of people in industrialized countries are diagnosed with cancer during their lifetime (IARC, 2014). Overall, cancers cause 8% of the global disease burden (in DALYs) (IHME, 2014). Around 19% of all cancers were estimated to be attributable to environmental factors (WHO, 2011d). Among those, occupational exposures to carcinogens are important global risks (Lim et al, 2012) and cause between 2% and 8% of all cancers (Purdue et al, 2014). In the UK, for example, 5.3% of all cancer deaths were estimated to be caused by occupational risks (Rushton et al, 2012). Environmental factors contribute to childhood cancers (IARC, 2014; Norman et al, 2014), and early exposures to environmental risk factors continue to impact cancer development in later life (Carpenter & Bushkin-Bedient, 2013). Cancer also has many risk factors that are not directly related to the environment, including tobacco smoking, alcohol use and diet, and certain genetic factors, which are not considered in this study.

Lung cancer caused nearly 1.6 million deaths in 2012 and is the largest contributor to cancer related mortality (WHO, 2015d). Smoking is the most important risk factor for developing lung cancer, however, more than 20 environmental and occupational agents are proven lung carcinogens in humans (IARC, 2015). Air pollution, for example from indoor burning of coal or biomass, was associated with substantial increases of lung cancer risk (Hosgood et al, 2011; Kurmi et al, 2012). Also, exposure to radon, a radioactive natural gas which

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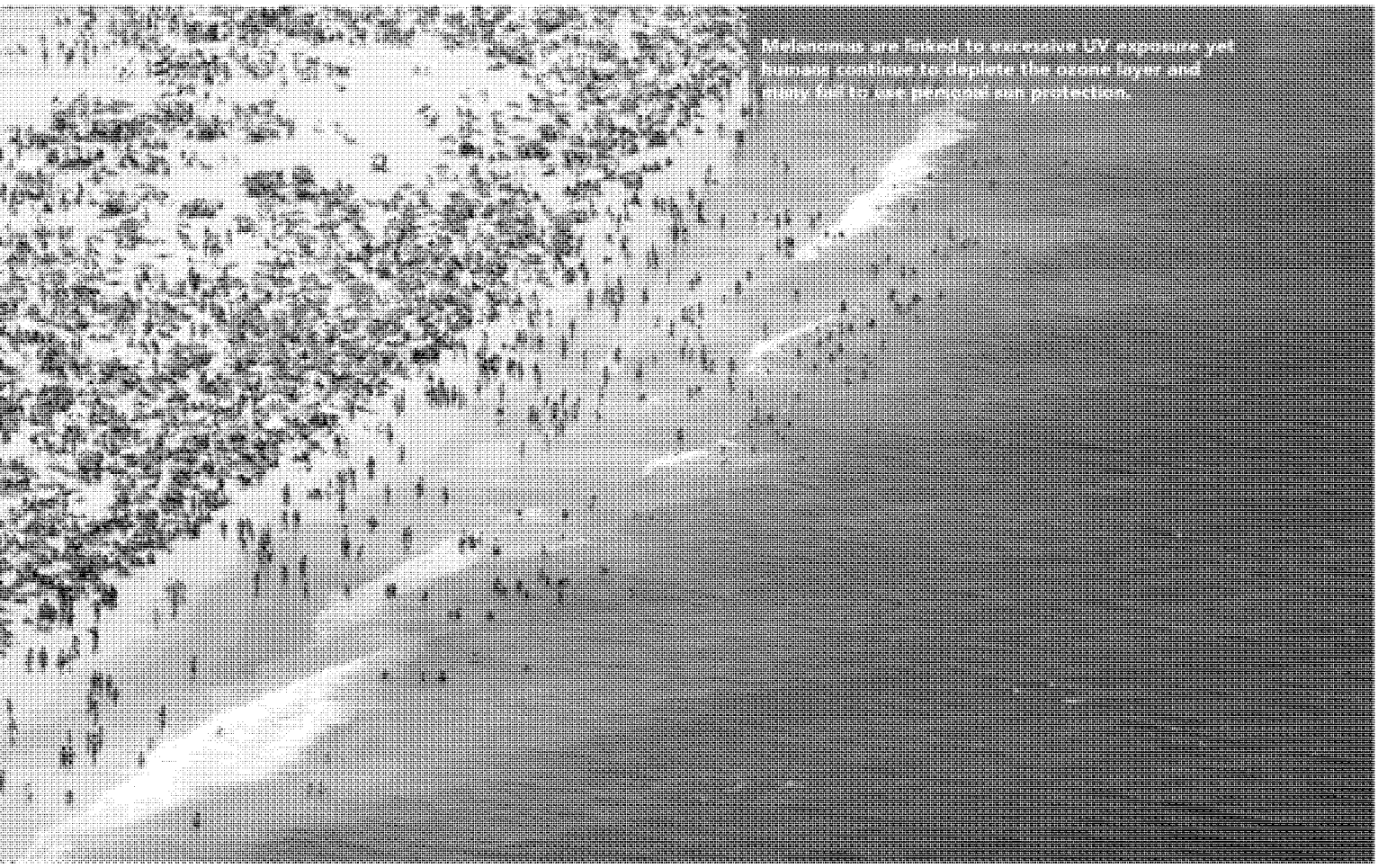

Melanomas are linked to excessive UV exposure yet humans continue to deplete the ozone layer and many fail to use personal sun protection.

can be found in indoor environments such as homes and workplaces, was associated with a 7% increased lung cancer risk with every additional 100 Bq/m3 radon exposure (Zhang et al, 2012). Second-hand tobacco smoke is estimated to have caused more than 21 000 lung cancer deaths in 2004 (Öberg et al, 2011). Occupational (Nielsen et al, 2014) and domestic (Goswami et al, 2013) asbestos exposure (including chrysotile) leads to lung cancer and mesothelioma (sufficient evidence), a rare cancer predominantly of the outer lining of the lung (IARC, 2015). Many more environmental and occupational exposures are proven causes of lung cancer, including diesel engine exhaust, hexavalent chromium, silica dust, coke or aluminium production, and painting (IARC, 2015). All these causes are supported by sufficient evidence (evidence addressed in this section refers to humans). Some of these exposures have also been linked to toxic waste sites (Chatham-Stephens et al, 2013). It was estimated that 14% of lung cancers are attributable to ambient air pollution, 17% to household air pollution (WHO, 2014c; WHO, 2014d), 6.5% to residential radon, 1.8% to second-hand tobacco smoke and 6.6% to occupational risks (in DALYs) (IHME, 2014).

Colon and rectum cancers caused more than 700 000 cancer deaths in 2012 (WHO, 2015d). The Global Burden of Disease Study 2010 (GBD 2010) estimated that 27% of all colon and rectum cancers (in DALYs) can be attributable to low physical activity (IHME, 2014) – and physical activity levels can be modulated by the environment (see specific section). Other reviews, however, found lower numbers (<10%) (Lee et al, 2012; Park et al, 2014; Wang et al, 2012). The International Agency for Research on Cancer (IARC) lists radiation (supported by sufficient evidence) and asbestos (supported by limited evidence) as two

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further potential environmental risk factors for this type of cancer (IARC, 2015).

Breast cancer is the most deadly cancer in women with over half a million deaths in 2012 (WHO, 2015d). The GBD 2010 estimated that 30% of breast cancer cases are attributable to physical inactivity or low physical activity (IHME, 2014), which can be influenced by the environment. As for colon cancers other analyses found lower numbers (8–10%) (Lee et al, 2012; Wang et al, 2012). The causal link with ionizing radiation is supported by strong evidence from studies of women exposed at younger ages (IARC, 2015). Causal links to several other environmental exposures such as PCBs, ethylene oxide and shift work that involves circadian disruption are supported by limited evidence (IARC, 2015).

Both **lymphomas/multiple myelomas** and **leukaemia** were responsible for around 300 000 deaths in 2012 (WHO, 2015d). Causal links have been reported for numerous environmental and occupational exposures, e.g. exposures to benzene, formaldehyde, chemicals in rubber manufacturing processes and ionizing radiation (sufficient evidence), and various pesticides and herbicides (diazinon, glyphosate, malathion), chemicals (solvents such as dichloromethane, trichloroethylene), and occupational exposures in petroleum refining (limited evidence) (IARC, 2015). High benzene exposure, occurring for example in the production of many organic chemicals and in the production of some types of rubber, dyes, pesticides or detergents, has been associated with a nearly tripled leukaemia risk (Khalade et al, 2010). Formaldehyde, a substance widely used in manufacturing, is contained in numerous consumer products, and therefore causes numerous airborne exposures at work and in the home. Exposure to formaldehyde as a cause of leukaemia is supported by sufficient evidence (IARC, 2015). Pesticide exposure at home and of pregnant women were suggested to increase the risk for childhood leukaemia (limited evidence) (Turner et al, 2011; Van Maele-Fabry et al, 2011). Also X- and gamma-radiation cause leukaemia (supported by sufficient evidence) (IARC, 2015). There is also limited evidence that extremely low frequency magnetic fields, as produced by power lines, support the

A centuries-old scene – a worker washes leather before it is dyed (Fez, Morocco). Many chemicals used in the leather tanning industry have been linked to various forms of cancer.

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development of childhood leukaemia (Calvente et al, 2010; IARC, 2015; Kheifets et al, 2010). It was estimated that 1.1% of global leukaemia was attributable to occupational risks (IHME, 2014).

Mouth and oropharynx cancer were responsible for nearly 300 000 deaths in 2012 (WHO, 2015d). The causal link between exposure to asbestos and larynx cancer is supported by sufficient evidence (IARC, 2012). Significantly increased risk of **larynx cancer** also has been observed for many production and transport professions, including miners, tailors, blacksmiths, toolmakers, painters, bricklayers, carpenters and transport equipment operators and potential risks include exposure to polycyclic aromatic hydrocarbons, engine exhaust, textile dust and working in the rubber industry (pooled risks from meta-analyses) (Bayer et al, 2014; Paget-Bailly et al, 2012). Wood dust and formaldehyde have been identified as risk factors for nasopharynx carcinoma (IARC, 2015; Jia & Qin, 2012). It is estimated that 3.6% of larynx cancer and 0.5% of **nasopharynx cancer** is attributable to occupational risks (IHME, 2014).

More than 170 000 people died of **bladder cancer** in 2012 (WHO, 2015d). Active smoking causes a large part of those cancers, e.g. 50% of urothelial bladder cancer, but also occupational and environmental exposures play an important role (Burger et al, 2013; IARC, 2015). Sufficient and consistent evidence supports that arsenic above a certain threshold (e.g. 50 µg/l) in drinking-water increases the risk for bladder cancer (Christoforidou et al, 2013; IARC, 2015). Sufficient evidence also supports *Schistosoma haematobium*, a major agent of schistosomiasis, in urinary bladder cancer. Schistosomiasis can be prevented through management of water and sanitation. In painters (supported by sufficient evidence) (IARC, 2015), the relative risk for bladder cancer was increased by 25% (Guha et al, 2010). Other occupations, such as dry cleaners, hairdressers and textile manufacturers, as well as exposure to printing processes, were also linked to bladder cancer, although supported by limited evidence (IARC, 2015). The risk for hairdressers increased with longer duration in the workplace (Harling et al, 2010). Another important risk factor for bladder cancer is exposure to aromatic amines (e.g. 2-naphthylamine, 4-aminobiphenyl and benzidine) (IARC, 2015) (sufficient evidence), which can occur through working in the plastic, chemical, dye and rubber industry (Letasiova et al, 2012). Aromatic amines are also present in diesel exhaust. More environmental risk factors, such as exposure to ionizing radiation have been reported as being causal (sufficient evidence) (IARC, 2015).

Melanoma and other skin cancers accounted for nearly 100 000 deaths in 2012 (WHO, 2015d). Ultraviolet exposure increases melanoma risk (sufficient evidence) (IARC, 2015). Occupational UV-exposure, e.g. through working outdoors, has been shown to increase the risk for basal and squamous cell carcinoma (Bauer et al, 2011; Schmitt et al, 2011). Indoor tanning is associated with a 16–25% increased melanoma risk with an increasing cancer risk for more frequent sunbed use (Boniol et al, 2012; Colantonio et al, 2014). Indoor tanning was also associated with increased squamous and basal cell carcinoma (IARC, 2015; Wehner et al, 2012). In the UK, 86% of melanomas were attributable to excess UV exposure (Parkin et al, 2011). For the US, Europe and Australia the population attributable fractions from indoor tanning were estimated at 3–22% for non-melanoma skin cancer and 3–9% for melanoma (Wehner et al, 2014). Other environmental and occupational exposures such as polychlorinated biphenyls, arsenic, soot and ionizing radiation have also been linked to cancer of the skin (sufficient evidence) (IARC, 2015).

Other different cancer types are associated with environmental or occupational exposures, for example **cervix, ovarian, prostate, liver, stomach, thyroid and mesothelium cancer**. Plutonium and vinyl

chloride are associated with an increased risk of liver cancer (sufficient evidence) (IARC, 2015). Furthermore, 17% of liver cancers were estimated to be related to aflatoxin in foods, a toxic chemical produced by certain fungi, mainly *Aspergillus flavus* and *Aspergillus parasiticus* (IARC, 2015; Liu et al, 2012). Asbestos exposure is a risk factor for cancer of the ovaries and the mesothelium (sufficient evidence) (Camargo et al, 2011; IARC, 2012). About 0.7% of ovarian cancer is estimated to be attributable to occupational risks (IHME, 2014). Various environmental and occupational factors have been suggested as risks for prostate cancer, including exposures in the rubber industry, to arsenic, cadmium and the insecticide malathion (limited evidence) (IARC, 2015). Working in rubber manufacturing (sufficient evidence) (IARC, 2015) is an established risk factor for stomach cancer. An association between asbestos exposure and stomach cancer (limited evidence) (IARC, 2015) is further supported by a recently published meta-analysis (Peng et al, 2014). Increased risks are also caused by ionizing radiation for bone, oesophagus, stomach, colon and rectum, brain, thyroid and salivary gland cancers (IARC, 2015).

It was estimated that 36% (9–19%) of lung cancer globally was attributable to environmental factors, with 20% in high-income countries and 46% in low- and middle-income countries. In high-income countries it was estimated that about 16% (7–38%) of cancers other than lung cancer in men, and 13% (7–28%) in women were attributable to the environment. In low- and middle-income countries, the corresponding population attributable fractions were 18% (7–48%) in men and 16% (7–38%) in women. The estimates for lung cancer are based on a combination of data from CRA type assessments, and for other cancers on expert survey 2005 (see Section 2 and Annex 3.2). Globally, 20% (9–43%) of all cancers were estimated to be attributable to the environment, resulting in 1.7 million deaths each year.

SELECTED INTERVENTIONS

- Educational and multi-component interventions can increase sun protective behaviour among outdoor workers (Horsham et al, 2014; Reinau et al, 2013). However, in the general population behavioural counselling only minimally increased sun protective behaviour, and only minimally decreased indoor tanning and skin pigmentation (Lin et al, 2011). Accordingly, the USA's Preventive Services Task Force currently only recommends behavioural counselling to prevent skin cancer in children and adolescents up to 24 years of age (Moyer & Force, 2012). Potential system interventions to reduce indoor tanning include taxing, age limits, advertising bans or even banning of tanning services (Watson et al, 2013).
- Smoke-free workplace legislation reduced exposure to second-hand tobacco smoke and thereby the risk for lung cancer in various countries (Jaakkola & Jaakkola, 2006).
- Legislation on cancer-related chemicals, e.g. the European REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals) regulations, can have a major influence on controls on the production, import and use of industrial chemicals in the EU (Rigolle et al, 2013). More examples on existing national and international environmental health policies for cancer prevention are listed in the following article (Espina et al, 2013).
- Regulations for substitution and phasing out of replaceable processes or carcinogenic substances in the workplace, by replacing them with less dangerous substances (Espina et al, 2015).
- Banning the use of asbestos (Jarvholm & Burdorf, 2015).
- For interventions on occupational and environmental cancer see also WHO cancer prevention guide (WHO, 2007).

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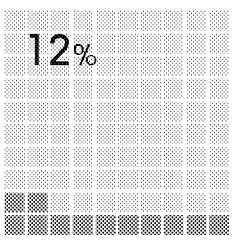
ECONOMIC EVALUATIONS

- Costs due to occupational cancer deaths in Italy in 2006 were estimated at around €360 million in indirect economic loss and €456 million in health care costs (Binazzi et al, 2013).
- Pre- and post-harvest aflatoxin control strategies in Africa were judged as being very cost-effective comparing saved costs from hepatocellular carcinoma to invested costs from intervention implementation (Wu & Khlangwiset, 2010).
- Physical inactivity was estimated to contribute to more than 15% of the total Chinese medical and non-medical annual costs from five major NCDs including cancer (Zhang & Chaaban, 2013). Total health-care costs of physical inactivity in Canadian adults in 2009 were estimated at Can$ 6.8 billion and represented nearly 4% of overall health-care costs (Janssen, 2012).
- Occupational lung and bladder cancer cost €88 million to the Spanish National Health System in 2008 (Garcia Gomez et al, 2012). Occupational respiratory cancers were also shown to be a considerable economic burden in France in 2010 (Serrier et al, 2014).
- Regulations to prevent household radon exposure, e.g. through remediation measures in selected areas in the UK and Germany were estimated as cost- to very cost-effective (Coskeran et al, 2006; Gray et al, 2009; Haucke, 2010).
- Economic investments to clean up polluted industrial sites and hazardous waste dumps in Italy were judged as cost-beneficial measures to prevent health effects (Guerriero et al, 2011; Guerriero & Cairns, 2009).
- An evaluation of the The SunWise School Program, a school-based sun safety education programme in the USA, concluded that for every US$ 1 invested, between US$ 2 and US$ 4 in medical care costs and productivity losses were saved (Kyle et al, 2008). Similar results were obtained for an evaluation of the Australian SunSmart skin cancer prevention programme (Shih et al, 2009). Also stricter solarium regulations in Australia targeting at-risk groups are likely to be economically viable (Hirst et al, 2009). However, UV-protection needs to take into account that many people depend on sunlight for the synthesis of vitamin D, which is protective for various conditions such as rickets in children, and osteoporosis (Holick, 2006).

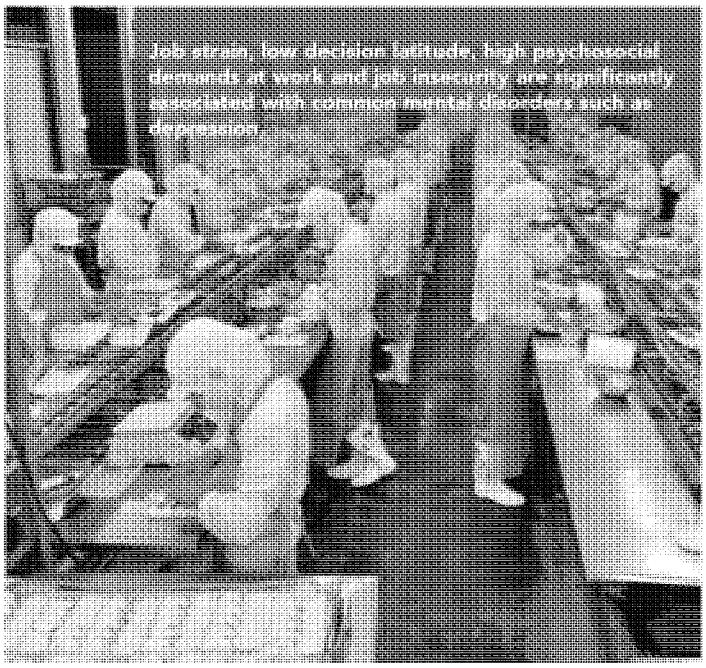
MENTAL, BEHAVIOURAL AND NEUROLOGICAL DISORDERS



Chemicals, occupational risks, built environment, climate change, noise
Method: expert survey

Mental, behavioural and neurological disorders account for only 3.0% of deaths worldwide, but for 10% of the global disease burden (WHO, 2015d). This number is projected to rise to 15% by the year 2020 (WHO, 2014u). Approximately 15% of adults aged 60 and older suffer from a mental or neurological disorder (WHO, 2013f). Main mental disorders include unipolar depressive disorder, bipolar disorder, schizophrenia, alcohol and drug use disorders, anxiety disorder, eating disorder, development disorders and intellectual disability. Main neurological disorders include Alzheimer's disease and other dementias, Parkinson's disease, epilepsy, multiple sclerosis, and migraine and non-migraine headache. Depressive disorder is the largest among these conditions, and affects more than 350 million individuals worldwide (WHO, 2012a).

Most of these disorders have a small to moderate link to the environment or occupation. **Depression** has been linked



to occupational stress, for example through high demands and low control in the workplace (Andrea et al, 2009; Niedhammer et al, 2014; Tennant, 2001; Wang et al, 2008) and certain occupations, e.g. army veterans (Blore et al, 2015). Job strain, low decision latitude, low social support and high psychosocial demands at work, and job insecurity were significantly associated with common mental disorders, including mainly mild-to-moderate depressive and anxiety disorders (Stansfeld & Candy, 2006). Work-life imbalance was further reported to contribute to depression (Hammig & Bauer, 2009). Depression has also been linked to the use of certain pesticides, although the evidence is very limited (Freire & Koifman, 2013). Physical activity, which can be fostered by suitable environments, has been shown to be associated with decreased symptoms of depression and anxiety (Mammen & Faulkner, 2013). **Drug and alcohol use** have been linked to the occupational environment, such as coca growing, or working in the entertainment or alcohol industry (Tutenges et al, 2013).

Post-traumatic stress disorders have been linked to disasters such as floods, earthquakes and fires, which could partly be prevented by environmental measures (Neria et al, 2008). Dams and land-use patterns could be used to control flooding, for example, and suitable materials and building methods could make houses more resilient to fires and earthquakes. Professional groups at increased risk of exposure to post-traumatic stress disorders include mainly police officers, firefighters, ambulance personnel and humanitarian relief workers, due to frequent exposure to traumatic events (Connorton et al, 2012; Skogstad et al, 2013). **Mood and anxiety disorders** were also linked to work stress and imbalance between work and family/personal lives (Andrea et al, 2009; Wang 2006; Wang et al, 2008). Environmental factors such as living in densely built-up areas and migration were shown to have an influence on the risk of developing **schizophrenia** (Vilain et al, 2013).

Various chemical exposures have been associated with **neurodevelopmental effects**. Exposure to lead during childhood has been associated with attention deficit disorder, and evidence on links between numerous other chemicals and neurodevelopmental disorders is accumulating (Grandjean & Landrigan, 2014; Polanska et al, 2013; Polanska et al, 2014). **Intellectual disability** was shown to be caused by childhood exposure to lead, methylmercury and other pollutants (Axelrad et al, 2007; Lanphear et al, 2005). Certain perinatal exposures to endocrine disrupting chemicals, for example certain organophosphate insecticides, appeared to be associated with the occurrence of **autism and attention deficit disorder**, although evidence was limited (Bergman et al, 2013; de Cock et al, 2012).

Parkinson's disease has been associated with exposure to pesticides in occupational and non-occupational settings (Allen & Levy, 2013). Links between Parkinson's disease and other neurodegenerative diseases such as Alzheimer's disease, and a variety of pesticides, solvents and metals have been suspected, but the evidence is not yet conclusive (Baltazar et al, 2014; Jiang

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et al, 2013; Tanner et al, 2014). **Epilepsy** has been linked to head injury (WHO, 2012b), including in the workplace. Also, exposure to methylmercury, a neurotoxic substance, and air pollution have been linked to epilepsy (Cakmak et al, 2010; Yuan, 2012). Furthermore, epilepsy has been put forward as a consequence of certain other diseases, which themselves are associated with the environment. Stroke is one example, epilepsy may therefore indirectly be prevented by action such as creating environments fostering physical activity and reducing air pollution. Another example is malaria, which has environmental links (see section on malaria); the cerebral form of malaria has also been associated with epilepsy (Anyanwu, 1999; Asindi et al, 1993). Lack of exposure to UV radiation has been repeatedly shown to influence the risk of **multiple sclerosis**; links between second-hand tobacco smoke, organic solvents and shift work, and multiple sclerosis have also been suggested (Hedstrom et al, 2015).

Insomnia has environmental and occupational components, mainly through exposure to residential and occupational noise, occupational stress, irregular working hours or jet lag (Porkka-Heiskanen et al, 2013); WHO Regional Office for Europe, 2009). Triggers for **migraine** and other headaches were reported to include bright lights, air quality, odours, stress and noise. Remediation of triggers in the home, workplace or classroom may improve attendance and productivity (Friedman & De ver Dye, 2009). Other disorders may be associated with population density in urban settings and poor quality of the local environment. Climate change may affect mental health directly through trauma, or indirectly through physical stress (e.g. extreme heat exposure) or deteriorating environments (Berry et al, 2010).

In Finland it was estimated that 4% of mental disorders and 3% of nervous system diseases were linked to occupation (Nurminen & Karjalainen, 2001). In France, 15–20% of mental disorders were attributable to job strain for men, and 14–27% for women (Sultan-Taieb et al, 2013). In Europe, 18% and 4.5% of mental disorders were attributed to job strain and job insecurity, respectively (Niedhammer et al, 2013).

Overall, the environmental contribution to the disease burden of neuropsychiatric disorders was relatively modest, and the population attributable fraction was estimated to be 12% (3–30%). The neuropsychiatric diseases with the largest environmental components included depression and anxiety disorders, alcohol use disorders, migraine and non-migraine headaches, epilepsy and childhood behavioural disorders, with population attributable fractions ranging between 12% and 20% (estimates based on expert survey 2015, see Section 2).

SELECTED INTERVENTIONS

- Active use of parks or recreational facilities and higher levels of neighbourhood social cohesion were associated with fewer depressive symptoms in Latinos in the USA as compared with those who did not use these spaces. Strategies for promoting active use of parks or recreational activities to address depression should therefore be tested (Perez et al, 2015).
- A stress reduction programme directed towards worksite supervisors has been shown to reduce depressive symptoms and sick leave (Kawakami et al, 1997).

ECONOMIC EVALUATIONS

- Exercise has been shown to be a cost-efficient treatment alternative for mild to moderate depression and a variety of anxiety disorders (Carek et al, 2011).
- Lead-safe window replacements in all pre-1960 homes in the USA would yield a net benefit of at least US$ 67 billion; additional benefits include for example avoided attention deficit hyperactivity disorder, reduced crime and delinquency, and associated long-term costs of climate change (Nevin et al, 2008).

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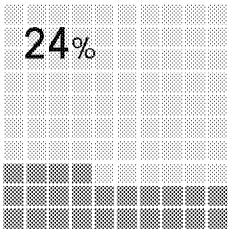
CATARACTS



Household air pollution, UV exposure
Method: CRA

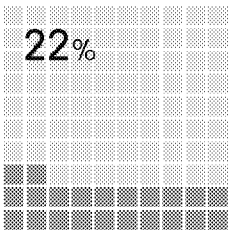
Cataracts are the leading cause of blindness worldwide. Globally, cataracts are responsible for 51% of blindness – an estimated 20 million individuals suffer from this degenerative eye disease (WHO, 2014f). A cataract is the clouding of the lens of the eye, which prevents clear vision. Cataract can be removed surgically, but access to the required medical services is limited in many countries (WHO, 2014f).

The prevalence of cataracts increases with age. Cataracts have been associated with several environmental factors. Ultraviolet light exposure is a significant factor in the genesis of cataract. Globally, about one fifth of cortical cataracts have been attributed to UV radiation (Lucas et al, 2008). The depletion of the stratospheric ozone layer has led to increasing UV exposure, and, accordingly, the risk of cataract development is likely to further increase (Norval et al, 2011). Also exposure to cookstove smoke increases the risk of cataract formation, with an estimated population attributable fraction of 35% of the cataract burden in women (Smith et al, 2014), and 24% of the total burden of cataracts (in DALYs) (WHO, 2015d).

The rate of cataracts may be decreased by environmental interventions such as increased UV protection (such as protective eyewear, brimmed hat) (AOA, 1993) and reduced exposure to cookstove smoke, and using alternative, clean fuels.

In total, it is estimated that about 24% of all cataracts are attributable to environmental risks, based on the burden related to cookstove smoke (CRA, see Section 2; WHO, 2015d).

HEARING LOSS



Occupational noise
Method: CRA

Approximately 360 million individuals suffer from hearing loss worldwide (WHO, 2014h), the majority being adults (91%). Disabling hearing loss refers to a hearing loss greater than 40dB in the better ear in adults – 25dB or better in both ears being the hearing threshold for normal hearing (WHO, 2014h). "Hard of hearing" refers to people with mild to severe hearing loss who can communicate through spoken language and can benefit from hearing aids. "Deaf" people have profound hearing loss which implies very little or no hearing. It is estimated that over one third of the global population ≥65 years of age are affected by hearing loss, most notably in regions of South Asia, Asia Pacific and sub-Saharan Africa (WHO, 2014h).

Hearing loss and deafness can have congenital causes (e.g. maternal infections during pregnancy such as rubella, inappropriate use of certain drugs during pregnancy, low birth weight, birth asphyxia) or acquired causes. Acquired causes include consequences of certain infectious diseases such as measles, chronic ear infection, use of ototoxic drugs, age-related hearing loss, head injury and excessive noise (WHO, 2014h).

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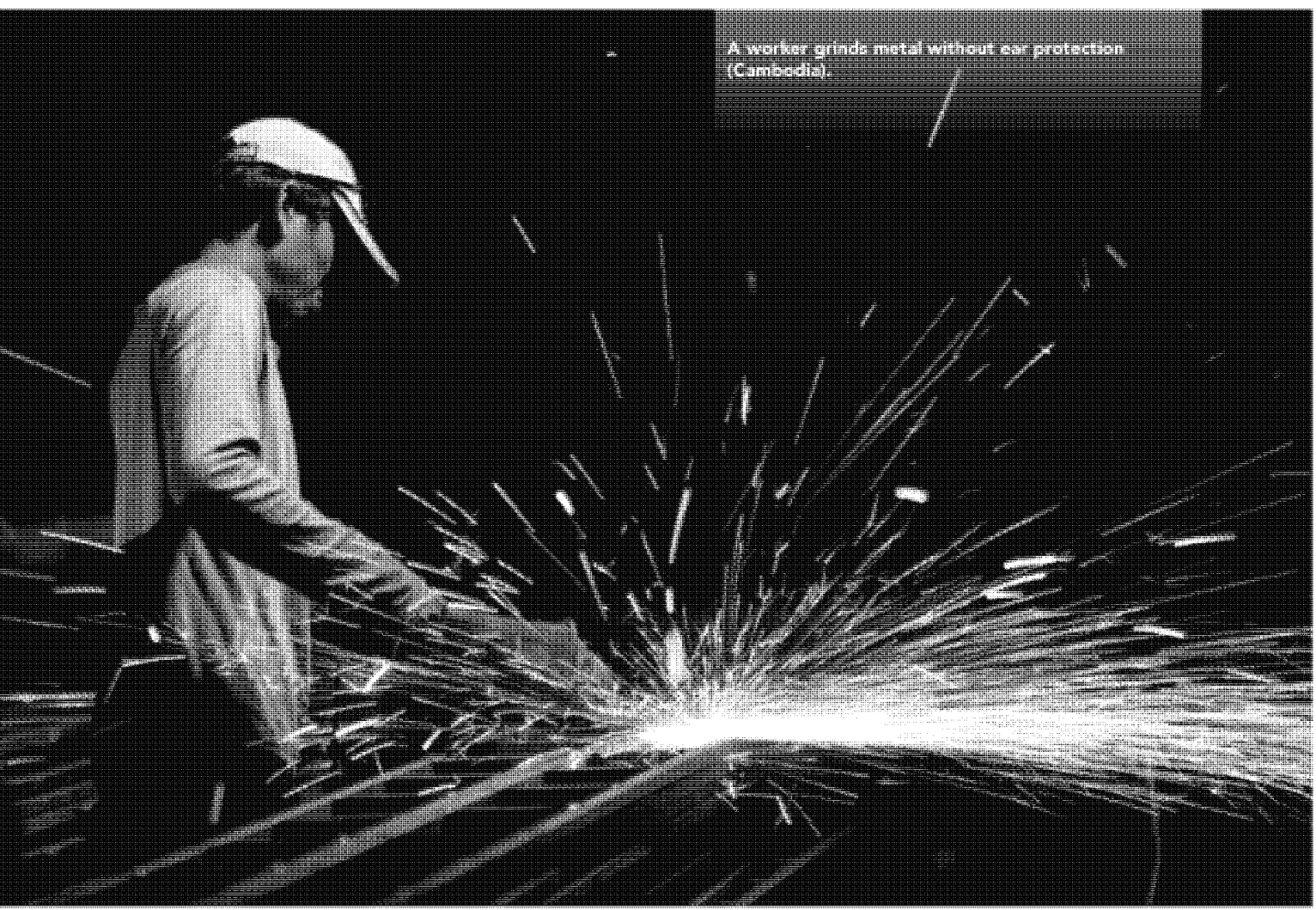
Workers may be exposed to excessive noise and ototoxic substances which increases their risk of hearing loss (EU-OSHA, 2009; Kurmis & Apps, 2007; Nies, 2012). Work in certain sectors, such as mining, manufacturing, construction work or night clubs is associated with an increased risk of occupationally acquired hearing loss (Kurmis & Apps, 2007). Globally, exposure to excessive noise at work caused 22% of hearing loss in 2010 (IHME, 2014). Exposure to music at excessive levels or other leisure-related noise may also induce hearing symptoms which are associated with an increased risk of hearing loss (Zhao et al, 2010).

Noise-induced and ototoxic hearing loss are largely preventable. Preventive action to reduce the hazard from occupational noise exposure may include engineering controls (e.g. reduce noise emission from industrial machinery), administrative controls (e.g. limiting the time a worker spends in noisy environments) and personal protective equipment (e.g. earmuffs and plugs). Comprehensive programmes also include noise monitoring and awareness raising/training among workers, as well as audiometric testing (Hong et al, 2013; OSHA, 2014). Similarly, monitoring and control measures can reduce exposure to ototoxic substances (EU-OSHA, 2009). Reduction of exposure to loud recreational noise (e.g. at music concerts, sporting events, gun sports, personal stereo systems with headphone use) by creating awareness, using personal protective equipment, and implementing suitable legislation are also recommended (WHO, 2014h).

The disease burden of hearing loss due to the environment is estimated to amount to 22% (19–25%), and is based on the occupational health evidence while evidence on leisure noise is accumulating (Method: CRA; IHME, 2014).



A worker grinds metal without ear protection (Cambodia)

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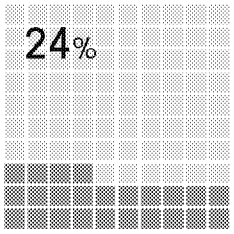
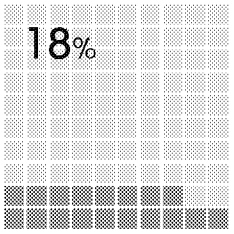
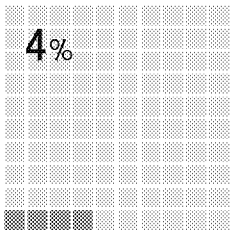
ISCHAEMIC HEART DISEASE



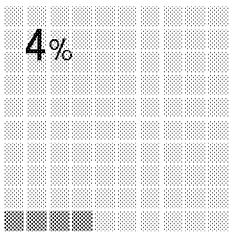
Ambient air pollution
Method: CRA



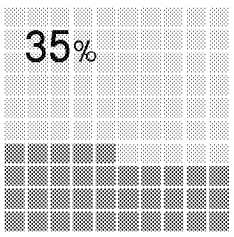
Household air pollution
Method: CRA



Second-hand tobacco smoke
Method: CRA



Lead
Method: CRA



Total environmental risks
Method: CRA

Ischaemic heart disease (IHD) is the leading cause of mortality and disability worldwide and accounts for 6.0% of the global disease burden in DALYs and 13% of global deaths (WHO, 2015d). High blood pressure, diet, physical activity and tobacco smoke are the most important risk factors (Lim et al, 2012), but also different environmental factors are crucial causes of the disease.

The most important environmental risk factor is ambient air pollution which increases both the risk to develop and to die of IHD (Brook et al, 2010; Yamamoto et al, 2014). Exposure to ambient air pollution can reduce life expectancy up to several years and was responsible for approximately 24% of the global burden of IHD (in DALYs) in 2012 (WHO, 2014d). Household air pollution from cooking, heating and lighting with solid fuels is another major environmental risk for IHD. Cooking with solid fuels is practised by nearly half of the world's population (Bonjour et al, 2013), the resulting smoke consists of similar components as ambient air pollution, e.g. particulate matter, carbon monoxide and sulphur dioxide. It is thus likely to have similar effects on development and evolution of IHD (Uzoigwe et al, 2013). About 18% of the global burden of IHD was attributable to household air pollution (WHO, 2015d). Exposure to second-hand tobacco smoke increases cardiovascular disease (Dunbar et al, 2013; Kaur et al, 2004) and was estimated to account for 3.6% of global DALYs lost due to IHD (IHME, 2014).

Another environmental risk factor for IHD is exposure to lead. Occupational lead exposures, e.g. mining and processing industries, and non-occupational exposures to lead, e.g. traffic exhaust and lead in paint (Poreba et al, 2011), can increase blood pressure (Navas-Acien et al, 2007), which is the most important risk factor for IHD. Lead exposure was estimated to account for 4.0% of the global IHD burden (IHME, 2014).

Various other environmental exposures have been linked to IHD: high arsenic exposure in drinking-water nearly doubled disease risk (Moon et al, 2012). Furthermore, evidence has emerged linking persistent organic pollutants to the disease (Lind & Lind, 2012). Environmental noise from road or air traffic was shown to increase stress levels, heart rate, blood pressure and IHD (Argalasova-Sobotova et al, 2013; Ndrepepa & Twardella, 2011). The nature of the built environment may influence whether people engage in physical activity (Sallis et al, 2012). Low physical activity was estimated to account for 31% of global IHD burden (IHME, 2014). Additionally, cardiovascular events increase with both extremely hot and extremely cold temperatures (Cheng & Su, 2010; Kysely et al, 2009; Sun, 2010).

Working conditions have been associated with IHD also, including stress, for example through high demand and lack of social support (Pejtersen et al, 2014), working more than 55 hours per week (Kivimaki et

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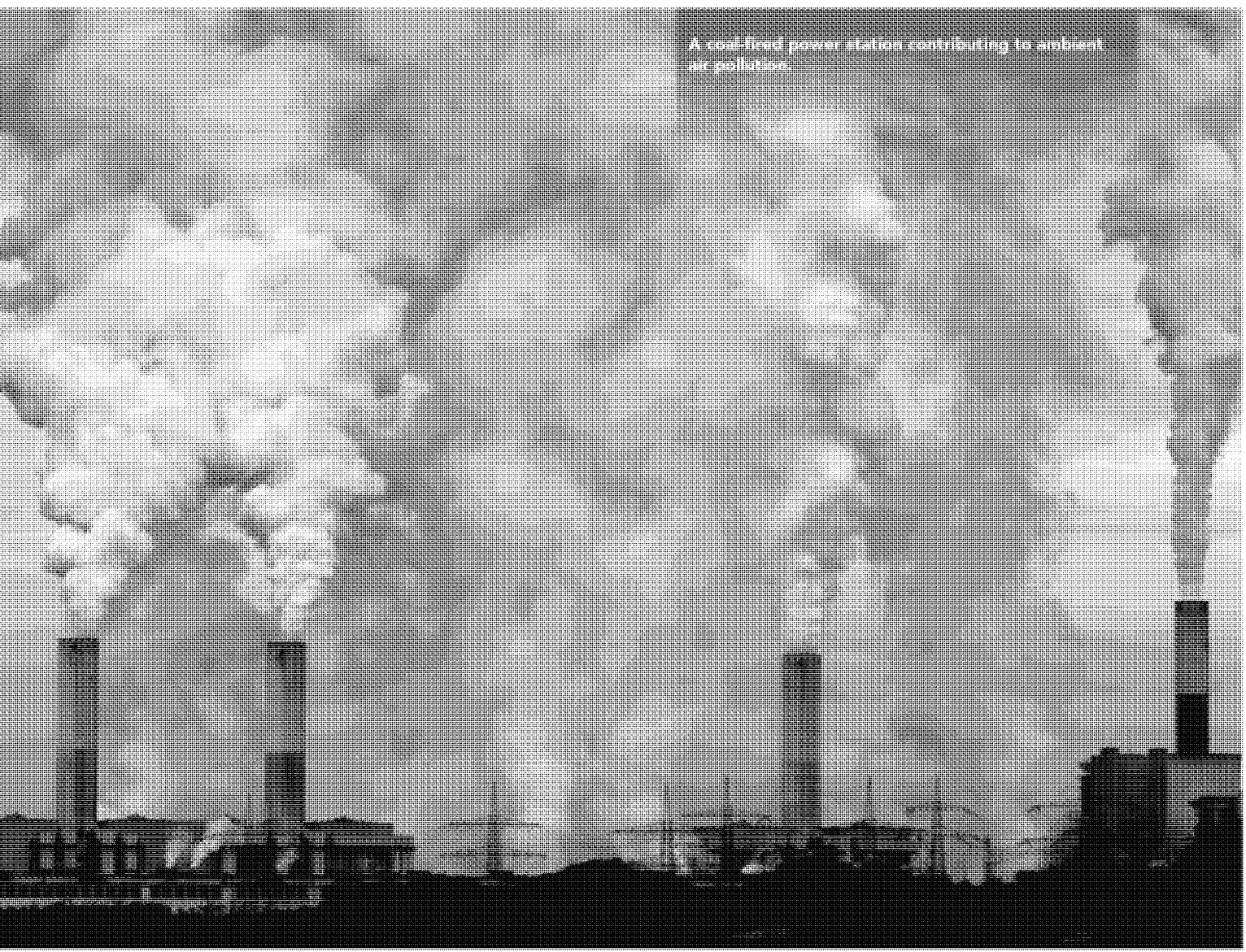
al, 2015), as well as occupational exposures to air pollution (Fang et al, 2010) and noise (Tomei et al, 2010). Psychosocial stress at work (high demand and low control) was found to increase the risk for IHD by 23%, and 3.4% of all IHD cases were attributed to this risk factor (Kivimaki et al, 2012). High versus low job insecurity was also associated with a 32% (9–59%) higher likelihood of IHD (Virtanen et al, 2013). Shift work increased coronary events by 24% and myocardial infarctions by 23% (Vyas et al, 2012). Sedentary behaviour, with sedentary work as a main component, was estimated to increase the risk of cardiovascular disease by 18% (Chomistek et al, 2013). In total, occupational risks accounted for 17% of deaths from IHD in Finland (Nurminen & Karjalainen, 2001). In the USA, about 12% of the IHD burden was related to occupation, for the age group 20–69 years (Steenland et al, 2003). The proportion of IHD cases attributable to workplace second-hand tobacco smoke exposure was estimated to range by country between 1–9% (Jaakkola & Jaakkola, 2006). In France, between 8.8% and 10.2% of IHD morbidity, and between 9.4% and 11.2% of IHD mortality, respectively, were estimated to be attributable to job strain in men (Sultan-Taieb et al, 2013).

In total, 35% (26–46%) of the total burden of IHD was attributed to the environment. Examples of interventions are provided in the section on stroke, as the same interventions may be efficient to decrease the risk of both cardiovascular diseases. These estimates are based on a combination of data from CRA type assessments (see Section 2 and Annex 3.2).



A coal-fired power station contributing to ambient air pollution.

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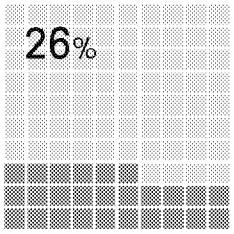
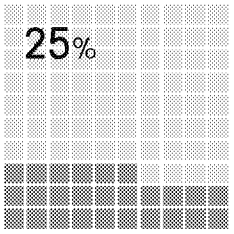
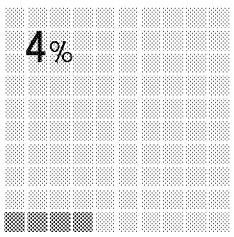
STROKE



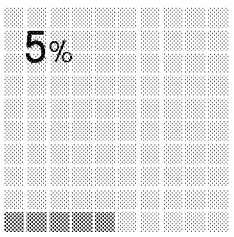
Household air pollution
Method: CRA



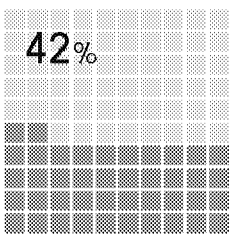
Ambient air pollution
Method: CRA



Second-hand tobacco smoke
Method: CRA



Lead
Method: CRA



Total environmental risks
Method: CRA

Stroke is the second most important cause of global mortality, after IHD. Even though stroke mortality rates are decreasing, the global burden of ischaemic and haemorrhagic stroke increased significantly between 1990 and 2010 in terms of number of people affected, number of deaths and DALYs lost. Most of the disease burden from cerebrovascular disease occurs in LMIC (WHO, 2015d).

Risk factors for stroke are similar to those for IHD, with high blood pressure being the main risk factor for both ischaemic and haemorrhagic stroke, with an attributable risk of 68% (IHME, 2014). Other important risks include various dietary factors and active smoking (IHME, 2014).

As for IHD, different environmental factors contribute to the burden of cerebrovascular disease. Ambient air pollution has been associated with increased hospital admissions and deaths from stroke (Galimanis et al, 2009). The evidence for an association between ischaemic stroke and both short-term and prolonged increased exposure to fine particles (PM2.5) is increasing (Brook et al, 2010; Burnett et al, 2014). Also, short-term exposure to increased ozone levels was associated with stroke incidence (Henrotin et al, 2007). In 2012, 25% of the global stroke burden (in DALYs) was attributable to ambient air pollution (WHO, 2015d).

Another important contributor to PM2.5 exposure is household air pollution mainly through cooking and heating with solid fuels. Accordingly, exposure to household air pollution has been associated with high blood pressure (Baumgartner et al, 2011). For the year 2012, 26% of stroke burden was attributable to household air pollution (WHO, 2015d).

Similar to active smoking, exposure to second-hand tobacco smoke is an important risk factor for cerebrovascular disease. A non-linear dose-response relationship has been described with substantial increases in risk already at low exposure levels. The increased risk for stroke incidence through exposure to second-hand tobacco smoke was 25%; from 16% for a daily exposure to five cigarettes up to 56% for daily exposure to 40 cigarettes (Oono et al, 2011). Second-hand tobacco smoke was estimated to account for 4% of global stroke burden in 2010 (IHME, 2014).

Occupational and environmental exposure to lead result in high blood pressure (Navas-Acien et al, 2007; Poreba et al, 2011), which is the most important risk factor for cerebrovascular disease. Lead exposure was estimated to account for 4.6% of global stroke burden in 2010 (IHME, 2014).

Physical activity, e.g. active commuting to work, has been shown to both decrease the risk for haemorrhagic and ischaemic stroke. Moderately intense physical activity compared with inactivity lowered total

stroke risk by 15–36% (Wendel-Vos et al, 2004). Higher risk reductions were observed at higher levels of physical activity (Hu et al, 2005). Low physical activity was estimated to account for 9% of global stroke burden in 2010 (IHME, 2014). Additionally, high residential traffic exposure as well as road traffic noise were associated with hypertension (Fuks et al, 2014; van Kempen & Babisch, 2012).

Occupational risks also play an important role in stroke burden: shift work and workplace exposure to second-hand tobacco smoke significantly increased stroke (Jaakkola & Jaakkola, 2006; Vyas et al, 2012), as well as long working hours (more than 55 hours per week) (Kivimaki et al, 2015). The proportion of stroke cases attributable to workplace second-hand tobacco smoke exposure was estimated to range by country between 1–24% (Jaakkola & Jaakkola, 2006). In Finland, it was estimated that occupational risks accounted for 11% of the deaths from stroke (Nurminen & Karjalainen, 2001). Additionally, job strain resulting from high workload and few decision-making opportunities in the workplace is associated with hypertension (Babu et al, 2014; Rosenthal & Alter, 2012) and some professions are especially prone to elevated blood pressure levels (Kales et al, 2009).

Links to various other environmental risks have been suggested for increased risk of stroke or hypertension (a major stroke risk factor), including chemicals such as PCBs, dioxins, phthalates, pesticides; and radiation (Bernal-Pacheco & Roman, 2007; Shiue, 2013). High arsenic levels in drinking-water have also been linked to increased risk of stroke (Moon et al, 2012), and arsenic exposure has furthermore been linked to hypertension (Abhyankar et al, 2012).

Globally, 42% (24–53%) of the total burden of stroke was attributed to the environment. These estimates are based on a combination of data from CRA type assessments (see Section 2 and Annex 3.2).

SELECTED INTERVENTIONS FOR CARDIOVASCULAR DISEASES

- Tobacco smoke-free legislation reduced the exposure to second-hand tobacco smoke (Callinan et al, 2010). Furthermore, the risk of acute coronary events decreased by 10% (pooled relative risk 0.90, 95% CI: 0.86–0.94) (Mackay et al, 2010). The effect was larger in the younger and non-smoking population (Meyers et al, 2009). Banning second-hand tobacco smoke in the workplace let to improvements in cardiac health (Jaakkola & Jaakkola, 2006).
- Provision of improved cookstoves lead to reductions in household air pollution and significantly reduced diastolic blood pressure (McCracken et al, 2007). Further interventions and strategies to reduce exposure to smoke from solid fuel combustion are provided in the WHO indoor air quality guidelines (WHO, 2014ee).
- Various environmental interventions, including urban planning and access to sports facilities, increased physical activity and thereby lowered the risk for NCDs including ischaemic heart disease and stroke (Brownson et al, 2006).
- A review of interventions and events that led to the reduction of air pollution showed that most of these interventions have been associated with health benefits, mainly via respiratory and cardiovascular mortality/morbidity. Examples for reduction of cardiovascular mortality include the reduction of sulphur content in fuel in Hong Kong in 1990, and the Irish coal ban in 1990. Other interventions have shown significant reductions in various air pollutants related to respiratory and cardiovascular health impacts, such as the European air emission policies (1990–2005), the London Congestion Charging Scheme and the Stockholm Congestion Charging Trial (Henschel et al, 2012). Many more approaches have been used to reduce air pollution levels, such as the replacement of older diesel vehicles, increased use of public transport, industrial emission control, and use of modern energy sources for domestic cooking and heating.

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ECONOMIC EVALUATIONS FOR CARDIOVASCULAR DISEASES

- For Denmark, the potential health-care system savings from reducing ambient air pollution (PM2.5) and the resulting cost reductions for coronary heart disease, stroke, chronic obstructive pulmonary disease (COPD) and lung cancer were estimated at €0.1–2.6 million per 100 000 people, mainly from stroke and COPD (Saetterstrom et al, 2012). The productivity costs from no longer being in the labour market due to these four diseases from exposure to PM2.5 was estimated at €1.8 million per 100 000 people aged 50–70 (Kruse et al, 2012).
- In the USA, the annual treatment costs for IHD from second-hand tobacco smoke were estimated between US$1.8–6.0 billion (for years 1999 to 2004) (Lightwood et al, 2009).
- A study estimated that introducing smoke-free legislation in all USA's workplaces would result in nearly US$ 49 million savings in direct medical costs. Reductions in second-hand tobacco smoke accounted for the majority of these savings (Ong & Glantz, 2005).
- Implementing smoke-free workplaces was about nine times more cost-effective per new non-smoker than free nicotine replacement therapy programmes (Ong & Glantz, 2005).
- The annual costs of additional cases of acute myocardial infarction, stroke and dementia attributable to exposure to home environmental noise in the UK were estimated at £1.09 billion (Harding et al, 2013).
- In France, the costs of IHD incurred by job strain, including medical and sick leave costs, amounted to €101 million in 2003 (Sultan-Taieb et al, 2013).
- A study on regulations on residential wood burning in San Joaquin Valley, California in 2003, banning wood burning in areas with a supply of natural gas in areas below 1000 m when the forecasted air quality was poor showed the mean annual mortality costs from cardiovascular and respiratory diseases saved by the intervention amounted to approximately US$ 400 million in Fresno/Clovis and US$ 200 million in Bakersfield metropolitan areas. Saved morbidity costs were also very significant, ranging between US$ 11 to 27 million and US$ 6 to 14 million in Fresno/Clovis and Bakersfield, respectively (Lighthall et al, 2009).
- The economic cost of premature deaths from ambient particulate matter pollution and household air pollution was estimated to amount to US$ 1.5 trillion in the European Union in 2010 (WHO Regional Office for Europe & OECD, 2015).

Air pollution readings frequently exceed recommended levels in almost all parts of the world

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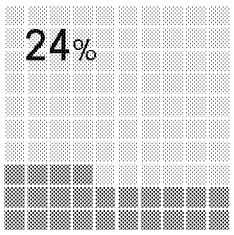
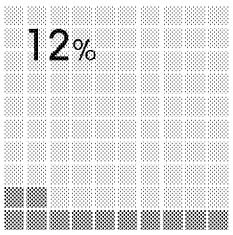
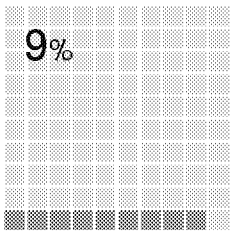
CHRONIC OBSTRUCTIVE PULMONARY DISEASE



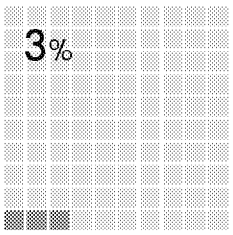
Household air pollution
Method: CRA



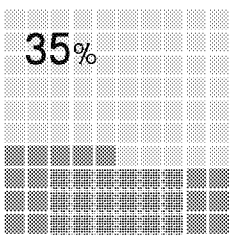
Occupational risks
Method: CRA



Ambient air pollution
Method: CRA



Ozone
Method: CRA



Total environmental risks
Method: CRA

Chronic obstructive pulmonary disease, a slowly progressing disease characterized by a gradual loss of lung function, caused 3.6% of overall global disease burden (in terms of DALYS) in 2012 (WHO, 2015d).

The most important risk factor is active smoking, estimated to contribute to 37% of the global COPD burden in 2010 (IHME, 2014). However, around one third of patients with COPD never smoked (Salvi & Barnes, 2009). Most other risk factors are environmental or occupational, including dusts and chemicals in the workplace, air pollution and second-hand tobacco smoke.

Ambient and household air pollution are associated with the development of COPD (Kurmi et al, 2010), causing a chronic inflammatory response in the airways and the lung (Ling & van Eeden, 2009) introducing remodelling and destruction of lung tissue (Baraldo et al, 2012). Exposure to smoke from biomass fuels combustion is considered as the main risk factor for COPD in poor rural areas (Salvi & Barnes, 2009; Tan, 2011), especially for women (Po et al, 2011). Additionally, air pollution can trigger acute exacerbation and increased hospital admissions and mortality in patients with chronic COPD (Ko & Hui, 2012). Ambient air pollution was estimated to cause 9% and household air pollution 24% of the COPD burden in 2012 in DALYs (WHO, 2015d). Ozone, which can increase airway inflammation and can lead to a deterioration of lung function and gas exchange (Jerrett et al, 2009), was estimated to cause 3.1% of the COPD disease burden (DALYS) in 2010 (IHME, 2014). Second-hand tobacco smoke has also been linked to COPD (Zhou & Chen, 2013).

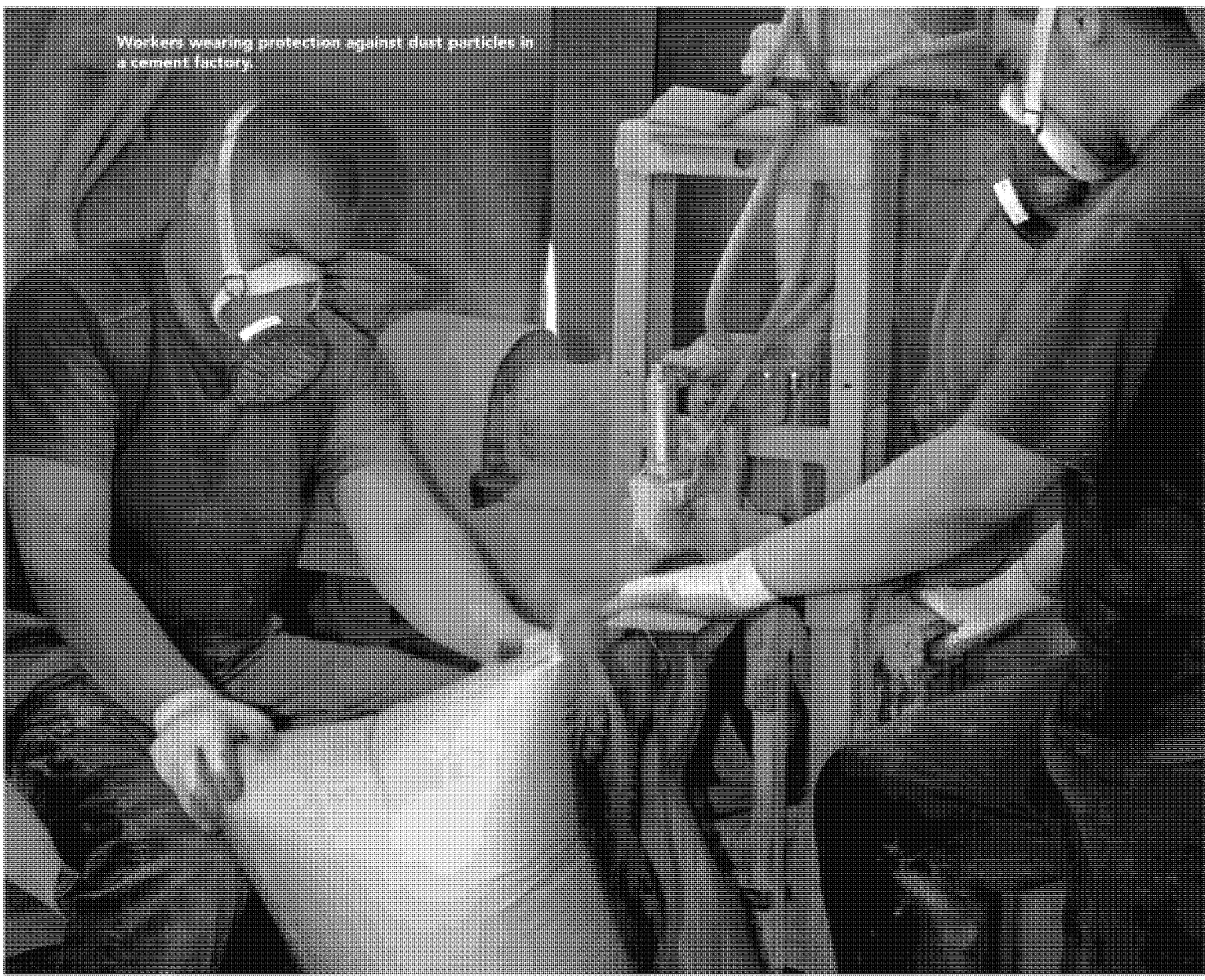
Antenatal and childhood exposure to household and ambient air pollution and second-hand tobacco smoke is associated with reduced lung function and predisposition to develop COPD in later life (Narang & Bush, 2012; Stocks & Sonnappa, 2013). Air pollution and second-hand tobacco smoke have furthermore been linked to adverse pregnancy outcomes like low birth weight and preterm birth which are in turn associated with reduced lung function in children and predisposition for COPD (Salvi & Barnes, 2009; Stocks & Sonnappa, 2013).

A substantial part of the COPD disease burden is attributable to occupation, e.g. from particulate matter, gases and fumes. It has been estimated that 12% of the overall COPD disease burden (DALYS) (IHME, 2014) and 31% (Salvi & Barnes, 2009) to 40% (Blanc, 2012) of COPD cases in those who have never smoked are attributable to the workplace.

Occupations with high risk for COPD are for example coal and hard-rock mining (Cohen et al, 2008; Santo Tomas, 2011), metal smelting (Soyseth et al, 2013), tunnel

and construction work and manufacture of concrete, plastic, textile (Lai & Christiani, 2013), rubber, leather and food products, transportation and trucking (Hart et al, 2012) automotive repair, some personal services (e.g. beauty care) and farming (Poole, 2012; Salvi & Barnes, 2009). Additionally, second-hand tobacco smoke exposure in the workplace is a considerable risk to health (Eisner 2010) and it was estimated that workplace exposure increases the risk for COPD by 36% in certain settings in the groups with highest exposures to the unexposed (Jaakkola & Jaakkola, 2006).

Globally, it was estimated, based on combination of data from CRA types of assessments (see Section 2 and Annex 3.2), that 35% (20–48%) of the COPD disease burden could be attributed to the environment. The population attributable fractions for COPD risk factors vary significantly between countries and by gender, a result of differences in the main risk factors to which people are exposed. In countries where solid fuel is widely used in homes for cooking or heating, indoor smoke levels can be high, and mean population attributable fractions often exceeded 30%, with higher values for women than for men. In higher income regions, with little reliance on burning solid fuel in the home, mean population attributable fractions were generally between 5% and 15%, with higher values for men because of occupational exposures to smoke.



Workers wearing protection against dust particles in a cement factory

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SELECTED INTERVENTIONS

- An intervention in rural China, that improved kitchen ventilation and promoted the use of clean fuels among people using biomass, led to a significant reduction of decline in FEV1 (forced expiratory volume at intervals of one second – a test of pulmonary function), and risk of COPD in long-term follow-up (Zhou et al, 2014).
- In rural Guatemala a randomized intervention trial comparing health effects in chimney stove and open fire users found 62% reduced carbon monoxide exposure, reductions in all respiratory symptoms in the chimney stove group but no significant effects on lung function after 12–18 months (Smith-Sivertsen et al, 2009).
- Legislative smoking bans are effective in reducing exposure to second-hand tobacco smoke both in public and in workplaces (Brownson et al, 2006; Callinan et al, 2010).
- Based on 90 studies that compared exposure with and without control measures in workplaces, the average percentage reduction of exposure to risks causing occupational disease and injury was 50% (4–74%) for enclosures of sources of pollution; 82% (78–84%) for local exhaust ventilation; 87% (73–94%) for specialized ventilation systems; 43% (17–61%) for general ventilation; 83% (77–88%) for dust suppression techniques; and 87% (71–95%) for separation of workers. These exposure reductions can reduce work-related cancer, pneumoconiosis, COPD, asthma and various other respiratory diseases (Verbeek & Ivanov, 2013).

ECONOMIC EVALUATIONS OF INTERVENTIONS TO REDUCE COPD AND OTHER RESPIRATORY CONDITIONS

- A cost-effectiveness analysis of installing natural gas as an alternative to using biomass fuels in rural communities on the Colombian Caribbean coast estimated that the costs of preventing one death from COPD or acute lower respiratory infections are US$ 56 000 (US$ 22 000–74 000) and preventing one DALY between US$ 43–66 (Alvis-Guzman et al, 2008).
- In Taiwan, China, the total health damage from air pollution (particulate matter) was estimated to amount to 2.4–4.9% of the city's GDP (or 1.7 billion Yuan) in 2000. Scenarios assuming use of cleaner fuels and infrastructure changes to heating systems could have prevented 200 to 1100 PM10 related premature deaths in 2010 and substantially reduce population morbidity (D. Zhang, K. Aunan et al, 2010).
- For Mumbai, India, the total monetary burden of health impacts, including personal burden, government expenditure and societal cost of respiratory symptoms and illnesses such as allergic rhinitis and chronic obstructive pulmonary disease was estimated at US$ 113 million for a 50-mg/m^3 increase in PM10, and US$ 218 million for a similar increase in NO_2 (Lim et al, 2012; Patankar & Trivedi, 2011).
- For Barcelona, Spain, reducing PM10 exposure from 50 mg/m^3 to 20 mg/m^3 was estimated to lead to 3500 fewer deaths, 1800 fewer hospitalizations for cardio-respiratory diseases, 5100 fewer cases of chronic bronchitis among adults, 31 100 fewer cases of acute bronchitis among children, and 54 000 fewer asthma attacks among children and adults. The mean total monetary benefits were estimated to be €6400 million per year (Perez et al, 2009).
- A household-level cost-benefit analysis in Nepal, Kenya and Sudan suggested that different household energy interventions provided economic returns between 19–429% to the households over a 10-year intervention period. The returns derived mostly from time and fuel cost savings (Malla et al, 2011). An earlier cost-benefit analysis with a societal perspective showed that investments in household energy interventions can be highly cost-beneficial and, in some cases, result in cost-savings (Hutton et al, 2006). Other economic evaluations of NGO programmes in different African countries support these findings (Habermehl, 2007; Renwick et al, 2007).
- In the Hong Kong SAR, China, population of 6.5 million in 1998, the annual direct costs of medical care, long-term care and productivity loss were estimated at US$ 156 million for second-hand tobacco smoke (McGhee et al, 2006).
- See the additional example from Denmark in the box on stroke.

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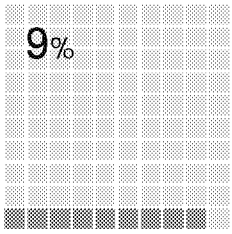
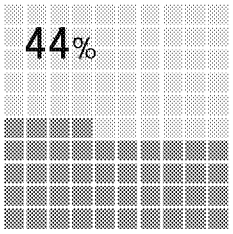
ASTHMA



Occupational risks
Method: CRA



Total occupational risks, indoor and ambient air pollutants
Method: expert survey

Asthma, an inflammatory respiratory condition, is a major cause of disability, health-care utilization and reduced quality of life and accounts for approximately 0.9% of global overall disease burden (WHO, 2015d). Among adults, diagnosed asthma was estimated in 4.3% of the population, globally (To et al, 2012). In children, asthma is one of the most important chronic diseases, with a mean of 14% of children around the world reporting current asthma symptoms (Pearce et al, 2007).

Genetic predisposition is one major asthma determinant (Moffatt et al, 2010). However, large geographic differences and important recent time trends in asthma occurrence are likely to be in part due to variations in environmental factors (Eder et al, 2006; Heinrich 2011; Tinuoye et al, 2013). The pathogenesis of asthma can start as early as in utero and both asthma development and exacerbation can be triggered by different indoor and outdoor environmental exposures.

Air pollution induces oxidative stress leading to inflammatory responses in the airways and bronchial hyper-reactivity, typical features of asthma (Auerbach & Hernandez, 2012). There is strong evidence that acute increases of ambient air pollution provoke asthma exacerbations and increase hospital admissions in adults and children (Anderson et al, 2013; Dick et al, 2014; Jacquemin et al, 2012). Long-term exposure to ambient air pollution, e.g. from motor vehicle exhaust, was furthermore associated with asthma development in both children and adults (Anderson et al, 2013; Gasana et al, 2012; Searing & Rabinovitch, 2011; Takenoue et al, 2012). Also, ozone exposure has been linked to acute reductions in lung function (Brown et al, 2008).

In cold and temperate climates, indoor pollutants are likely to be even more important than those outdoors as more time is spent indoors (Heinrich, 2011). Household air pollution, e.g. particulate matter or NO_2 from biomass smoke or living close to busy roads, was associated with increased asthma symptoms and morbidity both in children and adults (Breysse et al, 2010; Trevor et al, 2014).

The population attributable fraction for incident asthma in preschool Canadian children from both indoor and ambient PM10, PM2.5 and NO_2 were estimated at 11%, 1.6% and 4.0% respectively (Simons et al, 2011).

Another important indoor pollutant, second-hand tobacco smoke, is believed to detrimentally affect lung growth and development already prenatally (Wang & Pinkerton, 2008). Exposure in unborn children has furthermore been associated with increased wheezing, asthma exacerbations and asthma incidence in childhood (Burke et al, 2012). About 40% of children are exposed to second-hand tobacco smoke in their homes (Öberg et al, 2011). There is consistent evidence for a modest association between exposure to second-hand tobacco smoke and clinically confirmed childhood asthma (Tinuoye et al, 2013). Also increased asthma occurrence and morbidity in adults has been linked to exposure to second-hand tobacco smoke (Eisner, 2008). The population attributable fraction for incident asthma in preschool Canadian children from second-hand tobacco smoke was 2.9% (Simons et al, 2011). Population attributable fractions for asthma in different European countries and the USA from exposure to second-hand tobacco smoke in the workplace alone was estimated between 1–29% (most countries between 10–20%) (Jaakkola & Jaakkola, 2006).

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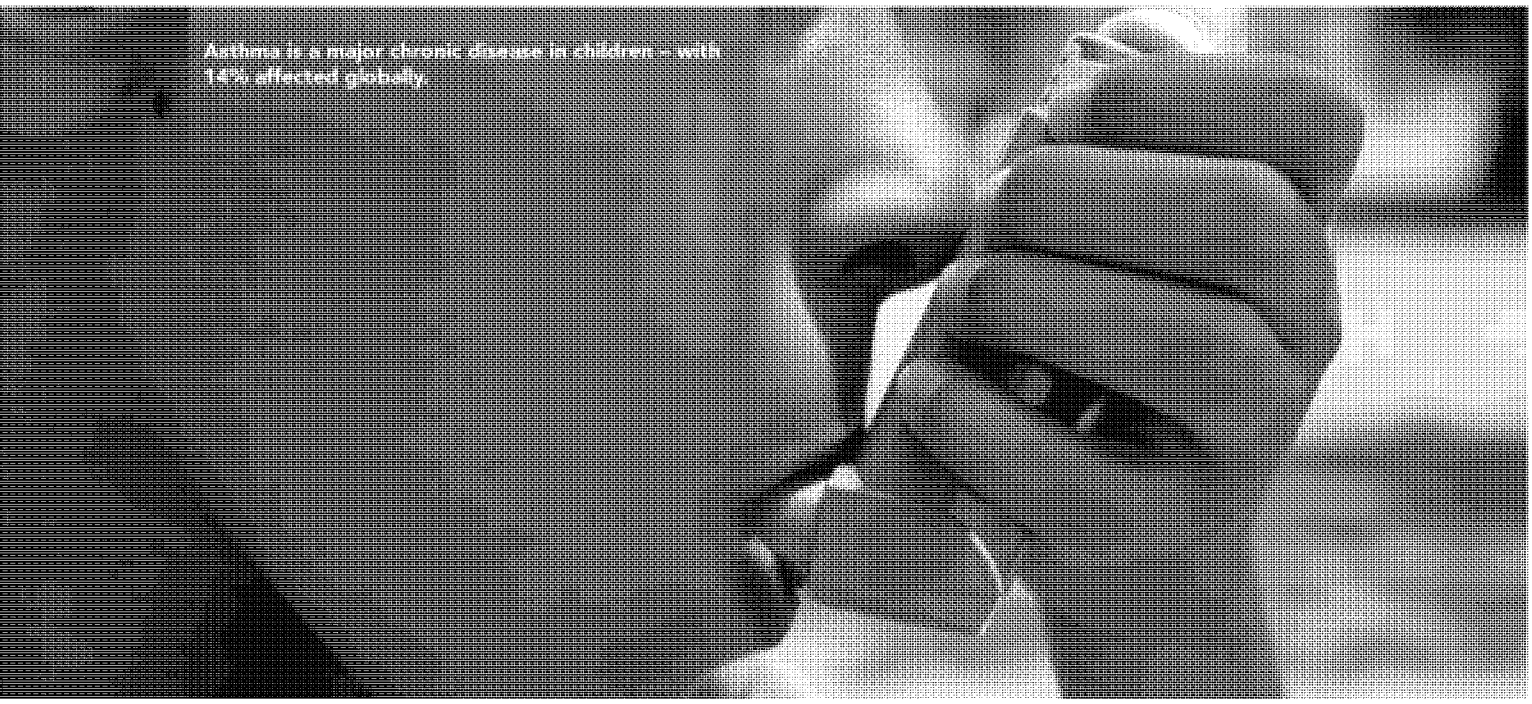

Many other environmental exposures have been linked to asthma. Indoor mould is common, with about 5–30% of homes being affected (Quansah et al, 2012). Indoor mould and dampness are associated with increased asthma symptoms and also new asthma cases in children and adults across different countries (Antova et al, 2008; Dick et al, 2014; Quansah et al, 2012; Tischer et al, 2011). It was estimated that 21% of asthma cases in the USA are attributable to mould and dampness at home (Mudarri & Fisk, 2007) and 6% in the Netherlands (Schram-Bijkerk et al, 2013). Other environmental exposures include formaldehyde (McGwin et al, 2010) and phthalates (Jaakkola & Knight, 2008). Also allergen exposure, e.g. from dust mites, pollens, cockroach or mice, is associated with increased asthma exacerbations in childhood (Dick et al, 2014). Between 6.5% and 13% of incident asthma in preschool Canadian children was attributed to exposure to cockroach and mouse allergens, respectively (Simons et al, 2011). However, other surroundings might offer a protective effect: a farming environment was associated with a decrease in doctor-diagnosed asthma and current wheeze by 25% (Genuneit, 2012).

Work-related asthma is among the most frequent occupational diseases (Baur, Aasen et al, 2012). It was estimated that around 18% of all adult-onset asthma is caused by occupational factors (Toren & Blanc, 2009) and that around 22% of adults with asthma suffer from work-exacerbated asthma (Henneberger et al, 2011). A large quantity of agents in the workplace is supposed to be responsible for the development of the disease (Baur, Bakehe & Vellguth, 2012). Those can be grouped as allergens and irritants and include, amongst many others, cleaning agents, disinfectants, isocyanides, enzymes, coffee, flour, animals and green house allergens, wood dust, colophony, latex and metals (Folletti et al, 2014; Moscato et al, 2011; Perez-Rios et al, 2010; Vandenplas et al, 2011). Occupational exposures were estimated to account for about 9% of the total disease burden from asthma (IHME, 2014).

Total environmental exposures were estimated to account for 44% (26–53%) (expert survey 2005, see Section 2). The estimate for environmental exposures did not include outdoor exposure to pollen, as this is not realistically modifiable.

SELECTED INTERVENTIONS

- Repairing mould-damaged houses and offices led to a reduction of asthma-related symptoms in adults; amongst other symptoms a reduction of wheezing by around 36% (25–45%). Similar remediation work in schools decreased pupil visits to physicians due to common cold (Sauni et al, 2013). Interventions decreasing the exposure to house dust reduced physician-diagnosed asthma in high-risk children by around 26% (5–42%) without reducing parental-reported wheeze or symptoms in existing disease (MacDonald et al, 2007).

- Current evidence does not support singular measures against dust mite exposure (Arroyave et al, 2014; Gotzsche & Johansen, 2008) but interventions reducing several environmental asthma triggers demonstrated beneficial effects on asthma morbidity (Crocker et al, 2011; Matsui, 2013; Rao & Phipatanakul, 2011; Wright & Phipatanakul, 2014).

- Smoke-free legislation reduced hospital attendance for childhood asthma by about 10% (Been et al, 2014).

- Removing people with occupational asthma from the relevant exposure was associated with beneficial effects on asthma symptoms and lung function (people removed from exposure were 21 times (7–64) more likely to report an absence of asthma symptoms and experienced a mean improvement of lung function of nearly 6% (3–8%) (de Groene et al, 2011). Reduction of exposure was also associated with beneficial effect on symptoms. However, the effect size was smaller and there was no improvement of lung function compared with workers that remained exposed (de Groene et al, 2011; Vandenplas et al, 2011). Eliminating exposure to asthma allergens was also effective for the primary prevention of occupational asthma (Heederik et al, 2012). However, certain causes of occupational asthma, in particular chemicals, can be more difficult to identify (Baur, Aasen et al, 2012; Cullinan & Newman Taylor, 2010).

- A review of interventions and events that led to the reduction of air pollution showed that most of these interventions have been associated with health benefits, mainly by the way of respiratory and cardiovascular mortality/morbidity. Examples for reduction of asthma incidence or related health-care visits include the closure of a steel mill in Utah Valley, USA; and measures to reduce traffic congestion during the 1996 Summer Olympic Games in Atlanta, USA. Additional interventions leading to better air quality have been documented, such as the European air emission policies (1990–2005), the London Congestion Charging Scheme and the Stockholm Congestion Charging Trial (Henschel et al, 2012). Many more interventions are available to reduce air pollution levels, such as the replacement of diesel vehicles, increased use of public transport, industrial emission control, and use of modern energy sources for domestic cooking and heating.

ECONOMIC EVALUATIONS

- The total present value costs for all cases of occupational asthma in the UK in 2003 were estimated at between £95 and £135 million with the largest economic burden born by the state and the individual (Ayres et al, 2011).

- The annual childhood asthma-related costs attributable to air pollution in two USA communities were large (estimated at US$ 18 million) and mainly borne by the children's families (Brandt et al, 2012). Exposure to PM2.5 was positively associated with increased costs of childhood asthma hospitalizations (Roy et al, 2011).

- Dampness and mould exposure in the home was estimated to lead to US$ 3.5 billion annual asthma costs in the USA (Mudarri & Fisk, 2007).

- Different environmental interventions were judged as cost-effective strategies against asthma, including housing interventions (Edwards et al, 2011), multi-component interventions reducing a range of indoor asthma triggers (Nurmagambetov et al, 2011) and environmental education (Jassal et al, 2013; Nguyen et al, 2011).

- Cost of illness from asthma during childhood attributable to the environment amounted to US$ 1 550 million in the EU in 2008 (Bartlett & Trasande, 2014).

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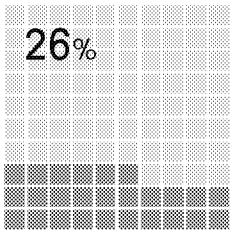
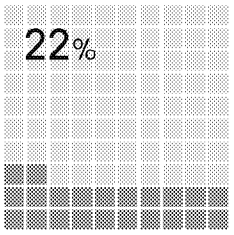
MUSCULOSKELETAL DISEASES

LOW BACK PAIN



Occupational risks
Method: CRA

TOTAL



Occupational risks, domestic risks
Method: CRA and expert survey

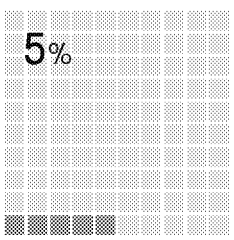
The main musculoskeletal diseases included in this study were rheumatoid arthritis, osteoarthritis, back and neck pain and gout. These are part of a group of 150 musculoskeletal conditions affecting millions of people globally (WHO, 2003b). These conditions are common, often progressive and associated with pain.

Low back pain has been associated with ergonomic stressors at work, and it was estimated that occupational exposures account for 26% (17–36%) of the burden of low back pain (Lim et al, 2012). The mean population attributable fraction was higher for men than for women (30% versus 21%) because men are more frequently engaged in occupations that expose them to risk. Occupational groups at highest risk of low back pain include farmers, forestry workers and fishermen, production and related workers, and service workers (Driscoll et al, 2014). Several risks in the work environment have been found to be associated with higher rates of neck pain, including high job demands and low social/work support, job insecurity, poor computer workstation design and work posture, sedentary work position, repetitive and precision work, and prolonged sitting at work (Côté et al, 2008; McLean et al, 2010). Domestic water carrying, mainly performed by women and children in Africa, has also been related to spinal pain (Geere et al, 2010).

Osteoarthritis has been associated with joint injury, obesity and occupational activity, all of which have an environmental component (Richmond et al, 2013). Occupational activities associated with increased risk included for example heavy lifting, using vibrating tools, kneeling or exposure to cramped space. Rheumatoid arthritis has been associated with proximity to traffic, and exposures to air pollutants and vibrations (Hoovestol & Mikuls, 2011; Olsson et al, 2004). It was estimated that environmental factors account for 17% (6–31%) of the disease burden from rheumatoid arthritis and 20% (11–29%) of that from osteoarthritis (expert survey 2005, see Section 2).

The group of "other musculoskeletal diseases" includes other forms of arthritis, arthropaties, joint disorders, systemic connective tissue disorders, muscle and soft tissue disorders. Evidence indicates that these diseases are also linked to occupational conditions. Overall, it was estimated that 22% (12–33%) of the disease burden of the group of musculoskeletal diseases was attributable to occupational risk factors (CRA and expert survey).

CONGENITAL ANOMALIES



Second-hand tobacco smoke and other air pollutants, chemicals
Method: expert survey

An estimated 6% of global infant deaths are due to congenital anomalies (Higashi et al, 2015). Congenital anomalies include chromosomal conditions, like Down and Edward syndrome, and non-chromosomal conditions, like different congenital organ defects (Loane et al, 2011; WHO, CDC & ICBDSR, 2014).

Second-hand tobacco smoke exposure in non-smoking pregnant women was

estimated to increase the overall risk for congenital malformations, particularly heart defects, limb-reduction defects, kidney/urinary tract defects, and cleft lip and palate defects, by 13% (Leonardi-Bee et al, 2011). There are, furthermore, potential links between prenatal exposure to pesticides, organic solvents and air pollution and congenital heart disease (Gorini et al, 2014; Vrijheid et al, 2011), exposure to some endocrine disrupting chemicals and cryptorchidism and hypospadias (DiVall, 2013; Virtanen & Adamsson, 2012), pesticide exposure and urinary malformations (Hei & Yi, 2014). Prenatal exposure might further influence male (DiVall, 2013; Meeker, 2012; Vested et al, 2014) and female (Fowler et al, 2012) reproductive health (Snijder et al, 2012). However, evidence on many of these linkages is still limited.

It was estimated that 5% (1–10%) of all congenital anomalies were attributable to environmental causes (estimate based on expert survey 2005, see Section 2).

SELECTED INTERVENTIONS

- The European (EUROCAT and EUROPLAN) "Recommendations on Policies to Be Considered for the Primary Prevention of Congenital Anomalies in National Plans and Strategies on Rare Diseases" list evidence-based actions for the reduction of congenital anomalies in Europe and include reduction of exposures to methylmercury, second-hand tobacco smoke and endocrine disruptors (Taruscio et al, 2014).

OTHER NONCOMMUNICABLE DISEASES

Links of other NCDs to environmental exposure have been documented. For example, chronic kidney diseases have been linked to exposure to lead in various settings (Ekong et al, 2006; Muntner et al, 2003; Patrick, 2006), and the fraction of chronic kidney diseases attributable to lead has been quantified at 2.5% (IHME, 2014). Exposure to lead also affects other cardiovascular diseases, causing 9% of hypertensive heart disease, 2% of rheumatic heart disease and 3% of other cardiovascular diseases worldwide (IHME, 2014). Certain occupations are at increased risk of skin diseases, for example workers frequently handling liquids and chemical substances, such as hairdressers, nurses, cleaners or metal workers (Behroozy & Keegel, 2014). Pneumoconiosis, including silicosis, asbestosis and coal-workers' pneumoconiosis are additional chronic respiratory diseases, of largely occupational origin, causing 260 000 deaths per year (GBD 2013 Mortality Causes of Death Collaborators, 2015).

Not all diseases or disease groups have been included in this analysis, either because they were not significantly linked to the modifiable environment under the definition used, or because the evidence was too incomplete to make a reasonable estimate. Examples of diseases that have not been considered here include for example anaemia, iodine deficiency, several skin diseases, diabetes and endocrine or immune disorders, although certain links with the environment have been established.

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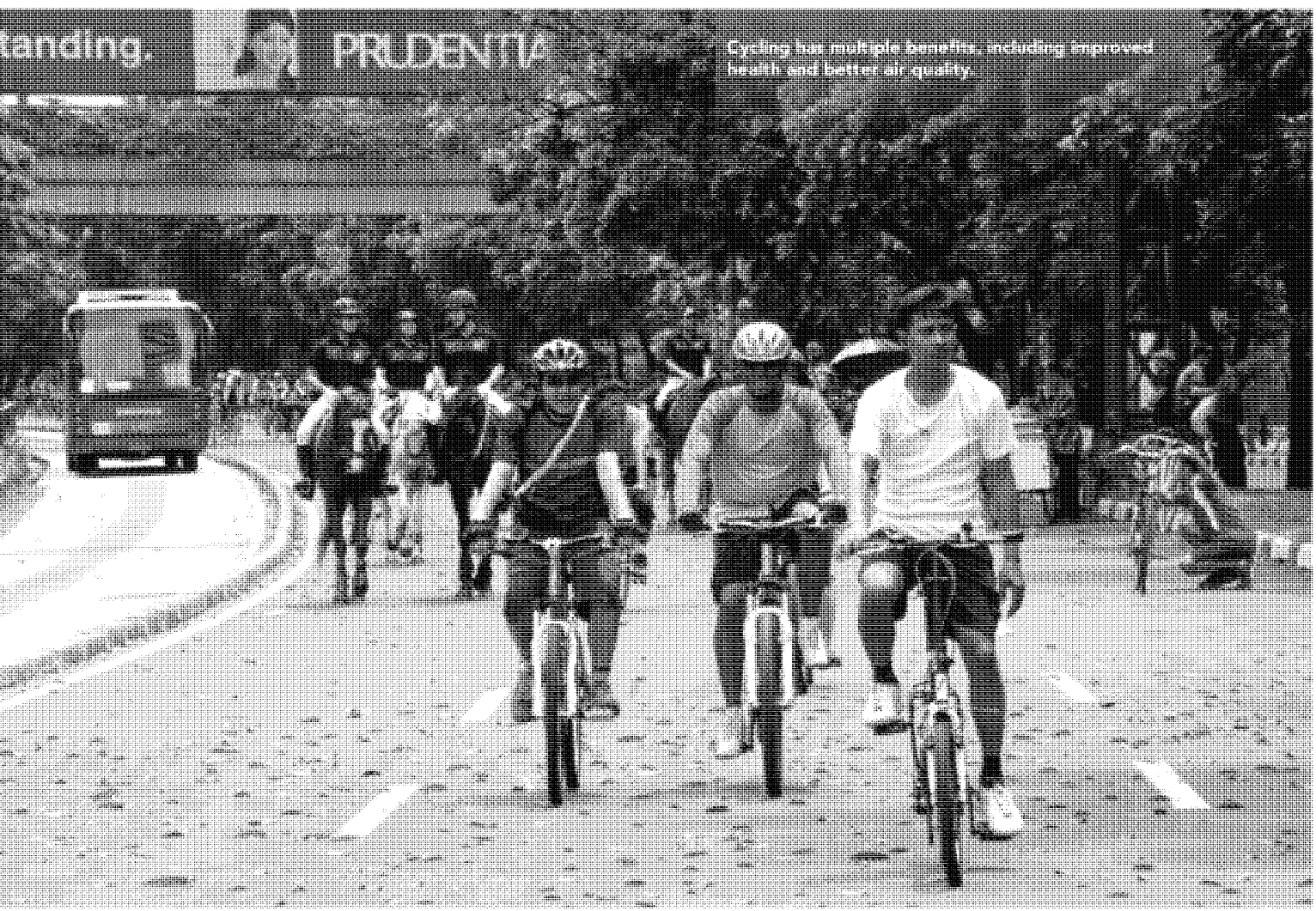
RISKS FACTORS FOR NONCOMMUNICABLE DISEASES FROM OTHER AREAS BUT RELATED TO THE ENVIRONMENT

Certain risk factors are strongly related to NCDs, and can be modulated by favourable environments. Overweight, obesity and physical activity are examples of such risks which can be influenced by the physical environment and occupational conditions, but which are not an integral part of the environment as they are also linked to lifestyle.

OVERWEIGHT AND OBESITY

Overweight refers to a condition of people with a body mass index (BMI) between 25 and 30 kg/m^3, and obesity to a condition where BMI is greater or equal 30 kg/m^3. In 2014, 39% of adults aged 20 years and above were overweight, and 13% were obese (WHO, 2015i). 42 million children under five years were overweight or obese in 2013. Overweight and obesity are major risk factors of NCDs such as cardiovascular diseases, diabetes, musculoskeletal disorders and certain cancers (WHO, 2014l; WHO 2015i).

Overweight and obesity are caused by an increased intake of energy-dense food, and also lack of physical activity and sedentary lifestyle (WHO, 2015i). Links between physical activity and the built environment, such as urban densities, street connectivity, pavements and other



Cycling has multiple benefits, including improved health and better air quality.

infrastructure facilitating walking, cycling, public transport and less car travel, and policies to increase space for recreational activity have been documented (Lopez & Hynes, 2006; O Ferdinand et al, 2012; WHO, 2009b; WHO 2011c). The home physical environment (TV limiting devices, physical activity devices) also shows an influence on physical activity levels (Kaushal & Rhodes, 2014). Physical activity can prevent several health outcomes and is further covered in a specific section in this document.

The creation of food environments that support healthy diets are also an essential component of population-wide childhood obesity prevention strategies. Policies that influence food environments may include government or local authority policies on land use, agriculture, food manufacturing and distribution, food marketing, food retail and food services (WHO, 2012g).

Schools and workplaces are settings where interventions promoting healthy diets and physical activity have been effective. Comprehensive, multi-component programmes include the provision of healthy foods options and beverages in the setting, and physical activity options or programmes (WHO, 2009b).

Occupation-related physical activity is another factor associated with obesity. Demands of physical activity at work were shown to have fallen drastically during the last decades in various regions of the world (Church et al, 2011; Ng et al, 2014). On the basis of a large population survey conducted over decades in the USA (US National Health and Nutrition Examination Survey – NHANES) it was estimated that between 1960–1962 and 2003–2006, the estimated mean daily calorie expenditure has dropped by more than 100 calories per day, which would induce a weight gain of more than 10 kg in certain age groups, corresponding to the weight gain observed during the same period (Church et al, 2011).

EXAMPLES OF INTERVENTIONS

- High-intensity school-based interventions that focus on diet and/or physical activity and are multi-component, including:
  - Curriculum on diet and/or physical activity taught by trained teachers;
  - Supportive school environments/ policies; and
  - Healthy food options available through school food services, such as the cafeteria or vending machines.
- Multi-component programmes in the workplace, including provision of healthy food and beverages at workplace facilities (WHO, 2009b, 2012g).
- In Beijing, China, a nutrition education and physical activity intervention involving children and their parents resulted in overweight prevalence being 9.8% in intervention schools as compared with 14.4% in control schools, and obesity being 7.9% compared with 13.3%, respectively. The intervention included the provision of educational materials to parents, classroom lessons on obesity, and a physical activity component.

Climate change may lower the nutritional quality of dietary intake, exacerbate obesity and amplify health inequalities (Lake et al, 2012). The links between the environment and overweight/obesity have to date been relatively poorly documented.

PHYSICAL INACTIVITY

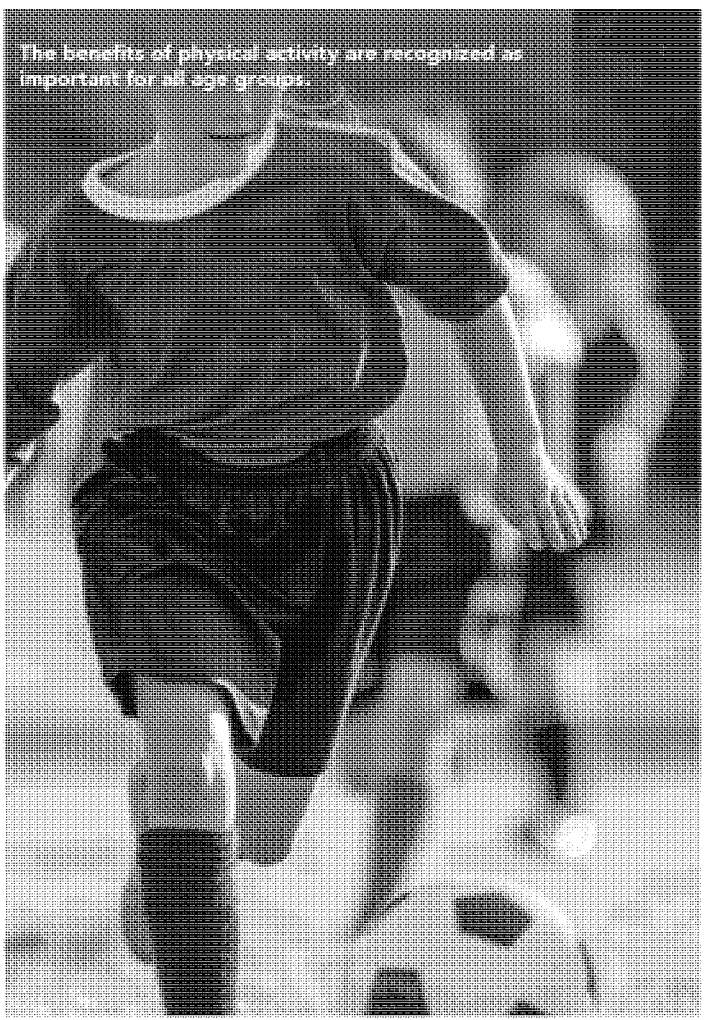
Physical inactivity is an important risk factor for NCDs, including ischaemic heart disease and stroke, cancers of the breast, colon and rectum, and diabetes mellitus. Through these diseases, insufficient physical activity causes 6.0% of all deaths globally (Lim et al, 2012). It was estimated that 23% of adults and 81% of adolescents globally are insufficiently active, which is defined as less than 150 minutes of moderate-intensity activity per week, or equivalent (WHO, 2015d). This means

that one third of the global population gets insufficient physical activity to protect them from the associated risks. In most regions of the world, inactivity is on the rise (Ng & Popkin, 2012).

Physical activity may take place at work, during transportation, while performing domestic tasks or during leisure time. Factors that have negatively affected the levels of physical activity include increased use of machinery to alleviate household and occupational tasks, and policies and practices leading to more motorized transport and less walking and cycling (Ng & Popkin, 2012). Also policies supporting decentralized land use, low urban density or low connectivity may contribute to reduced physical activity (Frumkin, 2002; Ng & Popkin, 2012).

With development, the spread of labour-saving technology in the workplace, and the shift away from agriculture to manufacturing and service sectors have been contributing to physical inactivity (Ng & Popkin, 2012). In China, for example, mean occupational physical activity has declined by 33% in men and 42% in women, respectively, between 1991 and 2011 (based on data from nine provinces) (Ng et al, 2014). Occupation is the greatest contributor of physical activity in China, accounting for more than 85% of all physical activity in men and 70% in women in 2011. Reduction in occupational physical activity alone has therefore led to an overall reduction of physical activity of 31% in men and 36% in women, respectively, between 1991 and 2011 in China (data from the Chinese Health and Nutrition survey cohort of 22 000 individuals from nine provinces followed over 20 years) (Ng et al, 2014). Occupational factors such as high job strain or passive jobs may also lead to less physical activity, suggesting a spill-over effect on leisure-time physical activity (Fransson et al, 2012). In the USA the occupational demands on physical activity have dropped significantly during the last decades also (Church et al, 2011).

Travel mode, transport infrastructure and favourable land-use patterns are also closely related to physical activity. More infrastructure facilitating walking, cycling, public transport use and less car travel have been associated with increased physical activity in numerous studies (WHO, 2011c). For example, active school transport has shown significantly higher levels of physical activity in 82% of studies reviewed in a systematic review of 68 studies (Larouche et al, 2014). Objectively measured walkability was most consistently correlated with measures of physical activity for transport (Grasser et al, 2013). Higher urban densities, less sprawl, land-use diversity (e.g. mixed residential/commercial areas), and the availability of green parks and open spaces have been associated with increased physical activity levels in numerous studies (WHO, 2011c). Furthermore, active transport options often bear multiple other co-benefits to health by reducing ambient air pollution and climate change.


The benefits of physical activity are recognized as important for all age groups.

The prevalence of physical inactivity can therefore be modulated through the workplace and the environment, alongside behavioural, cultural and societal factors, via factors that induce or encourage physical activity (Kohl et al, 2012; WHO, 2014w). Environmental and policy interventions that may foster physical activity may address: (a) compact land uses, with a mix of destinations in close proximity; (b) active transport policy and practices, with cycle and pedestrian facilities and site designs, such as pavements, safe crossings or bicycle paths; (c) access to places for physical activity, such as fitness equipment in parks, with informational outreach; and (d) safety and access for all users (de Nazelle et al, 2011; Fenton, 2012; Heath et al, 2012). Promotion of physical activity through occupational health services and work organization was also shown to be promising (Kwak et al, 2014).

EXAMPLES OF INTERVENTIONS

- Environmental interventions targeting the built environment, policies that reduce barriers to physical activity, transport policies to increase space for recreational activity.
- Multi-targeted approaches to encourage walking and cycling to school, healthier commuting and leisure activities.
- Some decades ago, the city of Bogotá, Colombia, launched an initiative of vast environmental transformation, including the provision of pathways for non-motorized transport and an improved public transport system. It is combined with weekly limits on the access of motorized transport. The prevalence of people travelling by car has dropped from 17% to 12% during peak times.
- School-based multi-component programmes focusing, for example, on physical activity taught by trained teachers, supportive school environments/policies and physical activity programmes have shown to be effective.
- Multi-component interventions which include, for example, the provision of space for fitness or signs to encourage the use of stairs were shown to be effective.

WHO, 2009b, 2013g.

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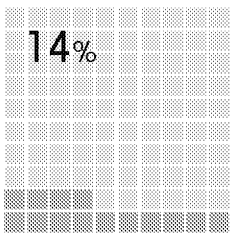
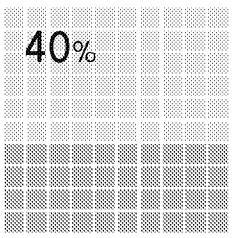
UNINTENTIONAL INJURIES

ROAD TRAFFIC ACCIDENTS



Occupational risks
Method: CRA

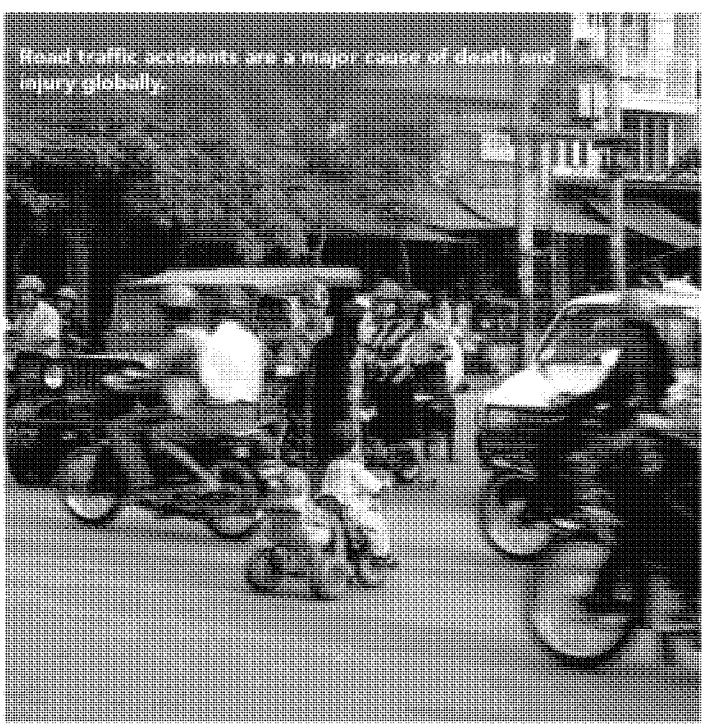


Occupational risks, built environment, traffic regulation, land use
Method: expert survey

Globally, road traffic injuries are the largest cause of injury deaths, causing 1.25 million deaths per year (WHO, 2015d). Almost half of all deaths on the world's roads are among those with the least protection – motorcyclists, cyclists and pedestrians (WHO, 2015e). Key risk factors for road traffic injuries include speeding, alcohol impairment, non-use of helmets, non-use of seat belts and child restraints, inadequate visibility of pedestrians and other road users, and inadequate enforcement of traffic laws.

The design of the built environment can either increase or reduce road traffic injury risk. Specifically, road design, in which facilities such as pavements, bicycle lanes and signalized crossings are missing, inadequate or in poor condition can create risks for pedestrians and cyclists (WHO, 2013g). A road design that does not cater for safety of different transport modes increases risks in a traffic mix situation. Thus, there is a need to consider the safety of all road users when designing roads and lanes, intersections, crossings and vehicle operating speed (Ewing & Dumbaugh, 2009).

Beyond design elements of the road itself, the design of the broader land use for commercial, industrial, recreational, transport, conservation, agricultural or mixed use, can contribute to the occurrence of road traffic injuries (WHO, 2013a; WHO & World Bank, 2004). In the absence of proper planning, these land uses will evolve in a haphazard pattern, and road traffic will evolve similarly to meet the needs of these various activities. This type of situation is likely to produce heavy flows of traffic through residential areas, vehicles of potentially high speed mixing with pedestrians, and heavy, long-distance commercial vehicles using routes not designed for such traffic. The resulting risk exposure affects car occupants, pedestrians, cyclists and motorized two-wheeler users (WHO & World Bank, 2004). Land-use planning factors that affect road traffic injury risk are density, land-use mix and city structure (Ewing & Dumbaugh, 2009; Mohan, 2008; Morency et al, 2012; Qin et al, 2004; WHO, 2013a). Additional environmental issues include weather and topography (Jaroszweski & McNamara, 2014; Qin et al, 2004).



Road traffic accidents are a major cause of death and injury globally.

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More specifically, effective road design and land-use planning measures to improve road safety include: building pavements and bicycle lanes, developing traffic-calming measures, pedestrianizing city centres, controlling vehicle speed, restricting vehicle traffic in residential areas, installing traffic signals and guard rails along roadsides, constructing under- and overpasses, including for pedestrians and, in rural areas and natural parks, for animals, creating a road network that separates access roads from through roads, designing pedestrian pathways to facilitate movement of people with mobility impairment, redesigning public spaces to cater for pedestrian safety needs, and increasing visibility of pedestrians and cyclists through road lighting (Elvik, 2001; Elvik et al, 2009; Forjuoh, 2003; Retting et al, 2003; Sethi et al, 2007; Waters et al, 2004; WHO, 2013a). Further measures include installing pedestrian countdown signals, improving the lighting, for example around pedestrian crossings, creating pedestrian zones, and using infrastructure solutions to enhance safety for school children on their routes to school (Elvik et al, 2009; Reynolds et al, 2009; WHO, 2013e; WHO, 2013g).

Work-related road traffic injuries account for an important share of workplace fatalities (WHO & World Bank, 2004). Various factors are associated with increased road traffic injury rates, such as sleepiness, time spent driving, long driving or working hours, occupational stress, alcohol use, medical conditions or excessive speed, require the attention of occupational health services (Robb et al, 2008; Rosso et al, 2007). About 14% of road traffic injuries were attributed to occupational risks (IHME, 2014).

It is relatively difficult to assess the contribution of environmental factors using intervention studies, because most of such studies must be implemented within an existing built environment, with only minor constructional modifications possible. Also, longer term environmental changes, such as modifications to the urban geography, density or road layout, or changes in the use of motor vehicles, could not be measured. Despite these limitations, it was estimated that 25% (10–64%) of road traffic injuries in Western Europe were attributable to the environment, 17% (0–50%) in Australia, North America and Japan, and 42% (25–65%) in low- and middle-income regions. The global average for road accidents attributable to environmental factors was 39% (23–64%) (expert survey 2005, see Section 2).

SELECTED INTERVENTIONS

- A systematic review of interventions to reduce traffic collisions and injuries has shown that the following infrastructure measures are effective: traffic-calming measures; engineering and other traffic control solutions to improve separation of pedestrians from motorized traffic, including the establishment of pedestrian streets; increasing visibility of pedestrians and cyclists; separation of roads, combined with bridges or underpasses. Overall, the various area-wide traffic-calming infrastructure measures were found effective in reducing road traffic collisions and related fatalities and injuries, with a range of 0–20% reduction (Elvik et al, 2009; Novoa et al, 2009).

ECONOMIC EVALUATIONS

- Estimates based on figures from Norway show that a variety of road improvements are of proven cost-benefit: €1 spent on simple road markings saves society €1.50, €1 spent on upgrading marked pedestrian crossings saves €14, pedestrian bridges or underpasses save €2.50 for every €1 spent and guard rails along the roadside save €10 for every €1 spent (European Transport Safety Council, 2003; Sethi et al, 2007). Further data from Norway indicate that the socioeconomic benefits of establishing a coherent network of routes for pedestrians and cyclists are at least four to five times the costs; area-wide traffic-calming measures show benefits 15% higher than costs, and the introduction of pedestrianized streets is estimated to be 20% higher than the costs (Elvik et al, 2009).

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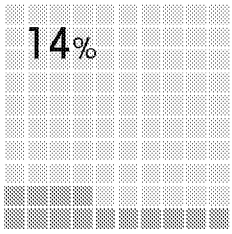
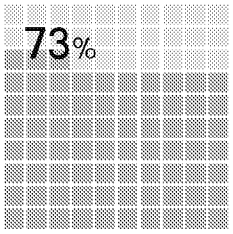
UNINTENTIONAL POISONINGS



Occupational exposure to chemicals
Method: CRA



Chemicals
Method: expert survey

Unintentional poisonings are estimated to cause 193 000 deaths annually (WHO, 2015d). Poisonings considered in this section include poisonings by chemicals or other noxious substances, including drugs, and toxic vapours and gases. Intentional intake of substances or attempted suicides and homicides are covered in other sections.

Pesticides, kerosene, household chemicals, carbon monoxide and drugs are common causes of poisoning in LMIC (Chaoui et al, 2014; Chhetri et al, 2012; Jesslin et al, 2010; Tagwireyi et al, 2006). In HIC, substances involved include drugs, carbon monoxide, and personal care and cleaning products in the home (Mowry et al, 2014; Muller & Desel, 2013). Poisoning can also arise from environmental contamination, for example mass lead poisoning resulting from informal recycling or gold extraction, or from industrial emissions (Dooyema et al, 2012; Haefliger et al, 2009). Occupational exposures to heavy metals, pesticides, solvents, paints, cleaning substances, various vapours and gases and other chemicals used in industrial production may occur (Begemann et al, 2011; Calvert et al, 2008; New Hampshire Occupational Health Surveillance Program, 2012). The attribution of unintentional poisonings to occupational exposure to toxic chemicals was estimated to amount to 14% (Lim et al, 2012).

Interventions to prevent unintentional poisonings include: (a) limiting intake of medications to doses prescribed by a health-care professional; (b) restricting access to toxic agents, for example using safety devices such as child-resistant containers and locked cabinets; (c) storing chemical products in their original containers and adequate labelling; (d) providing adequate information about the product's hazards; (e) adequate choice of chemicals, i.e. use less toxic alternatives if possible; and (f) substitution by less hazardous substances (CDC, 2014b; Harvey et al, 2009; International Programme on Chemical Safety, 2004; Jesslin et al, 2010). In addition, when using hazardous products, wearing protective clothing (e.g. gloves, long sleeves, long trousers, boots) and ensuring adequate ventilation as appropriate can protect from harmful exposures (CDC, 2014b; International Programme on Chemical Safety, 2004). In occupational settings, interventions to limit exposure may in addition include implementation of engineering controls and training (International Programme on Chemical Safety, 2004).

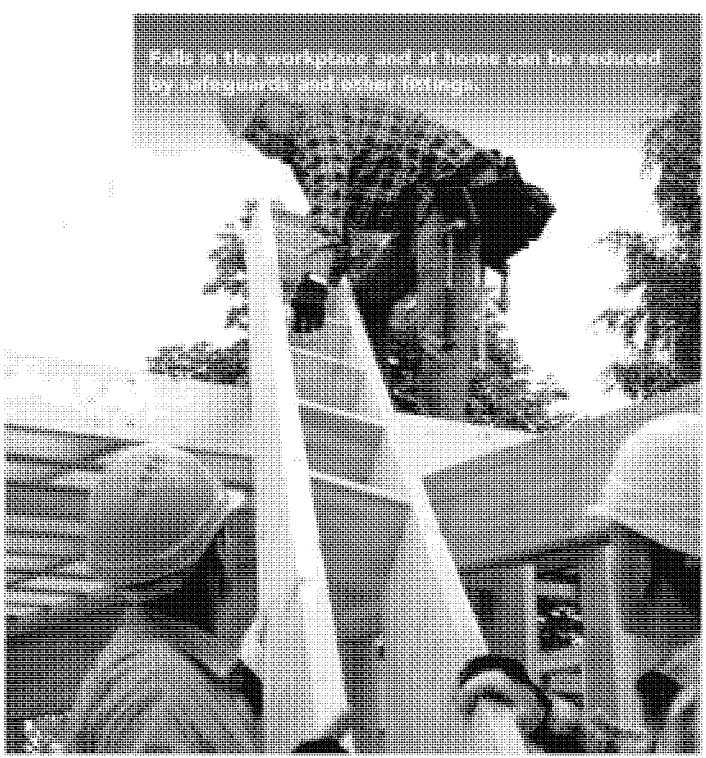
Nevertheless, some poisonings from accidental drug overuse or negligence will still occur, even when chemical safety measures are implemented and adequate information/education provided. These poisonings were not considered to be related to occupation or environment. It was estimated that 68% (50–87%) of poisonings in adults were attributable to occupation or the environment, and 85% (60–99%) in children. The figure is greater for children because certain behavioural and developmental factors specific to this group also make them more vulnerable to environmental risks associated with poisonings. For adults and children combined, environmental risk factors accounted for an average of 73% (53–90%) of all unintentional poisonings (expert survey 2005, see Section 2).

SELECTED INTERVENTIONS

- Documented home safety interventions were effective in increasing the proportion of families storing medicines (53% increase) and cleaning products (55% increase) out of reach, and having the poison centre numbers accessible (330% increase) (Kendrick et al, 2013).

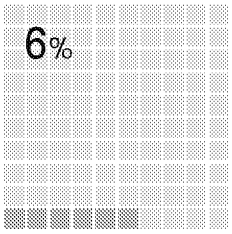
ECONOMIC EVALUATIONS

- Lead paint hazard control in homes to prevent children's exposure would yield a net saving of US$ 181–269 billion in the USA if considering costs of health care, lifetime earnings, tax revenue, special education, attention deficit disorder and direct costs of crime associated with elevated lead exposure. Investing in such control measures, especially targeted at early intervention of lead poisoning in communities most likely at risk, would be very cost effective (Gould, 2009).
- The estimated annual costs of illness of acute poisoning in Nepalese farmers due to the use of pesticides accounted for nearly one third of the total annual health-care costs (Atreya, 2008).
- In the state of Paraná, Brazil, for each US$ 1 spent on pesticides, approximately US$ 1.28 may be spent on health care and sick leave due to occupational poisoning (Soares & Porto, 2012).
- In the UK, compulsory installation of carbon monoxide detectors in homes would have a cost-benefit ratio between 0.02–0.28, and was therefore not considered cost effective. Due to the higher risk, installation of such detectors in boats and caravans would, however, be cost effective (UK Department of Local Communities and Local Governments, 2010).

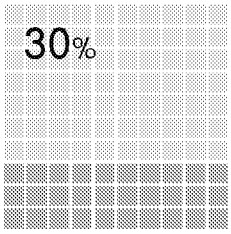


Falls in the workplace and at home can be reduced by safeguards and better footwear.

FALLS



Occupational risks
Method: CRA



Built environments, occupational risks
Method: expert survey

Globally, falls are the second cause of death from unintentional injuries with 690 000 deaths in 2012 (WHO, 2015d). Each year, 37 million falls are severe enough to seek medical attention (WHO, 2012c). A fall is defined as an event where a person comes to rest inadvertently on the ground or lower level (WHO, 2012c). Falls mostly affect adults older than 60 years.

Accidental falls may be associated with physical, sensory and cognitive decline due to ageing, substance abuse, underlying medical conditions, unsafe environments and occupational hazards (WHO, 2012c). Unsafe home and community environments including poor lighting, slippery floors, loose rugs etc. may increase the risk of falls in the elderly, which can be reduced through effective interventions (Ambrose et al, 2013; Bradley, 2011; Gillespie, 2004; Lord et al, 2006; WHO, 2012c). Safe environments may include window guards or grab rails, removal of slippery surfaces, adequate lighting and good visibility. Industries and services with the highest risk of occupational falls include the construction industry, manufacturing, buildings and dwellings services, and trade (US Bureau of Labor Statistics, 2014). Falls due to occupational hazards and alcohol abuse have attributable risk factors of 6.3% and 9.2% respectively (IHME, 2014).

Weather events, such as windstorms, can also increase the risk of falls, which may be influenced by climate change in certain regions (Goldman et al, 2014).

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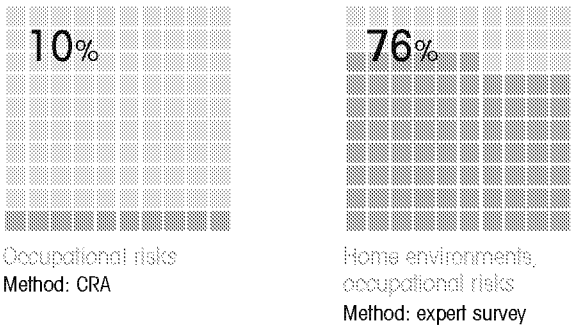
In high-income countries, about 26% (15–52%) of falls were attributed to the environment, and about 31% (15–60%) in low- and middle-income countries (estimate based on expert survey 2005, see Section 2).

FIRES, HEAT AND HOT SUBSTANCES



About 268 000 deaths occur each year due to burns from exposure to fire, heat or hot substances; the vast majority occurring in LMIC (WHO, 2015d). Such injuries occur when hot liquids, solids, gases or flames cause injuries to the skin or other tissues. Risk factors for burns include smoking, various environmental risks, occupational exposure to fire and alcohol abuse (WHO, 2014e). The fraction of fires attributable to alcohol abuse has been estimated to amount to 6.8% globally (in DALYs) (IHME, 2014).

Environmental risks include: (a) cooking, lighting or heating equipment and practices, in particular, open fires, unsafe stoves or use of candles (Diekman et al, 2014; National Fire Protection Association, 2014); (b) wearing loose-fitting clothing while cooking (WHO, 2008a); (c) lack of proper building fire codes (WHO, 2008b); (d) use of kerosene for cooking and lighting and/or inadequate safety measures for liquefied petroleum gas (WHO, 2014e); (e) household products composed of flammable materials (e.g. upholstered furniture, mattresses, rubbish) (National Fire Protection Association, 2014); (f) the malfunction of other appliances and equipment (e.g. household appliances, faulty electrical wiring) (National Fire Protection Association, 2014; WHO, 2008b); and (g) socioeconomic factors such as overcrowding (WHO, 2014e). Most burns, particularly among women and children, occur in the domestic environment, largely in the kitchen or cooking area (Diekman et al, 2014). For example, 41% of patients admitted for burns to one hospital in Sri Lanka had been injured by falling kerosene lamps (Laloe, 2002). A study from India revealed that 35% of flame burns over a nine-year period were due to malfunctioning kerosene pressure stoves (Ahuja & Bhattacharya, 2002).

Occupational risks affect certain occupations at increased exposure to fire or heat, such as work in accommodation and food services, agriculture, manufacturing and construction industries (Horwitz & McCall, 2004). The global attributable risk for occupational exposure to fire has been estimated to amount to 10% (IHME, 2014). The occupational fraction of burns treated in emergency departments in HIC tends to be much higher (Reichard et al, 2015).

Accordingly, practical measures can be taken to reduce the risk of burns, including for example: (a) enclosing fires and using safer cookstoves in the domestic environment, as well as installing stove guards; (b) lowering the temperature in hot water taps; (c) applying safety regulations to housing design and materials; (d) installing smoke detectors, fire sprinklers and fire-escape systems; (e) applying industrial safety regulations, e.g. for products used in homes and other buildings; (f) refraining from smoking in bed (Diekman et al, 2014; WHO, 2011a; WHO, 2014e). Additional domestic practices to prevent fires include never leaving food or water unattended on a stove, avoid wearing loose-fitting clothes while cooking, and keeping matches and lighters out of the reach of children (CDC, 2014a). Occupational safety measures for prevention of burns include engineering controls, use of personal protective equipment and education of workers.

Climate change is expected to increase the vulnerability to wildfires in many regions,

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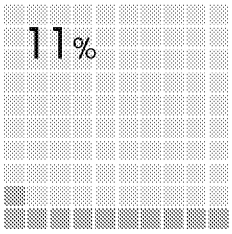
due to draughts and temperature increase (IPCC, 2013).

In high-income countries, an estimated 42% (1–67%) of fire-related injuries were estimated to be attributable to environmental and occupational risks. In low- and middle-income countries, the fraction attributable to the environment was estimated to be higher and reach 85% (74–97%), mainly because of unsafe cooking, heating and lighting fuels and devices, but also poorer building standards (estimate based on expert survey 2015, see Section 2).

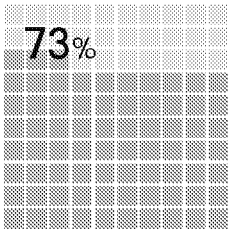
ECONOMIC EVALUATIONS

- A study in the USA found that the ratio of smoke detectors to the savings in health-care costs was 1:26 (CDC, 2000; WHO, 2008b).
- Smoke alarm giveaway and installation programmes were estimated to have a positive net benefit with a benefit-cost ratio of 2.1 and 2.3, respectively (Liu et al, 2012).
- Water at 60°C causes a burn within three seconds of exposure, while water at 49°C takes approximately 10 minutes to cause significant thermal injury to the skin. In 1992, a campaign against hot water scalds was launched in Australia, and a law was implemented to limit the water temperature to 50°C in bathrooms. Following that campaign, rates of the most serious scalds declined by 30%, resulting in an annual saving to the health-care system of between Aus$ 3.8–6.5 million (WHO, 2011a).

DROWNINGS



Occupational risks
Method: CRA



Safety of home and community environments, occupational risks
Method: expert survey

About 372 000 people drowned in 2012, and drowning is the leading injury in children under five years (WHO, 2015d). Drowning occurs by respiratory impairment due to submersion/immersion in liquid (WHO, 2014k). The highest drowning rates are among children aged between one and four years (WHO, 2014k). Risks factors for drowning include lack of physical barriers between people and water, particularly close to the home, as well as lack of child supervision. For example, children are at risk of drowning through proximity to water bodies, including baths when there is a lapse in supervision (Iqbal et al, 2007; WHO, 2014i). Recreational environments may present a risk of drowning, for example due to inadequate safety measures or equipment in swimming pools and other recreational water bodies (Modell, 2010), or for tourists unfamiliar with local risks and features (WHO, 2014i). Uncovered and unprotected water supplies and lack of safe water crossings also constitute a major risk (WHO, 2014k).

Certain occupational activities are at increased risk, e.g. fishing. Waterway transportation on overcrowded or unsafe vessels that lack safety equipment or insufficiently trained personnel also increases drowning risks (WHO, 2010; WHO, 2014k). Many drownings have occurred due to natural events, such as floods, torrential rains and tsunamis. Climate change may influence the frequency or amplitude of relevant natural events (WHO, 2014z). Further risks for drowning include alcohol or drug consumption that impairs swimming ability

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or parental supervision capacity of children near water (WHO, 2010).

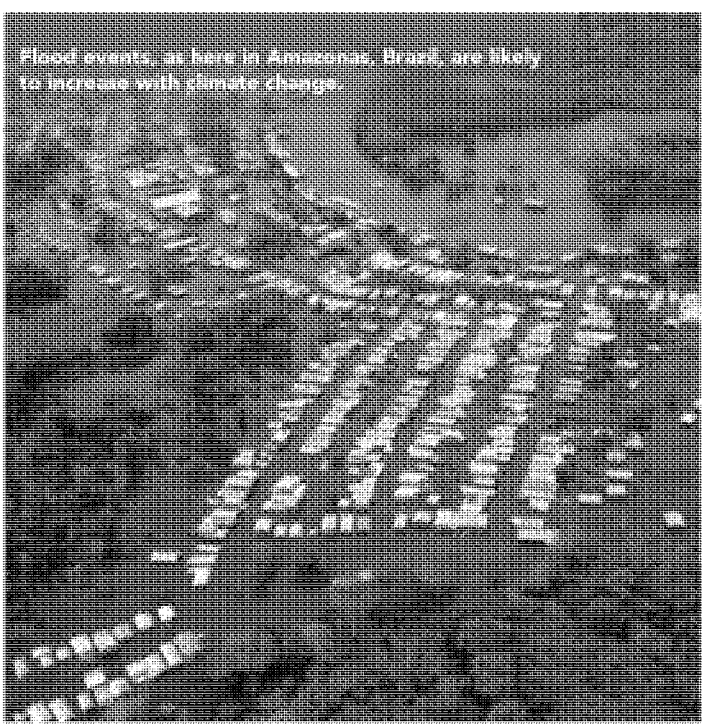
Strategies to prevent drowning may include improved community infrastructure, public awareness and appropriate policies and legislation (WHO, 2014k). Community-based action to improve infrastructure may be very effective and include the development and implementation of safe water systems, such as drainage systems and flood control; fencing around pools or other standing water; creating and maintaining safe water zones for recreation; covering wells and cisterns; and emptying water containers and baths (Iqbal et al, 2007; Thompson & Rivara, 2000; WHO, 2014i). Community infrastructure may also include the establishment of supervised child-care programmes (WHO, 2014k). Public awareness can be raised to highlight the particular risks of children, to signpost dangerous areas and pre-position rescue equipment. Individual and community education on drowning risks, teaching school-age children basic swimming, learning of water survival skills, the presence of lifeguards and increased capability of bystanders in safe rescue and resuscitation are further elements of drowning prevention strategies (WHO, 2014k).

Regulations to prevent drownings include safe boating, shipping and ferry regulations, such as establishing systems that ensure vessel safety, availability of flotation devices in boats, avoidance of overcrowding, and appropriate travel routes and rules. Other regulations include pool fencing, and laws on alcohol use while boating or swimming. Occupational safety measures may include the wearing of personal flotation devices and guard rails, for example on commercial fishing vessels (NIOSH, 1994). Building resilience and managing flood risks and other hazards can significantly modify those risks, which are developed in greater detail in the section on "other unintentional injuries". The development of national water safety plans, and the involvement of other sectors, can further ensure the systematic implementation of sound preventive action (WHO, 2014k).

The global population attributable fraction for occupational risks is 11%, while the attributable risk factor for alcohol or drug consumption that impairs swimming ability or parental supervision of children near water is 9.2% (IHME, 2014). Some alcohol-related drownings could be avoided by implementing safety measures in recreational environments, and by targeted education.

Drowning rates have decreased significantly in developed countries over the past decade, coinciding with a period in which interventions related to recreational environments and to education were emphasized. In Italy, for example, drowning rates were reduced by 64% in less than three decades (Giustini et al, 2003).

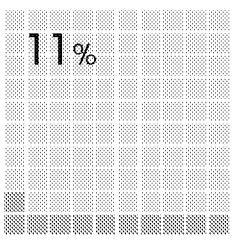
For high-income countries, it was estimated that 54% (24–79%) of drownings were attributable to the environment or to occupation. In low- and middle-income countries, where recreational safety, water transportation safety and flood control were less developed, the corresponding figure was higher with 74% (44–95%) (estimate based on expert survey 2005, see Section 2).


Flood events, as here in Amazonas, Brazil, are likely to increase with climate change.

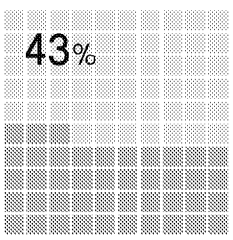
SELECTED INTERVENTIONS

- A surveillance system was implemented in a high-risk drowning area in Thailand. Following the intervention, the control area was 5.6 times more at risk for drownings than the intervention area, which saw a 90% rescue rate (Sansiritaweesook et al, 2013).
- A drowning prevention intervention for children aged between 4 and 12 years in Bangladesh, including swimming lessons, increased supervision, raised awareness about risks, and water safety and safe rescue skills, decreased the risk of drowning by more than 90%. Collective supervision of children between one and five years in child-care centres reduced drownings by more than 80%. Both interventions were evaluated as being very cost-effective (Rahman et al, 2012).
- Pool fencing reduces the risk of drowning or near drowning by about 73% (84–53%). Isolation fencing (enclosing the pool only) is superior to perimeter fencing (enclosing property with pool) (Thompson & Rivara, 2000).

OTHER UNINTENTIONAL INJURIES



Occupational risks
Method: CRA



Industrial risks, transport, natural forces, animal risks etc.
Method: expert survey

This category includes many different injuries that occur in a variety of circumstances and settings, many of which relate to the environment. The injuries are mainly sustained from:

- Mechanical forces (e.g. from tools, sports equipment and agricultural machinery);
- Explosions;
- Off-road transportation accidents;
- Animal bites, other contact with animals, and contact with venomous animals and poisonous plants;
- Exposure to ionizing radiation or electric currents;
- Suffocation;
- Natural forces (e.g. floods, storms, excessively hot or cold weather, earthquakes); and
- Complications of medical and surgical care.

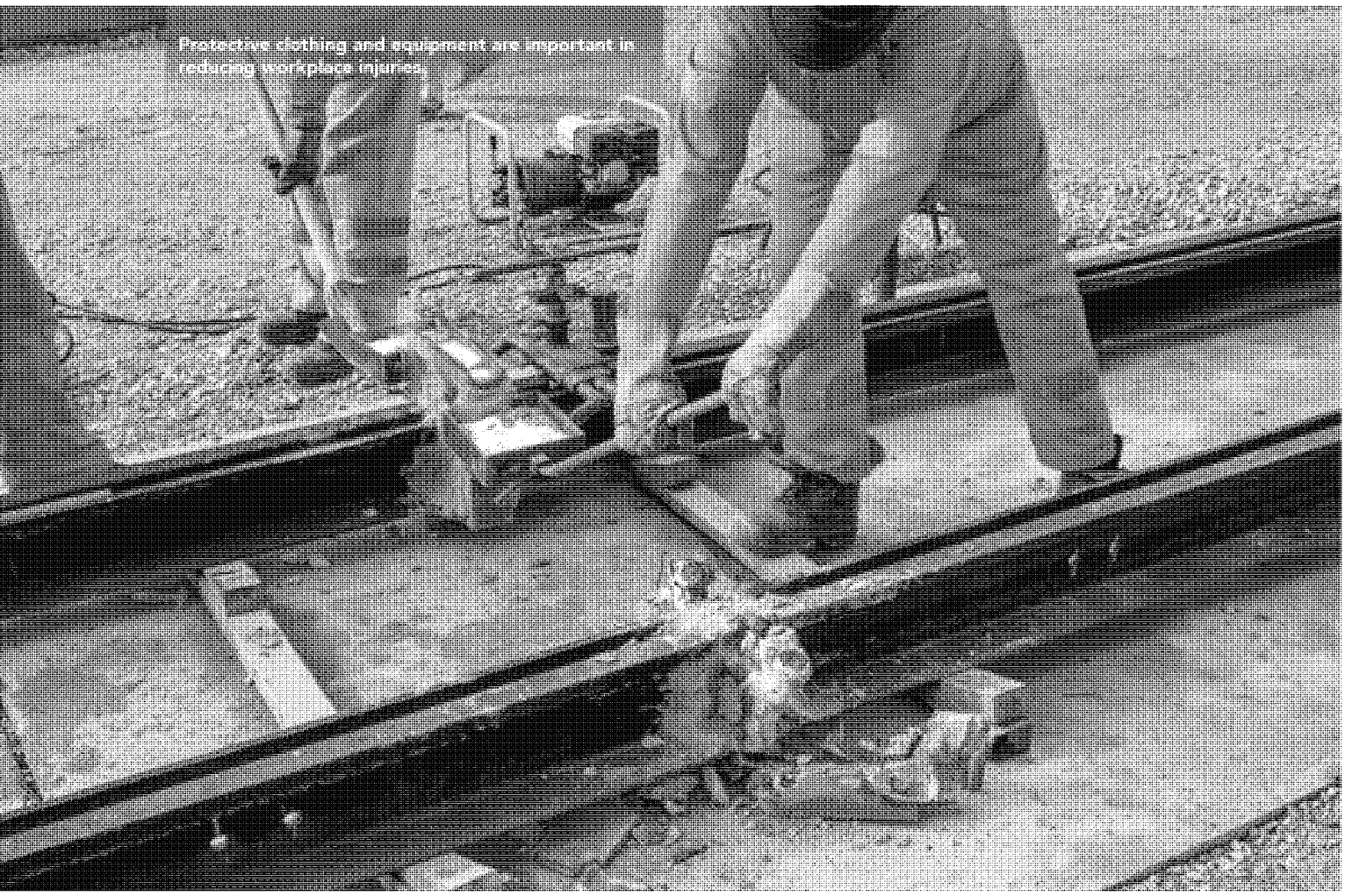
Injury prevention strategies in many areas may include a combination of environmental or engineering approaches, education/behavioural interventions and policies or legislations (Doll et al, 2007). About 14% of injuries from mechanical forces, 11% of injuries from animal contact, and also 11% of injuries not classified elsewhere, were attributed to occupational risks (IHME, 2014).

For example, there are approximately 400 000 poisonous snake bites per year resulting in 20 000 deaths, globally (Kasturiratne et al, 2008). Snakebites can be prevented through behavioural changes, e.g. wearing shoes when walking through undergrowth and avoiding contact with snakes, and keeping the ground around houses and compounds clear of bushes, long grass and rubbish (Warrell, 2010).

Although floods (and earthquakes) are natural events, both were included in this analysis because their consequences could in part be limited by environmental measures. Risks from tsunamis, floods and cyclones, e.g. coastal floods, river floods and flash floods, could be mitigated through a number of actions. These may include disaster preparedness plans and early warning systems, land-use planning to ensure that housing and critical infrastructure are not located in flood-prone areas, that buildings are designed to reduce the risk of flood damage, or that infrastructure such as levee systems or dams be implemented, as appropriate. Preserving forests, coastal mangroves, wetlands and washlands helps to retain natural storage capacity, and to maintain natural barriers, and may prevent floods and drowning fatalities (WHO, 2014k). Climate change may increase the intensity

of cyclones, cause sea level rise and associated floods may worsen (IPCC, 2012). Action to mitigate climate change and adaptation plans may therefore limit future risk of fatalities from such events (WHO, 2014z). The consequences of earthquakes could be limited by adequate building design.

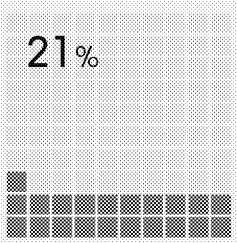
For high-income countries, it was estimated that 30% (19–41%) of all injuries in this category were attributable to the environment; in low- and middle-income countries the estimate was 45% (20–79%) (estimate based on expert survey 2005, see Section 2).



Protective clothing and equipment are important in reducing workplace injuries.

INTENTIONAL INJURIES

SELF-HARM



Chemicals, built environment, gun control, home and community safety
Method: epidemiological estimates

Over 800 000 individuals die from suicides annually (WHO, 2015d). Suicide is the second leading cause of death in the 15- to 29-year-old age group. Suicide risks may be linked to the community, via war, disaster, discrimination, abuse, violence and other stressful life events, or adverse working conditions. Individual risk factors include mental disorders, alcohol abuse and chronic pain (Baumert et al, 2014; WHO, 2014y).

Restricted access to means of suicide is effective in preventing suicide, particularly impulsive suicide, where the suicidal crisis is often short-lived (Leenaars et al, 2000; WHO, 2014y; Yip et al, 2012). Individuals tend to have a preference for a given means of suicide. Restriction of one method of suicide only leads to limited substitution by other means (Daigle, 2005).

Self-poisoning with pesticides accounts for about one third of the world's suicides, and is the most important means of suicide in India, China and some central American countries, where the majority of pesticide-related suicides occur (Gunnell, Eddleston et al, 2007; Patel et al, 2012; Phillips et al, 2002). Measures to reduce access to the most toxic pesticides may include removing those pesticides from agricultural practice through legislation, e.g. by enforcing regulations on the sale, safer storage and disposal of pesticides by individuals and the community (WHO, 2014y). Suicide by firearms, which is also a common method (and the most common method in the USA), can be influenced by gun control measures. Effective measures may include regulations to reduce firearm availability in households and procedures for obtaining licences and registration, decreeing a minimum age for firearm purchase, and enforcing safe storage requirements (Brent, 2001; Rodriguez Andres & Hempstead, 2011; WHO, 2014y).

Removing the most toxic pesticides from agricultural practice and reducing access to pesticides would prevent many suicides.

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Structural interventions to reduce suicide by jumping, for example from bridges, another common method of suicide, have proved to be effective (Cox et al, 2013; WHO, 2014y). In certain countries, charcoal-burning to generate carbon monoxide has become an emerging method of suicide. Such suicides could be reduced, for example by moving charcoal packs from open shelves into a controlled area (WHO, 2014y; Yip et al, 2010).

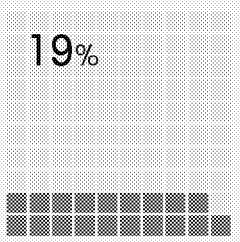
Climate change is likely to increase the frequency and severity of adverse weather events and thereby increase people's exposure to trauma, a risk factor for suicide (Berry et al, 2010). In addition, some studies have shown increased suicide rates during extreme temperature change and drought (Hanigan et al, 2012; Maughan et al, 2014; Page et al, 2007).

Estimates of the fraction of suicide that could be prevented by environmental interventions were: 28% (16–40%) in South-East Asia; 37% (29–43%) in low- and middle-income parts of the Western Pacific Region; 14% (8–42%) in sub-Saharan Africa; 15% (10–18%) in Latin America; and 12% (8–16%) in low- and middle-income parts of the Eastern Mediterranean Region. In high-income regions, the fraction of suicides that could be prevented by environmental measures was estimated to be less than 10%; the global fraction was estimated at 21% (13–30%). These estimates were based on the following inputs: (a) pesticides were used in about 33% of global suicides (with great regional variation) (Gunnell, Eddleston et al, 2007; Patel et al, 2012), about 60% of which are assumed to be preventable (expert-based estimate from survey performed in the framework of this study, further supported by decreased rates following interventions) (Gunnell, Fernando et al, 2007; Knipe et al, 2014); (b) firearms were used in about 46% of suicides in the Americas, and 4.5% in other high-income countries, 19% of which could be prevented (WHO, 2014y).

SELECTED INTERVENTIONS

- In Sri Lanka, significant decreases in suicides occurred following the ban of the most toxic pesticides class (Knipe et al, 2014).
- Reformed firearm legislation and a voluntary disarmament scheme conducted in Brazil led to a significant decrease in suicides (Marinho de Souza Mde et al, 2007).
- A meta-analysis of 14 observational studies resulted in 3.2 times higher odds of suicide if firearms were accessible as compared with if they were not (Anglemyer et al, 2014).

INTERPERSONAL VIOLENCE



Occupational risks, urban and home environments
Method: expert survey

About half a million people die from interpersonal violence every year (WHO, 2015d). Deaths and injuries are only a fraction of the burden caused by violence, which can result in lifelong consequences on mental health, sexual and reproductive health and chronic diseases (WHO, UNODC & UNDP, 2014). Violence can be influenced by individual, relationship, community and societal risks (WHO, 2004b). Various environmental factors influence interpersonal violence, and interventions in the physical environment could reduce the level of interpersonal violence.

Reducing access to firearms, such as restrictions on carrying or owning firearms, background checks and reduced circulation of firearms may have a significant impact on homicide rates (Matzopoulos et al, 2014; WHO, 2015h). Other examples

of reducing access to dangerous items in order to reduce violence include restricting glassware in bars (Forsyth, 2008).

Urban upgrading, situational violence prevention and crime prevention through environmental designs are a group of interventions that can prevent violent crimes. Such interventions are generally targeted at low-income urban communities, and aim at improving the physical and spatial environmental conditions, for example through increased mobility, visibility, access of services or communal ownership (Cassidy et al, 2014; WHO, 2015h). For example, improved transport, lighting and buildings, police accessibility and higher vegetation densities were all suggested to reduce youth violence (Cassidy et al, 2014; Welsh & Farrington, 2008; WHO, 2015h). Poverty de-concentration experiments relocating residents of economically impoverished public housing complexes into less poor neighbourhoods have also resulted in lower rates of violent crime arrests (Sciandra et al, 2013).

Exposure to certain substances, such as lead, can affect neuropsychological development and cognitive functioning, which could increase delinquent behaviour (Carpenter & Nevin, 2010; Mielke & Zahran, 2012). Climate change could also worsen conflict outcomes in comparison with a future without climatic changes (Hsiang et al, 2013).

Workers in certain occupations or settings, or who perform certain tasks, may be at increased risk of workplace violence or homicide. These may include: (a) workers handling money or valuables (cashiers, transport workers); (b) workers providing care, advice and education (nurses, teachers); (c) workers carrying out inspections or enforcement duties (ticket inspectors, police officers); (d) workers in contact with drunk or potentially violent people (prison officers, bar staff); and (e) those working alone (taxi drivers) (Chappell & Di Martino, 2006; Edward et al, 2014; ILO, 2009; Jenkins, 1996; Shahzad & Malik, 2014). For example, the retail trade and service industries accounted for about half of workplace homicides and 85% of nonfatal workplace assaults in the USA (Jenkins, 1996).

In high-income countries, environmental factors accounted for 16% (3–28%) of the injuries from interpersonal violence, and for about 19% (7–31%) in low- and middle-income countries. The global average was also about 19% (7–31%), as the majority of injuries from violence occurred in developing countries (estimate based on expert survey 2005, see Section 2).

SELECTED INTERVENTIONS

- Stricter gun control and licensing conditions under the Firearms Control Act in South Africa led to taking more than 200 000 weapons out of circulation between 2001 and 2005. This coincided with a decrease in firearm homicides of 13.6% per year over the same period (Matzopoulos et al, 2014).
- Building a public transit system connecting an isolated low-income neighbourhood in Medellín, Colombia, accompanied by improvements in neighbourhood infrastructure, resulted in a 66% higher reduction in homicide rates compared with control neighbourhoods (Cerda et al, 2012). Resident reports of violence also decreased 75% more in intervention neighbourhoods than in control neighbourhoods.

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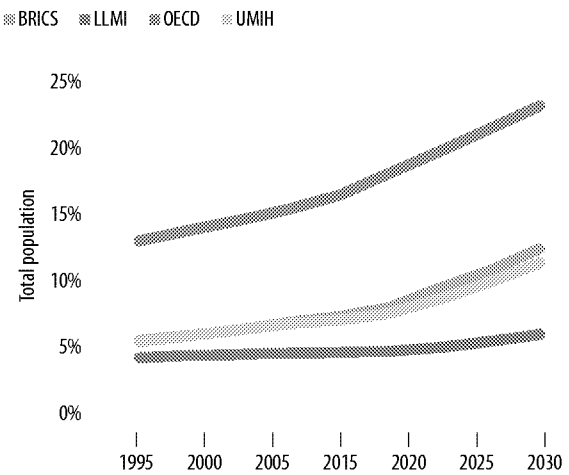
The link between the environment and demographics

The world's population is ageing rapidly, which in part reflects improvements in health care. Environmental determinants have different impacts according to people's age, and although impacts may start earlier they may only result in disease after several years or decades. A drastic shift – with large proportions of the population now in older age categories – has occurred in recent decades and this trend is set to become even more evident in the future (Figure 4). The effect of environmental risks, such as air pollution, affecting NCDs primarily, is therefore likely to become more important.

Figure 4. Proportion of population aged 65 years and older, 1990 to 2030, by country groupings



Notes: BRICS: Brazil, Russian Federation, India, China, South Africa; OECD: Organisation for Economic Co-operation and Development; LLMI: low- and lower middle income; UMIH: upper middle- and high-income (classification, World Bank, 2014).

The world's total population is still growing rapidly, with a projected increase of more than 50% between 1990 and 2030 (Figure 5). Africa's population is projected to more than double in just three decades, between 2000 and 2030. This growth is putting more pressure on the environment, drawing on more ecosystem services such as water, and producing more emissions into the air, pollutants into the water etc. At least two fifths of the world's population live in the five large emerging "BRICS" economies

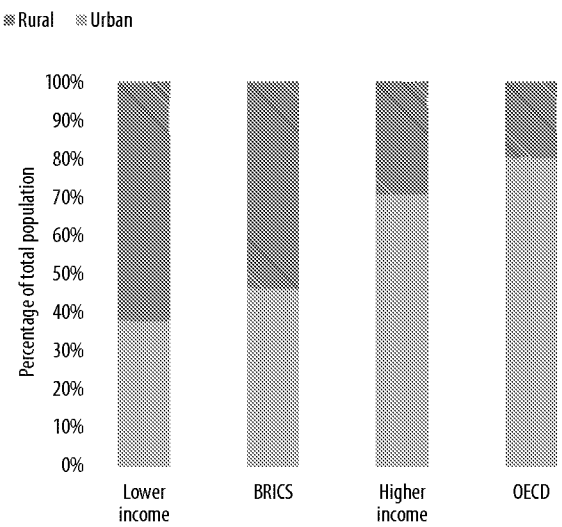
Figure 5. World population, 1990 to 2030, by country groupings

Notes: BRICS: Brazil, Russian Federation, India, China, South Africa; OECD: Organisation for Economic Co-operation and Development; LLMI: low- and lower middle income; UMIH: upper middle- and high-income (classification, World Bank, 2014).

(Brazil, Russian Federation, India, China and South Africa) undergoing fast-growing development.

Ever more people are migrating to urban areas (Figure 6). Cities have the potential to concentrate several modern risks, such as ambient air pollution, low physical activity due to poor urban planning and sedentary work.

Figure 6. Urban and rural fraction of the population, 2012



Notes: BRICS: Brazil, Russian Federation, India, China, South Africa; OECD: Organisation for Economic Co-operation and Development; LLMI: low- and lower middle income; UMIH: upper middle- and high-income (classification, World Bank, 2014).

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Global results of the analysis by disease and population subgroups

Globally, 23% (13–34%) of all deaths are estimated to be attributable to the environment, and 22% (13–32%) of DALYs. In total, the number of deaths linked to the environment amounts to 12.6 million per year (based on 2012 data). This burden could be lessened significantly by reducing risks through changes to the modifiable environment.

Disease specific results

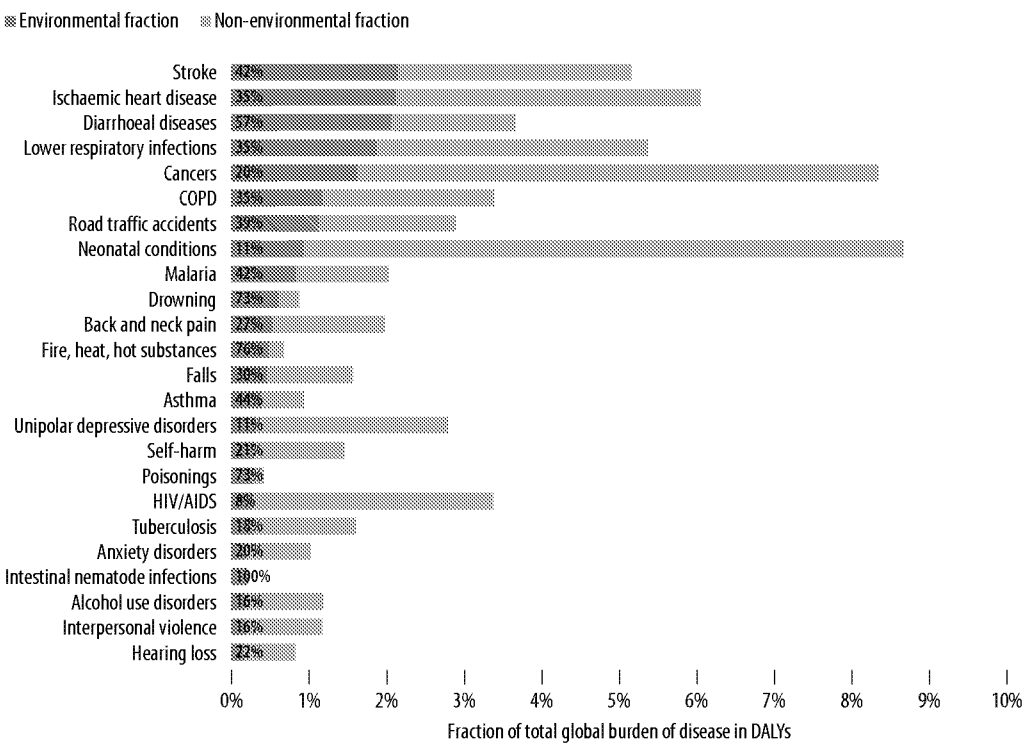
The impact of the environment on health is unevenly distributed across the major disease groups (Table 2). The largest number of deaths attributed to the environment is now caused by NCDs. The highest population attributable fractions are in the area of injuries, which are often largely conditioned directly by the environment.

The diseases with the main environmental contribution are the cardiovascular diseases, followed by diarrhoeal diseases, respiratory infections and cancers (Figure 7).

Table 2. Total and attributable deaths and disease burden to the environment, 2012

	Deaths			DALYs		
Disease group	**Total deaths (million)**	**Attributable to the environment (million)**	**Population attributable fraction (%)**	**Total DALYs (million)**	**Expert survey 2015**	**Population attributable fraction (%)**
Infectious, parasitic, maternal, neonatal and nutritional causes	12.8	2.5	20%	925	202	22%
Noncommunicable diseases	37.7	8.2	22%	1506	276	18%
Injuries	5.1	2.0	38%	305	118	39%
Total	55.6	12.6	23%	2736	596	22%

Figure 7. Diseases with the largest environmental contribution



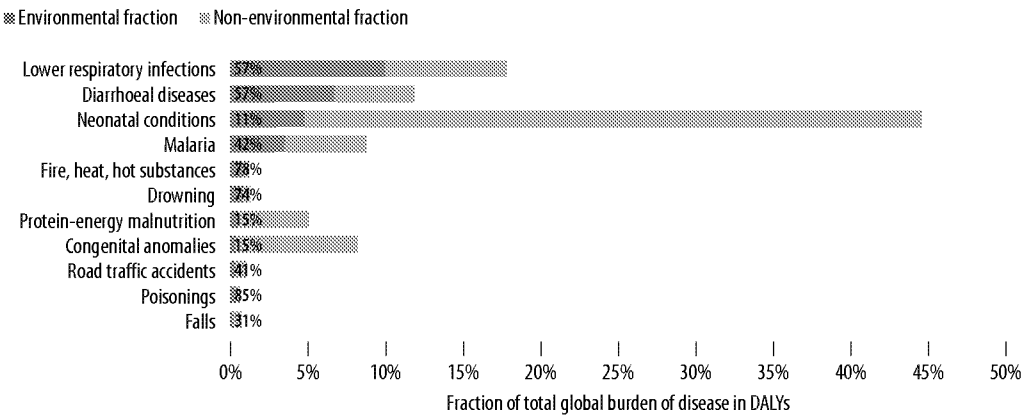
Notes: COPD: chronic obstructive pulmonary disease; percentages within bars relate to the environmental share of the respective disease.

Age differences

In children under five years, the fraction of total deaths attributable to the environment amounts to 26% (16–38%) and 25% (13–34%) of DALYs. The main environment-related diseases in this age group include lower respiratory infections and diarrhoeal diseases (Figure 8).

Adults after age 50 also show important susceptibilities to environmental conditions. At that age, the contributions of infectious diseases and injuries are still important, while NCDs, in particular cardiovascular diseases due to ambient and household air pollution, become very important. Each of the contributing disease categories varies with age, resulting in different prevention priorities over the life course (Figure 9). It should be noted that key exposures at younger ages, which may result in NCDs at older ages could not be adequately captured in this study.

Figure 8. Diseases with the largest environmental contribution, children under five years



Notes: COPD: chronic obstructive pulmonary disease; percentages within bars relate to the environmental share of the respective disease.

Figure 9. Environmental fraction of global burden of disease (in DALYs) by age and disease group, 2012

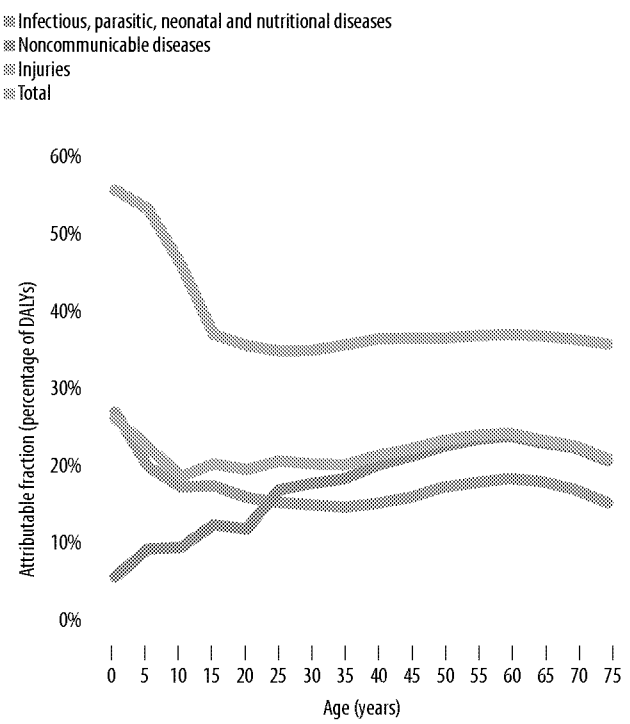


Figure 10. Main diseases contributing to the environmental burden of disease, all ages, world, 2012

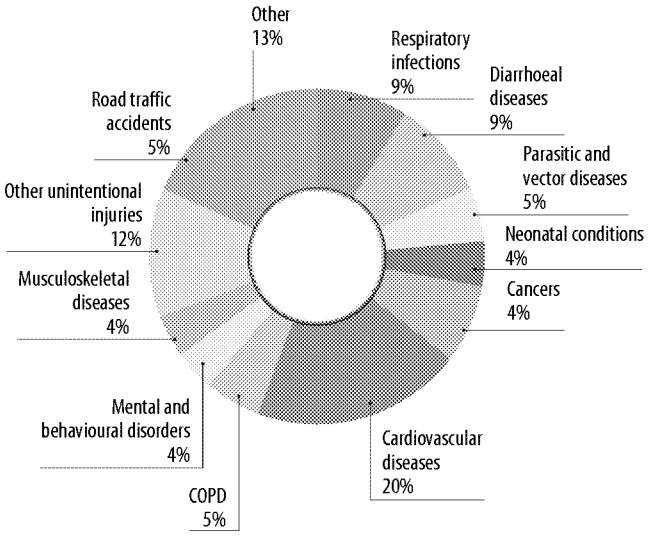
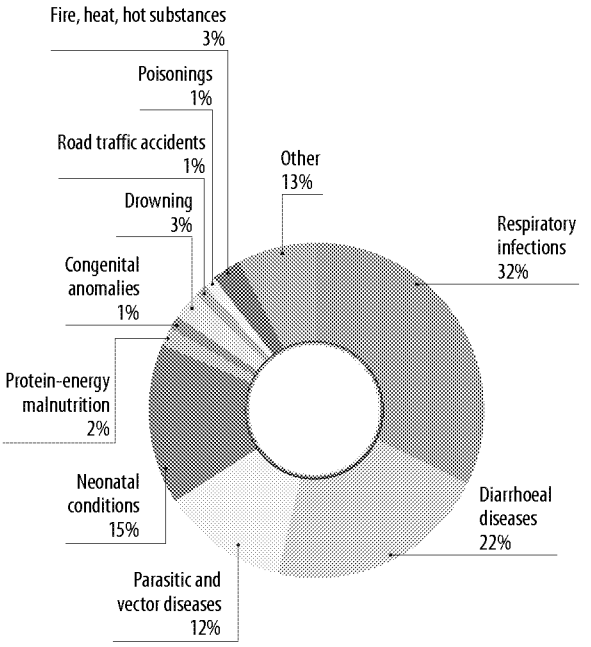


Figure 11. Main diseases contributing to the environmental burden of disease, for children under five years



The contribution of the various diseases to the total disease burden attributable to the environment for the total population, and for children under five years is shown in figures 10 and 11 respectively.

Gender differences

The environmental fraction of the global burden of disease is similar among men and women – 22.8% and 20.6% respectively. The differences vary by type of disease, with larger differences in NCDs and injuries (Table 3).

Men and women experience many environmental exposures at similar levels, such as exposure to ambient air pollution, unsafe water or noise. Some important differences in exposure should, however, be noted, such as for household air pollution, where women and small children are exposed to higher levels than men, as they tend to spend longer hours around the cookstove. Other exposures affect men more than women, such as many occupational risks. The employed percentage of men is about 50% higher than for women, globally

Table 3. Total burden and percentage attributable to the environment, by sex, 2012

	Males			Females		
Disease group	Total DALYs ('000)	DALYs attributable to the environment ('000)	Percentage attributable to the environment	Total DALYs ('000)	DALYs attributable to the environment ('000)	Percentage attributable to the environment
Infectious, parasitic, maternal, neonatal and nutritional causes	481 530	105 513	21.9%	443 308	96 209	21.7%
Noncommunicable diseases	790 449	154 587	19.6%	715 852	121 637	17.0%
Injuries	206 480	77 628	37.6%	98 155	40 838	41.6%
Total	1 478 459	337 728	22.8%	1 257 315	258 684	20.6%

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(ILO, 2014), and occupational exposures will, accordingly, be more frequent in men. In addition to exposures, some gender differences exist in terms of susceptibility to disease.

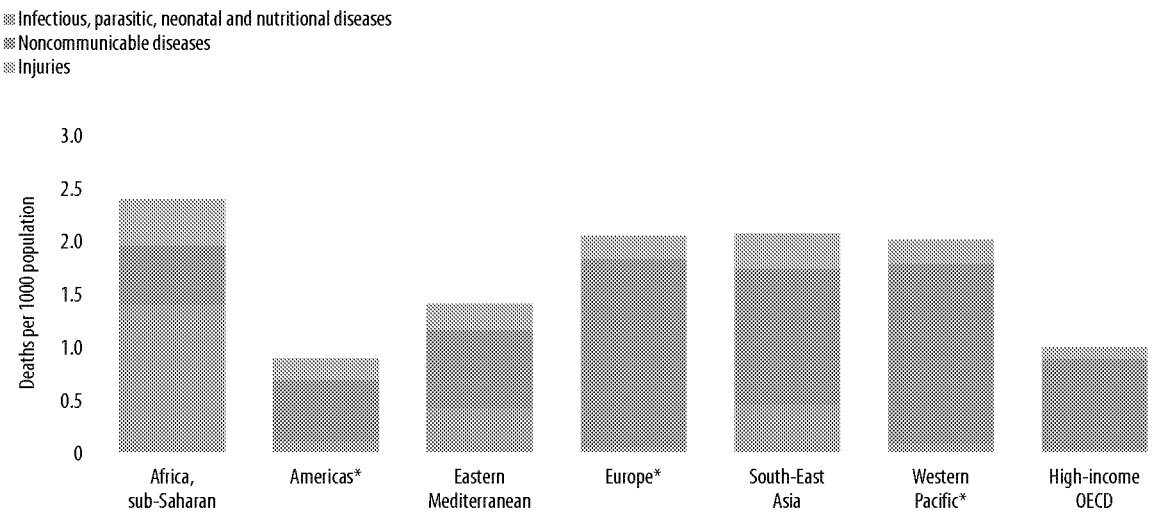
While the gender differences in occupational exposures and household air pollution exposures could partially be estimated, many of the more subtle differences in exposures and susceptibility could not be captured in this assessment, mainly due to limitations in the underlying body of evidence.

Regional and country differences

Environment-attributable deaths vary strongly between regions. While most deaths attributable to the environment still occur in sub-Saharan Africa, other regions have higher per capita rates of NCDs, which could be prevented by lowering environmental exposures (Figure 12).

The age-standardized deaths attributable to the environment by country are shown in Figure 13, and are shown by disease type in figures 14–16. Age-standardized measures of deaths and disease are often used to compare countries, as they adjust for differences in population age distributions by applying the age-specific mortality rates for each population to a standard population. In terms of methods used, the main part of the environment-attributable disease burden could be estimated using CRA type methods; 56% when counting in DALYs, and as much as 68% when counting in deaths, respectively (Table 4).

Figure 12. Deaths attributable to the environment, by region and disease group, 2012



Notes: * non-OECD countries. See Annex 1 for country groupings.

Figure 13. Age-standardized environmental deaths, 2012

Figure 14. Age-standardized infectious, parasitic, neonatal and nutritional disease deaths attributable to the environment, 2012

Figure 15. Age-standardized noncommunicable disease deaths attributable to the environment, 2012

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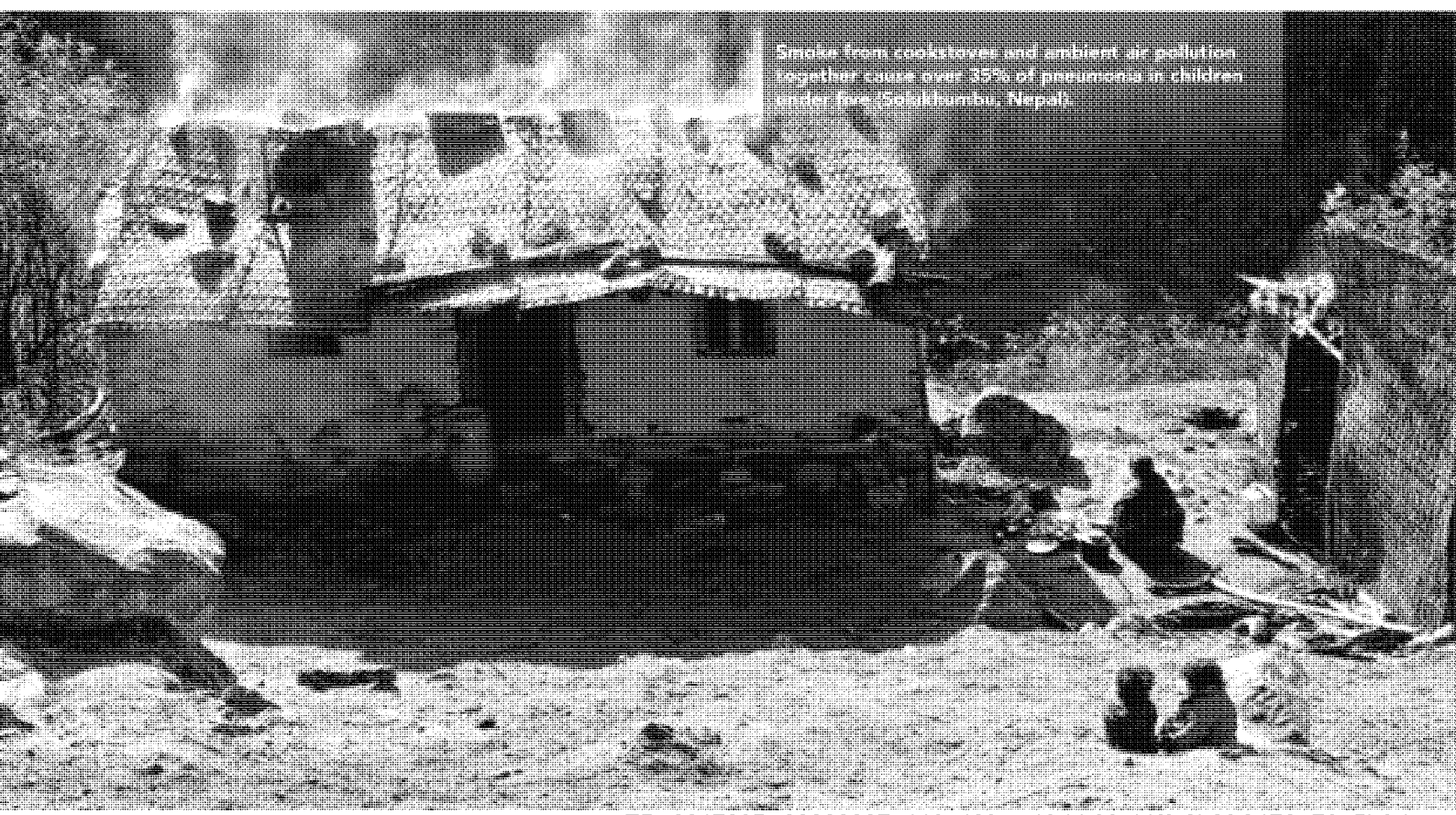
Figure 16. Age-standardized injury deaths attributable to the environment, 2012

Table 4. Methods used to estimate the burden of disease attributable to the environment

	CRA type		Estimation using more limited data	Expert survey		Transmission pathway	Total
	One risk	Combination of risks		2005	2015		
Percentage of total environment-attributable disease burden (DALYs)	20%	36%	3%	32%	8%	1%	100%
Percentage of total environment-attributable deaths	11%	56%	3%	27%	3%	0%	100%



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Trends

The health impacts due to the environment showed a slight improvement over the 10 years – between 2002 and 2012, the number of deaths attributable to the environment decreased from 13.3 to 12.6 million deaths per year, alongside a decrease in total deaths from 57.0 to 55.6 million deaths globally. The fraction of deaths attributable to the environment also slightly decreased, from 23.3% to 22.7% over the same period.

The main change in the environment-attributable disease burden between 2002 and 2012 lies in the shift in disease categories in which they occur. There was a significant reduction in environment-attributable deaths and disease burden in the communicable, neonatal and nutritional categories. That same period saw an increase in attributable deaths and disease burden in the NCD category (Figure 17). Also, the total deaths in those disease categories have undergone significant changes during the same period. Communicable, maternal, neonatal and nutritional deaths decreased, and NCD deaths increased, partly due to population ageing (Figure 18).

The burden of disease attributable to the environment measured in DALYs estimated for 2002 and 2012, however, is not directly comparable, as some of the basic parameters in DALY estimation changed over the period. Mainly, the age weighting and discounting of DALYs were dropped in the latest analysis. The attributable disease burden has decreased from 24% to 22% between 2002 and 2012. With comparable methods, this drop would have been even greater, as more deaths are now due to NCDs, which tend to occur at older ages, and induce fewer years of life lost (and fewer DALYs).

Part of the decrease between 2002 and 2012 in attributable infectious, parasitic, neonatal and nutritional diseases, and the increase in the NCD burden may be due to stronger evidence and knowledge of the exposure-disease links. Also trends in main risk factors have occurred: significant improvements took place in access to safe water and sanitation in both relative and absolute terms (WHO & UNICEF, 2014), which act on decreasing communicable disease risks. During that same period, the number of people using primarily cleaner fuels for

Figure 17. Trend in the fraction of deaths attributable to the environment by disease group, 2002–2012

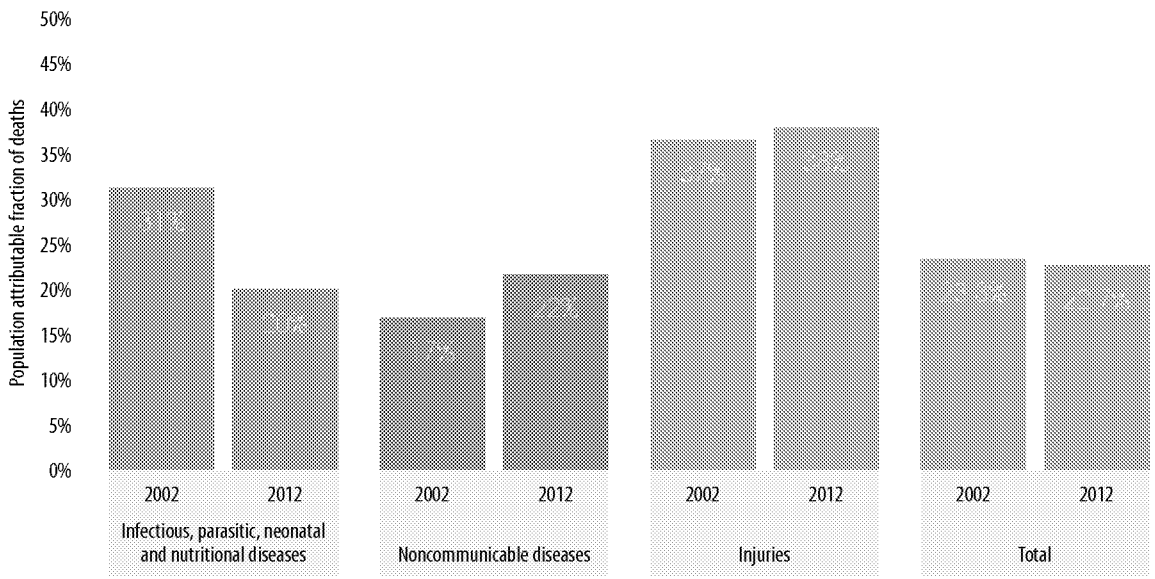
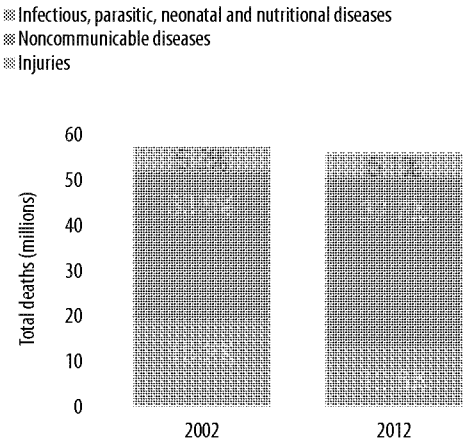


Figure 18. Trend in total deaths by disease group, 2002–2012



Source: (WHO, 2015d).

cooking slightly increased, and the number of people using primarily solid fuels remained unchanged, as new coverage could hardly keep up with population growth (Bonjour et al, 2013). Slight decreases in ambient air quality have been observed in many low- and middle-income cities around the world in recent years (WHO, 2014cc). Increased exposure to air pollution will mainly increase NCDs, but also respiratory infections in children under five years.

In general, traditional environmental risks, such as poor water, sanitation and unclean fuels, tend to improve with reductions in poverty. These are also the greatest risks for infectious diseases. On the other hand, modern risks, such as ambient air pollution and unsafe use of chemicals, tend to increase in countries undergoing rapid development, before control over such factors is improved when full transition to high-income societies is made. In parallel, emerging risks develop, which include risks such as climate change (Gordon et al, 2004).

4. DISCUSSION: LEVERAGING ENVIRONMENT-HEALTH LINKS

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This systematic and comprehensive review of the overall impacts of the environment on health showed that, in 2012, 23% of global deaths were attributable to the environment, amounting to 12.6 million deaths. This estimate focuses on the reasonably modifiable environment and data from intervention studies, and the results therefore indicate the potential burden of disease that could reasonably be prevented by environmental interventions.

Environment, health and the Sustainable Development Goals

Environmental improvements for health can make important contributions towards achieving the SDGs, many of which are closely interlinked with the environmental and social determinants of health (Figure 19). Numerous socioeconomic conditions are closely related to environmental exposures and health. Social determinants influence the exposure to and the effect of environmental risks, which consequently lead to illness and disease. In turn, when people fall ill this has multiple repercussions on their socioeconomic status. The section below outlines the links between SDGs, environmental risks and health, and their relevance in SDG attainment.

GOAL 1: **End poverty in all its forms everywhere.**
Elimination of extreme poverty is the overarching theme of the SDGs and the target of the first goal. Poverty in itself is a major determinant of ill health, through various environmental and social determinants. Many environmental risks, for example traditional hazards such as inadequate water and sanitation, but also global warming and extreme weather events or occupational risks, disproportionally affect the poor and those residing in lower income countries. Poverty implies that communities have to use the natural resources at their disposal in an unsustainable way to meet their basic needs. In the vicious circle of poverty and ill health, environmental and social impacts lead to poorer health, and poor health further precipitates people into poverty. Environmental hazards and the associated risks can affect community health status for all categories of diseases and disability: communicable and noncommunicable diseases, malnutrition, accidents and injuries and mental ill health. These impacts result in increased health-care expenditures, loss of shelter, lost income, or increased expenditure to compensate for inadequate services. This study corroborates these associations, with higher per capita disease burden (as expressed in DALYs lost) in poorer regions compared with wealthier ones. Therefore, reducing environmental risks particularly in vulnerable populations is likely to make an important contribution to poverty reduction.

GOAL 2: **End hunger, achieve food security and improved nutrition and promote sustainable agriculture**.
A well-cared for natural environment can provide food security for all. Climate change, coupled with other environmental changes such as ecosystem depletion and destruction, affect both food availability and food accessibility. Those already vulnerable to food insecurity will be at increased risk of reduced crop yields, loss of livestock and new patterns of pests. Inadequate water and sanitation, through repeated diarrhoea episodes, is also directly linked to malnutrition. Resource re-use and recycling of agricultural waste and of domestic wastewater will help promote the transition to a cyclical economy, including the development of nutrition sensitive agriculture. Mitigating climate change and adaptation strategies will be key for maintaining food security in the future. This study shows that already today, 0.5% of the disease burden in children under five years is related to nutritional factors linked to the environment.

GOAL 3: **Ensure healthy lives and promote well-being for all at all ages.**
This study estimates that 22% of the global disease burden (in DALYs) is attributable to modifiable environmental risks to health.

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Figure 19. Sustainable Development Goals and environment-health links

THE GLOBAL GOALS
For Sustainable Development

The greatest potential for health gains through environmental improvements is in children under five years, with 26% of the global disease burden being attributable to the environment in that age group. Other factors, such as air pollution, occupational risks and physical risks of falls, particularly affect the 50 to 70 years age group, in which 25% of all deaths could be avoided through environmental improvements. This shows that improving environmental conditions is a prerequisite for achieving this goal.

GOAL 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

Inadequate sanitation facilities in schools may prevent students, particularly girls, from attending primary school. Inadequate access to safe water and energy sources may require children, particularly girls, to spend important amounts of time fetching water and wood, which may compete or interfere with school attendance. Children may also need to look after younger siblings who get sick due to repeated infections from poor water and sanitation or smoke from solid fuels. Ensuring access to basic services and resources will help achieve this goal, by allowing more time to be dedicated to school attendance, homework, adult learning and vocational training.

GOAL 5: Achieve gender equality and empower all women and girls.

Exposures to environmental risk factors are often unequal for men and women. An important gender inequality resulting from environmental conditions consists in the hard and time-consuming task of collecting water and fuel for the household; a task which in many societies is considered to be the responsibility of women and girls. This time could instead be dedicated to income-generating activities, education, empowerment activities or leisure time. In rural settings where schistosomiasis is prevalent, adolescent boys and men have the highest disease burdens, because of recreational behaviour (swimming in contaminated water) and occupational water-contact patterns in irrigated areas.

GOAL 6: Ensure availability and sustainable management of water and sanitation for all.

Access to adequate water, sanitation and related hygiene could save more than 800 000 deaths annually. Access to water is further interlinked with other sustainable development goals including food security through adequate management of water resources, and gender equality. Access to sanitation must include the safe management of wastewater, to avoid faecal contamination of drinking-water sources. Moreover, this environmental risk factor is also directly linked with poverty, where the proportion (per capita) of the disease burden is much higher in poorer regions of the world. Development and management of water resources (dams, irrigation schemes, flood control infrastructure) will require effective health impact assessments to prevent increased transmission risks of waterborne and water-related vector-borne diseases, and to avoid growing inequality in disease incidence and prevalence affecting the most vulnerable groups.

GOAL 7: Ensure access to affordable, reliable, sustainable and modern energy for all.

Current energy sources – whether fossil fuel, coal or biomass based – are environmentally unsustainable and have negative health consequences. Access to modern fuels for all will end a significant threat to health: exposure to household air pollution resulting from the use of solid fuels for cooking and heating in the household is causing 4.3 million deaths each year. Achieving this goal will have a major impact on health and well-being.

GOAL 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.

Workers' health, promoted by a safe work environment, workers' productivity and more

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generally a healthy workforce, are all vital ingredients for economic growth. Working conditions are a major determinant of workers' health and well-being. This includes access to safe drinking-water and adequate sanitation in the workplace. Providing the environmental services to address health hazards and risks can be an important source of employment – compatible with the concept of a "green economy".

GOAL 9: **Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.**
Resilience, sustainable industrialization and innovation are all required to progress towards a more health-protective environment. Critical changes are needed to mitigate key environmental health risks such as climate change, air pollution and water and sanitation. Innovative transformation of existing systems for a fundamentally different functioning of societies and sectors, such as carbon-free approaches, will be required in order to achieve the SDGs.

GOAL 10: **Reduce inequality within and among countries.**
Environmental risks to health are distributed unequally within and among countries. Urban-rural and income gradients exist in terms of exposure to key environmental risks within and between countries. Improving the environment in those areas most affected by a lack of services will greatly contribute to reducing inequalities in health, access to services, income and education. Increasingly, the human rights framework will support actions, including environmental health interventions, that aim to reduce inequality and discrimination.

GOAL 11: **Make cities and human settlements inclusive, safe, resilient and sustainable.**
Many environmental risks tend to vary significantly across urban and rural settings. As the world is becoming increasingly urbanized, one key environmental risk in cities is ambient air pollution, causing 3.7 million deaths annually. Another is the supply of water and the proper management and disposal of waste. Addressing these risks would help progress towards this human settlement goal.

GOAL 12: **Ensure sustainable consumption and production patterns.**
Consumption and production patterns are closely linked to key environmental risks such as ambient air pollution, exposure to chemicals and water and sanitation. Progress on this goal would greatly reduce those risks and protect health. This goal is also relevant to healthy nutrition, which can be both fostered by and prevented by specific environments.

GOAL 13: **Take urgent action to combat climate change and its impacts.**
Climate change is one of the major health challenges of the future and its mitigation a prerequisite for sustainable development. Climate change is related to many of these goals, affecting, for example, water resources, food production, desertification, air pollution and, therefore, human health.

GOAL 14: **Conserve and sustainably use the oceans, seas and marine resources for sustainable development.**
Sustainable use of oceans has many links with environmental determinants of health. Examples include oceans as a sustainable food resource, and the need for adequate sanitation regarding excreta management before it reaches rivers and oceans.

GOAL 15: **Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.**
Anthropogenic influences on the environment are occurring at a fast pace, not allowing for the natural environment to adapt. The "Rio conventions" which address biodiversity, desertification and climate change were set up to address the environmental and human well-being impacts, and to control and reverse these

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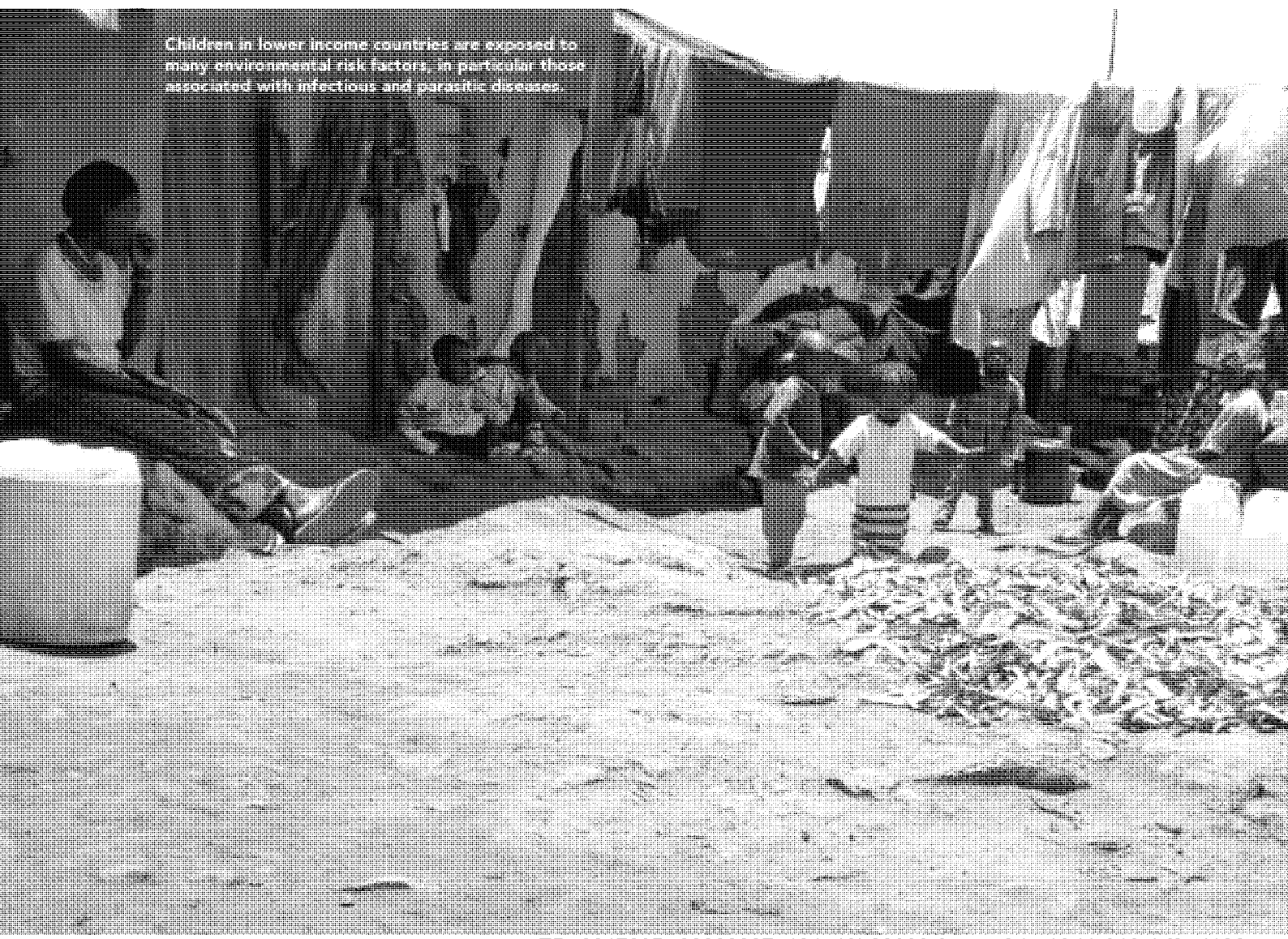
unwanted changes. There is now increasing evidence of the impacts of these large-scale changes on human health in the short, medium and long term.

GOAL 16: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels.
Inequitable access to ecosystem services, such as safe water and energy sources, and effects of extreme weather events are potential sources of conflict, displacement, inequality and exclusion. Equitable access and mitigation, in many instances supported by a legal framework of universal human rights, will help to avoid compromising progress towards this goal.

GOAL 17: Strengthen the means of implementation and revitalize the global partnership for sustainable development.
Both health sector and non-health sector actors can and need to take joint action to effectively address environmentally mediated causes of disease. Such action needs to be taken at both local and global level. Many alliances already exist in the field of children's environmental health; occupational health; in joint health sector and environment sector linkages; in the agriculture-nutrition-health nexus; and in actions in the water, chemical and transport sectors, and air pollution. Global partnerships need to be strengthened and reinforced, harnessing the full range of policy tools, strategies and technologies that are already available – to achieve the interrelated goals of health, environmental sustainability and development.



Children in lower income countries are exposed to many environmental risk factors, in particular those associated with infectious and parasitic diseases.

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All these goals are related to the environment and to health. Environmental health interventions can make a valuable and sustainable contribution towards reducing the global disease burden and improving the well-being of people everywhere. Many interventions will be cost-effective and have co-benefits beyond improving people's health; benefits such as helping to alleviate poverty and reduce gender inequalities.

Strengths and weaknesses of the analysis

This study summarizes and analyses the available evidence between health and environment to produce quantitative estimates of the links, and the potential for disease prevention. The evidence varies in strength across risk factors and diseases. The results therefore rely on various degrees of assumptions across diseases, while reflecting the current status of knowledge.

Strength of evidence and methods used: This analysis combines estimates from various sources and various types of assessments, ranging from CRA type analyses to approximate epidemiological estimates and surveys of expert opinion, or a combination. Where general, quantified exposure-response functions and sufficient global exposure information were available, CRA estimates were generally used, provided that the risk factor-disease pairing provided important disease burden estimates or was relevant for policy-making. Where approximate epidemiological estimates or expert surveys were used to estimate the population attributable fractions, the body of evidence was usually more limited, and the estimates therefore more uncertain.

Limited accounting for certain diseases and risks: The experts generally derived their estimates from the available evidence, yet only a fraction of environmental and occupational risks is adequately covered in the literature. It appeared from the responses to our survey that the experts did not consider poorly documented risk factors, as well as factors that are suspected to pose a risk, but for which there is no "hard" evidence. There are many examples of risks that have not been adequately evaluated, including the effects of emerging risks (e.g. more intensive agricultural practices and zoonoses), the effects of many long-term chemical exposures on cancers or endocrine disorders, and the impact of electromagnetic and other exposures from new technologies. Also the links between human health and contact with nature and benefits from biodiversity have as yet not been sufficiently assessed but could further contribute to the attributable disease burden (Sandifer et al, 2015). Finally, the potentially very wide ranging health impacts from climate change, many of them being indirect, for example acting through food prices and migration, will unfortunately not be captured by an assessment using the methods applied here. It is therefore likely that our analysis underestimates the global burden of disease attributable to reasonably modifiable environmental causes.

Changes in methods and data availability between 2002 and 2012: The changes in results between those from the 2002 data (Prüss-Ustün & Corvalan, 2006) should be interpreted with caution, as they are in part due to changes in methods and data availability, rather than actual trends in the disease burden attributable to the environment. Additional data and evidence have become available on certain diseases or injuries. The number of diseases that could be assessed with methods using higher quantities of evidence has significantly increased. The estimates should therefore have increased in precision between 2002 and 2012.

Uncertainty: A large part of this analysis is based on surveys of expert opinion and, like many such analyses, the uncertainties of such estimates are relatively large. In part, this is because expert opinion generally reflects the evidence in the literature, which may not be homogeneous, can be region-

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A modern water treatment plant (Timor-Leste).

specific or incomplete. We have therefore provided not only point estimates, but also the likely ranges of the estimate. The uncertainties reflect the confidence intervals provided by the experts.

Potential bias: In the framework of the expert surveys, experts in relevant risk disciplines may overestimate PAFs if they tend to work with evidence from populations with exposures. In this study, however, disease-specific rather than risk factor-specific experts were the majority. Also, epidemiological studies tend to cover mostly high-income countries where exposures to some environmental risks for noncommunicable diseases and injuries tend to be lower than in many industrializing countries, and expert surveys may therefore tend to underestimate environmental attribution for those diseases. The strong increase of CRA assessments used in this as compared to the previous study and the overall limited change in attribution of diseases to the environment however strengthens the validity of expert evaluations.

More distal causes: In this analysis the effects of more peripheral causes (for example the overall impact of some sectors, such as energy or transport) have not been taken into account. And this, too, may lead to an underestimate of the global health burden attributable to modifiable environmental factors.

Applicability: It is important to remember that the resulting population attributable fraction is a mean value and is not applicable to any individual country, particularly as the associated risks vary significantly from country to country.

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5. CONCLUSION: TOWARDS HEALTHY ENVIRONMENTS

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Key findings

Environmental risks account for a large fraction of the global disease burden: Across the total population, 23% of all deaths worldwide and 22% of all DALYs are attributable to the environment. Reducing environmental exposures would greatly reduce the global burden of disease.

SDGs are closely interlinked with environmental and social determinants of health: The environment directly influences health in many ways, including through harmful exposures, inadequate infrastructure, degraded ecosystems and poor working conditions; environmental risks, such as climate change and household air pollution often disproportionally affect the poor and poorer countries. Limited access to environmental services and infrastructure, such as safe water and sanitation, impacts more on women and girls, and may limit their access to education. Environmental and social impacts lead to poorer health, and poor health further precipitates people into poverty through increased health-care expenditures, loss of shelter, lost income, or increased expenditure to compensate for inadequate services.

Nearly two thirds of all deaths attributable to the environment are now composed of NCDs: Improvement of the environment would have the greatest effect on reducing NCDs. Some 8.2 million out of 12.6 million deaths caused by the environment are NCDs, and this number could be reduced through modifiable risks in the environment. Much of the burden is linked to fossil fuel combustion, and production and consumption patterns. There has been a shift from infectious to NCDs during the last decade, and stroke and ischaemic heart disease are now the diseases with the largest contribution to the environmental burden, while it used to be respiratory infections and diarrhoea, which are now relegated to third and fourth position. This shift is also seen in the decrease in the burden of infectious diseases in children under five years. Great progress has been made in recent years in improving the environmental conditions affecting mostly infectious diseases.

Environmental strategies often benefit multiple diseases: Many environmental interventions impact on multiple diseases at once. For example, the use of clean fuels for cooking reduces acute respiratory infections, chronic respiratory diseases, cardiovascular diseases and burns. The same is true for transport interventions, and adequate water and sanitation. The determinants of diseases linked to the environment often lie within the sphere of action of sectors other than health or environment.

Interventions to improve the environment can greatly contribute to SDG targets: The link between environmental risks and SDGs shows that improving environmental conditions for health is going to be an important element in progressing towards SDGs. There are direct pathways between environmental services and conditions and health, such as the type of energy used, access to safe water and sanitation, healthy, sustainable cities and climate change. In addition, the environment is closely linked to health through several other SDGs, such as poverty and working conditions.

Children under five years and older adults are most affected by the environment: Children under five years are most affected, with 26% of all deaths being attributable to the environment, as well as adults age 50 to 75 years with between 24% and 26% of deaths across that age range attributable to the environment. In children under age five, communicable diseases and injuries have the greatest preventive potential through environmental action, while in older adults, NCDs and injuries offer most potential. A large fraction of death and disease in children under age five is still connected to living in households without access to basic services such as safe water and basic sanitation, or that are smoky due to the use of unclean fuels for cooking or unclean technologies.

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Low- and middle-income countries bear the greatest burden of environmental burden of disease: The total and per capita rate of deaths and disease burden linked to the environment tends to be higher in low- and middle-income countries. The burden of NCD and deaths, however, is not necessarily highest in the lowest income countries.

Environmental impacts on health are uneven across different social groups: Exposure to environmental risk factors is unequally distributed, and this unequal distribution is often related to social characteristics such as income, social status, employment and education, but also non-economic aspects such as gender, age and ethnicity.

More diseases evaluated with more solid methods: This update was able to take into account the contribution of additional disease categories compared with the previous analysis. And, as much as 68% of deaths (and 56% of the burden in DALYs) attributable to the environment could now be estimated with CRA methods, which are based on the most solid evidence.

Recognizing the important burden of disease linked to environmental risks and being able to point to the main areas of concern is of great significance. Given that much of this burden is preventable, although not always with immediately implementable and cost-effective interventions, working to reduce environmental health risks will greatly improve our health.

Reducing the burden of unhealthy environments

Several approaches will assist in reducing the burden linked to unhealthy environmental conditions and in promoting healthier lifestyles:

Focus on primary prevention: Shifting resources to disease prevention through reducing environmental risks will not only alleviate suffering and increase well-being, but also lead to savings in health care. Some savings are immediate, for example reduced air pollution was shown to have an immediate effect on reducing health care, including emergency visits (Henschel et al, 2012). When evaluating the costs and benefits of prevention through healthier environments, avoided treatment costs and other externalities caused by unhealthy environments should be accounted for. The environment should be viewed as a key element for health protection and reduction of health inequalities and placed at the centre of primary prevention. This is an area where national and international leadership and cooperation will be essential.

Systematically consider health in all sectors: While the health sector can directly address certain environmental risks, others are usually managed by other sectors, and intersectoral action is essential. For example, reduced traffic congestion and improved public transport networks are important determinants of air pollution, and usually require cooperation with the transport sector and city planners. Using measures in all policy areas opens up an additional dimension in public health. Guidance on introducing Health in All Policies is available (WHO, 2015f). Sectors of particular relevance include energy, transport, industry/commerce, housing and water.

Promote and support local governance to address environmental health planning: Through their local scope and democratic nature, municipalities are natural leaders of local environment and health planning. They are often involved in developing the local economy, including transport, tourism and industry, and can play an important role in healthy planning if they are aware of the potential risks and benefits at stake, and provided with the tools and support they need. Today, more than half, and by 2050 more than 70%, of the world's population will live in cities. Cities are often unhealthy places, characterized by heavy traffic, pollution, noise, violence and social isolation. City planning and management

are therefore of particular importance. Many success stories document local approaches promoting safe and healthy living in cities (WHO, 2015k; WHO Office for Europe, 2015).

Create healthy environments to support SDG achievement: The SDGs place healthy and equitable environments at the centre of their goals. Given the multiple linkages between sustainable development, environment and health in the SDGs, creating health-supportive, sustainable and equitable environments will be a prerequisite to the attainments of SDGs.

Integrate actions to address the social determinants of health and provide basic services to all: As social determinants are closely linked to and mediate exposure to environmental risk factors, they need to be systematically integrated into risk monitoring and policy planning in order to reduce health inequalities. Also, providing universal access to basic services such as safe water, basic sanitation and access to clean fuels would provide great health benefits, in particular to the poorest in society.

Introduce win-win strategies while building on low carbon approaches: Certain management strategies can lead to health, climate, environment, and social and development co-benefits. For example, well-conceived transport strategies can reduce air pollution, mitigate climate change and increase physical activity which all help prevent disease. They can also improve access to work and to health care. They are cost-effective and can remove certain market distortions that cause excessive motor vehicle travel leading to important negative externalities (WHO, 2011c). They can yield a wide range of equity benefits for vulnerable groups. Similar opportunities can be found in the energy and housing sectors. Changing consumption patterns and transport choices can further support such strategies.

Promote assessment of health impacts of projects and policies: The introduction of most policies and projects in a development context will affect the environmental and social determinants of health. Tools such as health impact assessment (HIA) are available to measures or estimate these changes and translate them into predictions of health consequences, both positive and negative. It is important to perform such assessments at the planning stage in order to allow for adaptation of the project at the early concept and design stages if necessary. Assessments of health impacts need to cover health in a comprehensive way, either in a strategic, upstream and equality-focused manner, or with a sustainability, vulnerability and resilience focus. Addressing environmental determinants of health in development planning significantly reduces the transfer of hidden costs of development to the health sector.

Manage and prevent emerging risks including climate change: While solutions are available for many of the more traditional risks, emerging risks need to be closely monitored, mitigated and solutions put in place in a timely manner to avoid future burden. Climate change can affect health in many ways, ranging from heat stroke to increased risks from expanding areas of disease transmission of vector-borne diseases. Also, indirect effects may be considerable, such as malnutrition and reduced access to safe drinking-water sources, and possibly more wide-ranging effects causing political instability or migration. Climate change is therefore a major health challenge and one which is set to increase in the near term. Other risks also need to be monitored closely and adequately addressed, such as the use of hazardous chemicals in our daily lives. Not all social and environmental hazards to human health are equally understood and it essential to continue building our understanding. Trusted facts about health and environment can lead to the best possible decisions to protect people from environmental health risks and improve public health for the next decades.

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ANNEXES

Annex 1: WHO Member States and country groupings by income region

WHO regions and OECD members (2012)

OECD members	
Americas	Canada, Chile, Trinidad and Tobago, United States of America
Europe	Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, United Kingdom
Western Pacific	Australia, Brunei Darussalam, Japan, New Zealand, Republic of Korea, Singapore
Non OECD members	
Africa, sub-Saharan	Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo, Côte d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, South Africa, South Sudan, Swaziland, Togo, Uganda, United Republic of Tanzania, Zambia, Zimbabwe
Americas	Antigua and Barbuda, Argentina, Bahamas, Barbados, Belize, Bolivia (Plurinational State of), Brazil, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Uruguay, Venezuela (Bolivarian Republic of)
Eastern Mediterranean	Afghanistan, Bahrain, Djibouti, Egypt, Iran (Islamic Republic of), Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Qatar, Pakistan, Saudi Arabia, Somalia, Sudan, Syrian Arab Republic, Tunisia, United Arab Emirates, Yemen
Europe	Andorra, Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Georgia, Hungary, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Malta, Monaco, Montenegro, Republic of Moldova, Romania, Russian Federation, San Marino, Serbia, Tajikistan, The former Yugoslav Republic of Macedonia, Turkey, Turkmenistan, Ukraine, Uzbekistan
South-East Asia	Bangladesh, Bhutan, Democratic People's Republic of Korea, India, Indonesia, Maldives, Myanmar, Nepal, Sri Lanka, Thailand, Timor-Leste
Western Pacific	Cambodia, China, Cook Islands, Fiji, Kiribati, Lao People's Democratic Republic, Malaysia, Marshall Islands, Micronesia (Federated States of), Mongolia, Nauru, Niue, Palau, Papua New Guinea, Philippines, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu, Viet Nam

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Annex 2: Results tables

Table A2.1. Population attributable fractions for the environment (of DALYs), by disease and region[a]

Disease or disease group	Population attributable fraction (%)		
	Mean	95% Confidence interval	
		2.5%	97.5%
Infectious and parasitic diseases[b]			
Lower respiratory infections, global	35	27	41
LMIC	37	29	43
HIC	1	0	1
Upper respiratory infections and otitis, global	14	5	22
LMIC	24	6	45
HIC	12	5	18
Diarrhoeal diseases	57	34	72
LMIC	58	36	74
Sub-Saharan Africa	61	41	78
America	45	22	63
Eastern Mediterranean	58	36	74
Europe	33	8	58
South-East Asia	56	33	73
Western Pacific	44	20	66
HIC	13	0	45
Intestinal nematode infections	100	—	—
Malaria, global	42	28	55
Americas	64	51	77
Eastern Mediterranean	36	25	47
Europe	50	38	63
South-East Asia	42	30	54
Sub-Saharan Africa	42	28	55
Western Pacific	40	34	46
Trachoma	100	—	—
Schistosomiasis	82	71	92
Chagas disease	56	28	80
Lymphatic filariasis, global	67	39	89
Africa	40	20	71
Americas	70	59	81
Asia and Western Pacific	82	50	99
Onchocerciasis	10	7	13
Leishmaniasis, global	27	9	40
Africa and Asia	27	9	40
Central and Latin America	12	1	30
Dengue	95	89	100
Japanese encephalitis	95	90	99
HIV/AIDS[b,c], global	10	8	13
HIC	1–2	0	1–6
Sub-Saharan Africa[c]	14	11	18
Americas, LMIC[c]	4	2	8
Eastern Mediterranean[c]	2	1	4
Europe, LMIC[c]	1	1	3
South-East Asia[c]	5	4	11
Western Pacific, LMIC[c]	3	2	5

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Disease or disease group	Population attributable fraction (%)		
	Mean	95% Confidence interval	
		2.5%	97.5%
Sexually transmitted diseases excluding HIV	8	4	17
Syphilis[c]	6	3	14
Chlamydia[c]	8	3	16
Gonorrhoea[c]	12	7	25
Trichomoniasis[c]	4	2	6
Hepatitis B[c], global	2	1	4
Sub-Saharan Africa[c]	4	1	7
Other LMIC[c]	2	1	4
Tuberculosis, global	18	5	40
Parts of Africa strongly affected by HIV/AIDS	14	4	25
Other regions	19	5	46
Neonatal and nutritional conditions			
Neonatal conditions, global	11	2	27
HIC	6	1	11
LMIC	11	2	27
Protein-energy malnutrition[d]	15	10	19
Measles[e]	5	3	7
Noncommunicable diseases			
Cancers, global	20	9	43
Lung cancer, men, LMIC	45	22	61
Lung cancer, women, LMIC	48	26	63
Other cancers, men, LMIC	18	7	48
Other cancers, women, LMIC	16	7	38
Lung cancer, men, HIC	21	6	37
Lung cancer, women, HIC	17	4	33
Other cancers, men, HIC	16	7	38
Other cancers, women, HIC	13	7	28
Mental, behavioural and neurological disorders, global	12	3	30
Depression[c]	12	5	35
Bipolar affective disorder	4	0	9
Schizophrenia	4	1	9
Alcohol use disorders	16	6	38
Drug use disorders	11	2	36
Anxiety disorders	20	5	42
Eating disorders	7	0	20
Pervasive developmental disorders	7	0	26
Childhood behavioural disorders	12	3	36
Idiopathic intellectual disability	6	1	25
Other mental and behavioural disorders	10	3	24
Alzheimer's disease and other dementias	6	1	13
Parkinson's disease	7	2	14
Epilepsy	14	2	30
HIC	11	2	24
LMIC	15	2	30
Multiple sclerosis	6	1	22
Migraine	14	2	36
Non-migraine headache	17	2	46
Other neurological conditions	11	2	24

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Disease or disease group	Population attributable fraction (%)		
	Mean	95% Confidence interval	
		2.5%	97.5%
Cataracts	24	14	33
Hearing loss	22	19	25
HIC	8	7	9
LMIC	24	21	28
Cardiovascular diseases	31	20	40
Rheumatic heart disease	2	1	4
Ischaemic heart disease, global	35	26	46
HIC	23	15	30
LMIC	39	30	50
Africa	40	31	50
America	28	19	37
Eastern Mediterranean	37	27	49
Europe	29	19	38
South-East Asia	46	36	58
Western Pacific	40	30	51
Stroke, global	42	24	53
HIC	22	10	31
LMIC	46	27	57
Africa	47	29	58
America	30	15	42
Eastern Mediterranean	42	23	55
Europe	30	14	42
South-East Asia	50	31	61
Western Pacific	47	27	59
Hypertensive heart disease	9	5	15
Chronic obstructive pulmonary disease, global	35	20	48
HIC	12	5	21
LMIC	38	23	52
Africa	23	17	42
America	17	8	27
Eastern Mediterranean	29	16	34
Europe	20	9	32
South-East Asia	43	26	57
Western Pacific	40	24	54
Asthma	44	26	53
Musculoskeletal diseases, global	22	12	33
Rheumatoid arthritis	17	6	31
Osteoarthritis	20	11	29
Back and neck pain	27	17	41
Other musculoskeletal diseases	15	6	24
Congenital anomalies	5	1	10
Unintentional injuries			
Road traffic injuries, global	39	23	64
LMIC	42	25	65
Eastern Mediterranean, HIC	42	25	65
Europe, HIC	25	10	65
America and Western Pacific, HIC	17	0	50
Unintentional poisonings, global	73	53	90
Adults	68	50	87
Children	85	60	99

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Disease or disease group	Population attributable fraction (%)		
	Mean	95% Confidence interval	
		2.5%	97.5%
Falls, global	30	15	58
LMIC	31	15	60
HIC	26	15	52
Fires, heat, hot substances	76	58	90
HIC	42	1	67
LMIC	78	62	92
Africa	85	74	97
America	63	51	73
Eastern Mediterranean	72	53	87
Europe	52	30	68
South-East Asia	74	48	93
Western Pacific	62	50	72
Drownings, global	73	46	90
LMIC	74	44	95
HIC	54	24	79
Other unintentional injuries, global	43	20	74
LMIC	45	20	79
HIC	30	19	41
Intentional injuries			
Self-harm, global	21	13	30
HIC			
America	9	7	11
Eastern Mediterranean	4	3	6
Europe	4	1	7
Western Pacific	3	2	3
LMIC			
Africa	14	8	42
America	15	10	18
Eastern Mediterranean	12	8	16
Europe	2	2	3
South-East Asia	28	16	40
Western Pacific	37	29	43
Interpersonal violence, global	16	3	28
HIC	19	7	31
LMIC	16	3	28

Notes: [a] See Annex 1 for country groupings. [b] HIV/AIDS: human immunodeficiency virus/acquired immunodeficiency syndrome. [c] Data for adult populations only. [d] Data for children under five years only. [e] Fraction of diseases induced by malnutrition related to the environment. LMIC: low- and middle-income countries; HIC: High-income countries.

Main diseases and injuries without quantification: whooping cough, diphtheria, tetanus, meningitis, encephalitis, trypanosomiasis, leprosy, rabies, iodine deficiency, vitamin A deficiency, iron-deficiency anaemia, diabetes mellitus, endocrine, blood, immune disorders, glaucoma, refractive errors, macular degeneration, vision loss, peptic ulcer disease, cirrhosis of the liver, appendicitis, hyperplasia of prostate, urolithiasis, infertility, gynaecological diseases, skin diseases, gout, dental caries, periodontal disease, edentulism, collective violence and legal intervention.

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Table A2.2. Indicative linkages between environmental risk factor and disease or injury

The environmental population attributable fractions are indicative values, based on CRA or expert opinion. The ranges of the population attributable fractions are: ◍ <5%; ◉ 5–25%; ● >25%.

	Environmental risk factor													
Disease or injury	Water, sanitation and hygiene	Indoor fuel combustion	Second-hand tobacco smoke	Ambient air pollution	Noise	Chemicals[a]	Other housing risks	Recreational environment	Water resources management	Land use and built environment	Other community risks	Radiation	Occupation	Climate change
Infectious and parasitic diseases														
Respiratory infections		●	◉	◉			◍							
Diarrhoeal diseases	●							◍						◍
Intestinal nematode infections	●												◍	
Malaria									●		◉		◍	◍
Trachoma	●													
Schistosomiasis	●							◍					◍	
Chagas disease							●							
Lymphatic filariasis	●								◉				◍	
Onchocerciasis									◉				◍	
Leishmaniasis							◉						◍	
Dengue							●						◍	◍
Japanese encephalitis									●				◍	
HIV/AIDS													◍	
STDs													◉	
Hepatitis B and C													◉	
Tuberculosis		◍					◉						◍	
Other infectious diseases	◍						◍		◍				◍	
Neonatal and nutritional diseases														
Neonatal conditions	◍	◍	◍	◍		◍							◍	
Protein-energy malnutrition	◉										◍			◍
Noncommunicable diseases														
Cancers		◍	◍	◍		◍					◍	◍	◍	
Neuropsychiatric disorders					◍	◍	◍						◍	◍
Cataracts		◍										◍	◍	
Hearing loss						◍							◉	
Cardiovascular diseases		◉	◍	◉	◍	◍				◍			◍	◍
Chronic obstructive pulmonary disease		◉		◍									◉	
Asthma		◉	◉	◍			◍						◉	
Other respiratory diseases													◍	
Chronic kidney diseases						◍							◍	
Skin diseases						◍							◍	
Musculoskeletal diseases													◉	
Congenital anomalies				◍		◍						◍	◍	
Injuries														
Road traffic accidents										●			◉	
Falls							◉	◍		◍	◉		◉	
Drownings								●			◉		◍	◍
Fires			●				◉						◉	
Poisonings						●	◍						◍	
Other unintentional injuries							◍	◍		◉	◍	◍	◍	◍
Violence						◍	◉			◉				
Self-harm						◉	◍			◍			◍	

Notes: [a] Limited to industrial and agricultural chemicals and chemicals involved in acute poisonings.

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Table A2.3. Deaths attributable to the environment, by region, 2012

	World Total	World Children 0–4 years	Africa[a] Sub-Saharan	Americas HIC OECD	Americas Non-OECD	Eastern Mediterranean
Population	7 044 272 076	651 316 807	903 366 628	369 808 057	586 970 922	601 534 755
Total deaths	55 656 266	6 550 241	9 400 673	2 999 179	3 435 168	3 870 847
Total environmental deaths	12 624 495	1 709 860	2 176 353	320 135	526 754	854 396
Burden attributable to the environment	22.7%	26%	23%	11%	15%	22%
Infectious and parasitic diseases						
Respiratory infections						
Lower respiratory infections[b]	566 361	566 361	298 263	102	8 272	77 553
Upper respiratory infections and otitis	1 190	426	312	67	144	80
Diarrhoeal diseases	845 810	360 751	372 810	2 168	11 458	75 939
Intestinal nematode infections	3 299	1 132	735	0	134	291
Parasitic and vector diseases						
Malaria	258 702	199 623	234 733	6	469	4 251
Trachoma	0	0	0	0	0	0
Schistosomiasis	17 871	875	15 003	2	504	1 559
Chagas disease	4 371	2	0	40	4 192	0
Lymphatic filariasis	1	0	0	0	1	0
Onchocerciasis	0	0	0	0	0	0
Leishmaniasis	12 952	2 190	3 842	0	92	1 613
Dengue	27 249	3 392	1 863	1	2 946	877
HIV/AIDS[c]	137 985	0	129 867	24	1 810	300
Sexually transmitted diseases excluding HIV	761	0	372	15	47	51
Acute hepatitis B	2 828	0	635	0	40	179
Tuberculosis	166 687	8 279	31 051	206	3 637	18 611
Other infectious diseases	160 234	28 906	55 256	2 966	8 448	17 449
Neonatal and nutritional conditions						
Neonatal conditions	270 087	270 048	101 422	896	9 122	38 304
Protein-energy malnutrition[d]	27 291	27 291	18 220	0	399	3 017
Noncommunicable diseases						
Cancers						
Trachea, bronchus, lung cancers	568 632	0	6 275	30 007	17 895	10 108
Other cancers	1 097 144	5 476	72 120	80 265	86 704	58 084
Mental, behavioural and neurological disorders						
Unipolar depressive disorders	536	0	0	82	128	0
Bipolar disorder	30	0	0	7	4	0
Schizophrenia	839	0	98	25	35	39
Alcohol use disorders	17 104	0	350	2 070	2 830	62
Drug use disorders	10 213	0	1 220	2 661	560	1 208
Anxiety disorders	13	0	0	7	3	0
Eating disorders	636	0	86	94	77	45
Pervasive developmental disorders	0	0	0	0	0	0
Childhood behavioural disorders	0	1	0	0	0	0
Idiopathic intellectual disability	106	0	0	33	21	0
Alzheimer's disease and other dementias	41 936	13	779	16 784	2 306	559
Parkinson's disease	8 293	0	674	1 922	582	206
Epilepsy	30 031	2 866	13 013	272	1 381	2 255

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Europe		South-East Asia	Western Pacific		
HIC OECD	Non-OECD		HIC OECD	Non-OECD	
479 378 896	425 104 643	1 833 358 645	203 762 708	1 640 986 822	Population
4 421 429	4 809 343	13 759 124	1 633 467	11 327 037	Total deaths
538 490	877 254	3 821 244	187 434	3 322 435	Total environmental deaths
12%	18%	28%	11%	29%	Burden attributable to the environment
					Infectious and parasitic diseases
					Respiratory infections
73	4 364	145 735	48	31 951	Lower respiratory infections[b]
117	45	167	55	204	Upper respiratory infections and otitis
1 952	3084	363 904	327	14 167	***Diarrhoeal diseases***
1	40	1 730	0	368	***Intestinal nematode infections***
					Parasitic and vector diseases
26	4	17 806	3	1 405	Malaria
0	0	0	0	0	Trachoma
2	0	0	3	798	Schistosomiasis
2	0	0	0	137	Chagas disease
0	0	0	0	0	Lymphatic filariasis
0	0	0	0	0	Onchocerciasis
3	82	6 964	0	355	Leishmaniasis
126	374	14 907	1	6 154	Dengue
21	541	4 143	3	1 276	***HIV/AIDS***[c]
19	55	114	12	77	***Sexually transmitted diseases excluding HIV***
0	7	1 192	0	774	***Acute hepatitis B***
668	6 514	85 377	1 216	19 407	***Tuberculosis***
2 843	721	59 823	1 865	10 862	***Other infectious diseases***
					Neonatal and nutritional conditions
622	4 611	95 736	141	19 233	***Neonatal conditions***
0	49	5 398	0	208	***Protein-energy malnutrition***[d]
					Noncommunicable diseases
					Cancers
58 184	36 573	72 556	17 214	319 822	Trachea, bronchus, lung cancers
149 033	100 671	177 762	59 847	312 658	Other cancers
					Mental, behavioural and neurological disorders
277	6	0	43	0	Unipolar depressive disorders
17	0	0	2	0	Bipolar disorder
69	44	94	30	407	Schizophrenia
2 973	5 642	1 844	353	981	Alcohol use disorders
958	1 473	1 122	208	803	Drug use disorders
2	0	0	1	0	Anxiety disorders
111	50	52	34	87	Eating disorders
0	0	0	0	0	Pervasive developmental disorders
0	0	0	0	0	Childhood behavioural disorders
37	7	0	7	0	Idiopathic intellectual disability
13 275	979	568	2 294	4 392	Alzheimer's disease and other dementias
2 548	311	424	734	893	Parkinson's disease
1 081	968	8 084	169	2 808	Epilepsy

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	World Total	World Children 0–4 years	Africa[a] Sub-Saharan	Americas HIC OECD	Americas Non-OECD	Eastern Mediterranean
Multiple sclerosis	1 141	0	74	279	74	52
Migraine	1	0	0	0	0	0
Non-migraine headache	0	0	0	0	0	0
Other mental, behavioural and neurological conditions	43 297	2 266	3 514	3 532	2 645	6 134
Sense organ diseases						
Cataracts	0	0	0	0	0	0
Hearing loss	0	0	0	0	0	0
Cardiovascular diseases						
Rheumatic heart disease	6 934	0	634	30	272	856
Hypertensive heart disease	93 652	0	8 256	3 141	12 757	9 174
Ischaemic heart disease	2 273 811	0	123 389	73 791	102 528	169 272
Stroke	2 476 553	0	197 662	22 750	73 131	126 762
Other circulatory diseases	49 291	0	4 055	2 958	5 607	4 256
Respiratory diseases						
Chronic obstructive pulmonary disease	1 193 590	0	33 881	21 040	18 940	38 261
Asthma	169 449	2 943	21 780	1 714	3 867	13 279
Kidney diseases	27 143	0	2 609	1 073	3 045	2 854
Musculoskeletal diseases						
Rheumatoid arthritis	10 928	0	2 248	499	653	400
Osteoarthritis	829	0	0	179	228	0
Back and neck pain	158	0	0	41	29	0
Other musculoskeletal disorders	20 666	0	2 193	1 666	2 323	698
Congenital anomalies	27 770	22 471	7 536	692	2 443	3 719
Injuries						
Unintentional injuries						
Road injury	497 079	21 091	85 188	6 483	48 482	55 165
Poisonings	137 339	19 837	26 220	9 765	2 300	15 307
Falls	208 469	10 162	27 280	9 719	8 468	7 425
Fire, heat and hot substances	199 776	49 974	104 588	1 478	3 944	17 462
Drownings	268 166	48 565	56 906	2 650	13 081	21 269
Other unintentional injuries	393 136	51 813	79 928	7 987	25 956	40 841
Intentional injuries						
Self-harm	164 394	0	8 789	4 465	5 251	3 437
Interpersonal violence	81 730	3 103	20 624	3 483	26 488	5 131

Notes: [a] See Annex 1 for country grouping. [b] Lower respiratory infections in adults were not estimated. [c] HIV/AIDS: human immunodeficiency virus/acquired immunodeficiency syndrome.
[d] Malnutrition and consequences.

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Europe		South-East Asia	Western Pacific		
HIC OECD	Non-OECD		HIC OECD	Non-OECD	
356	96	76	19	114	Multiple sclerosis
0	0	0	0	0	Migraine
0	0	0	0	0	Non-migraine headache
3 885	1 655	18 424	1 265	2 243	Other mental, behavioural and neurological conditions
					Sense organ diseases
0	0	0	0	0	Cataracts
0	0	0	0	0	Hearing loss
					Cardiovascular diseases
192	374	3 481	30	1 064	Rheumatic heart disease
7 486	6 272	27 758	935	17 872	Hypertensive heart disease
128 693	370 319	670 993	30 024	604 802	Ischaemic heart disease
76 700	199 052	657 284	34 225	1 088 988	Stroke
9 253	3 081	11 261	1 919	6 902	Other circulatory diseases
					Respiratory diseases
20 578	20 058	600 908	4 383	435 540	Chronic obstructive pulmonary disease
2 946	7 101	95 156	1 770	21 835	Asthma
2 027	614	11 374	775	2 771	***Kidney diseases***
					Musculoskeletal diseases
635	625	3 306	353	2 208	Rheumatoid arthritis
344	15	0	63	0	Osteoarthritis
62	3	0	24	0	Back and neck pain
2 627	1 099	5 706	943	3 412	Other musculoskeletal disorders
670	1 392	7 517	191	3 610	***Congenital anomalies***
					Injuries
					Unintentional injuries
7 034	15 052	141 743	2 494	135 436	Road injury
3 150	11 063	38 277	1 073	30 183	Poisonings
11 917	8 417	91 883	3 154	40 208	Falls
1 412	9 105	52 580	719	8 487	Fire, heat and hot substances
2 996	16 132	96 311	4 443	54 377	Drownings
17 289	31 737	118 998	12 254	58 146	Other unintentional injuries
					Intentional injuries
2 216	2 070	88 025	1 518	48 623	Self-harm
980	4 704	14 682	251	5 387	Interpersonal violence

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Table A2.4. Burden of disease (in DALYs) attributable to the environment, by region, 2012

	World Total	World Children 0–4 years	Africa[a] Sub-Saharan	Americas HIC OECD	Americas Non-OECD	Eastern Mediterranean
Population	7 044 272 076	651 316 807	903 366 628	369 808 057	586 970 922	601 534 755
Total DALYs	2 735 774 494	635 842 474	669 356 692	104 368 534	170 415 002	240 831 776
Total environmental DALYs	596 412 171	161 224 280	160 333 445	12 726 942	27 978 016	49 858 253
Burden attributable to the environment	21.8%	25%	24%	12%	16%	21%
Infectious and parasitic diseases						
Respiratory infections						
Lower respiratory infections[b]	51 752 604	51 752 605	27 157 888	10 107	766 215	7 073 754
Upper respiratory infections and otitis	989 751	143 165	171 310	61 296	85 161	73 647
Diarrhoeal diseases	56 606 913	34 775 075	28 566 128	80 631	934 041	6 111 580
Intestinal nematode infections	5 229 544	555 077	876 763	2 678	558 162	190 886
Parasitic and vector diseases						
Malaria	23 074 450	18 667 064	21 251 064	842	43 677	324 908
Trachoma	298 711	0	106 498	0	31	99 092
Schistosomiasis	3 301 300	511 892	2 931 460	60	34 747	289 113
Chagas disease	295 450	1 346	0	1 710	289 514	0
Lymphatic filariasis	1 893 574	3 265	392 300	0	1 789	21 223
Onchocerciasis	59 827	0	52 174	0	1	7 652
Leishmaniasis	903 053	200 132	292 394	1	6 079	120 004
Dengue	1 369 867	308 325	124 878	51	146 045	48 395
HIV/AIDS[c]	7 780 321	0	7 327 221	1 302	100 455	17 443
Sexually transmitted diseases excluding HIV	254 531	0	84 961	11 249	12 561	16 267
Acute hepatitis B	111 446	0	26 159	3	1 610	5 953
Tuberculosis	7 688 971	755 331	1 702 379	9 077	186 604	887 384
Other infectious diseases	11 457 676	3 466 873	4 299 090	63 436	446 938	1 274 111
Neonatal and nutritional conditions						
Neonatal conditions	25 819 567	24 967 476	9 520 569	99 120	914 941	3 619 711
Protein-energy malnutrition[d]	2 834 186	2 834 186	1 769 312	0	40 758	314 550
Noncommunicable diseases						
Cancers						
Trachea, bronchus, lung cancers	13 902 105	0	191 034	667 963	457 762	294 511
Other cancers	31 047 781	500 635	2 602 333	1 924 304	2 476 495	2 026 785
Mental, behavioural and neurological disorders						
Unipolar depressive disorders	8 473 707	0	920 685	494 602	775 107	927 433
Bipolar disorder	528 985	0	54 529	27 767	47 647	42 942
Schizophrenia	561 463	0	43 197	40 035	46 244	37 274
Alcohol use disorders	5 121 132	2 428	359 863	530 757	563 766	34 366
Drug use disorders	1 663 568	0	171 994	235 668	154 037	167 474
Anxiety disorders	5 479 365	72	731 233	427 504	549 605	637 796
Eating disorders	158 276	0	11 866	22 322	15 597	15 717
Pervasive developmental disorders	546 443	38 227	69 943	30 723	43 282	47 275
Childhood behavioural disorders	742 156	0	137 465	28 807	74 592	81 226
Idiopathic intellectual disability	193 742	8 164	36 707	10 646	11 943	20 659
Alzheimer's disease and other dementias	1 088 036	1 152	44 238	255 229	74 792	32 196
Parkinson's disease	171 015	14	16 819	28 655	12 263	5 963
Epilepsy	3 023 792	357 174	1 132 248	47 715	267 741	273 527

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Europe		South-East Asia	Western Pacific		
HIC OECD	Non-OECD		HIC OECD	Non-OECD	
479 378 896	425 104 643	1 833 358 645	203 762 708	1 640 986 822	Population
137 262 179	177 124 905	739 598 145	50 642 692	446 174 570	Total DALYs
18 202 832	30 532 811	176 691 631	6 471 334	113 616 908	Total environmental DALYs
13%	17%	24%	13%	25%	Burden attributable to the environment
					Infectious and parasitic diseases
					Respiratory infections
8 166	399 686	13 369 591	5 169	2 962 029	Lower respiratory infections[b]
90 758	65 538	225 428	34 705	181 908	Upper respiratory infections and otitis
79 203	319 167	18 887 760	18 798	1 609 605	***Diarrhoeal diseases***
11	12 400	1 614 719	1 285	1 972 642	***Intestinal nematode infections***
					Parasitic and vector diseases
1 120	586	1 302 459	170	149 625	Malaria
0	0	7 405	0	85 684	Trachoma
81	10	0	31	45 798	Schistosomiasis
73	0	0	0	4 152	Chagas disease
9	0	1 424 730	0	53 523	Lymphatic filariasis
0	0	0	0	0	Onchocerciasis
309	6 632	456 209	0	21 426	Leishmaniasis
4 487	21 369	615 088	51	409 503	Dengue
1 262	27 298	235 687	138	69 518	***HIV/AIDS***[c]
13 895	18 457	43 049	5 530	48 560	***Sexually transmitted diseases excluding HIV***
8	380	51 856	6	25 471	***Acute hepatitis B***
25 449	359 302	3 552 501	36 766	929 509	***Tuberculosis***
52 496	69 730	3 928 196	37 362	1 286 318	***Other infectious diseases***
					Neonatal and nutritional conditions
72 737	461 205	9 137 636	19 022	1 974 627	***Neonatal conditions***
0	6 900	665 296	0	37 369	***Protein-energy malnutrition***[d]
					Noncommunicable diseases
					Cancers
1 332 363	1 025 478	2 117 211	338 474	7 477 309	Trachea, bronchus, lung cancers
3 197 395	2 769 716	6 111 023	1 249 847	8 689 884	Other cancers
					Mental, behavioural and neurological disorders
692 467	702 683	2 042 893	182 381	1 735 457	Unipolar depressive disorders
34 237	33 861	139 432	14 273	134 297	Bipolar disorder
44 673	38 361	123 193	22 579	165 906	Schizophrenia
563 003	877 820	728 671	143 570	1 319 317	Alcohol use disorders
143 639	142 539	364 811	47 628	235 779	Drug use disorders
476 930	385 655	1 367 941	147 024	755 678	Anxiety disorders
30 672	11 199	15 244	13 578	22 081	Eating disorders
33 619	31 239	142 991	15 302	132 069	Pervasive developmental disorders
30 306	36 124	196 816	12 862	143 958	Childhood behavioural disorders
10 558	8 686	63 527	3 145	27 869	Idiopathic intellectual disability
274 388	75 113	86 167	77 485	168 428	Alzheimer's disease and other dementias
40 593	8 423	16 059	12 821	29 420	Parkinson's disease
76 308	126 794	732 283	19 969	347 206	Epilepsy

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	World Total	World Children 0–4 years	Africa[a] Sub-Saharan	Americas HIC OECD	Americas Non-OECD	Eastern Mediterranean
Multiple sclerosis	69 729	0	5 022	12 614	4 335	3 411
Migraine	2 585 608	0	242 564	112 481	232 561	204 878
Non-migraine headache	310 613	0	29 863	19 899	25 336	24 207
Other mental, behavioural and neurological conditions	1 985 121	206 216	217 336	128 161	143 041	250 543
Sense organ diseases						
Cataracts	1 669 157	0	235 973	851	40 681	81 844
Hearing loss	4 787 242	0	600 608	49 085	367 151	293 391
Cardiovascular diseases						
Rheumatic heart disease	217 314	0	20 991	740	7 677	26 189
Hypertensive heart disease	2 146 830	0	222 310	69 819	281 562	224 629
Ischaemic heart disease	58 561 916	0	3 775 365	1 673 723	2 731 148	4 657 652
Stroke	58 985 983	0	5 516 929	561 239	1 846 792	3 112 672
Other circulatory diseases	1 355 822	0	133 919	65 941	152 420	132 648
Respiratory diseases						
Chronic obstructive pulmonary disease	32 280 161	0	1 881 755	554 208	594 488	1 391 180
Asthma	11 055 150	452 706	2 042 595	555 583	967 688	994 522
Kidney diseases	759 826	0	77 616	24 212	81 221	76 848
Musculoskeletal diseases						
Rheumatoid arthritis	934 393	0	114 159	90 901	76 488	42 201
Osteoarthritis	3 606 529	0	280 213	244 814	334 484	264 227
Back and neck pain	14 627 733	0	1 565 782	572 840	1 018 584	1 033 471
Other musculoskeletal disorders	4 961 741	0	481 736	505 407	441 797	293 319
Congenital anomalies	2 621 857	2 088 287	700 956	61 457	230 157	333 263
Injuries						
Unintentional injuries						
Road injury	31 000 887	1 929 893	5 846 221	389 959	2 945 448	3 534 231
Poisonings	7 824 627	1 800 107	1 920 884	478 601	151 625	973 111
Falls	12 671 696	942 880	1 938 627	434 312	602 330	764 211
Fire, heat and hot substances	13 665 389	4 544 990	7 684 642	81 183	259 870	1 197 214
Drownings	16 948 334	4 403 865	4 160 346	146 991	828 903	1 520 975
Other unintentional injuries	23 133 586	4 722 549	5 604 214	363 301	1 600 105	2 759 063
Intentional injuries						
Self-harm	8 119 700	0	487 580	202 142	276 416	185 850
Interpersonal violence	5 101 921	283 108	1 368 538	212 219	1 595 507	341 689

Notes: [a] See Annex 1 for country grouping. [b] Lower respiratory infections in adults were not estimated. [c] HIV/AIDS: human immunodeficiency virus/acquired immunodeficiency syndrome.
[d] Malnutrition and consequences.

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Europe		South-East Asia	Western Pacific		
HIC OECD	Non-OECD		HIC OECD	Non-OECD	
16 313	6 880	8 490	1 818	10 845	Multiple sclerosis
220 135	197 035	921 492	72 762	381 700	Migraine
25 473	20 949	78 068	9 246	77 571	Non-migraine headache
140 231	97 321	822 753	47 120	138 617	Other mental, behavioural and neurological conditions
					Sense organ diseases
206	18 504	969 175	65	321 859	Cataracts
67 242	189 427	1 826 465	27 238	1 366 634	Hearing loss
					Cardiovascular diseases
3 499	11 691	115 761	608	30 158	Rheumatic heart disease
102 499	127 944	725 659	13 432	378 975	Hypertensive heart disease
2 564 792	8 678 496	19 643 744	659 166	14 177 830	Ischaemic heart disease
1 374 988	4 296 351	16 896 984	698 109	24 681 920	Stroke
165 048	87 443	392 457	32 889	193 057	Other circulatory diseases
					Respiratory diseases
522 089	696 443	17 383 610	112 238	9 144 149	Chronic obstructive pulmonary disease
657 864	473 718	3 968 056	250 972	1 144 152	Asthma
42 726	20 818	329 745	15 482	91 157	***Kidney diseases***
					Musculoskeletal diseases
129 468	69 606	187 764	55 970	167 837	Rheumatoid arthritis
306 755	333 113	656 218	191 134	995 571	Osteoarthritis
1 068 823	877 639	3 399 336	432 705	4 658 552	Back and neck pain
509 303	357 678	1 034 603	251 450	1 086 447	Other musculoskeletal disorders
56 518	130 475	729 629	18 081	361 322	***Congenital anomalies***
					Injuries
					Unintentional injuries
646 547	1 051 591	8 763 491	156 437	7 666 963	Road injury
117 056	510 733	2 169 242	41 509	1 461 868	Poisonings
1 150 743	820 416	4 019 023	338 818	2 603 216	Falls
78 917	432 183	3 398 261	33 385	499 735	Fire, heat and hot substances
132 851	876 197	6 120 912	104 509	3 056 652	Drownings
615 412	1 754 678	6 553 038	367 115	3 516 659	Other unintentional injuries
					Intentional injuries
88 092	98 611	4 930 408	60 590	1 790 009	Self-harm
68 028	254 521	881 375	18 517	361 529	Interpersonal violence

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Annex 3: Technical annex on methods

Annex 3.1. Calculation of population attributable fractions

A generalized population attributable fraction can be calculated for an exposure distributed continuously across the study population (Ezzati et al, 2003):

$$\text{PAF} = \frac{\int_{x=0}^{m} RR(x)P(x)dx - \int_{x=0}^{m} RR(x)P'(x)dx}{\int_{x=0}^{m} RR(x)P(x)dx}$$

Where:

x = Exposure level.
P(x) = Population distribution of exposure.
P′(x) = Alternative ("counterfactual") population distribution of exposure.
RR(x) = Relative risk at exposure level x compared with the reference level.
M = Maximum exposure level.

When the exposure becomes a categorical variable, the formula for the population attributable fraction gets simplified (Last, 2001):

$$PAF = \frac{\Sigma P_i RR_i - \Sigma P_i' RR_i}{\Sigma P_i RR_i}$$

Where:

PAF = Population attributable fraction.
P_i = Proportion of the population in exposure category $_i$.
P_i' = Proportion of the population in the alternative exposure category $_i$.
RR_i = Relative risk at exposure category $_i$ compared with the reference level.

If the risk factor were to be completely removed, or if exposed populations were to be compared with unexposed populations, the burden of disease reduction can be calculated from a simplified form of the above formula:

$$PAF = \frac{\Sigma P_i RR_i - 1}{\Sigma P_i RR_i}$$

Annex 3.2. Combination of risk factors for one disease: additional information

This section provides additional information on the methods used for the combination of population attributable fractions where quantified assessments (CRA type) estimates were available for several risks. Table A3.2.1 lists the major diseases in this case.

Table A3.2.1 Global risk factors attribution, by disease and by risk factor (in DALYs)

	Particulate matter				Other mechanisms			
Disease	HAP	AAP	SHS	Occupational	Occupational carcinogens	AAP ozone	Lead	Radon
ALRI	33%	8%	9%	—	—	—	—	—
Lung cancer	17%	14%	2%	—	7%	—	—	7%
COPD	24%	9%	—	12%	—	3%	—	—
Ischaemic heart disease	18%	24%	4%	—	—	—	4%	—
Stroke	26%	25%	4%	—	—	—	5%	—

AAP: ambient air pollution; ALRI: acute lower respiratory infections; COPD: chronic obstructive pulmonary disease; HAP: household air pollution; SHS: second-hand tobacco smoke.
Source: (Lim et al, 2012; WHO, 2014c; WHO, 2014d).

The exposure of the general population to particulate matter in the air was combined into exposure "profiles", i.e. the population was distributed into exposure level for each microgram/m^3 by country, age (adults/children) and sex. For exposure to ambient air pollution, the exposure from combined satellite/chemical transport model, calibrated by ground measurements was used (Brauer et al, 2012). Exposure to household air pollution was added to ambient air pollution levels using the WHO exposure database for solid fuel use (WHO, 2015d). Finally, exposure to second-hand tobacco smoke was added to ambient and household air pollution (Öberg et al, 2011).

The environmental risks operating through somewhat different mechanisms or affecting specific population subgroups (i.e. occupations exposed to occupational particulate matter) were combined with the population attributable fractions from the "profile" of particulate matter by using the product of complements.

This approach provides slightly lower population attributable fractions than if the product of complements was used for exposure of the general population to air pollution (household and ambient) of particulate matter.

Annex 3.3. Additional information on estimation of PAFs for selected diseases

HIV/AIDS

Methods and data sources: The fraction of HIV attributable to occupation was based on the comparison of HIV prevalence rates in workers at high risk (female sex workers) (Prüss-Ustün et al, 2013; UNAIDS, 2012; UNAIDS, 2013) and workers at intermediate risk (truck drivers, fishermen, miners, armed workforce) (unpublished database) with HIV prevalence rates in the general population (UNAIDS, 2012; UNAIDS, 2013). HIV transmission among people who inject drugs were deduced.

The population sizes of female sex workers, persons who inject drugs and workers at intermediate risk were extracted from major surveys and databases (Aceijas et al, 2006; ILO - Laborsta; Mathers et al, 2008; Vandepitte et al, 2006).

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Estimates were performed by WHO region and income group (low- and high-income groups of the Americas, Eastern Mediterranean Europe, South-East Asia and the Western Pacific).

Limitations: The main uncertainties relate to:
(a) Limited data availability on HIV prevalence in sex workers and workers at intermediate risk.
(b) The estimation of the sizes of the populations of workers in the specific occupations.
(c) The approach used for addressing the overlap of intravenous drug use and occupational exposures (essentially assuming that all transmission occurring in intravenous drug users is due to drug use).
(d) Migration of workers, and therefore possible bias in rate comparison.
(e) Turnover in sex worker populations.
(f) The failure to include male sex workers due to data scarcity.

Sexually transmitted diseases excluding HIV/AIDS

Methods and data sources: The fraction of HIV attributable to occupation was based on the comparison of prevalence rates of syphilis, and of *chlamydia trachomatis, Neisseria gonorrhoeae* and *Trichomonas vaginalis* infections in workers at high risk (female sex workers) (Cwikel et al, 2008; WHO, 2014aa) and workers at intermediate risk (truck drivers, fishermen, miners, armed workforce) (unpublished database) with prevalence rates in the general population (WHO, 2012d). Only half of the excess cases in intermediate workers are assumed to be attributable to occupational causes.
The population sizes of female sex workers and workers at intermediate risk were extracted from major surveys and databases (Aceijas et al, 2006; ILO - Laborsta; Vandepitte et al, 2006). Estimates were performed by WHO region and income group (low- and high-income groups of the Americas, Eastern Mediterranean Europe, South-East Asia and the Western Pacific).

Limitations: The main uncertainties relate to:
(a) Limited data availability on prevalence of sexually transmitted infections in sex workers, workers at intermediate risk, and also the general population for certain regions and infections.
(b) The estimation of the sizes of the populations of workers in the specific occupations.
(c) Migration of workers, and therefore possible bias in rate comparison.
(d) Turnover in sex worker populations.
(e) The failure to include male sex workers due to data scarcity.

Hepatitis B

Methods and data sources: PubMed was systematically searched with the terms "hepatitis" or "HBsAg" in combination with "sex workers" or "occupation" or "high-risk" or "fishermen" or "truck drivers" or "police" or "military" or "armed", between the beginning of 2000 and March 2015. We found 33 studies reporting HBsAg (hepatitis B surface antigen) in female commercial sex workers, covering all regions. For HBsAg in workers at intermediate risk, 10 studies were found, covering mainly truck drivers, but also fishermen, and the uniformed workforce. All regions were represented, except Europe and sub-Saharan Africa. The fraction of hepatitis B infections attributable to occupation was based on the differences between the median regional prevalence rates of HBsAg in those workers and the regional values for the general population, after matching age group and year (Ott et al, 2012).

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The population sizes of female sex workers and workers at intermediate risk were extracted from major surveys and databases (Aceijas et al, 2006; ILO - Laborsta; Vandepitte et al, 2006).

Results were pooled by WHO region and income group (low- and high-income groups of the Americas, Eastern Mediterranean, Europe, South-East Asia and the Western Pacific).

Limitations: The main uncertainties relate to:

(a) Limited data availability on prevalence of HBsAg in sex workers, workers at intermediate risk.
(b) Availability of comprehensive HBsAg prevalence in the general population disaggregated by region, and only limited data availability at national level.
(c) The overlap of female sex workers and people who inject drugs.
(d) The estimation of the sizes of the populations of workers in the specific occupations.
(e) Migration of workers, and therefore possible bias in rate comparison.
(f) Turnover in sex worker populations.
(g) The failure to include male sex workers due to data scarcity.

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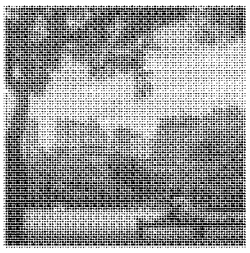

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A global assessment of the burden of disease from environmental risks

The main message emerging from this new comprehensive global assessment is that premature death and disease *can* be prevented through healthier environments – and to a significant degree. Analysing the latest data on the environment-disease nexus and the devastating impact of environmental hazards and risks on global health, backed up by expert opinion, this report covers more than 130 diseases and injuries.

The analysis shows that 23% of global deaths (and 26% of deaths among children under five) are due to modifiable environmental factors – and therefore can be prevented. Stroke, ischaemic heart disease, diarrhoea and cancers head the list. People in low-income countries bear the greatest disease burden, with the exception of noncommunicable diseases.

The report's unequivocal evidence should add impetus to coordinating global efforts to promote healthy environments – often through well-established, cost-effective interventions. This analysis will inform those who want to better understand the transformational spirit of the Sustainable Development Goals agreed by Heads of State in September 2015. The results of the analysis underscore the pressing importance of stronger intersectoral action to create healthier environments that will contribute to sustainably improving the lives of millions around the world.

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Message

From: Lynn Goldman [goldmanl@gwu.edu]
Sent: 1/10/2018 9:02:21 PM
To: Spire, Paul [PSpire@aap.org]
CC: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Balk, Sophie [sbalk@montefiore.org]; Jennifer Lowry [jlowry@cmh.edu]
Subject: Re: FW: Green Book - Water chapter - response requested by September 18
Attachments: 17 - Water - revisions.docx

At long last, the water chapter. I think I have addressed all of the reviewer comments.

The least believable aspect is that the EPA standards haven't changed much, if at all, from the last edition.

I checked per the reviewer's comments.

Best,
Lynn

On Wed, Jan 10, 2018 at 2:03 PM, Lynn Goldman <goldmanl@gwu.edu> wrote:

Yes!

On Sat, Jan 6, 2018 at 11:51 AM, Spire, Paul <PSpire@aap.org> wrote:

Hi Dr. Goldman.

I'm sorry to pester you, but it appears that we have not yet received your chapter and we are really down to the wire on publication deadlines. Do you think you would be able to get this to us within 2 weeks, by Friday, Jan 19?

Many thanks,

Paul

From: Spire, Paul
Sent: Friday, November 17, 2017 6:04 PM
To: Goldman, Lynn <goldmanl@gwu.edu>
Cc: Etzel, Ruth <etzel.ruth@epa.gov>; Balk, Sophie <sbalk@montefiore.org>; Jennifer Lowry <jlowry@cmh.edu>
Subject: RE: Green Book - Water chapter - response requested by September 18
Importance: High

Hi Dr. Goldman.

It appears that we have not yet received your chapter. Do you think it would be possible to receive by Nov 30?

Thanks much for your continued support,

Paul

From: Spire, Paul
Sent: Friday, October 27, 2017 5:20 PM
To: Goldman, Lynn <goldmanl@gwu.edu>
Cc: Etzel, Ruth <etzel.ruth@epa.gov>; Balk, Sophie <sbalk@montefiore.org>; Jennifer Lowry <jlowry@cmh.edu>
Subject: FW: Green Book - Water chapter - response requested by September 18

Hi Dr. Goldman.

It appears that we have not heard back from you yet regarding the requested adjustments to the "Water" chapter. We are unfortunately starting to push-up again some firm publication deadlines. Is there any chance you could respond within 2 weeks, by November 10?

Many thanks for considering and for your continued support.

Best,

Paul

From: Spire, Paul
Sent: Thursday, September 28, 2017 12:19 PM
To: Goldman, Lynn <goldmanl@gwu.edu>
Cc: Etzel, Ruth <etzel.ruth@epa.gov>; Balk, Sophie <sbalk@montefiore.org>; Jennifer Lowry <jlowry@cmh.edu>
Subject: FW: Green Book - Water chapter - response requested by September 18

Hi Dr. Goldman.

It appears that we have not yet received a response from you regarding the updated "Water" chapter. Any chance you get this to us by Friday, Oct 13?

Many thanks,

Paul

From: Spire, Paul
Sent: Thursday, August 17, 2017 6:59 PM
To: Goldman, Lynn <goldmanl@gwu.edu>
Cc: Etzel, Ruth <etzel.ruth@epa.gov>; Balk, Sophie <sbalk@montefiore.org>; Jennifer Lowry <jlowry@cmh.edu>
Subject: Green Book - Water chapter - response requested by September 18
Importance: High

Dear Dr. Goldman,

I am writing on behalf of the Green Book editorial team to follow-up on the development of the "Water" chapter for the *Pediatric Environmental Health, 4th Edition* manual (Green Book).

Attached please find a copy of the draft chapter as it was reviewed by the AAP's Council on Environmental Health (COEH), as well as comments from the committee members that emanated from this review. We are requesting that you review these comments and adjust the chapter to address these issues. If there are any

items that you will not be addressing or that you disagree with, it would be helpful to receive a short explanation of these issues for the committee's consideration.

We also wanted to share one new request and additional guidance that has emerged as this project has progressed:

- Please write 3 - 5 bullet points for your chapter that summarize key issues and take-home messages. These are being added at the start of each chapter.
- Please pay special attention to providing citations wherever it would be appropriate to do so, ensuring that all sources are cited and acknowledged.
- If you are using information from another AAP policy statement (or other Academy document), please modify the content so that it is not worded exactly like the existing policy document.
- Please continue to make all adjustments utilizing Word's "Track Changes" feature.

We are hoping to receive all updated chapters within one month, by Monday, September 18.

Thanks again for your ongoing support. If you have any questions or need anything more, please do not hesitate to let me know.

Many thanks,

Paul

--
Lynn R. Goldman, MD, MS, MPH
Michael and Lori Milken Dean, Milken Institute School of Public Health,
George Washington University
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--

Lynn R. Goldman, MD, MS, MPH
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Message

From: Foos, Brenda [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=18B24F2F79414190852A748BF650D2B9-BPERKOVI]
Sent: 3/24/2015 1:25:21 PM
To: AO-OCHP-Everyone [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=222d03d48d634481af638d4892296469-AO-OCHP-Everyone]
Subject: FW: Pesticide residues in produce - EMBARGOED CR materials
Attachments: Consumer Reports Food Safety and Sustainability Report about Pesticide Use on Produce--March 2015--reduced.pdf; Consumer Reports Methodology and Charts for Pesticides Use on Produce Report--March 2015.pdf; Consumer Reports Policy Recommendations for Pesticides on Produce--March 2015.pdf; Consumer Reports Produce Article Embargoed Until March 19 at 6 AM.pdf

I haven't read through all of this yet, but it looks pretty interesting!

Brenda

****

Brenda Foos
Director, Regulatory Support and Science Policy Division
US EPA Office of Children's Health Protection
202-564-2707

-----Original Message-----
From: Jerry Paulson [mailto:jerry@envirohealthdoctor.com]
Sent: Monday, March 23, 2015 11:44 AM
To: robertsj@musc.edu; Aparna Bole (Aparna.Bole@UHhospitals.org); aspanier@peds.umaryland.edu; Baum, Carl; Foos, Brenda; Bruce Lanphear (blanphear@sfu.ca); Carla Campbell (ccc57@drexel.edu); Gadhia, Ami; Heather Brumberg (heather_brumberg@nymc.edu); Jennifer Lowry (jlowry@cmh.edu); John Balbus MD ; leonardo.trasande@nyumc.org; 'Mary Mortensen'; Nate DeNicola ; Pacheco, Susan E; Paul Spire; Samantha Ahdoot ([redacted] Ex. 6); Sharon Savage; Todd Brubaker ([redacted] Ex. 6); Zachary Laris (zlaris@aap.org)
Cc: Gadhia, Ami
Subject: FW: Pesticide residues in produce - EMBARGOED CR materials

FYI. No need for action @this time.

Jerry

Jerome A. Paulson, MD, FAAP
Medical Director
Pediatric Environmental Health Specialty Units - East p [redacted] Ex. 6 e jerry@envirohealthdoctor.com

and

Professor Emeritus
of Pediatrics and Environmental & Occupational Health George Washington University Schools of Medicine and Public Health

-----Original Message-----
From: Gadhia, Ami [mailto:agadhia@aap.org]
Sent: Wednesday, March 18, 2015 9:08 AM
To: Jerry Paulson; Jennifer Lowry
Cc: Laris, Zachary; Spire, Paul
Subject: Fwd: Pesticide residues in produce - EMBARGOED CR materials

Hi Drs. Paulson and Lowry,

FYI, attached to this message are embargoed Consumer Reports materials on pesticides in produce for the upcoming May issue, which I received this morning.

Here is what is included:

1. Consumer Reports article, which will post online at 6 AM on March 19 (tomorrow)

2. Consumer Reports Policy Recommendations (excerpted from the report for your convenience)

3. Methodology and Charts (also excerpted from the report for your convenience)

4. Full Food Safety and Sustainability Center report

Please note that all of these materials are embargoed until 6 AM tomorrow. Please let me know if you have any questions for the CR folks and I can connect us.

Regards,

Ami

> *****
>
>

FROM CROP TO TABLE

PESTICIDE USE IN PRODUCE

ConsumerReports®

FOOD SAFETY & SUSTAINABILITY CENTER

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Pesticide Use in Produce

About Consumer Reports' Food Work and Its Food Safety and Sustainability Center

Consumer Reports has been concerned about the quality and safety of the food supply since its earliest years. It did pioneering research on the presence of nuclear fallout in the American diet (Strontium-90) in the 1950s and 1960s, which helped build support for the Test Ban Treaty of 1963. The magazine's 1974 landmark series on water pollution played a role in the Safe Drinking Water Act. The organization has been testing meat and poultry for pathogens and antibiotic resistance for more than 15 years and has used its research to successfully fight for reforms such as the 2010 campylobacter standard for chicken and turkey, the 2011 Food Safety Modernization Act, and improvements to the salmonella standards.

In 2012, Consumer Reports launched its Food Safety and Sustainability Center to fight for sweeping, systemic change and address the root causes plaguing the food system. The Center's work focuses on issues including foodborne illness and antibiotic resistance; pesticide use; heavy metals (mercury, lead, arsenic); truth and transparency in labeling; and promoting more sustainable agricultural practices that advance the marketplace, such as animal welfare, organic farming, and fair trade. At the core of the Center's work is the principle that there is a clear intersection between how food is produced and the impact on public health.

Bios

CR Scientists

Dr. Urvashi Rangan leads Consumer Reports' Consumer Safety and Sustainability Group and serves as the Executive Director of its Food Safety and Sustainability Center. Dr. Rangan directs all of the organization's food-safety testing and research in addition to the scientific risk assessments related to food and product safety, which she translates into actionable recommendations for lawmakers and consumers. She is an environmental health scientist and toxicologist and is a leading expert, watchdog, and spokesperson on food labeling and food safety. Dr. Rangan received her Ph.D. from the Johns Hopkins School of Public Health.

Dr. Michael Crupain is the Associate Director for Food Safety in Consumer Reports' Consumer Safety and Sustainability Group and the Director of Consumer Reports' Food Safety and Sustainability Center. He oversees the day-to-day operations of the organization's food-safety testing with a particular focus on the impact of industrial agricultural farming on public health. He is a trained physician in preventive medicine with expertise in public health-based risk assessment. Dr. Crupain received his master's degree in public health from the Johns Hopkins School of Public Health, where he also teaches.

Dr. Doris Sullivan is the Associate Director for Product Safety in Consumer Reports' Consumer Safety and Sustainability Group. She oversees product safety testing, research, and prioritization. She is also an expert in compiling and analyzing large datasets. She received her Ph.D. in chemistry from Boston University and completed postdoctoral research at the Free University of Brussels and University of Pennsylvania.

Dr. Michael K. Hansen is a Senior Scientist with Consumers Union, the policy and advocacy arm of Consumer Reports. He works primarily on food safety issues, including pesticides, and has been largely responsible for developing the organization's positions on the safety, testing and labeling of genetically engineered food and mad cow disease. Dr. Hansen served on the Department of Agriculture's Advisory Committee on Agricultural Biotechnology from 1998 to 2002 and on the California Department of Food and Agriculture Food Biotechnology Advisory Committee from 2001 to 2002.

Dr. Keith Newsom-Stewart is a Statistical Program Leader at Consumer Reports. During his tenure, he has worked on a wide range of projects, including those related to meat, seafood, and poultry safety and food additives. He specializes in linear and nonlinear mixed models, experimental design, and analysis of complex surveys. Prior to coming to CR, he worked for the Cornell Biometrics Unit and College of Veterinary Medicine. His educational background is in statistics, general biology, and genetics. He is an adjunct math professor at Western Connecticut State University and a member of the American Statistical Association.

CR Communications

Jennifer Shecter is the Director of External Relations at Consumer Reports and the Senior Adviser to the Food Safety and Sustainability Center. In this capacity, she manages the center's partnerships and relationships, coordinates its overall public service activities, and pursues strategic initiatives to build support for its mission. She has been with Consumer Reports for more than a decade, serving first in its Communications Department, promoting food and product safety issues, then working as the Senior Adviser to the President—writing speeches, op-eds, and briefing materials—and advising on key organizational issues.

CR Advisers

Charlotte Vallaeys is a contributing researcher, writer, and policy analyst to the Consumer Reports' Food Safety and Sustainability Center. She focuses on sustainability and justice in the food system and works on a variety of food policy and food safety issues, including food labeling and organic policy. She regularly attends National Organic Standards Board meetings as a watchdog for the organic label and has done work for the National Organic Coalition. She previously worked as Policy Director at The Cornucopia Institute. She received her master's degree in theological studies from Harvard University, where she studied social and environmental ethics, and a master's of science in nutrition from the Friedman School of Nutrition Science and Policy at Tufts University.

Dr. Charles Benbrook consulted to Consumer Reports on this pesticide report, including providing expert analysis of his Dietary Risk Index (DRI). He currently serves as the leader of the Center for Sustaining Agriculture and Natural Resources program Measure to Manage (M2M) at Washington State University. Over a long career, Dr. Benbrook has developed a variety of analytical systems quantifying food quality and safety, and the impacts of agricultural technology and policy. Before moving west, Dr. Benbrook worked in Washington, D.C., for 18 years, including in the Executive Office of the President and on Capitol Hill. He collaborated with Consumer Reports on the organization's 1998 Worst First pesticides report.

Chantelle Norton is an artist and designer and is a lead designer of Consumer Reports' Food Safety and Sustainability Center reports. She has worked in many fields of design, from fashion to print to costume to graphic design. She lives in the Lower Hudson Valley with a medley of animals, including her pet chickens. Her latest paintings take the chicken as muse and feature portraits of her feathered friends in landscapes inspired by the Hudson Valley and Ireland.

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Introduction: Produce Matters

FRUITS AND VEGETABLES are a crucial part of a healthy diet. In its latest report, the Dietary Guidelines Advisory Committee, a panel at the U.S. government's Office of Disease Prevention and Health Promotion, found that high levels of fruit and vegetable consumption are strongly or moderately associated with decreased risks of chronic diseases such as heart disease, high blood pressure, type 2 diabetes, obesity and cancer. The committee also found limited evidence that suggests that dietary patterns with high fruit and vegetable consumption may decrease the likelihood of congenital anomalies as well as neurological and psychological diseases.

Unfortunately, Americans eat far too few fruits and vegetables. In fact, 80 percent of Americans fail to consume the daily recommended number of servings of fruit (1.5 to 2.5 cups for adults), and 90 percent fail to meet the daily recommended number of servings of vegetables (2 to 3.5 cups for adults). That means we are not even close to what some studies suggest may be the ideal number of servings of fruits and vegetables per day: 7 or more.[1] One simple thing you can do to be healthier and live longer is to eat a diet rich in fruits and vegetables as well as whole grains, and low in saturated fats.

A key part of understanding the produce we eat is to understand how it is produced. Since the industrial revolution, chemical-based pesticides have been used extensively in crop production. Farmers use nearly 700 million pounds of pesticides every year.[2]

We have come to learn that the widespread use of pesticides in crop production comes with a range of consequences that should affect our thinking on how crops *should* be produced. It also highlights the connections between practices on the farm and what ends up on our table. In an ideal world, pesticides sprayed on a farm field would kill only the targeted pests, then disappear. That, unfortunately, is not the case. Pesticides can harm their intended targets as well as nontargeted living organisms. Pesticides used in agriculture can contaminate not only our food but also the environment, and they're widely present in the air, rain, and rivers. Their use affects not only the consumers who eat the treated crops but also farmworkers, rural residents, wildlife, and

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pollinators that are exposed.

The good news is that over the past two decades, there has been quite a bit of progress addressing the use of some of the most toxic pesticides we initially called out in our 1998 report, *Worst First*. That report identified 40 specific insecticide uses on nine fruit and vegetable crops that, together, accounted for a very large portion of children's overall dietary insecticide exposure and risk. But more work needs to be done so that we can maximize the benefits of eating produce, making our produce choices even healthier.

We also know from a Consumer Reports April 2014 national survey that consumers expect more when shopping for food. Eighty-nine percent of people think it is critical to protect the environment from chemicals. In addition, 86 percent think it is critical to reduce pesticide exposure and support fair working conditions.[3] Those statistics indicate an overwhelming consumer demand for food produced in a way that is more sustainable and healthier for the environment, workers, and consumers.

This report discusses the range of issues associated with chemicals used to grow and market the majority of fruits and vegetables in the U.S. It also takes a close look at the specific risks of individual crops, including where and how they are produced. We describe the effects of these chemicals on the environment and human health, and the importance of decreasing our use and exposure to these pesticides. We also discuss emerging science on the potential harms that can't be quantified at this time but, again, can guide us to make better decisions from crop to table.

Ideally *you* wouldn't have to worry about the potential hazards associated with pesticide use in fruit and vegetable production. We offer important recommendations for systemic policy changes that would better protect public health, but until that happens, we provide you with advice on how to reduce your exposure.

In our judgment, the best way to maximize the nutritional benefit from fruits and vegetables while minimizing the negative effects of pesticides on the health of the environment, workers, and yourself is to buy organic. Federal law requires that food labeled as "organic" must be grown and handled without the use of synthetic chemicals, including synthetic pesticides, with very few exceptions.[4] Studies have shown that people who eat organic fruits and vegetables reduce their exposure to pesticide residues.[5-7]

We do recognize that organic can cost more, and organic options may not always be available to all consumers, so we give you advice on how to find nonorganic produce items with the lowest levels of harmful pesticides. We also underscore that *even eating conventionally produced fruits and vegetables is always healthier than not eating any.* This report seeks to empower you, so you can make more informed decisions about the produce you eat and the policies that have an impact on their production. Together, we believe we can create a healthier food system. ❋

The Intersection of Safety and Sustainability: Why Pesticides Are a Bad Deal

When chemical pesticides became widely available in the mid-20th century, the dominant approach to pest control in agriculture shifted. Farming practices that naturally prevent and control serious pest problems, such as rotating crops, planting cover crops, providing habitat for pest predators, maintaining diversity on the farm, selecting crops suited for particular growing conditions and regions, scouting for pests, and labor-intensive weeding, fell out of favor. Farmers no longer needed to rely on those farming practices. They could plant vast fields of single crops—monoculture—and focus on exterminating pests through chemical means.

The chemical approach to pest control, however, has backfired. It has been shown to be unsustainable because it ignores a basic reality that governs the natural world: adaptation. Within a decade, many pests will adapt and develop resistance to the pesticides designed to kill them.[8] The National Academy of Sciences writes that "pesticide resistance is now universal across taxa."[9] It typically takes less than a decade for insects to develop resistance to an insecticide, sometimes as few as three to four years.[10]

The constant and inevitable evolution of resistance and the resulting need to develop and apply new chemicals has put farmers on what has been referred to as a "pesticide treadmill." That continued use and development of new pesticides comes at the expense of public health and the environment, which requires long-term testing and caution for maximum protection. Living organisms are complex, and it takes time to come to a thorough understanding of the often subtle ways that pesticides do harm. It was only after it was banned that the carcinogenic effects of DDT, and its effects on the endocrine system, became clear. As history shows, specific pesticides are approved, and millions of pounds are released into our environment and food supply, before scientists have thoroughly researched and understood their wide-ranging and long-term effects. We cannot assume that the safety tests required today will capture the full spectrum of negative effects and adequately protect us from those harmful effects.[11,12]

Meanwhile, the long-term negative effects of pesticides on nontarget organisms—including humans—can linger longer than their effectiveness against the pests they are intended to kill. We are still living with the consequences of the pesticides that were used generations ago. Though inorganic arsenic-based pesticides were popular in the early 20th century and are no longer used (they were banned in the U.S. in the 1980s), arsenic continues to contaminate orchards and farm fields.[13,14] Today arsenic is considered a known carcinogen implicated as a risk factor for lung, bladder, and skin cancer, as well as a risk for other diseases such as cardiovascular disease and diabetes.[15] In part because of its use as a pesticide in the past and the present, it is found in measurable amounts in highly consumed foods such as apple juice and rice.[16]

Likewise, the use of DDT in the mid-20th century continues to affect public health and the environment today. Though DDT was banned more than 40 years ago, its breakdown product continues to be found in certain foods, such as dairy, potatoes, and meat,[17] and consumers are still at significant risk of exposure.[18] Recent reports show that birds are still dying from DDT in towns where the pesticide was manufactured more than 50 years ago.[19] Despite those clear lessons from history, the cycle continues.

Based on history, two things are certain: Pesticides eventually lose their effectiveness, and the full extent of negative effects on human health and the environment will eventually come to light—probably after the pesticide is no longer effective and has been replaced by something new and differently toxic. We believe it is important to step off the "pesticide treadmill" and break the cycle.

Consumers can play a key role in breaking this cycle by buying foods grown without the use of industrial and toxic pesticides.

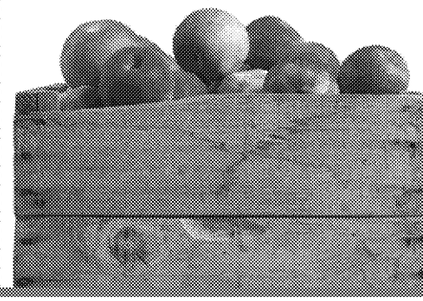
Pesticides Used Before and After Plant Cultivation

When people think of pesticides applied to crops, they probably picture an airplane flying over a farm field, or a truck with a sprayer driving through an orchard, spraying pesticides on the crops while they are growing. But in the case of many pesticides, application is often applied to seeds, soil, and crops before and after the actual growing period.

For example, on some fruits and vegetables, one-third to one-half of the residues are from pesticides that were not applied in the fields or orchards but in storage.[20]

Some pesticides applied in storage target insects, but others are used to lengthen the shelf life of the produce. For example, many types of fruit, such as oranges and peaches, are treated with a fungicide to inhibit mold.[21] Chemicals can also be applied to vegetables after harvest to prevent sprouting.[22]

In the case of seeds, fungicides may be applied during storage to prevent molding, or the seeds may be individually coated in pesticides as a prophylactic pest treatment.[23] Additionally, pesticides in the form of gas, known as fumigants, are often injected into the soil prior to planting to sterilize the fields from subterranean pests.[24]



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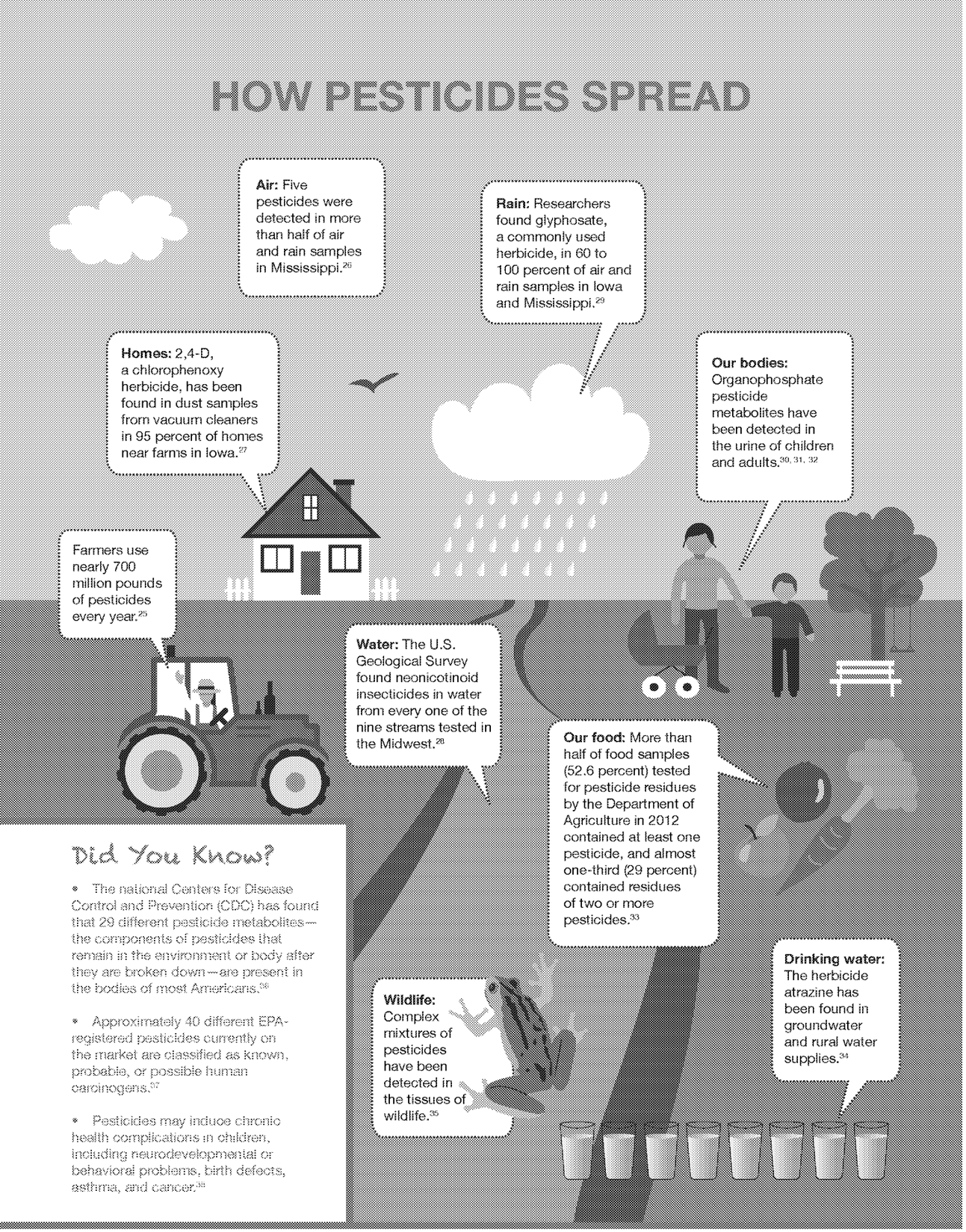
HOW PESTICIDES SPREAD



Did You Know?

- The national Centers for Disease Control and Prevention (CDC) has found that 29 different pesticide metabolites—the components of pesticides that remain in the environment or body after they are broken down—are present in the bodies of most Americans.[36]
- Approximately 40 different EPA-registered pesticides currently on the market are classified as known, probable, or possible human carcinogens.[37]
- Pesticides may induce chronic health complications in children, including neurodevelopmental or behavioral problems, birth defects, asthma, and cancer.[38]

Human Health Concerns

Pesticides are unique among manufactured chemical products. Unlike other chemical products that are designed for a certain purpose and may have toxic properties as an unintended side effect, pesticides are intentionally toxic—*toxic by design*. They are made to interfere with biological functions in living organisms and are manufactured and released into our environment and food supply not in spite of their toxicity but *because* of their toxicity.

Fully understanding and documenting the full range of negative effects on nontargeted living organisms—including humans—requires long-term and in-depth study. Because of the inherent toxicity of pesticides, medical and public health experts have long raised concerns.

For example, the American Academy of Pediatrics (AAP) points out that there is "a growing body of literature that suggests that pesticides may induce chronic health complications in children, including neurodevelopmental or behavioral problems, birth defects, asthma, and cancer."[39]

The President's Cancer Panel of the National Institutes of Health writes that exposure to pesticides has been linked to brain/central nervous system, breast, colon, lung, ovarian, pancreatic, kidney, testicular, and stomach cancers, as well as Hodgkin and non-Hodgkin lymphoma, multiple myeloma, and soft tissue sarcoma.[40] Approximately 40 different EPA-registered pesticides that are currently on the market are classified as known, probable, or possible human carcinogens.[41]

Although 40 known, probable, or possible human carcinogens may be a disconcerting number in and of itself, it occupies a small percentage of the approximately 900 registered active ingredients in use today.[42] Unfortunately, many of these chemicals have not been proved noncarcinogenic but rather fall into the cancer classifications of "not likely to be carcinogenic to humans" and "not classifiable" (because of a lack of sufficient information on which to base an assessment).[43]

The Environmental Protection Agency (EPA) acknowledges that the associations between pesticide exposure and certain cancer and noncancer chronic health effects are well documented in the peer-reviewed literature and sets tolerance levels for residues to try to protect the public and environment from adverse effects.[44]

Protecting Human Health

The EPA approves and sets tolerances for pesticides. Its regulatory authority comes from two federal laws: the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and the Federal Food, Drug, and Cosmetics Act (FFDCA).[45]

FIFRA authorizes the EPA to approve or deny the registration and use of any pesticide.[46] Decisions to approve or prohibit a pesticide are based on a risk-benefit approach. FIFRA does not limit the decision to approve a pesticide solely on the human health or environmental *risks* of pesticides; rather, FIFRA also states that "*benefits* of the use of the pesticide" must be considered.[47, 48]

A problem with that approach is that the benefits are assessed under the assumption that farmers must have chemicals for pest control.[49] The availability and feasibility of "alternatives," including alternative practices used in organic agriculture, do not appear to be given much weight when considering the benefits of the chemical.[50] And although the EPA's mission is "to protect human health and the environment,"[51] the law governing the EPA's approach to pesticide regulation does not require that the risks to human health and the environment be prioritized over "benefits" in the decision-making process.[52] EPA sets a tolerance level for most pesticides when they become registered. Tolerances are the maximum amount of the pesticide residue that is allowed to occur on a food, and that is an amount that the EPA expects with reasonable certainty to cause no harm. If levels above a tolerance are found, the government can take enforcement actions. Tolerances are based on a risk assessment conducted by the EPA that takes into account a

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number of factors, including how much of the pesticide is used, how much is found on food, and the toxicity of the chemical.[53] The toxicity is determined by reviewing multiple toxicology studies conducted on animals. Typically the agency will determine what the lowest dose of the chemical is that can have an effect on animals and then apply additional safety or uncertainty factors. The factors are applied for many reasons, including the uncertainty inherent in doing toxicology studies in humans as well as translating those animal results to humans.[54]

Of course, those tolerance levels are only as good as the data on which they are based. Much of the scientific evidence and data that EPA reviews and relies upon in making its decision during the risk assessment are provided by the companies seeking pesticide registration.[55] And it is that initial submission of evidence and data that will continue to form the basis for re-evaluations and reviews in the future, despite the potential for the data to become outdated as scientific techniques and our understanding of pesticide toxicity evolves.[56]

Another limitation is that for some effects, animal models may not be adequate for evaluating the effects on humans, such as the development of neurological diseases and the disruption of the human hormone system (endocrine disruption). There is widespread agreement in the scientific community that traditional safety testing does not adequately capture the effects of endocrine disrupting chemicals. A report by the World Health Organization and the United Nations Environmental Programme states: "For a large range of human health effects, such as female reproductive disorders and hormonal cancers, there are no viable laboratory models. This seriously hampers progress in understanding the full scale of risks."[57]

The endocrine disruption effects of DDT are a good example of that issue. DDT was banned decades ago because it persists in the environment, accumulates in fatty tissues, and can cause adverse health effects on wildlife.[58] But it wasn't noted until well after its ban that it could have subtle but important effects on pregnancy, birth weight, and lactation.[59]

Traditional safety testing also assumes that higher doses are more harmful than lower doses.[60] Yet in 2000, an independent panel of experts convened by the National Institute of Environmental Health Sciences and the National Toxicology Program found that some endocrine disrupting chemicals defy that convention and can have effects at *very low levels*, even below the "no effect" levels determined by traditional toxicology testing methods.[61]

In addition, while our ability to understand the true toxicity of individual pesticides is limited, mixtures of pesticides present an even greater challenge to toxicologists.[62] Unfortunately, finding mixtures of multiple pesticide residues on one type of produce is the rule and not the exception. In addition, consumers probably consume multiple produce items with multiple different residues on them.

Numerous studies have reported that exposure to a combination of pesticides will have unique effects and that mixtures of pesticides could have "greater than additive" effects.[63] Those combined effects are often termed "synergistic" effects. In addition, pesticides are formulated products, which means they are mixtures with an active ingredient and many "inert" ingredients.[64]

Yet the effects of chemical mixtures are largely untested and unknown,[65] and "mixture assessment" is an evolving discipline within toxicology.[66] Testing is generally done on individual pesticides rather than on mixtures, and on the active ingredient alone, rather than on the final product with inert ingredients.[67]

The active ingredients may be tested alone for toxicology studies, but the inert ingredients may also be toxic themselves.[68] And unlike the active ingredients, inert ingredient disclosure on pesticides labels is not required (because of confidential business information protections), making it almost impossible for the public or independent scientists to assess exposure and adverse impacts.[69]

And finally, the EPA continues to make decisions based on incomplete safety information. For example, the agency approved the now widely used neonicotinoid pesticide imidacloprid, even though the EPA stated in a 2008 review that "the existing hazard data base for imidacloprid does not include any immunotoxicity data," and "therefore, an immunotoxicity study will be required."[70] Despite incomplete data, the EPA has approved the pesticide, and residues appear in and on the foods that Americans eat.[71]

PESTICIDE TERMINOLOGY

Types of Pesticides

PESTICIDE: A general term for products that control pests. Pesticides can target insects ("insecticides"), plants ("herbicides"), fungi ("fungicides"), or other pests.[72]

FUMIGANT: A pesticide that produces gas or vapor intended to destroy pests.

HERBICIDE: These products kill weeds and other plants that grow where they are not wanted.

INSECTICIDE: These products kill insects and other arthropods.

FUNGICIDE: Kills fungi (includes blights, mildews, molds, rusts).

Classes of Insecticides

ORGANOCHLORINE pesticides: A class of insecticides commonly used in the mid-20th century. They're very harmful to wildlife, especially birds of prey. Almost all have been banned or phased out in the U.S.[73,74]

CARBAMATE pesticides: A class of pesticides that affects the nervous system of insects by disrupting an enzyme that regulates acetylcholine, a neurotransmitter also found in the nervous system of mammals (including humans).[75,76]

ORGANOPHOSPHATE pesticides: A class of pesticides that affect the nervous system by disrupting an enzyme that regulates acetylcholine, a neurotransmitter also found in the nervous system of mammals (including humans). They were developed prior to World War II as nerve gas, and they were developed as insecticides because of their similar toxic effects on insects.[77]

PYRETHROID pesticides: A class of pesticides that is the synthetic version of a naturally occurring pesticide found in chrysanthemum flowers. The synthetic version resists degradation by sunlight and persists in the environment.[78]

NEONICOTINOID pesticides: A class of pesticides with a common mode of action that affects the central nervous system of insects, causing paralysis and death. Neonicotinoids are a relatively new class of pesticides and are used heavily as a replacement for older pesticides that have lost their effectiveness. Neonicotinoids are implicated in honeybee deaths and colony collapse disorder.[79]

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Risks to Young Children

In a 1993 National Research Council report, public health experts articulated their concern that infants and children can be especially vulnerable to the effects of pesticides.[80] In 2012 the American Academy of Pediatrics reiterated that point, based on a growing body of scientific literature that links pesticide exposure to chronic health complications in children, including neurodevelopmental or behavioral problems, birth defects, asthma, and cancer.[81]

Most insecticides have neurotoxic potential, and children can be especially vulnerable because of their stage of development, differences in metabolism, and inability to detoxify compounds.[82] Infants and children also eat more food per pound of body weight than adults. There are other, less obvious, reasons children may be more vulnerable to pesticide exposure. Children's bodies have much lower levels of detoxifying enzymes that deactivate widely used pesticides.[83-86] Children may also be vulnerable because their immune and nervous systems are still developing, in some cases through adolescence.[87]

Some of the most widely used insecticides, such as chlorpyrifos,[88] belong to a class of pesticides called organophosphates.[89] Those pesticides are designed to interfere with nerve transmissions in insects—enough that it kills them. But the enzymes that those pesticides target in insects are also found in the nervous systems of mammals, including humans.[90] The Environmental Protection Agency readily acknowledges that organophosphates are neurological toxicants to mammals.[91]

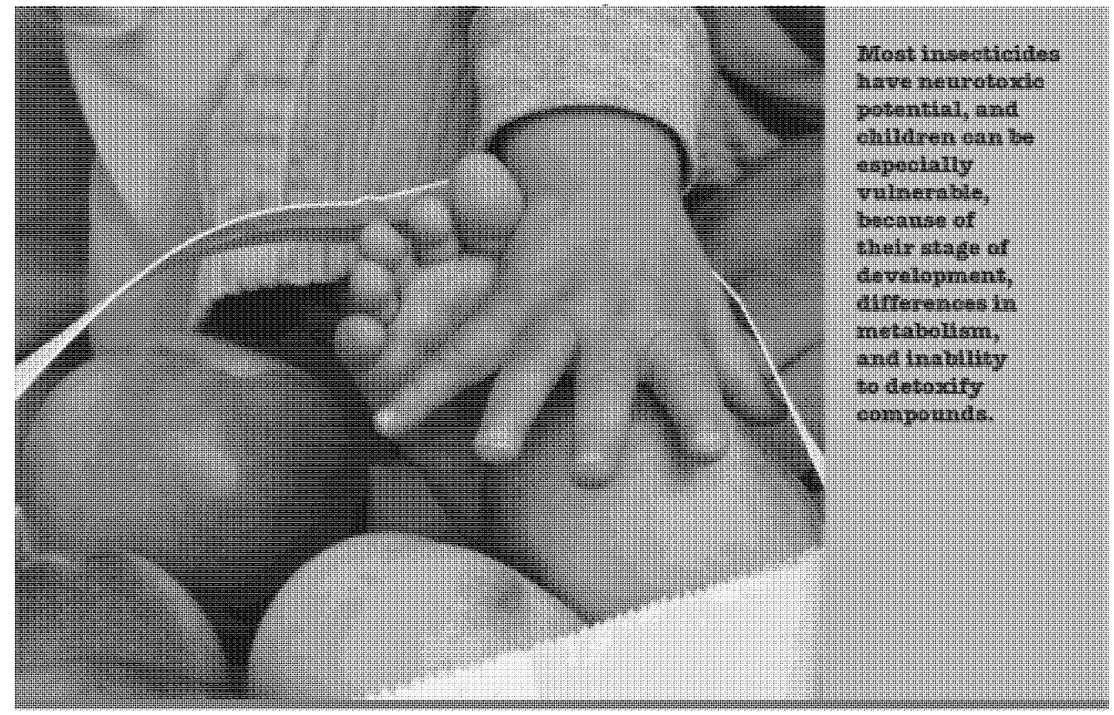
The National Institutes of Health (NIH) has voiced concern that studies in animals show that "even a single, low-level exposure to certain organophosphates, during particular times of early brain development, can cause permanent changes in brain chemistry as well as changes in behavior, such as hyperactivity."[92] And the NIH has pointed out that early childhood exposures to certain organophosphate pesticides, which can go undetected because of the lack of overt symptoms, can lead to lasting effects on learning, attention, and behavior.[93]

Research is now beginning to show adverse effects on the neurological development of children who are exposed to organophosphate pesticides from the foods they eat. A 2010 study by researchers at the Harvard School of Public Health found that children with higher levels of organophosphate pesticide metabolites in their urine were more likely to be diagnosed with attention deficit hyperactivity disorder (ADHD). Their conclusion: "These findings support the hypothesis that organophosphate exposure, at levels common in U.S. children, may contribute to ADHD prevalence."[94]

Other types of pesticides, including those belonging to the neonicotinoid class, which are supposedly safer alternatives to organophosphates, also target the nervous system and are potentially harmful.[95] There are few studies on the precise effects of neonicotinoids on mammals, and emerging developmental neurotoxicity studies raise concerns that these pesticides may adversely affect human health, especially the developing brain.[96, 97]

Organophosphate Pesticides

- Organophosphate pesticides are toxic to the neurological system.
- 33 million pounds of organophosphate pesticides were used in the U.S. in 2007.[98]
- Organophosphate pesticides are prohibited on organic farms.
- Children who eat organic fruits and vegetables drastically reduce their exposure to organophosphate pesticides.
- Organophosphate pesticide metabolites are detected in the urine of children who eat conventional fruits and vegetables.
- Children with higher levels of organophosphate pesticide metabolites in their urine were more likely to be diagnosed with attention deficit hyperactivity disorder (ADHD) in a 2010 study.[99]



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Monitoring Pesticides

Laws and Regulations: Protecting Children

In 1996, Congress unanimously passed the Food Quality Protection Act (FQPA), which amended two existing laws that address pesticides (the Federal Insecticide, Fungicide, and Rodenticide Act and the Federal Food, Drug, and Cosmetics Act).[100]

The FQPA required the EPA to ensure that pesticide tolerances are safe for all vulnerable populations, including infants and children. When setting tolerance levels for residues on foods, the law requires that the EPA account for aggregate exposure from multiple sources of pesticide residues and apply an additional tenfold safety factor to the "reasonable certainty of no harm" tolerance-setting calculations, unless reliable and sufficient information exists for the agency to determine that another factor provides adequate protection.[101] That is to account for the unique risks faced by infants and children and to ensure that all sources of pesticide residue consumption and exposure (food, water, residential uses) are included in the calculations.[102]

In 2001 Consumer Reports reported that in more than two-thirds of decisions on organophosphate pesticides, the EPA did not apply a tenfold safety factor. The EPA applied a tenfold safety factor in only 16 percent of decisions, and in another 16 percent of decisions, the EPA applied a threefold safety factor.[103]

As of 2006, it appears that the FQPA has led to a reduction in pesticide dietary risks, especially from domestic produce.[104, 105]

Q&A With Dr. Charles Benbrook

Q&A with Dr. Charles Benbrook on the progress since passage of legislation in 1996 mandating a reduction in pesticide use, with a special focus on crops affecting children and the challenges that still lie ahead.

Dr. Benbrook has been a collaborator on this project and is the co-author of Consumer Reports' 1998 groundbreaking pesticide report, *Worst First*.

CR: What are the victories since the passage of FQPA almost 20 years ago? What progress have we seen?

Benbrook: Getting the EPA focused and moving to better protect vulnerable populations, especially pregnant women, infants, and children, was by far Consumer Reports' most important accomplishment. In a 1998 report called *Worst First* (WF), Consumer Reports urged the EPA to act quickly and aggressively in reducing, or better yet eliminating, the major children's food uses of the most toxic half-dozen organophosphate (OP) insecticides. The seminal 1993 NAS report "Pesticides in the Diets of Infants and Children" explained the compelling scientific case for action against the top OP risk drivers. The report named names and identified 40 pesticide-food combinations then accounting for disproportionally high risks to infants, children, and pregnant women. OPs accounted for 25 of those 40 pesticide-food combinations. Carbamate insecticides were the risk drivers in 13 more.

Since FQPA implementation began in 1996, U.S. growers have eliminated 99 to 100 percent of the risk stemming from 16 of the 40 Worst First pesticide uses. Overall among conventional farmers in the U.S., the cumulative risk accounted for by the 40 WF uses went down 85 percent. Consumer Reports obviously picked the 40 WF uses well, because they accounted for 66 percent of overall risk in 1996, across all 200-plus pesticides applied on 150-plus foods.

Taking into account both domestically grown and imported conventional foods, 40 WF risk fell 77 percent, and overall dietary risks were reduced 81 percent from 1996 to 2013.

But Department of Agriculture (USDA) pesticide residue data shows that there is unfinished business, still, on the 40 WF uses. Those uses accounted for 60 percent of overall risk in 1996, and though risks have gone down 81 percent since 1996, the 40 WF still account for 70 percent of total risk in 2013.

CR: What challenges still remain? What crop/pesticide combinations are still being used that are harmful to consumers, especially the most vulnerable populations?

Benbrook: Acephate, and its breakdown product methamidophos, on green beans was the No. 1 risk driver in 2013. That use accounted for around one-half of total risk across all pesticides and food. Residues and risk stemming from a half-dozen post-harvest fungicides applied in packing sheds and warehouses are a growing concern. Iprodione residues in fruits such as plums, nectarines, and peaches account for 10 percent or more of annual, overall risks. Fludioxonil, another packing-shed fungicide, is also often found in soft-skinned fruits, and a third fungicide, imazalil, is a problem in bananas, citrus, and some other fruits. The very high-risk insecticides chlorpyrifos and oxamyl still show up regularly in peppers, squash, and several other fruits and vegetables.

There are growing reasons for concern about residues of the widely used herbicide glyphosate as well, along with the half-dozen systemic insecticides in the nicotinyl family (the pesticides implicated in honeybee colony collapse disorder). While glyphosate and the nicotinyls are not nearly as toxic ounce for ounce as the 40 WF OPs, there are far more residues of both in the U.S. food supply and drinking water than of the OPs, even back in the mid-1990s. Risk, after all, is a function of dose, toxicity, and time of exposure (i.e., a person's age and health status). The EPA needs to finish the job of getting the rest of the WF risk driver uses out of the food supply. Then it needs to sharpen its focus on the handful of pesticides used in conjunction with GE (genetically engineered) crops.

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Strawberries: A Case Study in Industrial Agriculture

Conventional strawberry production, with its heavy reliance on chemicals, comes at a high cost to the environment and public health.

Conventional strawberry farmers often fumigate the soil to essentially sterilize it, killing most living organisms in the soil.[110] Conventional strawberry growers have relied for years on the fumigant methyl bromide.[111] Methyl bromide is banned by international treaty because it depletes the ozone layer.[112] The EPA has granted "critical use exemptions" that have allowed California strawberry growers to continue using it.[113]

In an estimated 30 to 50 percent of agricultural applications, methyl bromide is released into the air when applied to the soil, even if soil covers are used.[114]

Methyl bromide is a "multisystem toxicant," producing severe and sometimes permanent nervous system effects.[115] Methyl bromide is also considered a potential occupational carcinogen[116] and has been linked to an increase in stomach cancer rates among farmers.[117] Methyl bromide poses risks not only to farmworkers but also to people living nearby.[118] Studies of men who were not necessarily farming themselves but who were exposed to "ambient pesticides" from nearby farms found evidence of a strong association between exposure to methyl bromide and prostate cancer risk.[119, 120]

In addition, high methyl bromide use within close proximity of the home during the second trimester of pregnancy adversely affects babies (lower birth weight and shorter birth length).[121]

Methyl bromide is just one of many toxic pesticides used by conventional strawberry growers. Other types of pesticides, such as neonicotinoids (see "Honeybees and Pollination" section), are also used.

Agricultural Health Study

The Agricultural Health Study (AHS) is a prospective cohort study that is investigating the effects of environmental, occupational, dietary, and genetic factors on the health of the agricultural population. The first interview was conducted in 1993, and within four years nearly 90,000 participants had been enrolled.

The research project is sponsored by the National Institutes of Health, the Environmental Protection Agency, and the National Institute for Occupational Safety and Health. A major focus of the study is looking at the health effects of pesticides.

Some of the study's findings to date:

✸ Acute poisoning

People who work in agriculture are at risk for acute poisoning by pesticides, which can be fatal. Almost a quarter (23 percent) of pesticide applicators have reported at least one "high pesticide exposure event" in their lifetime. Episodes of high exposure are associated with changes in health, including subtle changes in memory and attention as well as increased respiratory disease.[122, 123]

✸ Cancer

In general, farmers have lower levels of cancer than the rest of the population; however, rates of certain types of cancer are higher among farmers, including prostate cancer and ovarian cancer.[124] AHS researchers identified three organophosphate pesticides and one organochlorine pesticide that are significantly associated with aggressive prostate cancers.[125]

Interestingly, participants in the AHS study have lower rates of lung cancer than the general population, probably because of low levels of smoking among farmers. But when researchers examined the relationship between pesticides and lung cancer incidence, they found that two widely used herbicides and two widely used insecticides—including the widely used organophosphate chlorpyrifos—increased the odds of being diagnosed with lung cancer in a dose-dependent fashion.[126] AHS researchers have also observed a significant increase in stomach cancer risk in those with high exposure to the soil fumigant methyl bromide,[127] which is the third most widely used soil fumigant.[128]

AHS researchers have also found a potential for increased risk of colorectal cancer in farmers with high levels of exposure to two insecticides: chlorpyrifos and aldicarb.[129-131]

✸ Thyroid disease

Surprisingly little is known about the causes of thyroid disease or abnormal thyroid hormone levels, conditions that affect between 1 and 9 percent of American adults.[132] Hypothyroidism is the most common type of thyroid condition, which can cause weight gain, excessive tiredness, and sensitivity to cold.[133]

In a 2013 study involving more than 22,000 male pesticide applicators, AHS researchers found a link between the use of many kinds of pesticides and hypothyroidism. There were increased odds of hypothyroidism with the use of six herbicides and eight insecticides. The analysis shows increasing odds of developing hypothyroidism with increasing level of exposure to two of the herbicides and five of the insecticides.[134]

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Risks to Farmers and Farmworkers

Compared with the general population, farmers, farmworkers, and even their children are at higher risk because they experience more direct exposure to pesticides, at higher doses, and through various routes (e.g., inhalation after spraying).[106]

The Environmental Protection Agency (EPA) estimates that 10,000 to 20,000 physician-diagnosed pesticide poisonings occur each year among the approximately 2 million people who work in agriculture.[107] Those numbers, however, may actually underestimate the problem, because studies also estimate high rates of underreporting by workers.[108]

Farmers and farmworkers are at higher risk not only for acute poisoning but also for illnesses associated with long-term exposure. The EPA has identified at least six chronic diseases that have a well-documented association with agricultural pesticide exposure: non-Hodgkin lymphoma, prostate cancer, Parkinson's disease, lung cancer, bronchitis, and asthma.[109]

Laws and Regulations: Protecting Farmworkers

Most workers in the U.S. labor force are protected by standards of the Occupational Safety and Health Administration (OSHA) of the Department of Labor. Because they are places of employment, farms are required under the Occupational Safety and Health Act to provide safe and healthful working conditions to workers.[135] However, OSHA standards actually do very little to protect farmers and farmworkers from the harmful effects of pesticides.

The OSHA standards for agriculture that deal with pesticides are limited to "hazard communication"[136] and informing workers of the importance of "good hygiene practices" such as hand washing before eating to minimize exposure to agrochemical residues.[137] Farms with fewer than 10 employees are exempt from those OSHA regulations.[138]

Through the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), the responsibility to regulate pesticides, including to protect farmworkers from the hazards of pesticide exposure, has been assigned to the EPA. Specifically, in 1972 amendments to FIFRA, Congress directed the EPA to take steps to protect humans and the environment from unreasonable adverse effects of pesticides, with the intent that farmers and farmworkers should be among those afforded protection.[139] As a result, the EPA issued its Worker Protection Standard (WPS) in 1992.[140]

The EPA relies on risk-benefit analyses in its approach to protecting farmers and farmworkers from the toxic effects of pesticides. The EPA acknowledges that "the associations between pesticide exposure and certain cancer and non-cancer chronic health effects are well documented" and that reducing the risk of harm is an important goal.[141] The agency's approach to protecting workers is not to prohibit the use of pesticides that are harmful to human health but rather to set requirements focused on reducing exposure to those hazardous pesticides. That includes requiring employers to provide personal protective equipment, clear instructions on pesticide labeling, and basic safety training as well as setting basic requirements for notification of treated areas and restricting entry by farmworkers after pesticides have been applied.[142]

Those protections are important but have been inadequate.[143] For example, the EPA has found that risks from certain organophosphate exposures to farmworkers still exceed the agency's level of concern, even when all provisions in the current WPS are followed.[144] After years of pressure from various farmworker advocacy groups to afford farmworkers better protections from pesticides, the EPA is in the process of revising its standards (as of date of publication).[145] While the agency proposes to strengthen the protections from exposure, the basic risk-benefit approach remains the same and harmful pesticides will probably continue to be used.[146]

Risks to Rural Residents

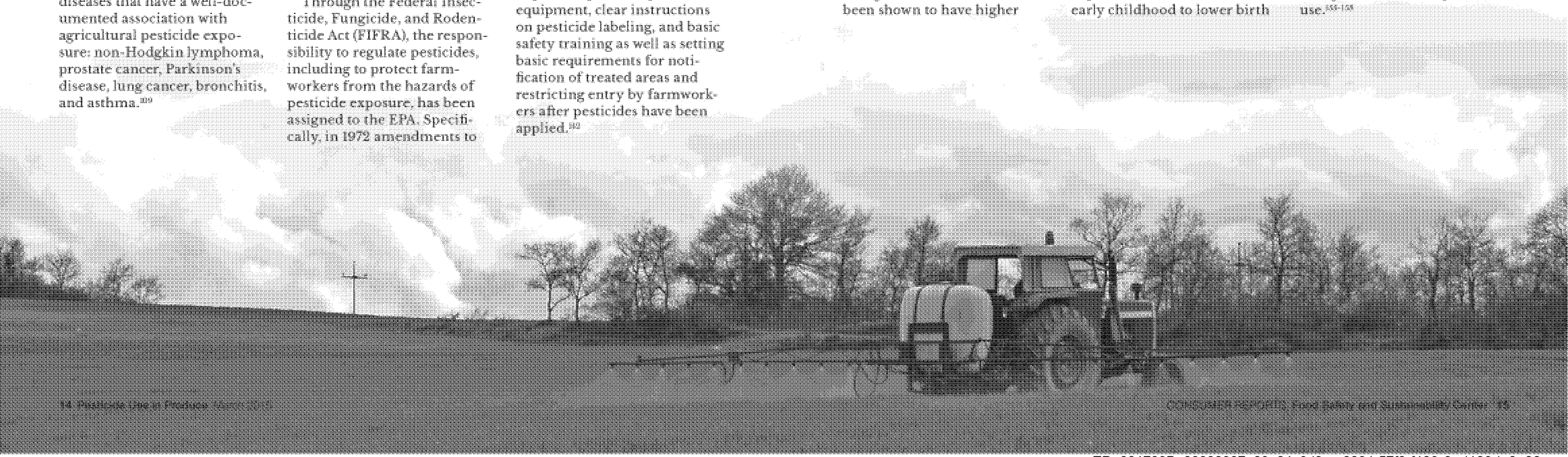
Pesticides contaminate the air, water, and even rain, with levels of contamination higher in rural areas near farms. That contamination affects those living near farms, who have been shown to have higher levels of pesticide metabolites in their urine than those living farther away.[147] This puts rural residents at potentially higher risk.

Childhood exposure to pesticide residue is especially concerning. The neurological effects from pesticide exposure on children living near farm fields were first documented in the late 1990s. A study in Mexico compared children living in an agricultural valley where pesticide use is common with children living in the foothills of the same region, where pesticide use is less common. The children in the valley, who had been exposed to multiple pesticides in pregnancy and childhood, had more decreases in stamina, eye-hand coordination, memory, and figure-drawing skills than the children living in the foothills.[148]

Research in the agricultural Salinas Valley in California (the CHAMACOS study) has linked organophosphate pesticide exposure in the womb and early childhood to lower birth weight,[149] neurodevelopmental delays and problems with attention,[150] and reduced IQ.[151] Those deficits in IQ are similar to those documented from exposure to lead.[152, 153]

And a 2014 study found higher rates of autism in California children who were exposed to organophosphates and other types of pesticides when their mothers were pregnant with them. Children of mothers who were living within a mile of a farm field that was treated with a pesticide during their pregnancy were found to be at 60 percent increased risk for autism spectrum disorder.[154]

The effects on the neurological system of rural residents starts in the womb and continues throughout life. Studies have suggested that people living in regions with greater pesticide use may be more likely to develop Alzheimer's disease, Parkinson's disease, and multiple sclerosis as compared with people living in regions with lower pesticide use.[155-158]



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CHAMACOS Study

Organophosphate pesticides are toxic to the neurological system at high doses, but much remains unknown about how long-term, low-level pesticide exposure in the womb, during infancy, and during early childhood affects health and development.

To shed more light on questions of pesticide exposure and growth, health, and development, researchers involved with the CHAMACOS (Center for the Health Assessment of Mothers and Children of Salinas) study in California have followed hundreds of children living in the agricultural Salinas Valley in California from birth to age 12. The study began in 1998 and is funded by the National Institute for Environmental Health Sciences, the Environmental Protection Agency, the National Institute for Occupational Safety and Health (2001 to 2006), and private foundations.

CHAMACOS study researchers have published studies linking pesticide exposure to lower birth weight, neurodevelopmental delays, lower IQ, and other adverse effects:

Neurodevelopmental development & attention (2010):

Exposure to organophosphate pesticides in the womb, as measured by the levels of the pesticide's breakdown products in the pregnant mother's urine, is associated adversely with attention, especially when measured at age 5, and especially in boys.[159]

Reduced IQ (2011):

Prenatal exposure to organophosphate pesticides is associated with poorer intellectual development in 7-year old children. Children whose mothers had the highest levels of pesticide residues in their urine when they were pregnant have an average deficit of 7 IQ points compared with the children whose mother's urine had the lowest pesticide levels while pregnant.[160]

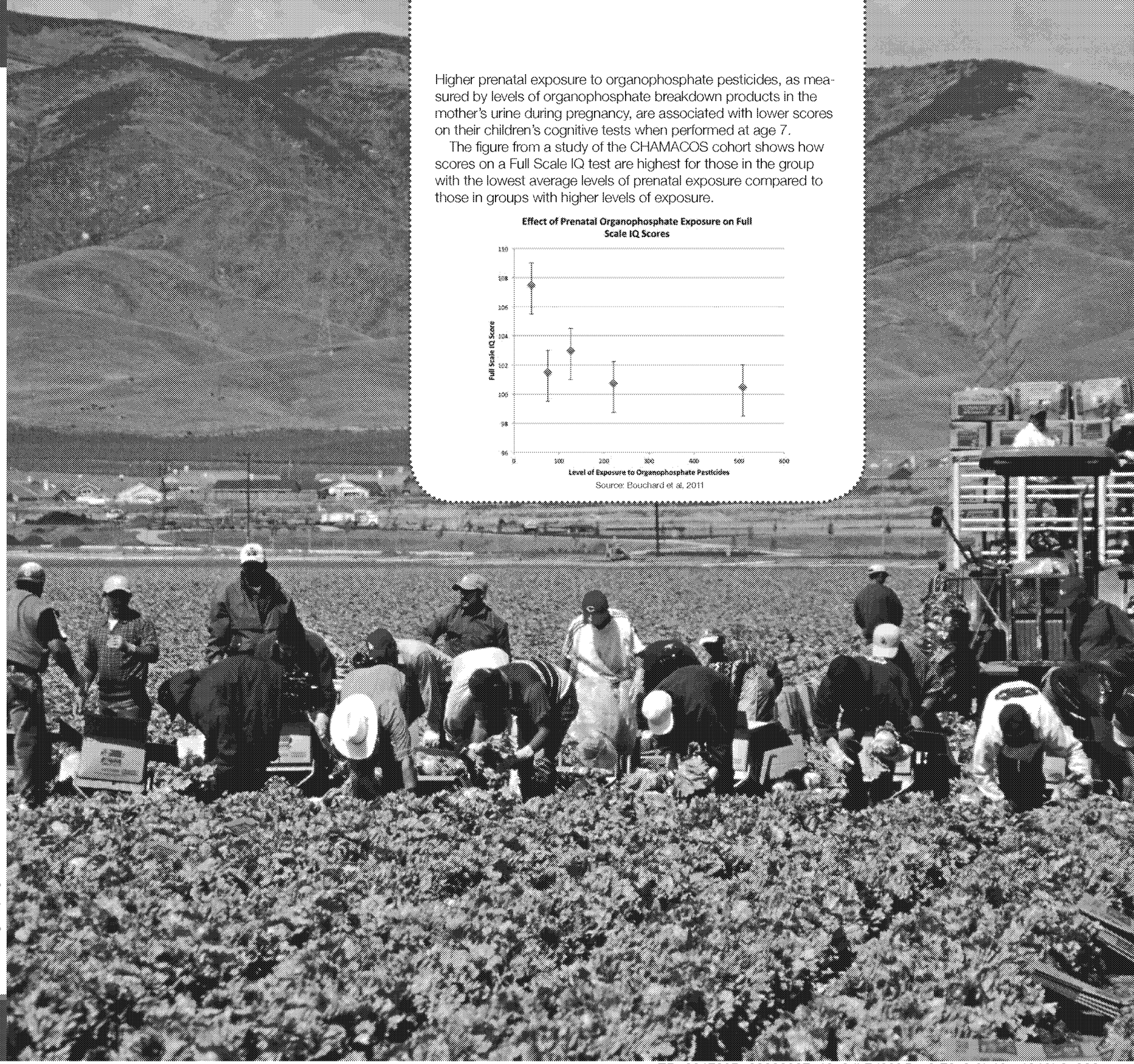
Birth outcomes (2013):

Living near farms where methyl bromide was used during pregnancy is associated with lower birth weight andshorter birth length.[161]

Higher prenatal exposure to organophosphate pesticides, as measured by levels of organophosphate breakdown products in the mother's urine during pregnancy, are associated with lower scores on their children's cognitive tests when performed at age 7.

The figure from a study of the CHAMACOS cohort shows how scores on a Full Scale IQ test are highest for those in the group with the lowest average levels of prenatal exposure compared to those in groups with higher levels of exposure.

Source: Bouchard et al, 2011



Jeff Greenberg / Getty Images

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Environmental Concerns

One of the inherent drawbacks of pesticides is that it is not possible to design the chemicals to kill only plants and animals that farmers consider "pests" while sparing all others. Many of the most commonly used classes of pesticides are very toxic to other living organisms, including beneficial insects and wildlife.[166]

For example, the most widely used soil fumigant,[167] metam sodium, is toxic to turtles. When researchers applied this pesticide to a farm field, then deposited snapping turtle eggs in the treated soil, they found that even at the lowest rates of metam sodium application, all of the turtle eggs died.[168]

Pesticides can also be harmful to birds. It has been estimated that 72 million birds die each year from pesticide poisoning, but the U.S. Fish and Wildlife Service states that this is an underestimate.[169, 170]

The difficulty of controlling where pesticides and their metabolites end up makes it even more challenging to avoid unintended impacts to wildlife and the environment. Pesticide drift, runoff, leaching, and persistence all factor into a pesticide's ability to migrate into the environment and pose threats to the health of people and ecosystems beyond the boundaries of the fields where a chemical is applied.[171]

Atrazine, one of the most broadly used herbicides in the United States, is a prime example.[172] After scientific research revealed atrazine's pervasive presence in water supplies, detrimental impacts to aquatic life, and potential human health threats, the European Union banned atrazine in 2004.[173] Despite similar evidence available in the U.S., however, the EPA concluded after a review of atrazine in 2003 to allow the chemical's continued use with some additional restrictions.[174, 175]

Of course, atrazine is only one of many pesticides finding its way into surface and drinking water, soil, and air. And although monitoring requirements and regulatory safety standards exist to some degree for atrazine and other pesticides, many remain unmonitored and lacking in adequate safety standards.[176]

Honeybees and Pollination

The EPA acknowledges that most insecticides are toxic to bees.[177] Healthy populations of bees are critical to maintaining a healthy food supply. Almonds, apples, cherries, blueberries, squash, and pumpkins are just a handful of the 90 commercially grown crops—mostly fruits and vegetables—that depend on honeybees for pollination.[178]

In southwest China, where wild bees have been eradicated by excessive pesticide use and a lack of natural habitat, farmers have been forced to painstakingly pollinate their apple and pear trees by hand.[179]

Beekeepers in the U.S. have noticed devastating declines of honeybees in recent years: losses of entire beehives, known as colony collapse disorder (CCD). According to a survey funded by the USDA, 31.1 percent of managed honeybee colonies were lost nationwide during the winter of 2012 to 2013.[180]

The EPA and USDA claim that CCD cannot be explained by a single factor. However, the National Research Council notes that pesticides can have negative effects on bee behaviors,[181] and independent research increasingly points to a specific class of pesticides, neonicotinoids, as a major cause of CCD.[182-188] The first of the neonicotinoid pesticides, imidacloprid, was registered with the EPA in 1994.[189]

According to the EPA, neonicotinoids are highly toxic to aquatic organisms, honeybees, and other beneficial insects on an acute basis.[190] Neonicotinoids disrupt the central nervous system of insects, causing paralysis and death from acute exposure.[191]

The EPA generally attempts to protect honeybees from the acute toxic effects of pesticides, including neonicotinoids,[192] by urging farmers not to apply pesticides while bees are foraging. But neonicotinoids are unique in several ways, which has an impact on how they affect honeybees.

First, neonicotinoids are systemic pesticides, which means they are absorbed in every tissue of the plant. As the plant grows, it continues to release small doses of the insecticide through every tissue, including nectar and pollen, thereby continuing to expose beneficial insects such as honeybees that forage on those crops.[193]

Second, neonicotinoids probably have harmful effects even at low doses that are not acutely toxic but ultimately affect long-term honeybee survival. Recent research increasingly links low-level exposure to neonicotinoid pesticides with effects on the memory[194] and navigational skills of bees, and survival of hives.[195-198] A growing number of independent scientists are concluding that *sublethal* exposure to neonicotinoids is probably the main culprit for the occurrence of CCD.[199] The European Food Safety Authority (EFSA) reviewed recent science,[200-202] and based on the findings, the European Commission announced in 2013 that it would impose a two-year restriction on the use of three commonly used neonicotinoid pesticides.[203]

Laws and Regulations: Protecting Wildlife and Pollinators

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) requires the EPA to ensure that a pesticide will not pose unreasonable harm to the environment, and defines "environment" as "water, air, land, and all plants and man and other animals living therein, and the interrelationships that exist among these."[204]

However, it is very uncommon for the EPA to either deny or cancel an existing registration for a pesticide solely or largely because of risks to birds, fish, and other nontarget (nonhuman) organisms.[205]

Despite the mounting evidence implicating neonicotinoids in honeybee deaths, and pressure from environmental and public interest groups, the EPA continues to allow the use of neonicotinoids in agriculture.

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The Impacts of Pesticide Use

Pesticides are designed to be toxic to living organisms.

☛ **Rural residents.** 2,4-D and other chlorophenoxy herbicides are listed as 2B carcinogens, "possibly carcinogenic to humans."[206] Studies show an association between cancer mortality and living near farm fields treated with the herbicide 2,4-D.[207]

☛ **Honeybees.** Neonicotinoids are linked to honeybee colony collapse disorder.[208] Nearly one-third of managed honeybee colonies were lost during the winter of 2012 to 2013.[209]

☛ **Monarch butterflies.** Glyphosate kills the milkweed plant, the primary food of monarch butterflies. Monarch butterfly populations have declined drastically over the past decade.[210]

☛ **Children.** Organophosphate pesticide exposure has been linked to deficits in IQ,[211] attention,[212] and behavioral development in children.

☛ **Rural residents.** Atrazine is a suspected endocrine disruptor, which may affect reproductive health and children's sexual development.[213]

☛ **Turtles.** The eggs of snapping turtles die when they are laid in a field treated with the common soil fumigant metam sodium.[214]

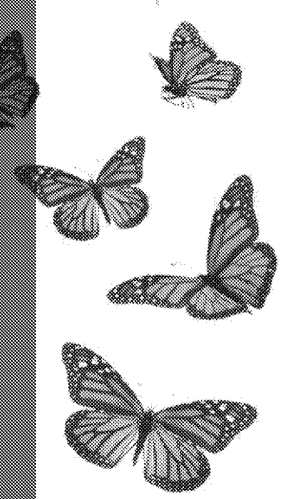
☛ **Farmers.** High pesticide exposure among farmers has been linked to prostate and ovarian cancer,[215] lung cancer,[216] stomach cancer,[217] hypothyroidism,[218] changes in memory and attention,[219] and increased respiratory disease.[220]

☛ **Birds.** An estimated 72 million wild birds die each year from pesticide exposure.[221]

☛ **Farmworkers.** 10,000 to 20,000 physician-diagnosed pesticide poisonings occur each year among farmers and farmworkers.[222]

Organic: Farming Without Pesticides

Federal law prohibits the use of almost all synthetic pesticides on organic farms.



☛ There are currently no synthetic herbicides approved for use on organic food crops.[223]

☛ All neonicotinoids are prohibited on organic farms.

☛ The herbicide glyphosate is prohibited on organic farms.

☛ All organophosphate pesticides are prohibited on organic farms.

☛ Only 10 synthetic insecticides are approved for use on organic farms. Some can be used only if they do not come into direct contact with soil or crops (e.g., as bait traps).[224]

☛ The herbicide atrazine is prohibited on organic farms.

☛ Synthetic soil fumigants are prohibited on organic farms.

☛ Biodiversity is richer in organic than conventional farm fields.[225]

☛ Children who eat organic fruits and vegetables have fewer pesticide residues in their bodies compared with children who eat conventional fruits and vegetables.[226]

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Genetically engineered crops and increased pesticide use

The same chemical companies that manufacture herbicides have genetically engineered crops such as corn, cotton, and soybeans to resist the application of their herbicides. Herbicides that would damage or kill the crops can be applied directly to the genetically engineered crop, and the resistant crop survives the herbicide application. Genetic engineering of crops is different from traditional plant breeding because it requires intensive genetic overwriting to allow for genetic changes that cannot occur in nature.

And some crops are genetically engineered to produce their own pesticides instead of having the pesticides sprayed onto crops or into the soil where they are planted. This type of genetic engineering incorporates a "natural" pesticide from bacteria into the genetic makeup of a crop. And because it is secreted by the plant, it cannot be washed off.[230]

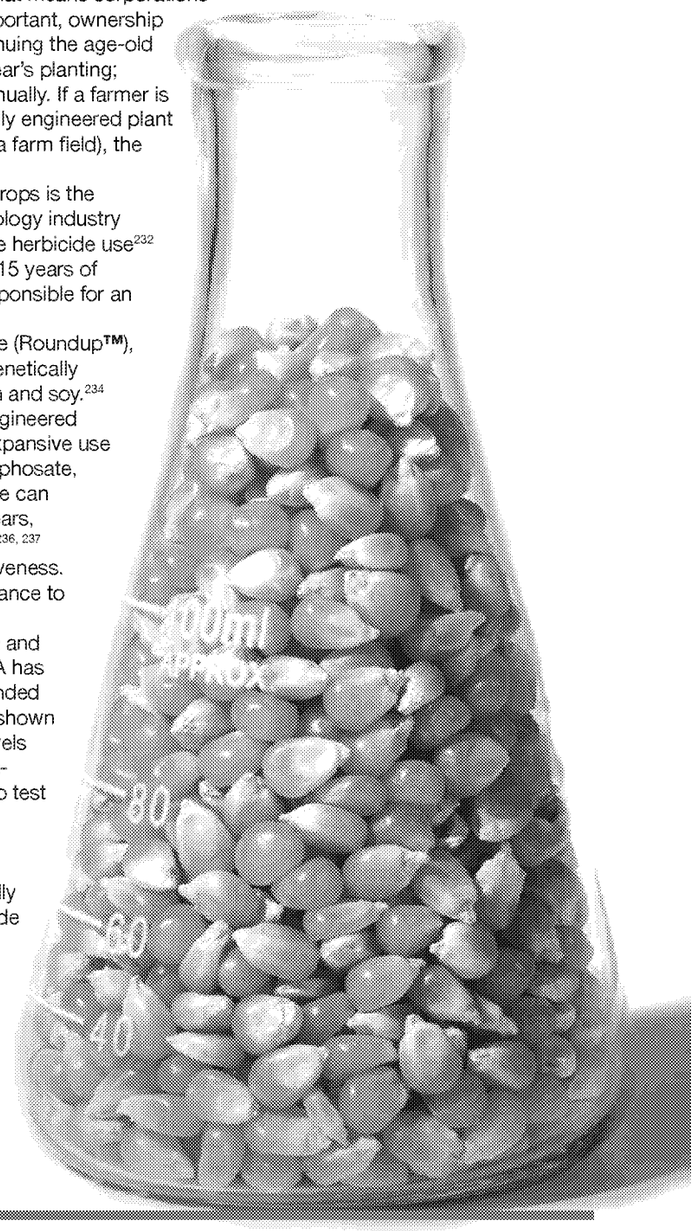
There are many ethical concerns around the genetic engineering of plant seeds and crops. Biotech corporations can patent genetically engineered seed and animals. That means corporations can claim ownership of the genetic code, and most important, ownership of the seed. That has eliminated the possibility of continuing the age-old practice of saving seed from this year's crop for next year's planting; instead, farmers are required to purchase new seed annually. If a farmer is the victim of "genetic pollution" (pollen from a genetically engineered plant drifts onto his or her field, or seed falls off a truck onto a farm field), the company can sue the farmer for patent infringement.[231]

Another major concern with genetically engineered crops is the accompanying increase in pesticide use. The biotechnology industry claimed that genetically engineered crops would reduce herbicide use[232] but failed to deliver on those promises. During the first 15 years of commercial use, genetically engineered crops were responsible for an increase of 527 million pounds of herbicide use.[233]

One of the most widely used herbicides is glyphosate (Roundup™), in part because resistance to this chemical has been genetically engineered into popular commodity crops such as corn and soy.[234] Because of the quickly expanding use of genetically engineered crops since their introduction and the corresponding expansive use of glyphosate, weeds now exist that are resistant to glyphosate, earning them the nickname "superweeds."[235] Resistance can develop relatively fast; in fact, within as little as three years, weed species may develop resistance to the chemical.[236, 237] As a result, glyphosate may quickly be losing its effectiveness. There are currently at least 28 weeds with known resistance to glyphosate.[238]

With reduced effectiveness, farmers have used more and more glyphosate.[239] For that and other reasons, the EPA has raised tolerance levels for glyphosate to allow for expanded uses on food crops.[240] As a result, recent studies have shown that genetically engineered crops often retain higher levels of glyphosate residues.[241] Yet the most recent pesticide-tolerance-testing reports released by the USDA failed to test for glyphosate residues.[242]

Rather than acknowledge the value in diversified crop practices and moderated pesticide use, chemical companies have come up with a new wave of genetically engineered common crops for resistance to the herbicide 2,4-D in addition to resistance to glyphosate. Much like the case of glyphosate and the first round of glyphosate-tolerant crops, the USDA estimates that approval of these new genetically engineered crops would lead to an increase in the use of 2,4-D on crops from 77.8 million to 176 million pounds.[243] The USDA approved these 2,4-D-resistant varieties in six states in September 2014 and as of April 2015 is currently considering whether to approve expanded uses in 10 additional states.[244, 245]



Reducing Exposure to Pesticides: What Consumers Can Do

It is important to remember that fruits and vegetables are a crucial part of a healthy diet. People who eat plenty of fruits and vegetables tend to be healthier and live longer, even when the produce they eat comes from conventional production systems. But there are many benefits to making choices that avoid pesticide residues and support farmers who are committed to reducing their dependence on pesticides. To help consumers make such informed decisions, we created two guides.

The first is our guide to residue risk, which is based on a comprehensive analysis of government data to generate a produce Dietary Risk Index (DRI). This index can help consumers minimize the risk from exposure to pesticide residues. The methodology for creating the index and our findings is explained in detail below. This index can help consumers minimize their risk from exposure to pesticide residues in and on the foods they eat.

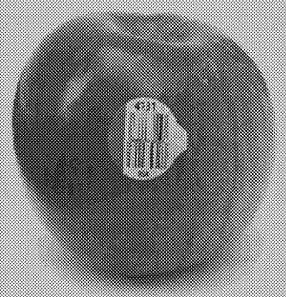
The second is our guide to labels. Labels on foods can help consumers understand the way the food was produced, and better understand which pesticides were used even when there are low or no residues on the fruits and vegetables. For example, soil fumigants may not show up as residues on fruits and vegetables but their use may have negative impacts on farmworkers, rural residents and wildlife. Moreover, some pesticides that have low known risks to consumers (and therefore do not contribute significantly to DRI) may have unknown risks or known risks to the environment, wildlife and pollinators. Labels can vary widely in how meaningful they are, what the standards require, and how they are verified. Understanding labels is therefore critical for consumers who wish to support farmers following strict and verified standards that reduce the use of pesticides.

Did You Know?

A 2015 study found that people who ate conventionally grown produce had high concentrations of organophosphate pesticide metabolites in their urine, and people who reported eating organic produce had significantly lower levels.[227]

A 2006 study found that levels of two organophosphate pesticide metabolites in the urine of children fell to undetectable levels when the children were switched to an organic diet.[228]

A 2010 study suggests that children with higher levels of organophosphate pesticide metabolites in their urine are more likely to be diagnosed with attention deficit hyperactivity disorder (ADHD).[229] All organophosphate pesticides are prohibited in organic agriculture.



4 digit: XXXX
Conventionally Grown

5 digit: 9-XXXX
Certified Organic

Tip for navigating the produce aisle: Unpackaged, fresh fruits and vegetables are sold with a code, often found on stickers or rubber bands. If the code has four digits, the produce is conventional. If the code has 5 digits and starts with a "9," that signifies that the produce is certified organic.

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A Consumer Reports Guide to Risk

Creating the Dietary Risk Index

THE RESIDUES GUIDE is based on a Dietary Risk Index (DRI). A DRI is a measure that allows for the comparison of the relative non-cancer "risks" of pesticide exposures from different food sources, risk trends over time, and differences in relative risk levels in domestically grown vs. imported foods. It depends on EPA-recommended pesticide dietary risk assessment methods and takes into account:

- The amount and frequency of **residues** on a given food, as reported in annual Department of Agriculture pesticide residue-testing results.
- The typical **serving size** of that food.
- The **weight** of the person consuming that food.
- The **toxicity** of the pesticide as determined by the Environmental Protection Agency.

Below we explain in detail where the above data is obtained and how it is used to calculate the DRI score.

Data Sources

Residue Data: USDA PDP

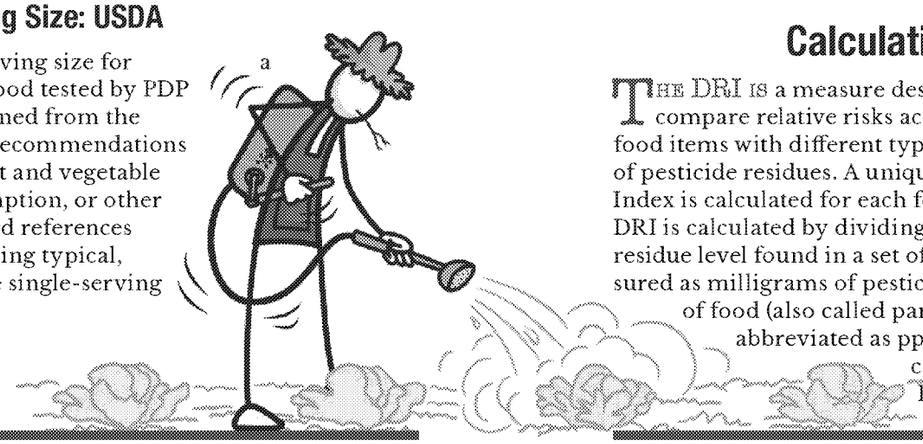
The Department of Agriculture (USDA) monitors the presence of pesticide residues on foods through its Pesticide Data Program (PDP). In operation since 1991, the PDP tests a variety of food commodities from many different states, and some countries abroad, throughout a given year for residues of hundreds of pesticides. Congress designed the program to collect pesticide residue data in food "as eaten" to help the EPA sharpen the accuracy of its dietary risk assessments. Since the beginning, the PDP has focused mostly on foods that play an important role in the diets of infants and children.

The program focuses on testing a different set of approximately 12 to 15 commodities each year (though some items are tested for two to three years in a row). According to the USDA, commodities are purchased in bulk at terminal markets and large chain-store distribution centers as close as possible to the point of consumption. The samples are chosen at random based on availability without regard for the origin of the item, though origin data is recorded. In many cases, large samples of products from both the U.S. and multiple other countries are collected, as well as smaller samples of imported and domestic organic products for some commodities.

After collection, samples are shipped to one of seven state laboratories, where they are prepared for residue testing by first washing, then removing inedible portions to mimic consumer experience. About 5 pounds of each food are then blended together into a composite sample. The USDA publishes an annual report that summarizes the results by food and pesticide. Detailed, raw data files are also made available; information in them includes commodity name, purchase state (e.g., California), purchase date, country of origin, production claims (such as organic), and pesticide residue level for each sample. Using that data, the frequency of finding a given pesticide on each food can be calculated, as can average residue levels in positive samples (called "mean of the positives"). In our analysis, we used only the most recent year(s) that data was available for a given produce-country-production method combination. Data was derived from the 2002 to 2013 testing years.

Serving Size: USDA

The serving size for given food tested by PDP is obtained from the USDA recommendations for fruit and vegetable consumption, or other standard references addressing typical, average single-serving sizes.



Weight

Our calculations for DRI are based on the diet of a 3½-year-old child estimated to weigh 16 kilograms (35.2 pounds). We chose to base our calculation on the diet of a child because children are especially vulnerable to the dietary risks from pesticides and because they have a relatively substantial amount of intake of a variety of foods relative to their body size (large dose). In addition, as part of its responsibilities set forth in the Food Quality Protection Act (FQPA), the EPA is required to consider the unique effects of pesticides on infants and children as their brains and bodies mature.

Toxicity Data: EPA

The Environmental Protection Agency (EPA) has developed chronic reference doses (RfDs) for pesticides, which are toxic chemicals. RfD values are used by regulatory agencies to set limits for human exposure to chemicals via the diet and drinking water.

RfDs are the amount of a substance that people can consume on a daily basis, consistent with "a reasonable certainty of no harm," both in the short run and over a lifetime. However, RfDs do not take the risk of cancer into consideration, nor has the agency developed test methods to take into account epigenetic or endocrine-system-driven impacts. RfDs are expressed as milligrams of a pesticide's active ingredient per kilogram of body weight per day.

RfDs are calculated by evaluating multiple toxicology studies. The EPA first identifies the study producing a statistically significant, adverse impact at the lowest dose level, compared with all other studies. It determines the lowest dose level producing the adverse impact (the Lowest Observed Adverse Effect Level, or LOAEL).

Then the agency identifies the next-lowest dose level (the No Observable Adverse Effect Level, or NOAEL). Because the toxicology studies are typically conducted on mammals other than humans, the study NOAEL is then typically divided by a hundredfold safety, or uncertainty, factor. A safety factor of 10 is thought to be warranted to account for the uncertainty in extrapolating from animals to humans, and another tenfold safety factor is applied to account for differences in the vulnerability of different population groups.

Since its passage in 1996, the FQPA mandates that the EPA apply an additional tenfold safety factor to better protect children, unless the agency determines that it has adequate data to fully account for the unique sensitivity on infants, children, and pregnant women. When this additional safety factor is applied, the new RfD value is called the chronic Population Adjusted Dose (cPAD). As a result of the FQPA, the total safety factor applied to a pesticide will typically be 1,000, although the EPA has dropped the added tenfold safety factor in many cases.

Ideally, on any given day, a person is not exposed to a substance at a level greater than his or her personal RfD. Amounts of a pesticide that lead to exposure greater than the RfD (or cPAD) can be referred to as exceeding the EPA's "level of concern." That puts those exposed to them at increased risk by eroding the safety factor embedded in cRfDs or cPADs.

Calculation of the Dietary Risk Index (DRI)

THE DRI IS a measure designed to compare relative risks across different food items with different types and levels of pesticide residues. A unique Dietary Risk Index is calculated for each food item. The DRI is calculated by dividing the average residue level found in a set of samples, measured as milligrams of pesticide per kilogram of food (also called parts per million abbreviated as ppm), by what is called the chronic Reference Concentration (cRfC).

Just like average residue levels, the cRfC is measured as milligrams per kilogram body weight per day. It is the concentration level in a single serving of a specific food that delivers the full amount of the pesticide that a child of known size could consume per day, without exceeding the EPA's level of concern (or, put otherwise, retaining a "reasonable certainty of no harm"). A pesticide's cRfD or cPAD drives cRfC levels; the more toxic the pesticide, the lower the cRfD or cPAD, and hence the lower

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the cRfC.

A DRI value of 1 would indicate that the average residue level in a given food delivers to a consumer the maximum allowed amount of a pesticide in a given day, in one serving of the food. DRIs that exceed 1 mean that the hundredfold, or thousandfold margin of safety is being cut into.

Our calculations for DRI are based on the diet of a 3½-year-old child weighing 16 kilograms (35.2 pounds). We chose to base our calculation on the diet of a child because children are especially vulnerable to the dietary risks from pesticides. The index score would be lower for an adult than for a child because of an adult's greater weight (140 lb). Calculating the risk index for an adult diet would result in an index score that is 4 times lower than that of the 35 lb child, but relative risks across foods and pesticides would not change, nor would trends over time.

The Food-Supply DRI

The DRI is based on the mean level of all samples testing positive in a given year. Suppose PDP tests 500 samples of apples in a given year, and 100 of them tested positive for pesticide X, with a cRfC of 0.025 ppm. Also suppose the mean residue level across the 100 positive samples was 0.05 ppm.

Accordingly, the mean-of-residue DRI would be 2—well over the EPA level of concern. For consumers unlucky enough to buy only apples with residues of pesticide X, the DRI value of 2 would be accurate. But what about consumers choosing apples at random? On average, three out of four samples would have no residues, hence the DRI-mean metric could overestimate risk. In fact, the lower the frequency of positives among any set of samples, the bigger the difference between DRI-mean risk levels, and actual risk levels.

Therefore we use another metric—the Food Supply-DRI, to take into account the frequency of residues in a set of samples. The FS-DRI is simply the percent of samples testing positive multiplied by the DRI-mean. In the very unusual case where 100 percent of the samples tested are positive, the FS-DRI = DRI-mean. And in any single sample, compared with another single sample, the FS-DRI again equals the DRI-mean.

Because there may be aggregate risk from the combination of individual pesticides present on food items, and because the interaction of pesticides is not well understood, the FS-DRI for each pesticide-food combination can be added together to create a composite index (the aggregate FS-DRI). That sum can be used to compare the *relative "risk"* of pesticide residues on different foods. That value can also be summed across all foods eaten to determine an overall daily risk index. We recommend that individuals do not exceed a DRI of 1 based on all produce consumed in a day.

From DRI to Risk Categories

Based on our calculation of an FS-DRI for each produce item-country-production method, we placed items into one of five categories based on their FS-DRI score. These categories represent a range of FS-DRI scores that we have characterized as "very high" (one serving of an individual food with a FS-DRI of 1 or more), "high" (between one and five servings would lead to a FS-DRI score of 1 or more, which corresponds to a FS-DRI score of 0.2 to 1), "moderate" (five to 10 servings would lead to a FS-DRI score of 1 or more, which corresponds to a FS-DRI score of 0.1 to 0.2), "low" (10 to 100 servings would lead to a FS-DRI score of 1 or more, which corresponds to a FS-DRI score of 0.01 to 0.1), and "very low" (more than 100 servings would lead to a FS-DRI score of 1 or more, which corresponds to a FS-DRI score of less than 0.01).

Risk Category	Daily Servings Needed to Exceed 1*	FS-DRI Range
Very High	1	1 or greater
High	2 - 5	0.2 - 1
Moderate	5 - 10	0.1 to 0.2
Low	10 - 100	0.01 to 0.1
Very Low	More than 100	Less than .01

* for a 35 lb child

Comparing Consumer Reports Guide With The Environmental Working Group's (EWG) Shopper's Guide to Pesticides in Produce™

The Consumer Reports guide is significantly different from the Environmental Working Group's (EWG) Shopper's Guide to Pesticides in Produce™ (which includes the EWG's Dirty Dozen and Clean Fifteen lists). Both the Consumer Reports and EWG guides utilize the USDA PDP database, but the advice in the EWG guide is mainly driven by the number of pesticide residues on a produce item.

CR's advice and guide differ from the EWG's in the following ways:

- We take into account the number of residues per sample, the average level of each residue, the frequency of finding it, the serving size, and the toxicity of each pesticide.
- We adhere closely to recommended EPA dietary risk assessment policies.
- We provide more complete information to consumers about differences in the risks associated with pesticides in domestically grown food, compared with imported food.
- We integrate noncancer as well as cancer risks.

Calculation of Cancer Risk in CR Guide

Although the DRI score is driven by the chronic toxicity of pesticides, it does not take into account cancer risk. We did, however, perform a separate cancer risk analysis.

In order to calculate lifetime cancer risk for a given produce-country combination, we used the cancer slope factor for each pesticide (as available from the EPA) and assumed a lifetime of exposure of one serving per day for a 70-year lifetime. We multiplied that risk by the probability of the pesticide being on the item (i.e., percent of total samples testing positive). Then, for each pesticide-produce-country combination, we added up the cancer risk for all of the pesticides present in the food to get a combined cancer risk score. Ideally, the population should be exposed to no excess cases of cancer from exposure to a substance.

Typically, from a regulatory perspective, an ideal cancer risk is considered to be no more than one excess case of cancer in a population of 1 million people exposed to the pesticide over a lifetime. For this study, we adopted a less strict public-health protection goal—a more lenient risk tolerance of no more than one excess case of cancer in 100,000 people over a lifetime. Produce-country combinations with a combined cancer risk from pesticide residues of more than one in 100,000 are denoted on our figures.

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Produce DRIs: The Results

WE USED ALL available USDA PDP residue data to calculate the FS-DRI for each produce item-country-production method combination, including data from crop year 2013 that was released in December 2014. For all foods, we based our rankings on the "Most Recent Year" for which of PDP data are available.

How to Read and Understand Consumer Reports' DRI/Residues Guide

We categorized each produce-country-production type combination into one of five categories discussed above. *The average FS-DRI score (often abbreviated as just "DRI") for all organic produce item-country combinations fell into the "low" or "very low" category. As a result of this finding and because of the strict standards required to earn, and retain, organic certification, and well-documented and significant environmental benefits,* ***we always recommend organic produce as the best choice.***

Fortunately, the majority of residues found in conventional produce items also fell into the "low" or "very low" categories as well. Conventional items that fall into the very low or low categories are roughly equivalent to organic produce when comparing residue related risk. For consumers who are mainly worried about exposure to residues, these conventional products represent good options, especially when available at a markedly lower price. Still, we recommend organic as the best choice.

Relatively smaller proportions of produce items fall into the "very high," "high," and "medium" categories. Items in the "very high" category have a DRI score of greater than 1. From a single serving of such items, children would ingest pesticides associated with a DRI risk level of 1 or higher (our "level of concern" that takes into consideration EPA reference doses). Items in the "high" risk category have a DRI score between 0.2 and 1. For those items, children would reach a DRI of 1 with two to five servings. Five servings of fruits and vegetables is the typical amount recommended by the USDA. Items in the moderate risk category have a score between 0.2 and 0.1. Children would reach a DRI of 1 after five to 10 servings.

Even for produce items that fall into one of the three highest risk categories ("very high," "high," or "medium"), there is often a lower risk ("low" or "very low") conventional produce option.

Limits to Choosing Produce According Only to Pesticide Residues and Risk

ALTHOUGH THE GUIDE we created takes into account the chronic toxicity and the cancer risk of the residues, our guide does not consider many other important harmful effects of pesticides that consumers may want to consider (nor does the EWG guide). For example, our analysis does not take into account the well-known negative effects of the use of pesticides on farmworker health; beneficial insects such as honeybees and other pollinators; adverse impacts on birds, fish, and other wildlife; or the potential for low levels of pesticides to be endocrine disruptors, triggering subtle but sometimes heritable genetic mutations.

Given the pesticide-related as well as other environmental and soil health benefits of organic farming, *we always recommend certified organic food as the best choice.* Future iterations of this guide will attempt take these additional concerns into consideration as well.

Using Our Charts That Follow

The figures display the risk categories ("very low" to "very high") into which different conventionally grown produce item-country combinations fall. The risk categories are calculated for a 16-kilogram (35.2-pound) child eating one serving of the item per day. For a 35.2-pound child, eating one serving of a given very high-risk produce-country item per day would lead them to their maximum daily limit based on our level of concern (that takes into consideration EPA reference doses). Though the absolute risk would be lower for a consumer who weighed more, the relative risk of each produce item and country combination would be unchanged.

We have created two tables, one for fruits and one for vegetables.

If the excess cancer risk for a produce item-country combination was greater than one in 100,000 exposed people, that item was marked with footnote. Even though all of the footnoted items were in the "high" category for DRI score, because of the cancer risk consumers should treat them as if they were in the "very high" category.

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FRUIT

FRUIT	ORGANIC	CONVENTIONAL PRODUCE				
		VERY LOW	LOW	MEDIUM	HIGH	VERY HIGH
Peaches	✓				Chile, USA	
Tangerines	✓				Chile[1], South Africa[1], USA, (Australia, Spain)	
Plums	●		USA		Chile[1]	
Nectarines	✓			USA	Chile[1]	
Apples	●		New Zealand		USA	
Strawberries	✓				USA, (Mexico)	
Cantaloupe	●	Honduras, Mexico	Costa Rica, Guatemala		USA	
Cranberries	✓			USA		
Mangoes	●	Mexico	Guatemala	Brazil		
Pears	●		Argentina, USA			
Oranges	●		Chile, South Africa, USA			
Cherries	●		USA			
Grapefruit	●		USA			
Watermelon	●	Guatemala	Honduras, Mexico, USA			
Blueberries	●	Uruguay	Argentina, Canada, Chile, USA			
Grapes	●		Chile, Mexico, Peru, USA			
Raspberries	●		Mexico, USA			
Apple Sauce	●		Canada, USA			
Bananas	●		Columbia, Costa Rica, Ecuador, Guatemala, Honduras, Mexico			
Raisins	●		USA			
Papaya	●	Belize, Brazil, Guatemala, Jamaica, Mexico, USA	Columbia, Costa Rica, Ecuador, Guatemala, Honduras, Mexico			
Peaches, Canned	●	Greece, South Africa, USA				
Pineapples	●	Costa Rica, Ecuador, Mexico, USA				
Plums, Dried (Prunes)	●	USA				

✓ **ALWAYS BUY** ● **RECOMMENDED BUY**

1 Cancer risk greater than 1/100,000
For countries in parenthesis, average score placed country in displayed category, but sample size was small and there is less certainty.

VEGETABLES

COMMODITY	ORGANIC	CONVENTIONAL PRODUCE				
		VERY LOW	LOW	MEDIUM	HIGH	VERY HIGH
Green Beans	✓			Guatemala	Mexico	USA
Sweet Bell Peppers	✓				USA	Mexico
Hot Peppers	✓				USA	Mexico
Winter Squash	●	Guatemala	Honduras, Mexico		USA	
Cucumbers	●		Canada		Mexico, USA	
Summer Squash	●		Mexico		USA	
Snap Peas	●		Mexico, USA		Guatemala, Peru	
Tomatoes	●		Canada	USA	Mexico	
Sweet Potatoes	✓				USA	
Cherry Tomatoes	●		USA		Mexico	
Celery	●	Mexico		USA		
Carrots	✓			Canada, Mexico, USA		
Greens, Kale	●		Mexico	USA		
Potatoes	●		Canada	USA		
Asparagus	●	Mexico	USA	Peru		
Eggplant	●	Honduras	USA	Mexico		
Lettuce	●		Mexico, USA			
Spinach	●	Mexico	Mexico, USA			
Greens, Collard	●		USA			
Cauliflower	●		Mexico, USA			
Cilantro	●	USA	Mexico			
Green Onions	●	Mexico	USA			
Broccoli	●	USA	Mexico			
Mushrooms	●	Canada	USA			
Cabbage	●	Canada, Mexico, USA				
Sweet Corn	●	Mexico, USA				
Avocado	●	Chile, Mexico, Peru				
Onion	●	Peru, USA				

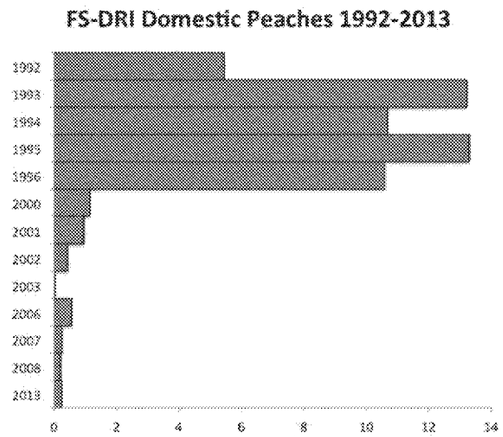
✓ **ALWAYS BUY** ● **RECOMMENDED BUY**

DRI Scores Have Decreased Over Time

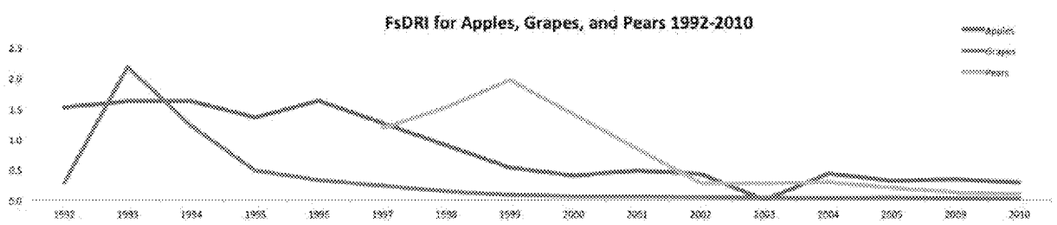
DRI SCORES ARE a measure of both the amount of pesticide residues found on produce and their toxicity. Fortunately, the trend in total DRI score for all conventional domestic produce items over time shows that DRI scores have decreased dramatically over the past 20 years, especially for domestically grown produce. As discussed previously, much of this reduction in U.S.-grown produce can be attributed to the FQPA.

Looking at individual produce items over time provides interesting insights into the use of pesticides. Some produce items' FS-DRI scores have not changed much over time. For example, domestic green beans have remained in the very high-risk category almost every year since testing began in 1992.

Other produce DRIs have changed significantly since passage of the FQPA. Peaches are the most dramatic. Although conventional peaches from all origins are still in our high-risk category, their total DRI score has dropped significantly. Up until the testing for the year 2000, the main pesticide residue contributing to the DRI score for peaches was methyl parathion. That pesticide is one of the most potent in the organophosphate family. The EPA accepted the voluntary cancellation of the chemical for use on many crops, including peaches, in 1999. Today the majority of the peach DRI score is caused by residues of fludioxonil, a fungicide often used post-harvest.



Other commonly consumed crops that have also seen relatively large decreases in DRI score over the years (though not as dramatic as peaches) include pears and apples, on which methyl parathion was also commonly used. Grape DRI scores have dropped steadily from around 2.2 in 1993 to less than 0.02 in recent years.



High-Risk Pesticides

THE MAJORITY OF the known risk from pesticide-residue exposure is the result of only a few commonly found pesticides. There have been significant decreases in DRI scores over time, but there is still room for significant improvement, and today's relatively high-risk chemicals represent important targets for reduction.

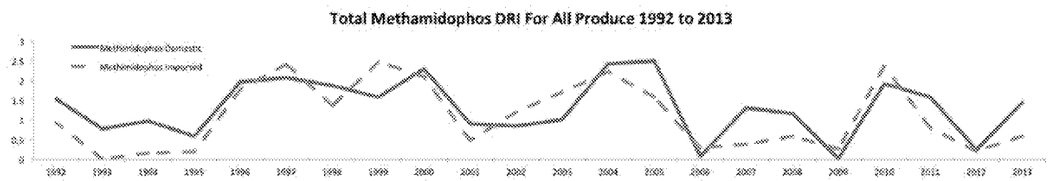
The single most important contributor to toxic pesticide exposure and FS-DRI risk is an organophosphate chemical called methamidophos. Methamidophos residues also appear in food after applications of another organophosphate insecticide called acephate (methamidophos is a major breakdown product of acephate). Over the past 20 years the total DRI score for that chemical has remained relatively constant (the overall trend is important, and year-to-year variations may be the result of the differing mix of produce items tested each year).

Interestingly, all methamidophos uses were cancelled by the EPA in 2009 after registrants voluntarily requested an end to all food uses. Despite that, residues of methamidophos remain a concern. Acephate is another pesticide whose residues have been a relatively large contributor to the total DRI score each year over the past decade. Methamidophos residues are a major contributor to the high DRI scores for green beans, sweet bell peppers, and hot peppers, and are also commonly found on other vegetables.

The carbamate insecticide oxamyl is another large contributor to total DRI scores during recent years. Oxamyl is used on a variety of vegetables and is one of the top contributors to the DRI for sweet bell peppers and summer squash.

Fungicides are another important class of chemicals that are significant contributors to total FS-DRI scores. Those pesticides are often applied after harvest to tree fruits, especially stone fruits such as peaches, tangerines, nectarines, and plums, as well as citrus fruits. The most common ones found are fludioxonil, iprodione, and imazalil.

Although not permitted in organic production, post-harvest fungicides leave residues that are sometimes detected on some organic produce. Those residues may be the result of cross-contamination in packing plants in which both organic and conventional produce is cleaned, packed, and shipped. Fungicide residue levels on organic produce are much lower, and present lower risk, compared with conventional produce.



Behind the Label

EVEN WHEN A fruit or vegetable carries a low residue risk to consumers, pesticides could have been used to produce it, with potential negative impacts on farmworkers, rural residents, wildlife, pollinators, air, soil and water. But there are many labels that can help consumers make better choices when it comes to how farms and pesticide use are managed. The table that follows shows which labels are verified, which labels are backed by standards that prohibit or limit the number of toxic pesticides and require meaningful Integrated Pest Management (IPM) practices. The table also shows whether the standards behind the label allow, prohibit, or restrict the use of 18 specific pesticides of concern.

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PROHIBITED

ALLOWED

RESTRICTED USE

✓ YES ✗ NO

LABELS	Is it verified?	Do standards prohibit toxic pesticides?	Do standards require nonchemical pest prevention & management?	Do standards require least-toxic options be used first?	Are foods tested for pesticide residues?	GLYPHOSATE	ATRAZINE	DDT	CHLORPYRIFOS	ALDICARB	ACEPHATE	IMIDACLOPRID	ACETAMIPRID	OXAMYL	BIFENTHRIN	PHOSMET	METHAMIDOPHOS	1,3-DICHLOROPROPENE	METHYL BROMIDE	FLUDIOXONIL	IPRODIONE	IMAZALIL	THIABENDAZOLE
General Claims																							
Conventional / No label	✗	✗	✗	✗	✗	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Natural	✗	✗	✗	✗	✗	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Pesticide Free	✗	✗	✗	✗	✗	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Environmental Sustainability Labels																							
USDA Organic	✓	Yes, nearly all	✓	✓	Sometimes	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Demeter Biodynamic	✓	Yes, nearly all	✓	✓	Sometimes	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Rainforest Alliance	✓	Some (minimal)	Encouraged, but not required	Encouraged, but not required	✗	●	●	○	●	●	●	○	●	○	●	○	○	●	●	●	●	○	●
Whole Foods Responsibly Grown - "Unrated"	✗	✗	✗	✗	✗	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Whole Foods Responsibly Grown - Good	✓	Some (minimal)	Encouraged, but not required	✗	✗	●	●	●	○	●	●	●	●	●	●	○	●	●	●	●	●	●	●
Whole Foods Responsibly Grown - Better	✓	Some	✓	Sometimes	✗	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Whole Foods Responsibly Grown - Best	✓	Some	✓	Sometimes	✗	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Certified Naturally Grown	✓	Yes, nearly all	✓	✓	✗	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Eco Apple - certified by the IPM Institute	✓	Some	✓	✓	✗	●	●	○	○	●	●	○	○	●	●	●	●	●	●	○	●	●	●
Eco Stone Fruit - certified by the IPM Institute	✓	Some	✓	✓	✗	●	●	○	○	●	●	○	○	●	●	●	●	●	●	○	●	●	●

PROHIBITED

ALLOWED

RESTRICTED USE

✓ YES ✗ NO

LABELS	Is it verified?	Do standards prohibit toxic pesticides?	Do standards require nonchemical pest prevention & management?	Do standards require least-toxic options be used first?	Are foods tested for pesticide residue?	GLYPHOSATE	ATRAZINE	2,4-D	CHLORPYRIFOS	ALDICARB	ACEPHATE	IMIDACLOPRID	ACETAMIPRID	DIAZINON	BENFLUTHRIN	PHOSMET	METHAMIDOPHOS	TRICHLORFORMONE	METHYL BROMIDE	FLUDIOXONIL	IPRODIONE	IMAZALIL	THIABENDAZOLE
Food Alliance	✓	Some (minimal)	Encouraged, but not required	Encouraged, but not required	✗	●	●	●	●	◐	●	●	●	◐	●	●	●	●	◐	●	●	●	●
Stemilt Responsible Choice	✗	✗	✗	✗	✗	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
SCS Pesticide Residue Free	✓	✗	✗	✗	✓	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Salmon Safe	✓	✗	✓	✓	✗	●	○	○	○	●	○	○	●	●	○	○	●	○	●	●	○	●	●
SCS Sustainably Grown	✓	Some (minimal)	✓	✓	Encouraged, not required	●	●	●	●	◐	●	●	●	◐	●	●	●	●	○	●	●	●	●
Non GMO Labels																							
Non-GMO Project Verified	✓	✗	✗	✗	✗	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Social Responsibility Labels																							
Fair Trade Certified	✓	Some (minimal)	Sometimes	Sometimes	✗	●	●	●	●	◐	●	●	●	○	●	●	●	●	●	●	●	●	●
Fairtrade International	✓	Some (minimal)	Sometimes	✗	✗	●	●	●	●	◐	●	●	●	○	●	●	●	●	●	●	●	●	●
Fair for Life	✓	Some	Encouraged, but not required	Encouraged, but not required	✗	●	◐	●	○	◐	◐	●	●	○	◐	○	○	◐	◐	●	○	○	○
Food Justice Certified	✓	✓	✓	✓	✗	●	◐	◐	◐	◐	◐	◐	●	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
Fair Food Program	✓	✗	✗	✗	✗	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Responsibly Grown. Farmworker Assured	✓	✗	✓	✓	Sometimes	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Whole Foods - Whole Trade Guarantee	✓	Some (minimal)	Encouraged, but not required	✗	✗	●	●	●	●	◐	●	●	●	○	●	●	●	●	●	●	●	●	●

Visit greenerchoices.org for more information

A note about pest control in organic production. Some pesticides are derived from plants, bacteria, or other natural sources. Those pesticides are allowed in organic production, unless they pose potential harm to human health or the environment.[246] For example, even though arsenic and lead are "natural" substances, pesticides containing those substances are prohibited.[247] Natural pesticides that are permitted, such as those derived from the bacterium bacillus thuringiensis and the botanical extract pyrethrum, can be used only as a last resort after other methods of pest control have failed.[248]

Integrated Pest Management. Integrated Pest Management (IPM) is an approach to managing pests that uses a variety of methods, including cultural and biological methods. However, the use of chemical pesticides is also a component of IPM. IPM's acceptance of chemical pesticides means it is significantly different from organic management, which prohibits nearly every chemical pesticide. IPM is a step in the right direction, though. It aims to solve pest problems while minimizing risks to people and the environment, using chemical pesticides only when needed. By scouting for pests, monitoring and keeping records of pests, growers can choose to use pesticides only when pest numbers are determined to exceed acceptable levels. IPM also aims to use pesticides with lower toxicity and risk before turning to pesticides with higher known toxicity. Unfortunately, there is no one way to practice IPM and some producers are more rigorous in its application than others.

Stretching your produce and organic dollar

ORGANIC FOOD — produced on organic farms without the use of most pesticides — is better for your health and for the environment. Organic produce also generally costs more than conventional, so here are some tips on how to fit organic in your budget.

☛ Buy whole foods and process at home. Whole and unprocessed organic foods are often less expensive than their processed nonorganic counterparts. Carrots are a perfect example: "Baby carrot" is just a fancy name for a carrot that has been peeled and cut into pieces for you. But if you don't mind doing the peeling and cutting yourself, organic whole carrots will often cost less than the nonorganic "baby" variety. The same is often true for organic whole heads of lettuce vs. the bagged nonorganic kind, whole organic apples vs. sliced nonorganic, etc.

☛ Buy in bulk. It's often thought of as a cost-saving measure when buying grains, dried beans, nuts, and other grocery items, but buying in bulk can also save you money on fresh or dried fruits and vegetables. Look for dried fruit in the bulk section of your store. Buying fresh produce in bulk can save money as well. Many stores offer organic apples, oranges, carrots, avocados, and other organic produce in bags, which can cost less on a per-pound basis than buying loose produce.

☛ Buy in season. Fruits and vegetables are much less expensive when you buy them in season. Stock up during the summer and fall months, when produce is abundant and prices are lower, and preserve them for the winter and early spring months. Canning, freezing, and drying are good options.

- Find a farmers market. They're are a great way to buy in season, directly from local farmers.
- Or join an organic CSA. CSA stands for "community supported agriculture." When you join a CSA farm, you will receive a weekly share of the harvest, and you're likely to spend much less money on fruits and vegetables than if you bought those items at the store. You'll be supporting local farmers, and you'll probably end up with more vegetables and fruits than you know what to do with. Consider preserving them for the winter months by canning, drying, or freezing.

☛ Buy frozen. If you didn't have the chance to freeze produce at home during the summer, look for frozen options in the store. Many organic fruits and vegetables are available in the freezer section of most stores year-round and can cost less than the fresh nonorganic options. Because they are frozen immediately after harvest, nutrient levels in frozen organic fruits and vegetables are comparable to, or even better than, those of fresh produce that has been shipped many miles and arrives less than fresh at the store.

☛ Or buy dried. In the winter months, when certain kinds of organic fruits and vegetables are either unavailable or too expensive, look for their dried versions instead. An additional benefit of buying organic dried fruit is that sulfite preservatives—often used in conventional dried fruits—are prohibited in organic foods.

☛ Replace processed snack foods with organic fruits and vegetables. USDA researchers have found that some healthy foods, including fresh produce, can often cost less than unhealthy foods such as sweet and salty snacks.[249] To fit organic fruits and vegetables in your food budget, consider cutting out unhealthy sweet and salty snack foods.

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Cleaning Produce

When organic options are not available or affordable, consumers can take certain actions to lower their exposure to pesticide residues.

- Wash fruits and vegetables thoroughly under running water.[250] Make sure you wash for 30 seconds to 1 minute, and gently rub the produce to dislodge the residues.[251]
- Produce with firm edible skin can be scrubbed with a clean produce brush.[252] Wash produce brushes regularly with hot soapy water or in a dishwasher and dry completely. And consider not peeling since nutrients are in the peel too.
- Wash produce before removing inedible peels to prevent pesticide residue contaminationon your hands and on the edible parts.[253]
- Remove the outer leaves of heads of lettuce or cabbages, because the outer leaves are likely to have higher levels of pesticide residues.[254, 255]
- If you will use citrus peel (such as for zesting), consider buying organic.
- Wash organic produce as well. Organic regulations prohibit the use of synthetic pesticides, but synthetic pesticides used on neighboring conventional farms could contaminate organic crops. Washing eliminates more than just pesticide residues; it also removes dirt and potentially harmful microorganisms that might contaminate.

Conclusion

The reliance on toxic pesticides to produce food is neither safe nor sustainable. Since living organisms adapt, toxic pesticides eventually lose their effectiveness. This leads chemical companies to develop different pesticides to attack resistant weeds and pests — pesticides that are perhaps more toxic, or perhaps toxic simply in a different way. But while new pesticides can control pests for a while, it is never a long-term solution. Rather, pesticides — the chemicals that are supposed to be a solution — turn into problems themselves, as their toxic effects on non-target populations, including humans, become apparent.

Given the growing body of scientific evidence pointing to harm, we believe that the costs are too high and do not justify the short-term benefits of controlling pests with toxic chemicals.

We urge people to eat several servings of fruits and vegetables daily. Whenever available and affordable, we urge people to choose the most safe and sustainably farmed options, using our DRI/residues guide and labels guide. By using our guides and making informed purchases, consumers can protect themselves and support farmers who are reducing their pesticide use, which is better for human health and the environment.

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Consumer Reports' Food Safety and Sustainability Center's Pesticide Policy Recommendations

Recommendations for the Environmental Protection Agency (EPA)

EPA should ban or take immediate action on the riskiest pesticides.

We agree with the canceling of methamidophos in 2009. However, methamidophos is also the breakdown product of acephate, and combined, these two chemicals make up the largest contribution to dietary risk. Acephate, along with other major pesticide contributors to risk such as iprodione, fludioxonil, imazalil, and oxamyl should be fully banned. Other pesticides we would like discontinued include methyl bromide, chlorpyrifos and other organophosphates.

EPA should take immediate action on neonicotinoids.

Many crops, especially fruits and vegetables, face an uncertain future with the severe decline of pollinators. While many factors are at play, mounting evidence implicates neonicotinoid pesticides in their decline. Thus far, the EPA has delayed meaningful action in the name of more research. We believe there is enough information to take action now. Research should continue, but in the meantime, the EPA should proceed immediately with cancellation or reclassification proceedings, utilizing the "imminent hazard" provision, and suspend the use of these pesticides while proceedings take place.

EPA should complete the delisting of arsenical pesticides.

Pesticides containing organic forms of arsenic are still permitted for use on golf courses, rights of way, sod farms and cotton crops. The use of these pesticides contributes to the contamination of our environment with this dangerous heavy metal. The EPA should deregister the use of these pesticides immediately.

EPA should improve the science behind tolerance limits.

Tolerance levels should incorporate the best available science, including potential toxicological and health endpoints that are not included today. Those include stricter tests for more immunologic and neurobehavioral endpoints. Further, the EPA's program for incorporating endocrine-disrupting effects into tolerances and pesticide approvals should be fully implemented as the FQPA directed in 1996. Epigenetic effects should also be incorporated when it becomes feasible.

EPA should rein in emergency exemptions and conditional registrations.

EPA "allows the use of a pesticide for an unregistered use for a limited time if EPA determines that emergency conditions exist." The EPA can currently grant exemptions with or without public comment or granting public access to supporting data. Emergency exemptions should only be granted for a finite period of time and after three years, should not be allowed to continue, especially when there are alternatives, including integrated pest management, crop diversification, and organic production practices.

Conditional registration means that the use of the pesticide can be allowed while the EPA waits for additional data to be submitted by the registrant. This raises concerns about using materials where there is insufficient safety information. Many pesticides were first brought on the market through this pathway, including the neonicotinoid pesticide, imidacloprid. While the EPA has already started to close this loophole, there is still room for continued improvement.

EPA should require public access to all ingredients in pesticides and easy access to current registration status.

While active ingredients in pesticides must be disclosed, this requirement does not apply to "inert" ingredients. Only full disclosure of all ingredients on pesticide labels will enable the public and independent researchers to begin evaluating the full range of synergistic effects. The EPA should issue new rules concerning disclosure of inert ingredients and should do so immediately. In addition, the EPA should provide an easy-to-search database of current pesticide registration status on its website.

Recommendations for the US Department of Agriculture (USDA):

USDA should expand pesticide residue testing in the PDP.

The USDA Pesticide Data Program (PDP) is an important tool for informing the public about pesticide residues on produce and is used by the EPA for understanding pesticide exposure and setting tolerances. Currently, the USDA does not test for some widely used pesticides such as glyphosate and should.

USDA should protect and promote organic standards and meaningful integrated pest management (IPM).

Conservation incentives should promote organic production methods and meaningful IPM—where chemical pest controls are utilized as last resorts and require review and approval. The USDA should ensure the highest integrity in organics including minimizing the approval of exempted materials, such as pesticides.

Recommendations for the Food and Drug Administration (FDA):

FDA should expand and improve pesticide residue testing and enforcement.

The FDA is charged with enforcing pesticide tolerance levels on fruits and vegetables. According to a 2014 report by the U.S. Government Accountability Office (GAO), the FDA does not regularly test for some of the most common pesticides such as glyphosate, 2,4-D and methyl bromide. In addition, the FDA tests only a very small percentage of both imported and domestic fruits and vegetables. The FDA should begin regularly testing for those chemicals identified by the GAO, and should increase its sampling of both domestic and imported produce.

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ConsumerReports®

Consumer Reports' Food Safety and Sustainability Center's Pesticide Policy Recommendations

Recommendations for the Environmental Protection Agency (EPA)

EPA should ban or take immediate action on the riskiest pesticides.

We agree with the canceling of methamidophos in 2009. However, methamidophos is also the breakdown product of acephate, and combined, these two chemicals make up the largest contribution to dietary risk. Acephate, along with other major pesticide contributors to risk such as iprodione, fludioxonil, imazalil, and oxamyl should be fully banned. Other pesticides we would like discontinued include methyl bromide, chlorpyrifos and other organophosphates.

EPA should take immediate action on neonicotinoids.

Many crops, especially fruits and vegetables, face an uncertain future with the severe decline of pollinators. While many factors are at play, mounting evidence implicates neonicotinoid pesticides in their decline. Thus far, the EPA has delayed meaningful action in the name of more research. We believe there is enough information to take action now. Research should continue, but in the meantime, the EPA should proceed immediately with cancellation or reclassification proceedings, utilizing the "imminent hazard" provision, and suspend the use of these pesticides while proceedings take place.

EPA should complete the delisting of arsenical pesticides.

Pesticides containing organic forms of arsenic are still permitted for use on golf courses, rights of way, sod farms and cotton crops. The use of these pesticides contributes to the contamination of our environment with this dangerous heavy metal. The EPA should deregister the use of these pesticides immediately.

EPA should improve the science behind tolerance limits.

Tolerance levels should incorporate the best available science, including potential toxicological and health endpoints that are not included today. Those include stricter tests for more immunologic and neurobehavioral endpoints. Further, the EPA's program for incorporating endocrine-disrupting effects into tolerances and pesticide approvals should be fully implemented as the FQPA directed in 1996. Epigenetic effects should also be incorporated when it becomes feasible.

EPA should rein in emergency exemptions and conditional registrations.

EPA "allows the use of a pesticide for an unregistered use for a limited time if EPA determines that emergency conditions exist." The EPA can currently grant exemptions with or without public comment or granting public access to supporting data. Emergency exemptions should only be granted for a finite period of time and after three years, should not be allowed to continue, especially when there are alternatives, including integrated pest management, crop diversification, and organic production practices.

Conditional registration means that the use of the pesticide can be allowed while the EPA waits for additional data to be submitted by the registrant. This raises concerns about using materials where there is insufficient safety information. Many pesticides were first brought on the market through this pathway, including the neonicotinoid pesticide, imidacloprid. While the EPA has already started to close this loophole, there is still room for continued improvement.

EPA should require public access to all ingredients in pesticides and easy access to current registration status.

While active ingredients in pesticides must be disclosed, this requirement does not apply to "inert" ingredients. Only full disclosure of all ingredients on pesticide labels will enable the public and independent researchers to begin evaluating the full range of synergistic effects. The EPA should issue new rules concerning disclosure of inert ingredients and should do so immediately. In addition, the EPA should provide an easy-to-search database of current pesticide registration status on its website.

Recommendations for the US Department of Agriculture (USDA):

USDA should expand pesticide residue testing in the PDP.

The USDA Pesticide Data Program (PDP) is an important tool for informing the public about pesticide residues on produce and is used by the EPA for understanding pesticide exposure and setting tolerances. Currently, the USDA does not test for some widely used pesticides such as glyphosate and should.

USDA should protect and promote organic standards and meaningful integrated pest management (IPM).

Conservation incentives should promote organic production methods and meaningful IPM—where chemical pest controls are utilized as last resorts and require review and approval. The USDA should ensure the highest integrity in organics including minimizing the approval of exempted materials, such as pesticides.

Recommendations for the Food and Drug Administration (FDA):

FDA should expand and improve pesticide residue testing and enforcement.

The FDA is charged with enforcing pesticide tolerance levels on fruits and vegetables. According to a 2014 report by the U.S. Government Accountability Office (GAO), the FDA does not regularly test for some of the most common pesticides such as glyphosate, 2,4-D and methyl bromide. In addition, the FDA tests only a very small percentage of both imported and domestic fruits and vegetables. The FDA should begin regularly testing for those chemicals identified by the GAO, and should increase its sampling of both domestic and imported produce.

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LOW RISK
Organic peaches have little pesticide residue.

HIGH RISK
A conventional peach is about four times riskier than an organic one.

EAT THE PEACH, NOT THE PESTICIDE

A shopper's guide

Our new produce guidelines show you how to make the best choices for your health and for the environment

ACROSS AMERICA, confusion reigns in the supermarket aisles about how to eat healthfully. One thing on shopper's minds: the pesticides in fruits and vegetables. In fact, a recent Consumer Reports survey of 1,050 people found that pesticides are a concern for 85 percent of Americans. So, are these worries justified? And should we all be buying organics—which can cost an average of 49 percent more than standard produce?

Experts at Consumer Reports believe that organic is always the best choice because it is better for your health, the environment, and the people who grow our food. The risk from pesticides on conventional produce varies from very low to very high, depending on the type of produce and on the country where it's grown. The differences can be dramatic. For instance, eating one serving of green beans from the U.S. is 200 times riskier than eating a serving of U.S.-grown broccoli.

"We're exposed to a cocktail of chemicals from our food on a daily basis," says Michael Crupain, M.D., M.P.H., director of Consumer Reports' Food Safety and Sustainability Center. For instance, the Centers for Disease Control and Prevention reports that there are traces of 29 different pesticides in the average American's body. "It's not realistic to expect we wouldn't have any pesticides in our bodies in this day and age, but that would be the ideal," says Crupain. "We just don't know enough about the health effects."

If you want to minimize your pesticide exposure, see the chart on page 31. We've placed fruits and vegetables into five risk categories—from very low to very high. In many cases there's a conventional item with a pesticide risk as low as organic. Below, you'll find our experts' answers to the most pressing questions about how pesticides affect health and the environment. Together, this information will help you make the best choices for you and your family.

Q. How Risky Are Pesticides?

There's data to show that residues on produce have actually declined since 1996, when Congress passed the Food Quality Protection Act. This law requires that the EPA ensure that levels of pesticides on food are safe for children and infants.

Every year, the Department of Agriculture tests for pesticide residues on a variety of produce. In its latest report, more than half of the samples had residues, with the majority coming in below the EPA tolerance levels. "Conventionally grown fruits and vegetables are very safe," says Teresa Thorne, spokesperson for the Alliance for Food and Farming (AFF), an organization that represents conventional and organic produce growers.

But that's not the whole story. Looking at *specific* produce items, you see that progress has been made for some but not others. Grapes and pears, for example, once would have been in the high-risk or very high-risk categories but now rank low. But others, such as green beans, have been in the higher-risk categories for the past 20 years.

And there's more to consider than just the amount of pesticides on the apple you eat. "Tolerance levels are calculated for individual pesticides, but finding more than one type on fruits and vegetables

PROP STYLING: LINDA KEIL/HALLEY RESOURCES

PHOTOGRAPH BY LEVI BROWN

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is the rule—not the exception," says Urvashi Rangan, Ph.D., a toxicologist and executive director of the Food Safety and Sustainability Center.

Our survey found that a third of Americans believe there's a legal limit on the number of different pesticides allowed on food. But that's not the case. Almost a third of the produce the USDA tested had residues from two or more pesticides. "The effects of these mixtures is untested and unknown," Rangan says.

Q. What's the Evidence That Pesticides Hurt Your Health?

A lot of the data comes from studies of farmworkers, who work with these chemicals regularly. Studies have linked long-term pesticide exposure in this group to increased risk of Alzheimer's and Parkinson's disease; prostate, ovarian, and other cancers; depression; and respiratory problems. There's some suggestion that adults and children living in farm communities could also be at risk for chronic health problems.

The rest of us may not handle the stuff, but we *are* exposed through food, water, and air. The fact that pesticide residues are generally below EPA tolerance limits is sometimes used as "proof" that the health risks are minimal. But the research used to set these tolerances is limited.

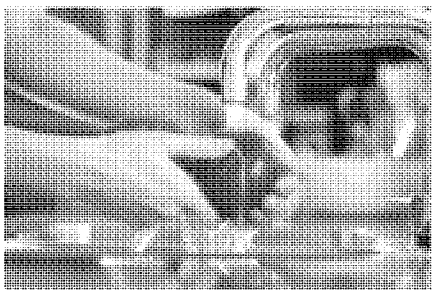
In a 2010 report on environmental cancer risks, the President's Cancer Panel (an expert committee that monitors the country's cancer program) wrote: "The entire U.S. population is exposed on a daily basis to numerous agricultural chemicals. ... Many of these chemicals have known or suspected carcinogenic or endocrine-disrupting properties." Endocrine disruptors can block or mimic the action of hormones, even at low doses. "Endocrine effects aren't sufficiently factored into the EPA pesticide-tolerance levels," Crupain says. "And there's concern they could cause reproductive disorders; birth defects; and breast, prostate, and other hormone-related cancers."

Q. Who May Be at Greatest Risk From Pesticide Exposure?

Aside from farmworkers, it's children. A child's metabolism is different from an adult's, so toxins can remain longer in a child's body, where they can do more damage. Pesticide exposure can affect children's development at many stages, starting in the womb. "Fetuses, babies, and kids are more vulnerable to the effects of pesticides because their organs and nervous systems are still developing," says Philip Landrigan, M.D., director of the Children's Environmental Health Center at the Icahn School of Medicine at Mount Sinai Hospital in New York. And children's risk is concentrated because they eat more food relative to their body weight than adults.

The health risks to children are significant. Even small amounts of pesticides may alter a child's brain chemistry during critical stages of development. One study of 8- to 15-year-olds found that those with the highest urinary levels of a marker for exposure to a particularly toxic class of pesticides called organophosphates (OPs) had twice the odds of developing attention deficit hyperactivity disorder as those with undetectable levels. Another study found that at age 7, children of California farmworkers born to mothers with the highest levels of OPs in their bodies while they were pregnant had an average IQ 7 points below those whose moms had the lowest levels during pregnancy. That's comparable to the IQ losses children suffer due to low-level lead exposure.

The risk to adults is lower but still worrisome. "Pesticide exposure likely increases the risk, first, of cancerous tumor



Mom Was Right. Wash It.

The USDA measures pesticide residues *after* produce has been rinsed in cold running water and/or inedible peels and rinds are removed. So the pesticide residues used to calculate our risk guide are those that remain after the fruit or vegetable has been prepped the way you would at home.

Rules to Shop By

Our risk guide for conventional produce

This chart shows the risk of pesticide exposure from eating 48 fresh conventional fruits and vegetables from 14 different countries. Analyzing 12 years of data from the Department of Agriculture's Pesticide Data Program, Consumer Reports scientists, in consultation with Charles Benbrook, Ph.D., of Washington State University, placed each produce-country combination into one of five risk categories. Risk assessment included the number of pesticide residues on each food, the frequency with which they were found, and the toxicity of the pesticides. The risk categories correlate with the number of daily servings of that fruit or vegetable. (See the key below.)

We also took into account the typical serving size of the food and the weight of the person eating that food. Our analysis is based on the risk to a 3½-year-old child, estimated to weigh 35.2 pounds, because children are especially vulnerable to the dietary risks from pesticides and the EPA is required to consider the effects of pesticides on children. The risks to adults would be lower.

We recommend buying organic for any produce-country combination in the medium or higher risk categories. We found that all organic produce falls into the low- or very low-risk categories. Conventional items in the low or very low categories are essentially equivalent to organic.

OUR NO. 1 RULE: Eat more produce! Though we believe that organic is always the best choice because it promotes sustainable agriculture, getting plenty of fruits and vegetables—even if you can't obtain organic—takes precedence when it comes to your health.

RISK LEVEL

Very Low	Low	Medium	High	Very High
100 or more daily servings	10 to 100 daily servings	5 to 10 daily servings	1 to 5 daily servings	1 daily serving

GET MORE INFO

Go to ConsumerReports.org/cro/produce0515 for an interactive version of our risk guide and more information on pesticides and produce.

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FRUITS	Risk Level [1]					You Can Choose Conventional If It's From:	Beware of Conventional If It's From:	Always Buy Organic
	Very Low	Low	Med.	High	Very High			
Peaches				■			Chile, U.S.	✔
Tangerines				■			Chile, South Africa, U.S.	✔
Plums				■		U.S.	Chile	
Nectarines			■	■			U.S., Chile [2]	✔
Apples				■		New Zealand	U.S.	
Strawberries				■			U.S.	✔
Cantaloupe				■		Honduras, Mexico, Costa Rica, Guatemala [2]	U.S.	
Cranberries			■				U.S.	✔
Mangoes			■			Mexico, Guatemala [2]	Brazil	
Pears						Argentina, U.S.		
Oranges						Chile, South Africa, U.S.		
Cherries						U.S.		
Grapefruit						U.S.		
Watermelon						Guatemala, Honduras, Mexico, U.S. [2]		
Blueberries						Uruguay, Argentina, Canada, Chile, U.S. [2]		
Grapes						Chile, Mexico, Peru, U.S.		
Raspberries						Mexico, U.S.		
Bananas						Colombia, Costa Rica, Ecuador, Guatemala, Honduras, Mexico		
Papaya						Belize, Brazil, Guatemala, Jamaica, Mexico, U.S.		
Pineapples						Costa Rica, Ecuador, Mexico, U.S.		

VEGETABLES								
Green Beans			■	■	■		Guatemala, Mexico, U.S. [2]	✔
Sweet Bell Peppers				■	■		U.S., Mexico [2]	✔
Hot Peppers				■	■		U.S., Mexico [2]	✔
Winter Squash				■		Guatemala, Honduras, Mexico [2]	U.S.	
Cucumbers				■		Canada	Mexico, U.S.	
Summer Squash				■		Mexico	U.S.	
Snap Peas				■		Mexico, U.S.	Guatemala, Peru	
Tomatoes			■	■		Canada	U.S., Mexico [2]	
Sweet Potatoes				■			U.S.	✔
Cherry Tomatoes				■		U.S.	Mexico	
Celery			■			Mexico	U.S.	
Carrots			■				Canada, Mexico, U.S.	✔
Kale			■			Mexico	U.S.	
Potatoes			■			Canada	U.S.	
Asparagus			■			Mexico, U.S. [2]	Peru	
Eggplant			■			Honduras, U.S. [2]	Mexico	
Lettuce						Mexico, U.S.		
Spinach						Mexico, U.S. [2]		
Collard Greens						U.S.		
Cauliflower						Mexico, U.S.		
Cilantro						U.S., Mexico [2]		
Green Onions						Mexico, U.S. [2]		
Broccoli						U.S., Mexico [2]		
Mushrooms						Canada, U.S. [2]		
Cabbage						Canada, Mexico, U.S.		
Corn						Mexico, U.S.		
Avocado						Chile, Mexico, Peru		
Onion						Peru, U.S.		

PHOTOS: GETTY IMAGES

[1] Our analysis is based on the risk to a 3½-year-old child, estimated to weigh 35.2 pounds. [2] Countries are in risk order from least risk to highest risk. When the risk is equal, countries are ordered alphabetically.

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development, and, second, your body not being able to control a tumor growth," says Charles Benbrook, Ph.D., a research professor at the Center for Sustaining Agriculture and Natural Resources at Washington State University and a consultant to Consumer Reports. In addition, research has linked endocrine disrupters with fertility issues, immune system damage, and neurological problems. "However, unlike cancer, quantifying those effects is difficult at this time," Crupain says.

Q. Does Eating Organic Mean I Won't Be Eating Any Pesticides?

There are two groups of agricultural pesticides: synthetic and natural. Synthetics are created in labs, and natural ones are substances that occur in nature. The majority of synthetic pesticides (and all of the most toxic ones) used in conventional farming are banned in organic farming, but pesticide drift can mean chemicals sprayed on conventional crops may find their way to nearby organic farms. Still, all of the organic produce in our analysis fell into the very low-risk or low-risk categories.

USDA organic standards allow for the use of certain natural pesticides and very few synthetic ones. "But you can't compare conventional and organic farming in an oranges-to-oranges kind of way," says Michael Sligh, a farmer, founding chairman of the National Organic Standards Board, and Just Foods Program director at Rural Advancement Foundation International.

Natural pesticides are usually less toxic than synthetic ones. "'Pesticide' is a broad term used to refer to a range of substances from the very, very limited low-toxic ones allowed in organic farming to the highly toxic chemicals that can be used in conventional farming," he says. "They are very different. Before a pesticide is even approved for use in organic farming, it must be evaluated for potential adverse effects on humans, animals, and the environment, and prove it's compatible with a system of sustainable agriculture. And farmers must follow integrated pest-management plans that require that they use any approved organic pesticide as a last resort and develop strategies to avoid repeated use." Those differences have implications for personal health but also for the health of farmworkers and the planet. "Folks need to understand the multiple benefits they are getting when they choose organic," he says, "and the multiple choices they are making when they don't."

Some conventional farmers do follow pest-management plans similar to those of organic farmers. "Practices such as crop rotation and the use of beneficial insects or pheromones are tools both conventional and organic farmers use," says the AFF's Thorne. That may be so. However, Sligh says, "for organic farmers it's a requirement, not an option."

And eating organic means you may have fewer pesticides in your body. A study in Environmental Health Perspectives found that people who said they often or always ate organic produce had about 50 percent lower levels of OP breakdown products in their bodies than those who rarely or never did. Those who sometimes chose organic produce had levels as much as 35 percent lower.

Q. Should I Skip Conventionally Grown Produce?

No. The risks of pesticides are real, but the myriad health benefits of fruits and vegetables are, too. A 2012 study estimated that increasing fruit and vegetable consumption could prevent 20,000 cancer cases annually, and 10 cases of cancer per year could be attributed to consumption of pesticides from the additional produce. Another study found that people who ate produce at least three times per day had a lower risk of stroke, hypertension, and death from cardiovascular disease.

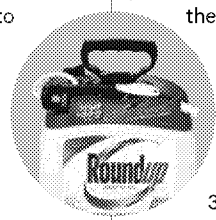
"We believe that organic is always the best first choice," says Consumer Reports' Rangan. "Not only does eating organic lower your personal exposure to pesticides, but choosing organic you support a sustainable agriculture system." However, your primary goal is to eat a diet rich in fruits and vegetables—ideally five or more servings a day—even if it's a type that falls into our very high-risk category. If organic produce is too pricey or not available, our analysis shows that you often have a low-risk conventional option.

The Pesticide That's Probably in Your Garage

The herbicide glyphosate, known by the commercial name Roundup, is the most commonly used agricultural pesticide in the U.S. on farms. It's often used in backyards, too. Yet we have no idea how much of it is in our food because the government doesn't regularly test produce for it.

Glyphosate use has increased tenfold in the past 20 years thanks to the rise in genetically modified corn and soy. Most of those crops are engineered to be resistant to glyphosate, which means Roundup will kill the weeds but not the crops. According to Charles Benbrook, Ph.D., of Washington State University, data shows that U.S. farmers used enough glyphosate in 2014 to apply the equivalent of almost three-quarters of a pound on every acre of farmland used to grow crops. "When a single pesticide is used that widely, people can't help but be exposed to it," Benbrook says.

And now there will be even more glyphosate sprayed thanks to the EPA's approval in late 2014 of the herbicide Enlist Duo, a combination of glyphosate and another chemical herbicide, called 2,4-D. That latest approval has drawn criticism. "I think if the EPA had followed the mandates of the Food Quality Protection Act, there's no way that they could have ever approved this very substantial increase in the use of glyphosate," says Philip Landrigan, M.D., of Mount Sinai Hospital. He says the EPA's decision that Enlist Duo is safe was based on old studies and that the agency was wrong to approve it without adhering to additional child-safety protections required by the act.



In one small study, the USDA found glyphosate residues on about 90 percent of 300 soybean samples. All were below the EPA's tolerance level of 20 parts per million, but one of the samples came very close at 18.5 ppm. And we don't know what other foods are contaminated.

CONSUMER REPORTS' TAKE: The health effects of glyphosate are not well understood, but given its widespread use, we believe it should be monitored by the government.

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Message

From: Bernardi, Cassandra [CBernardi@aap.org]
Sent: 12/1/2017 3:49:20 PM
To: pehsu@pehsu.net
Subject: FW: Children's Environmental Health newsletter - November 2017
Attachments: oledata.mso; November 2017.pdf

Lots of good information in the November CEH International Initiatives newsletter.

Happy Friday!!!

From: HECANET [mailto:HECANET@LISTSERV.WHO.INT] **On Behalf Of** heca
Sent: Friday, December 01, 2017 2:49 AM
To: HECANET@LISTSERV.WHO.INT
Subject: Children's Environmental Health newsletter - November 2017

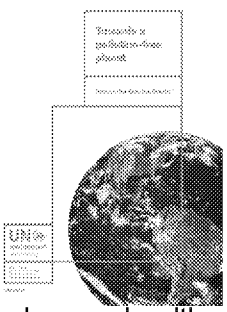
You're receiving this newsletter because you have subscribed to the Healthy Environments for Children Alliance

Children's Environmental Health International Initiatives

This is an international mailing list provided by WHO and UNEP
dedicated to promoting healthy environments for children

November 2017

TOWARDS A POLLUTION-FREE PLANET, REPORT OF THE EXECUTIVE DIRECTOR, UNEP



Every part of the planet and every person is affected by pollution – the world's largest killer – and while solutions are within reach, new policies, enhanced public and private sector leadership, redirected investments and massive funding are all desperately needed.

The 2017 Executive Director's Report: Towards a Pollution-Free Planet, presented by UNEP Executive Director Erik Solheim, analyses impacts on human health and ecosystems brought on by air, land, freshwater, marine, chemical and waste pollution.

The report lists implementation, knowledge, infrastructure, limited financial and industry leadership, pricing and fiscal, and behavioural as five main gaps that limit the effective actions.

Full report Available in Arabic, Chinese, English, French, Russian and Spanish

UN News Release

CHILDREN'S ENVIRONMENTAL HEALT

Press Releases

WHO's Africa Nutrition Report highlights a
in Africa
A newly released nutrition report by the W
(WHO) Regional Office for Africa has reve
still persistent in the region and the numbe
increased. The Africa Nutrition Report, la
Ivory Coast also indicates that a growing
five years old are overweight. The Repo
status in relation to six global nutrition ta
have committed to achieve by 2025, and u
the recently released Global Nutrition
(16/11/2017)

Working Towards Citywide Inclusive Sanit
Citywide Inclusive Sanitation: Good Pra
World
[Video recordings] Citywide Inclusive San
benefits from adequate sanitation, with hu
managed at every point along the se
showcased in this video series each demo

JOURNAL ARTICLES

Air Pollution

Early-life exposure to indoor air pollution or tobacco smoke and lower respiratory tract illness and wheezing in African infants: a longitudinal birth cohort study

Indoor air pollution (IAP) and environmental tobacco smoke (ETS) are associated with lower respiratory tract illness (LRTI) or wheezing in children. However, the effect of the timing of these exposures, specifically antenatal versus postnatal, and of alternate fuel sources such as the increasingly used volatile organic compounds have not been well studied. This study longitudinally investigated the effect of antenatal or postnatal IAP and ETS on LRTI or wheezing prevalence and severity in African infants. Antenatal exposures were the predominant risk factors associated with LRTI or wheezing illness. Toluene was a novel exposure associated with severe LRTI. Urgent and effective interventions focusing on antenatal environmental factors are required, including smoking cessation programmes targeting women of childbearing age pre-conception and pregnant women.
The Lancet Planetary Health

Chemicals

Children's Lead Exposure: A Multimedia Modeling Analysis to Guide Public Health Decision-Making

The primary objective was to develop a coupled exposure–dose modeling approach that can be used to determine what drinking water lead concentrations keep children's blood lead levels (BLLs) below specified values, considering exposures from water, soil, dust, food, and air. A modeling approach using the EPA's Stochastic Human Exposure and Dose Simulation (SHEDS)-Multimedia and Integrated Exposure Uptake and Biokinetic (IEUBK) models was developed using available data. Modeled BLLs compared well with nationally representative BLLs (0–23% relative error). Analyses revealed relative importance of soil and dust ingestion exposure pathways and associated Pb intake rates; water ingestion was also a main pathway, especially for infants. *Environmental Health Perspectives*

Developmental PBDE Exposure and IQ/ADHD in Childhood: A Systematic Review and Meta-analysis

In the United States, one in six children are affected by neurodevelopmental disorders, and polybrominated diphenyl ethers (PBDEs) in flame-retardant chemicals are measured ubiquitously in children. Authors conducted a systematic review regarding developmental exposure to PBDEs and intelligence or Attention Deficit/Hyperactivity Disorder (ADHD) and attention-related behavioral conditions in humans. The meta-analysis of four studies estimated a 10-fold increase (in other words, times 10) in PBDE exposure associated with a decrement of 3.70 IQ points (95% confidence interval: 0.83, 6.56). Authors concluded the body of evidence was of "moderate" quality for ADHD with "limited" evidence for an association with PBDEs, based on the heterogeneity of association estimates reported by a small number

have embraced such approaches to ensur
with sanitation services. The World Bank (

Climate change puts millions of people
insecurity, malnutrition and poverty

Emissions from the agriculture sectors a
future, further contributing to climate ch
adopts sustainable, climate-smart ways o
processing and consuming food, FAO
Graziano da Silva warned today at the
Change conference, COP 23. "Climate
people in a vicious cycle of food insecurity,
Yet, we must confront the harsh reality: we
deal with this immense threat," Graziano d
that Least Developed Countries and Small
are "particularly vulnerable" to climate cha

Launch of special initiative to address cl
health in Small Island Developing States

Today, at the United Nations Climate Char
WHO, in collaboration with the UN Climate
in partnership with the Fijian Preside
Conference of the Parties (COP23), has la
to protect people living in Small Island De
heath impacts of climate change. The vi
Small Island Developing States will have
resilient to climate change and countries
reducing their carbon emissions both to pr
from climate risks and deliver large he
emitting countries. UNFCCC/WHO (12/11/

Partnering for the health of people and pla

Climate change has far-reaching impacts o
being. Changing temperature and rainf
yield, food and water security, and n
frequency and intensity of extreme events
but also increase the risk of water-bor
disease, Hepatitis A and E, bacterial dis
diseases associated with crowding (me
respiratory infections) and vector-borne dis
as well as psychological and emotional dis
events. These impacts will be felt e
populations, including children, the e
communities. UNDP (6/11/2017)

Latin America and the Caribbean commit v

The Latin American and Caribbean Sta
Bogotá, Colombia, their commitment wit
during a regional consultation for the thi
Nations Environment Assembly, that will ta
Nairobi. In the region, 100 million peopl
susceptible to air pollution –with the risk
diseases and other health problems-, and
are in direct contact with polluted water o
UNEP (13/10/2017)

of studies and the fact that chance, bias, and confounding could not be ruled out with reasonable confidence.
Environmental Health Perspectives

Prenatal and postnatal bisphenol A exposure and social impairment in 4-year-old children
Prenatal and postnatal exposure to bisphenol A (BPA) may affect early brain development. Authors investigated the association between prenatal and postnatal exposure to BPA and social impairments in a sample of 4-year-old children. The relationship between prenatal BPA exposure and social communication was non-linear and statistically significant at or above the flexion point for BPA levels of 3.0 µg/g creatinine in girls (58.4%, 95% confidence interval [CI], 6.5% to 135.8%). Each 2-fold increase in postnatal BPA exposure was significantly associated with an 11.8% (95% CI, 0.6% to 24.3%) increase in impairment in social communication in 4-year old girls, as indicated by the linear regression model. Prenatal and postnatal BPA exposure is associated with social impairment at 4 years of age, particularly in girls.
Environmental Health

Gestational exposure to endocrine disrupting chemicals in relation to infant birth weight: a Bayesian analysis of the HOME Study
Gestational EDC exposures may be associated with changes in fetal growth that elevates the risk for poor health later in life, but few studies have examined the health effects of simultaneous exposure to multiple chemicals. This study aimed to examine the association of gestational exposure to five chemical classes of potential EDCs: phthalates and bisphenol A, perfluoroalkyl substances (PFAS), polychlorinated biphenyls (PCBs), polybrominated diphenyl ethers (PBDEs), and organochlorine pesticides (OCPs) with infant birth weight. For a 10-fold increase in chemical concentration, the mean differences in birth weights (95% credible intervals (CI)) were 1 g (-20, 23) for phthalates, -11 g (-52, 34) for PFAS, 0.2 g (-9, 10) for PCBs, -4 g (-30, 22) for PBDEs, and 7 g (-25, 40) for OCPs. Gestational exposure to phthalates, PFAS, PCBs, PBDEs, OCPs or OPPs had null or small associations with birth weight. Gestational OPP, Pb, and PFAS exposures were most strongly associated with lower birth weight.
Environmental Health

Perfluorooctanoic acid and low birth weight: Estimates of US attributable burden and economic costs from 2003 through 2014
Authors aimed to estimate the proportion of PFOA-attributable low birth weight (LBW) births and associated costs in the US from 2003 to 2014, a period during which there were industry-initiated and regulatory activities aimed at reducing exposure. Serum PFOA levels remained approximately constant from 2003–2004 (median: 3.3 ng/mL) to 2007–2008 (3.5 ng/mL), and declined from 2009–2010 (2.8 ng/mL) to 2013–2014 (1.6 ng/mL). In 2003–2004, an estimated 12,764 LBW cases (4% of total for those years) were potentially preventable if PFOA exposure were reduced to the base case reference level (10,203 cases in 2009–2010 and 1,491 in 2013–2014). The total cost of PFOA-attributable LBW for 2003 through 2014 was estimated at $13.7 billion, with $2.97 billion in 2003–2004, $2.4 billion in 2009–2010 and $347 million in 2013–2014. Declines were of a magnitude expected to meaningfully reduce the estimated incidence of PFOA-attributable LBW and associated costs.
International Journal of Hygiene and Environmental Health

WHO Fact Sheets

Children: reducing mortality Updated Octo

Newborns: reducing mortality Updated Oc

Preterm birth Updated November 2017

In the Media

Germany swings EU vote in favor of weed
Germany defeated its key EU ally Franc
Monday to clear the use of weed-killer gl
years after a heated debate over whethe
months of indecisive votes among the
Brussels, Germany, whose Chancellor A
form a new coalition after a September ele
after abstaining in previous meetings. It s
Commission proposal against the wish
(28/11/201)

Data shows air pollution rising to hazardou
Air pollution levels have risen once again
some respite for the residents of Lahore la
data published by the Environment Prote
(Fine Particulate Matter) PM2.5 values at J
Lahore High Court's (LHC) Smog Health
labels 'very poor' quality and calls for shut
institutions among other measures if suc
Pakistan Today (23/11/2017)

After Flint, Helping Doctors Recognize Ch
Before doctors in Flint, Mich., knew they
of lead poisoning, there were warning sig
water supply. The doctors just didn't know
including Dr. Mona Hanna-Attisha, the p
uncovering the widespread lead poisonin
said Flint was exposed to a "toxic soup
drinking water violations for nine of those m
exactly what was in the soup, or more imp
doing to the health of the people d
community's slow response to the water c
symptom of what Dr. Hanna-Attisha calls
in the field of medicine today — the or
factors, like air and water quality, in the
patients about their health. New York Time

Delhi suffers second smog crisis in 12 mo
unheeded
A year ago Delhi was choking, as smog in
to 16 times the government's safe limit for
the same thing has happened again. Leve
particles, called PM2.5, have once again
levels: more than 700 micrograms per cub

E-waste

Hazardous waste and health impact: a systematic review of the scientific literature

Disposal and management of hazardous waste are worldwide challenges. Authors performed a systematic review to evaluate the evidence of the health impact of hazardous waste exposure, applying transparent and a priori defined methods. Fifty-seven papers of epidemiological investigations on the health status of populations living near hazardous waste sites were selected for the evidence evaluation. The association between 95 health outcomes (diseases and disorders) and residential exposure to hazardous waste sites was evaluated. The results, although not conclusive, provide indications that more effective public health policies on hazardous waste management are urgently needed. International, national and local authorities should oppose and eliminate poor, outdated and illegal practices of waste disposal, including illegal transboundary trade, and increase support regulation and its enforcement.

Environmental Health

Decreased lung function with mediation of blood parameters linked to e-waste lead and cadmium exposure in preschool children

Blood lead (Pb) and cadmium (Cd) levels have been associated with lower lung function in adults and smokers, but whether this also holds for children from electronic waste (e-waste) recycling areas is still unknown. To investigate the contribution of blood heavy metals and lung function levels, and the relationship among living area, the blood parameter levels, and the lung function levels, a total of 206 preschool children from Guiyu (exposed area), and Haojiang and Xiashan (reference areas) were recruited and required to undergo blood tests and lung function tests during the study period. Preschool children living in e-waste exposed areas were found to have a 1.37 μg/dL increase in blood Pb, 1.18 μg/L increase in blood Cd, and a 41.00 × 109/L increase in platelet counts, while having a 2.82 g/L decrease in hemoglobin, 92 mL decrease in FVC and 86 mL decrease in FEV1. Each unit of hemoglobin (1 g/L) decline was associated with 5 mL decrease in FVC and 4 mL decrease in FEV1. Authors conclude that children living in e-waste exposed area have higher levels of blood Pb, Cd and platelets, and lower levels of hemoglobin and lung function. Hemoglobin can be a good predictor for lung function levels.

Environmental Pollution

New Publications

Keeping the vector out - Housing improvements for vector control and sustainable development

This policy brief "Keeping the vector out: housing improvements for vector control and sustainable development" contributes to recognize the importance of integrated approaches of vector control and aiming at highlighting effective housing interventions to prevent vector-borne diseases. The evidence shows that poor quality housing and neglected peri-domestic environments are risk factors for the transmission of malaria, arboviral diseases (e.g. dengue, yellow fever, chikungunya, Zika virus disease), Chagas disease and leishmaniasis and that housing interventions such as screening windows, doors and eaves of houses,

the city. Experts say that prolonged exposu
is equivalent to smoking more than two p
Just 12 months after the record-breaking p
been a major wake-up call, Delhi is again
is a big embarrassment that authorities we
this year's smog season. The Conversatio

Haryana's air quality reaches dangerous le
last year

With the state engulfed in a toxic haze fo
pollution this time has reached hazardous
higher than last year's, prompting the adm
of measures to bring life back to normal.
Rohtak— one of the four districts in the sta
has set up real-time air monitoring centre
around 420 (hazardous level). On Sunda
than most parts of the national capital a
Times (14/11/2017)

Nepal yet to down phase dental amalgam

While more countries in the region are mov
dentistry, the highly-toxic metal still remain
cavity fillings in Nepal. Nepali dental profe
dental amalgam could have adverse effec
environment. "Mercury amalgam is still
cavity fillings. However, the rate of its use h
said Dr Sudin Shakya, former president of
(NDA). "Countries around the world are r
free dentistry, so we should adopt a simi
Post (14/11/2017)

Africa: Global Campaign for Mercury-Free

A vibrant global campaign to ban the use
shifting direction: moving from Europe t
Charlie Brown, Attorney & President of
Mercury-Free Dentistry, an organization w
campaign, told African and Asian delegate
late September: "When you return to you
do as the European Union has done:
children now, for one simple reason: The c
equally important as the children of Europe

'Absolutely shocking': Niger Delta oil spills

Babies in Nigeria are twice as likely to die
their mothers were living near an oil spil
researchers have found. A new study, the
pollution with newborn and child mortality
shows that oil spills occurring within 10kr
residence doubled neonatal mortality rates
of her surviving children. Crucially, oil spil
mother was still pregnant had no effe
mortality. But even spills that happened five
doubled the neonatal mortality rate from 3
every 1,000 births, the data found. The Gu

by fitting ceilings, and by reducing the vectors' indoor hiding and breeding places, such as cracks and crevices in walls, floors and roofs are essential for reducing morbidity, mortality, human suffering and thereby promoting economic growth, well-being and the reduction of poverty.
WHO

Protecting children's lungs by providing clean air during pregnancy?
Until a couple of decades ago, air pollution did not feature as a major determinant of ill health among infants. Since then, things have changed and the medical community has become more aware that the health of children greatly depends on breathing clean air. Thus, the 2015 UN resolution that defined the agenda for sustainable development recognises the adverse health effects caused by air pollution, which should be "substantially reduced" by 2030. Air pollution now also features more prominently than before among the risk factors that determine the global burden of disease In particular, child mortality and morbidity in low-to-middle-income countries has been shown to be strongly associated with household air pollution caused by burning solid fuels (eg, coal, charcoal, wood, dung, and crop residues) for cooking and heating.
The Lancet Planetary Health

UPCOMING EVENTS

9th Excellence in Pediatrics Conference
7-9 December 2017, Vienna, Austria

ICEHR 2018: 20th International Conference on Environmental Health and Remediation
24-25 May 2018, Prague, Czechia

INCHES Conference 2018
27-29 June 2018, Seoul, Republic of Korea

EDUCATION AND TRAINING

WHO Children's environmental Health training modules translated into Japanese
Three modules from the WHO Training Package for Health Care Providers "Why children?", "Children are not little adults" and "Chemicals" are now available in Japanese.

Climate change already damaging health
finds
The health of hundreds of millions of pe
already being damaged by climate char
revealed. Heatwaves are affecting many
and global warming is boosting the transm
such as dengue fever, the world's most ra
Air pollution from fossil fuel burning is also
deaths each year, while damage to crop
threatens hunger for millions of children. T
the Lancet journal, come from researchers
the world, including many universiti
Organization, World Bank and the UN
Organization (WMO). The Guardian (31/10

Call for effective enforcement of lead safet
Amid reports that public health is at risk c
various sources including paints, the cou
committed to make efforts to further reduce
in paints. During an interaction program
agencies and paint manufacturers in the
private sector said paint manufacturers ar
public health. Paint manufacturers in the c
criticism over the years as several studies
products contain 'a very high level' of lead
effects on human health. Kathmandu Post

How has air quality been affected by the U
Urban air pollution in the U.S. ha
continuously since the 1970s. Federal regu
Air Act passed by President Nixon, to re
such as benzene, a hydrocarbon, and c
effectively lowered their abundance in
progress. But about 10 years ago, the pictu
U.S. started to change. The "fracking boom
of the nation led to a new source of hydroca
affecting abundances of both toxic benzen
areas that were not previously affected m
The Conversation (31/10/2017)

Links to past issues and how to subscribe

This document is not a formal publication of the United Nations Environment Programme and the World Health Organization and
featured documents are not necessarily the views of the organizations.

Have news for us?

If you would like to submit information to future HECANET issues, email us at heca@who.int with the subject line "INFORMA

Collated and distributed with the cooperation of the
Children's Health and the Environment Program, The University of Queensland, Brisbane, Australia

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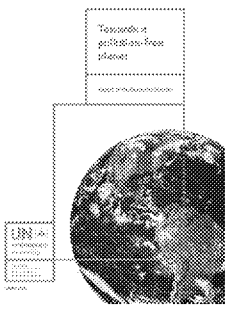
Children's Environmental Health International Initiatives

This is an international mailing list provided by WHO and UNEP
dedicated to promoting healthy environments for children

November 2017

TOWARDS A POLLUTION-FREE PLANET, REPORT OF THE EXECUTIVE DIRECTOR, UNEP



Every part of the planet and every person is affected by pollution – the world's largest killer – and while solutions are within reach, new policies, enhanced public and private sector leadership, redirected investments and massive funding are all desperately needed.

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UN News Release

JOURNAL ARTICLES

Air Pollution

Early-life exposure to indoor air pollution or tobacco smoke and lower respiratory tract illness and wheezing in African infants: a longitudinal birth cohort study
Indoor air pollution (IAP) and environmental tobacco smoke (ETS) are associated with lower respiratory tract illness (LRTI) or wheezing in

CHILDREN'S ENVIRONMENTAL HEALTH NEWS

Press Releases

WHO's Africa Nutrition Report highlights an increase in malnutrition in Africa
A newly released nutrition report by the World Health Organization (WHO) Regional Office for Africa has revealed that undernutrition is still persistent in the region and the number of stunted children has increased. The Africa Nutrition Report, launched today in Abidjan, Ivory Coast also indicates that a growing number of children under five years old are overweight. The Report describes the current status in relation to six global nutrition targets that member states have committed to achieve by 2025, and underscores findings from the recently released Global Nutrition Report. WHO AFRO (16/11/2017)

Working Towards Citywide Inclusive Sanitation
Citywide Inclusive Sanitation: Good Practices from Around the World
[Video recordings] Citywide Inclusive Sanitation means everybody benefits from adequate sanitation, with human waste being safely managed at every point along the service chain. The cities showcased in this video series each demonstrate experiences that have embraced such approaches to ensuring the poor are provided with sanitation services. The World Bank (16/11/2017)

Climate change puts millions of people in vicious cycle of food insecurity, malnutrition and poverty
Emissions from the agriculture sectors are set to increase in the future, further contributing to climate change, unless the world adopts sustainable, climate-smart ways of producing, transporting, processing and consuming food, FAO Director-General José Graziano da Silva warned today at the United Nations Climate Change conference, COP 23. "Climate change puts millions of people in

children. However, the effect of the timing of these exposures, specifically antenatal versus postnatal, and of alternate fuel sources such as the increasingly used volatile organic compounds have not been well studied. This study longitudinally investigated the effect of antenatal or postnatal IAP and ETS on LRTI or wheezing prevalence and severity in African infants. Antenatal exposures were the predominant risk factors associated with LRTI or wheezing illness. Toluene was a novel exposure associated with severe LRTI. Urgent and effective interventions focusing on antenatal environmental factors are required, including smoking cessation programmes targeting women of childbearing age pre-conception and pregnant women.
The Lancet Planetary Health

Chemicals

Children's Lead Exposure: A Multimedia Modeling Analysis to Guide Public Health Decision-Making
The primary objective was to develop a coupled exposure–dose modeling approach that can be used to determine what drinking water lead concentrations keep children's blood lead levels (BLLs) below specified values, considering exposures from water, soil, dust, food, and air. A modeling approach using the EPA's Stochastic Human Exposure and Dose Simulation (SHEDS)-Multimedia and Integrated Exposure Uptake and Biokinetic (IEUBK) models was developed using available data. Modeled BLLs compared well with nationally representative BLLs (0–23% relative error). Analyses revealed relative importance of soil and dust ingestion exposure pathways and associated Pb intake rates; water ingestion was also a main pathway, especially for infants.
Environmental Health Perspectives

Developmental PBDE Exposure and IQ/ADHD in Childhood: A Systematic Review and Meta-analysis
In the United States, one in six children are affected by neurodevelopmental disorders, and polybrominated diphenyl ethers (PBDEs) in flame-retardant chemicals are measured ubiquitously in children. Authors conducted a systematic review regarding developmental exposure to PBDEs and intelligence or Attention Deficit/Hyperactivity Disorder (ADHD) and attention-related behavioral conditions in humans. The meta-analysis of four studies estimated a 10-fold increase (in other words, times 10) in PBDE exposure associated with a decrement of 3.70 IQ points (95%

a vicious cycle of food insecurity, malnutrition and poverty. Yet, we must confront the harsh reality: we are not doing enough to deal with this immense threat," Graziano da Silva said. He stressed that Least Developed Countries and Small Island Developing States are "particularly vulnerable" to climate change. FAO (14/11/2017)

Launch of special initiative to address climate change impact on health in Small Island Developing States
Today, at the United Nations Climate Change Conference (COP23), WHO, in collaboration with the UN Climate Change secretariat and in partnership with the Fijian Presidency of the twenty-third Conference of the Parties (COP23), has launched a special initiative to protect people living in Small Island Developing States from the heath impacts of climate change. The vision is that, by 2030, all Small Island Developing States will have health systems that are resilient to climate change and countries around the world will be reducing their carbon emissions both to protect the most vulnerable from climate risks and deliver large health benefits in carbon-emitting countries. UNFCCC/WHO (12/11/2017)

Partnering for the health of people and planet
Climate change has far-reaching impacts on human health and well-being. Changing temperature and rainfall patterns impact crop yield, food and water security, and nutrition. The increased frequency and intensity of extreme events can cause not only injury, but also increase the risk of water-borne diseases (diarrhoeal disease, Hepatitis A and E, bacterial diseases such as cholera), diseases associated with crowding (measles, meningitis, acute respiratory infections) and vector-borne diseases (malaria, dengue), as well as psychological and emotional distress related to traumatic events. These impacts will be felt especially by vulnerable populations, including children, the elderly and low-income communities. UNDP (6/11/2017)

Latin America and the Caribbean commit with #BeatPollution efforts
The Latin American and Caribbean States reaffirmed today in Bogotá, Colombia, their commitment with a free-pollution planet during a regional consultation for the third session of the United Nations Environment Assembly, that will take place in December in Nairobi. In the region, 100 million people live in areas that are susceptible to air pollution –with the risk of developing

confidence interval: 0.83, 6.56). Authors concluded the body of evidence was of "moderate" quality for ADHD with "limited" evidence for an association with PBDEs, based on the heterogeneity of association estimates reported by a small number of studies and the fact that chance, bias, and confounding could not be ruled out with reasonable confidence.
Environmental Health Perspectives

Prenatal and postnatal bisphenol A exposure and social impairment in 4-year-old children
Prenatal and postnatal exposure to bisphenol A (BPA) may affect early brain development. Authors investigated the association between prenatal and postnatal exposure to BPA and social impairments in a sample of 4-year-old children. The relationship between prenatal BPA exposure and social communication was non-linear and statistically significant at or above the flexion point for BPA levels of 3.0 µg/g creatinine in girls (58.4%, 95% confidence interval [CI], 6.5% to 135.8%). Each 2-fold increase in postnatal BPA exposure was significantly associated with an 11.8% (95% CI, 0.6% to 24.3%) increase in impairment in social communication in 4-year old girls, as indicated by the linear regression model. Prenatal and postnatal BPA exposure is associated with social impairment at 4 years of age, particularly in girls.
Environmental Health

Gestational exposure to endocrine disrupting chemicals in relation to infant birth weight: a Bayesian analysis of the HOME Study
Gestational EDC exposures may be associated with changes in fetal growth that elevates the risk for poor health later in life, but few studies have examined the health effects of simultaneous exposure to multiple chemicals. This study aimed to examine the association of gestational exposure to five chemical classes of potential EDCs: phthalates and bisphenol A, perfluoroalkyl substances (PFAS), polychlorinated biphenyls (PCBs), polybrominated diphenyl ethers (PBDEs), and organochlorine pesticides (OCPs) with infant birth weight. For a 10-fold increase in chemical concentration, the mean differences in birth weights (95% credible intervals (CI)) were 1 g (-20, 23) for phthalates, -11 g (-52, 34) for PFAS, 0.2 g (-9, 10) for PCBs, -4 g (-30, 22) for PBDEs, and 7 g (-25, 40) for OCPs. Gestational exposure to phthalates, PFAS, PCBs, PBDEs, OCPs or OPPs had null or small associations with birth weight. Gestational OPP, Pb, and PFAS exposures were most strongly associated with lower birth weight.

respiratory diseases and other health problems-, and at least 25 million people are in direct contact with polluted water originated in urban areas. UNEP (13/10/2017)

WHO Fact Sheets

Children: reducing mortality Updated October 2017

Newborns: reducing mortality Updated October 2017

Preterm birth Updated November 2017

In the Media

Germany swings EU vote in favor of weed-killer glyphosate
Germany defeated its key EU ally France in a very tight vote on Monday to clear the use of weed-killer glyphosate for the next five years after a heated debate over whether it causes cancer. After months of indecisive votes among the 28 member states in Brussels, Germany, whose Chancellor Angela Merkel has yet to form a new coalition after a September election, came off the fence after abstaining in previous meetings. It said it backed a European Commission proposal against the wishes of France. Reuters (28/11/201)

Data shows air pollution rising to hazardous levels in Lahore
Air pollution levels have risen once again after heavy rains brought some respite for the residents of Lahore last week. According to the data published by the Environment Protection Department (EPD), (Fine Particulate Matter) PM2.5 values at Jail Road are beyond what Lahore High Court's (LHC) Smog Health Emergency Action Plan labels 'very poor' quality and calls for shutting down all educational institutions among other measures if such air quality is reached. Pakistan Today (23/11/2017)

After Flint, Helping Doctors Recognize Chemical Exposure
Before doctors in Flint, Mich., knew they were dealing with a crisis of lead poisoning, there were warning signs of a problem with the water supply. The doctors just didn't know what to do with them — including Dr. Mona Hanna-Attisha, the pediatrician credited with uncovering the widespread lead poisoning afflicting that city. She said Flint was exposed to a "toxic soup" for 18

Environmental Health

Perfluorooctanoic acid and low birth weight: Estimates of US attributable burden and economic costs from 2003 through 2014

Authors aimed to estimate the proportion of PFOA-attributable low birth weight (LBW) births and associated costs in the US from 2003 to 2014, a period during which there were industry-initiated and regulatory activities aimed at reducing exposure. Serum PFOA levels remained approximately constant from 2003–2004 (median: 3.3 ng/mL) to 2007–2008 (3.5 ng/mL), and declined from 2009–2010 (2.8 ng/mL) to 2013–2014 (1.6 ng/mL). In 2003–2004, an estimated 12,764 LBW cases (4% of total for those years) were potentially preventable if PFOA exposure were reduced to the base case reference level (10,203 cases in 2009–2010 and 1,491 in 2013–2014). The total cost of PFOA-attributable LBW for 2003 through 2014 was estimated at $13.7 billion, with $2.97 billion in 2003–2004, $2.4 billion in 2009–2010 and $347 million in 2013–2014. Declines were of a magnitude expected to meaningfully reduce the estimated incidence of PFOA-attributable LBW and associated costs.
International Journal of Hygiene and Environmental Health

E-waste

Hazardous waste and health impact: a systematic review of the scientific literature

Disposal and management of hazardous waste are worldwide challenges. Authors performed a systematic review to evaluate the evidence of the health impact of hazardous waste exposure, applying transparent and a priori defined methods. Fifty-seven papers of epidemiological investigations on the health status of populations living near hazardous waste sites were selected for the evidence evaluation. The association between 95 health outcomes (diseases and disorders) and residential exposure to hazardous waste sites was evaluated. The results, although not conclusive, provide indications that more effective public health policies on hazardous waste management are urgently needed. International, national and local authorities should oppose and eliminate poor, outdated and illegal practices of waste disposal, including illegal transboundary trade, and increase support regulation and its enforcement.
Environmental Health

months — with drinking water violations for nine of those months — but no one knew exactly what was in the soup, or more important, what the soup was doing to the health of the people drinking it. The medical community's slow response to the water contamination in Flint is a symptom of what Dr. Hanna-Attisha calls one of the largest deficits in the field of medicine today — the omission of environmental factors, like air and water quality, in the way that doctors talk to patients about their health. New York Times (21/11/2017)

Delhi suffers second smog crisis in 12 months, as wake-up calls go unheeded

A year ago Delhi was choking, as smog in the Indian capital soared to 16 times the government's safe limit for particulate pollution. Now the same thing has happened again. Levels of the most dangerous particles, called PM2.5, have once again reached last November's levels: more than 700 micrograms per cubic metre in some parts of the city. Experts say that prolonged exposure to this level of pollution is equivalent to smoking more than two packs of cigarettes a day. Just 12 months after the record-breaking pollution that should have been a major wake-up call, Delhi is again plunged into darkness. It is a big embarrassment that authorities were not better prepared for this year's smog season. The Conversation (19/11/2017)

Haryana's air quality reaches dangerous level, pollutants twice than last year

With the state engulfed in a toxic haze for the past one week, air pollution this time has reached hazardous level which is two times higher than last year's, prompting the administration to take a slew of measures to bring life back to normal. The air quality index in Rohtak— one of the four districts in the state where the government has set up real-time air monitoring centres — has been hovering around 420 (hazardous level). On Sunday, it touched 487, worse than most parts of the national capital and Gurgaon. Hindustan Times (14/11/2017)

Nepal yet to down phase dental amalgam

While more countries in the region are moving towards mercury-free dentistry, the highly-toxic metal still remains a standard material for cavity fillings in Nepal. Nepali dental professionals admit the use of dental amalgam could have adverse effects on human health and environment. "Mercury amalgam is still being used in Nepal for cavity fillings. However, the rate of its use has certainly come down," said Dr Sudin Shakya,

Decreased lung function with mediation of blood parameters linked to e-waste lead and cadmium exposure in preschool children

Blood lead (Pb) and cadmium (Cd) levels have been associated with lower lung function in adults and smokers, but whether this also holds for children from electronic waste (e-waste) recycling areas is still unknown. To investigate the contribution of blood heavy metals and lung function levels, and the relationship among living area, the blood parameter levels, and the lung function levels, a total of 206 preschool children from Guiyu (exposed area), and Haojiang and Xiashan (reference areas) were recruited and required to undergo blood tests and lung function tests during the study period. Preschool children living in e-waste exposed areas were found to have a 1.37 μg/dL increase in blood Pb, 1.18 μg/L increase in blood Cd, and a 41.00 × 109/L increase in platelet counts, while having a 2.82 g/L decrease in hemoglobin, 92 mL decrease in FVC and 86 mL decrease in FEV1. Each unit of hemoglobin (1 g/L) decline was associated with 5 mL decrease in FVC and 4 mL decrease in FEV1. Authors conclude that children living in e-waste exposed area have higher levels of blood Pb, Cd and platelets, and lower levels of hemoglobin and lung function. Hemoglobin can be a good predictor for lung function levels.

Environmental Pollution

New Publications

Keeping the vector out - Housing improvements for vector control and sustainable development

This policy brief "Keeping the vector out: housing improvements for vector control and sustainable development" contributes to recognize the importance of integrated approaches of vector control and aiming at highlighting effective housing interventions to prevent vector-borne diseases. The evidence shows that poor quality housing and neglected peri-domestic environments are risk factors for the transmission of malaria, arboviral diseases (e.g. dengue, yellow fever, chikungunya, Zika virus disease), Chagas disease and leishmaniasis and that housing interventions such as screening windows, doors and eaves of houses, by fitting ceilings, and by reducing the vectors' indoor hiding and breeding places, such as cracks and crevices in walls, floors and roofs are essential for reducing morbidity, mortality, human suffering and thereby promoting economic growth, well-being and the reduction of poverty.

WHO

former president of Nepal Dental Association (NDA). "Countries around the world are moving towards mercury-free dentistry, so we should adopt a similar practice." Kathmandu Post (14/11/2017)

Africa: Global Campaign for Mercury-Free Dentistry Targets Africa

A vibrant global campaign to ban the use of mercury in dentistry is shifting direction: moving from Europe to the developing world. Charlie Brown, Attorney & President of the World Alliance for Mercury-Free Dentistry, an organization which is spearheading the campaign, told African and Asian delegates at a meeting in Geneva late September: "When you return to your home countries, please do as the European Union has done: phase out amalgam for children now, for one simple reason: The children of your nation are equally important as the children of Europe." All Africa (13/11/2017)

'Absolutely shocking': Niger Delta oil spills linked with infant deaths

Babies in Nigeria are twice as likely to die in the first month of life if their mothers were living near an oil spill before falling pregnant, researchers have found. A new study, the first to link environmental pollution with newborn and child mortality rates in the Niger Delta, shows that oil spills occurring within 10km of a mother's place of residence doubled neonatal mortality rates and impaired the health of her surviving children. Crucially, oil spills that occurred while the mother was still pregnant had no effect on child or neonatal mortality. But even spills that happened five years before conception doubled the neonatal mortality rate from 38 deaths to 76 deaths for every 1,000 births, the data found. The Guardian (6/11/2017)

Climate change already damaging health of millions globally, report finds

The health of hundreds of millions of people around the world is already being damaged by climate change, a major report has revealed. Heatwaves are affecting many more vulnerable people and global warming is boosting the transmission of deadly diseases such as dengue fever, the world's most rapidly spreading disease. Air pollution from fossil fuel burning is also causing millions of early deaths each year, while damage to crops from extreme weather threatens hunger for millions of children. The findings, published in the Lancet journal, come from researchers at 26 institutions around the world, including many universities, the World Health Organization, World Bank and the

Protecting children's lungs by providing clean air during pregnancy?
Until a couple of decades ago, air pollution did not feature as a major determinant of ill health among infants. Since then, things have changed and the medical community has become more aware that the health of children greatly depends on breathing clean air. Thus, the 2015 UN resolution that defined the agenda for sustainable development recognises the adverse health effects caused by air pollution, which should be "substantially reduced" by 2030. Air pollution now also features more prominently than before among the risk factors that determine the global burden of disease In particular, child mortality and morbidity in low-to-middle-income countries has been shown to be strongly associated with household air pollution caused by burning solid fuels (eg, coal, charcoal, wood, dung, and crop residues) for cooking and heating.
The Lancet Planetary Health

UPCOMING EVENTS

9th Excellence in Pediatrics Conference
7-9 December 2017, Vienna, Austria

ICEHR 2018: 20th International Conference on Environmental Health and Remediation
24-25 May 2018, Prague, Czechia

INCHES Conference 2018
27-29 June 2018, Seoul, Republic of Korea

EDUCATION AND TRAINING

WHO Children's environmental Health training modules translated into Japanese
Three modules from the WHO Training Package for Health Care Providers "Why children?", "Children are not little adults" and "Chemicals" are now available in Japanese.

UN's World Meteorological Organization (WMO). The Guardian (31/10/2017)

Call for effective enforcement of lead safety standards
Amid reports that public health is at risk of lead poisoning through various sources including paints, the country's private sector has committed to make efforts to further reduce the levels of lead content in paints. During an interaction programme among government agencies and paint manufacturers in the Capital on Monday, the private sector said paint manufacturers are equally responsible for public health. Paint manufacturers in the country have come under criticism over the years as several studies have suggested that their products contain 'a very high level' of lead that could have adverse effects on human health. Kathmandu Post (31/10/2017)

How has air quality been affected by the US fracking boom?
Urban air pollution in the U.S. has been decreasing near continuously since the 1970s. Federal regulations, notably the Clean Air Act passed by President Nixon, to reduce toxic air pollutants such as benzene, a hydrocarbon, and ozone, a strong oxidant, effectively lowered their abundance in ambient air with steady progress. But about 10 years ago, the picture on air pollutants in the U.S. started to change. The "fracking boom" in several different parts of the nation led to a new source of hydrocarbons to the atmosphere, affecting abundances of both toxic benzene and ozone, including in areas that were not previously affected much by such air pollution. The Conversation (31/10/2017)

Links to past issues and how to subscribe
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Have news for us?
If you would like to submit information to future HECANET issues, email us at heca@who.int with the subject line "INFORMATION FOR HECANET".

Collated and distributed with the cooperation of the
Children's Health and the Environment Program, The University of Queensland, Brisbane, Australia

Message

From: Dzubow, Rebecca [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=403CA1721F3D43D38DE9189A93A95B76-DZUBOW, REBECCA]
Sent: 1/12/2017 2:43:38 PM
To: Berger, Martha [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=58f5ef445e4d4dc694a2d4fb35951b9a-Mberger]
CC: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Foos, Brenda [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=18b24f2f79414190852a748bf650d2b9-Bperkovi]
Subject: RE: hhbps technical document
Attachments: 2017 Update HHBP briefing 1 5 17 FINAL.DOCX; HHBP Technical Document 2017 Update Draft 1 4 17 FINAL-tk-postbriefing O....docx; Pesticide rollout 01 06 17_OCHP.docx

Hi Ruth,

I've attached the materials OW has provided us, with our markup of both the technical document and the communications piece.

The webpage for the 2013 edition of the HHBPs is https://iaspub.epa.gov/apex/pesticides/f?p=HHBP:home

The CHPAC letter in 2013 is here: https://www.epa.gov/sites/production/files/2014-05/documents/chpac_hhbp.pdf
And the EPA response is here: https://www.epa.gov/sites/production/files/2014-07/documents/2013.09.23_epa_response_to_chpac_on_hhbp.pdf

See my comparison below of what CHPAC recommended in 2013 and what was done in this 2017 update.

Let me know if you have questions.

Martha – I do think Betsy Behl would be the right contact.

~~~
~~~

Martha Berger
Office of Children's Health Protection
US Environmental Protection Agency
202/564-2191 or Ex. 6

Sign up for the Children's Health Protection Listserv!
Text KIDSENVHEATH to 22828

From: Dzubow, Rebecca
Sent: Monday, January 09, 2017 1:35 PM
To: Berger, Martha <Berger.Martha@epa.gov>
Cc: Foos, Brenda <Foos.Brenda@epa.gov>; Etzel, Ruth <Etzel.Ruth@epa.gov>; Susan.Blaine@icf.com
Subject: RE: hhbps technical document

Here are the changes I see in the HHBPs, with green text indicating the issue raised by CHPAC has been adequately addressed, and red text indicating the issue raised by CHPAC has not been adequately addressed.

Topic	CHPAC 2013 comments	EPA 2013 response	EPA 2017 updates
1) use of incorrect estimates of children's drinking water intake	The daily intake rate used to calculate acute HHBPs should be based on the formula-fed infant rather than a children's exposure of 100 mL/kg-day (1 Liter water per 10 kg body weight per day).	Ex. 5 - Deliberative Process	
	The 50th percentile is not sufficiently protective and CHPAC recommends use of the 95th percentile for intake.		
	CHPAC is concerned that		

	the rate intended to represent intake for pregnant women, 30 mL/kg-day (2 L/66 kg-day), is outdated.	Ex. 5 - Deliberative Process
	EPA's presentation of data shows that the 95th percentiles for tap water use by pregnant and lactating women, another very important population, are 42 and 55 L/kg-day, respectively.	
2) an acute health effect can be at least as, if not more, harmful to children as to adults	CHPAC recommends that EPA's acute advisory values for drinking water be based on or incorporate the most susceptible life stage, the formula-fed infant, and the 95th percentile of intake.	

			Ex. 5 - Deliberative Process

			Ex. 5 - Deliberative Process
	CHPAC recommends that advisory values calculated for any duration of exposure give closer consideration to the minimal length of exposure that must take place to initiate a health effect, even when that effect does not manifest during the period of exposure. When a neonate or fetus may be as susceptible as an adult to developing the health effect, EPA programs should calculate the corresponding minimal exposure period starting with the first age (e.g., infant exposure at birth,	Ex. 5 - Deliberative Process	

	mother's exposure during gestation) of susceptibility through the duration of exposure (whether it is a few days, months, or years) that appears to be necessary to induce the health effect.		
3) lack of inclusion of the FQPA safety factor	CHPAC has vigorously supported … the inclusion of the Food Quality Protection Act (FQPA) safety factor that addresses concerns about children's susceptibility	Ex. 5 - Deliberative Process	

			Ex. 5 - Deliberative Process
4) lack of inclusion of ADAFs	CHPAC has recommended that EPA programs, in using the EPA supplemental guidance for carcinogens, apply the ADAFs for any carcinogen unless there is sufficient information indicating that use of the default ADAFs is not appropriate.	Ex. 5 - Deliberative Process	
5) not using guidance on age groupings	5) The EPA Office of Water applied EPA's 2005 guidance on age groupings in developing guidance for perchlorate in drinking water and included in the analysis values based on drinking water ingestion rates during the first months of life.		

	CHPAC recommends that all EPA programs follow this precedent in developing advisories for pesticides and other contaminants in water.		

~~~~~~

Rebecca C. Dzubow, MPH, MEM
Acting Division Director
U.S. EPA Office of Children's Health Protection | Regulatory Support and Science Policy Division
1200 Pennsylvania Avenue, NW (1107T) | Washington, DC 20460
(202) 564-0967

From: Berger, Martha
Sent: Monday, January 09, 2017 10:10 AM
To: Dzubow, Rebecca <Dzubow.Rebecca@epa.gov>
Cc: Foos, Brenda <Foos.Brenda@epa.gov>; Etzel, Ruth <Etzel.Ruth@epa.gov>; Susan.Blaine@icf.com
Subject: Re: hhbps technical document

Ok, that would be great. Let me know if you think this could be an agenda item for Feb 1 and 2. We have a steering call on Wednesday to settle the agenda.

Also, brenda, can you think about how you want the agenda to accommodate the tsca letter and let me know?

Martha

Martha Berger
Office of Children's Health Protection
US Environmental Protection Agency
202/564-2191 office
Ex. 6 cell

On Jan 9, 2017, at 10:03 AM, Dzubow, Rebecca <Dzubow.Rebecca@epa.gov> wrote:

> I can review the letter and see what was done and what wasn't.
>
> ~~~~~~
>
> Rebecca C. Dzubow, MPH, MEM
> *Acting Division Director*
> U.S. EPA Office of Children's Health Protection | Regulatory Support and Science Policy Division
> 1200 Pennsylvania Avenue, NW (1107T) | Washington, DC 20460
> (202) 564-0967
~~~~~~

From: Berger, Martha
Sent: Friday, January 06, 2017 9:58 AM
To: Foos, Brenda <Foos.Brenda@epa.gov>
Cc: Dzubow, Rebecca <Dzubow.Rebecca@epa.gov>
Subject: Re: hhbps technical document

Great news and ideas, thanks y'all.

Martha

Martha Berger
Office of Children's Health Protection
US Environmental Protection Agency
202/564-2191 office
Ex. 6 cell

On Jan 6, 2017, at 8:32 AM, Foos, Brenda <Foos.Brenda@epa.gov> wrote:

> Yay! I think that CHPAC wrote a letter about this, and if they are posted on the web in the next week, then maybe OW would like to come talk about the success at the next meeting. (unless there are too many other things in that letter that didn't get done...)
>
> Brenda
>
> ****************************
>
> Brenda Foos
> 202-564-2707
> On detail to Risk Assessment Division, Office of Pollution Prevention and Toxics
>
> **From:** Dzubow, Rebecca
> **Sent:** Thursday, January 05, 2017 4:07 PM
> **To:** Foos, Brenda <Foos.Brenda@epa.gov>
> **Subject:** RE: hhbps technical document
>
> **Ex. 5 - Deliberative Process**
>
> ~~~~~~
>
> Rebecca C. Dzubow, MPH, MEM
> *Acting Division Director*
> U.S. EPA Office of Children's Health Protection | Regulatory Support and Science Policy Division
> 1200 Pennsylvania Avenue, NW (1107T) | Washington, DC 20460
> (202) 564-0967
>
> **From:** Strong, Jamie
> **Sent:** Thursday, January 05, 2017 3:58 PM
> **To:** Dzubow, Rebecca <Dzubow.Rebecca@epa.gov>

Cc: Krishna, Tara <krishna.tara@epa.gov>
Subject: FW: hhbps technical document

Here you go, thanks!

Human Health Benchmarks for Pesticides 2017 Update Briefing

4/5/2019

Purpose

- To discuss the updates to the Human Health Benchmarks for Pesticides (HHBP) table and the accompanying technical document
    - Updated toxicity information from Office of Pesticide Programs (OPP)
    - Addition of Food Quality Protection Act (FQPA) safety factors to RfDs
    - Updated exposure factors for body weight and drinking water intake to represent the most current science

Background

- In 2012, OW and OPP first published Human Health Benchmarks for Pesticides (HHBPs). Benchmarks were developed for 352 pesticides registered for use on food crops and were based on non-carcinogenic effects.
- Benchmarks are derived using reference doses (RfDs) and exposure assumptions similar to methods used to develop drinking water health advisories (HA).
- Benchmarks are intended to serve informational purposes for states and are derived for compounds that have no drinking water standards or HAs.
- The HHBP table includes pesticides that are detected by USGS in ambient waters. The pesticides on the table with the most frequent USGS detections are Acetochlor, EPTC, Fipronil, Pendimethalin, and Permethrin.
- Acute, chronic, and/or cancer benchmarks were derived from publically available Office of Pesticide Programs (OPP) toxicity information.
    - The acute and chronic noncancer benchmarks were calculated for the most sensitive population/life stage. The acute benchmarks were derived for children or females of reproductive age. The chronic benchmarks were derived for the general population or females of reproductive age. When toxicity values were available for multiple target populations, the value that provided the most protective drinking water benchmark was selected as a point of departure.
- In 2013, benchmarks for 11 new pesticides were added; benchmarks for 40 pesticides were revised to include carcinogenic benchmarks based on cancer slope factors; and benchmarks for 10 pesticides were revised to reflect new scientific information (i.e., RfDs revised). In total, benchmarks are available for 363 pesticides.
- The current update revises benchmarks to reflect new scientific information on toxicity values available from OPP and updated exposure assumptions.
- The benchmark values and accompanying technical document have been reviewed by OPP and the Office of Groundwater and Drinking Water (OGWDW)

Toxicity Values

- For pesticide registrations under FIFRA, OPP derives a RfD based on EPA guidelines and selects an FQPA safety factor to derive a population adjusted dose or PAD.

ED_001703B_00002555_0_33689191-eb53-f074-8ca5-0944ce2cf985

- The FQPA Safety Factor, mandated by the FQPA, takes into consideration pre and/or post natal toxicity and completeness of the data with respect to exposure and toxicity to infants and children.
- In the majority of instances, OPP determines no additional FQPA safety factors are needed.
- More recently, FQPA safety factors can account for uncertainties in the overall completeness of the toxicity database, extrapolation from subchronic to a chronic study duration, and LOAEL to NOAEL extrapolation.
- To ensure that all uncertainties are accounted for in the development of the benchmarks, the RfDs with added FQPA safety factors are used to calculate the HHBPs in the 2017 update.

Exposure Factors

- In the 2017 HHBPs, EPA has updated the adult body weight used to calculate the benchmarks to 80 kilograms based on National Health and Nutrition Examination Survey (NHANES) data from 1999 to 2006 (USEPA 2011). This represents the mean body weight for adults ages 21 and older. Previously, 70 kilograms was used.

- EPA also updated the drinking water intake (DWI) for adults. A DWI of 2.5 L/d, rounded from 2.546 L/d, based on NHANES data from 2003 to 2006 as reported in EPA's Exposure Factors Handbook (U.S. EPA 2011a, Table 3-33) was used in the 2017 benchmark calculations. This rate represents the consumer's only estimate of combined direct and indirect community water ingestion at the 90th percentile for adults ages 21 and older.

- For children and females of reproductive age, the following exposure assumptions were used:
    - The body weight for females of reproductive age (13-49 years) was updated from 66 kg to 69 kg based on NHANES data from 1999 to 2006.
    - For children, a normalized ratio of drinking water ingestion to body weight (DWI/ BW) of 0.15 L/kg/day was calculated using data for infants (birth to <12 months) and this represents the 90th percentile values of the consumers-only estimates of direct and indirect water ingestion based on 1994-1998 CSFII.

What has changed?

- In total, benchmarks are available for 396 pesticides are listed in the 2017 updated HHBP table.
- All benchmarks use the most current OPP scientific assessments and were calculated with updated exposure (body weight and drinking water intake) assumptions.
- Benchmarks were removed for 3 pesticides previously listed in the 2013 HHBP table because these pesticides are no longer used on foods (d-Allethrin, S-Bioallethrin, and Bioallethrin)
- 41 pesticides previously listed on the 2013 HHBP table have updated toxicity values
    - 33 previously listed pesticides have updated RfD values but did not apply an FQPA factor greater than 1
    - 8 previously listed pesticides have updated RfD values and apply FQPA factors greater than 1
- 28 previously listed pesticides on the 2013 HHBP table did not have new toxicity values, but had FQPA factors greater than 1 (previously not incorporated into the benchmark calculations) that were included in this update
- 41 new pesticides that were not previously on the table were added based on new toxicity data developed by OPP.
    - 8 of these new pesticides have FQPA factors greater than 1

ED_001703B_00002555_1_1f132c94-8ebd-cdf4-c5cb-107597fa4dd5

Next Steps

Internal outreach (OCHP)
Inform OW IO AAExternal outreach including:

- Federal-State Toxicology Risk Analysis Committee
- Association of State Drinking Water Administrators
- Water Division Directors
- American Water Works Association
- Natural Resources Defense Council, other NGOs
- United States Department of Agriculture
- Association of Clean Water Administrators
- Clean Water Action

ED_001703B_00002555_2_732edbf2-f8c2-025b-8665-253fcbc615cb

Table 1. Summary of Changes in Benchmarks Update

Type of Benchmark	Direction of Change	Pesticides with Change	Total
Acute	Increase	2,6-Dichlorobenzamide (BAM), Acetochlor, Bromoxynil, Bromoxynil octanoate, Chlorfenapyr, Dimethenamid, Dimethenamid-P, Fenzaquin, Fosthiazate, Furfural, Indaziflam, Indoxacarb, Mancozeb, Metaldehyde, Pinoxaden, Topramezone	16
	Decrease	Bifenthrin, Carbendazim (MBC), Chlorpyrifos methyl, Clodinafop-propargyl, Cypermethrin, Deltamethrin, Diaminochlrotrizine (DACT), Dichloran, Dicrotophos, Dinocap, Fenitrothion, Fenpropathrin, Hexaconazole, Imazalil, Methamidophos, Mevinphos, Norflurazon, Pebulate, Phorate, Phosmet, Pirimiphos-methyl, Prallethrin, Sulfosate (Glyphosate-trimesium), Tefluthrin, Thiodicarb, Tribufos, Trichlorfon, Triphenyltin hydroxide (TPTH), Vinclozolin, Zeta-Cypermethrin, Ziram	31
Chronic	Increase	Aminocyclopyrachlor, Chlorfenapyr, Chlorsulfuron, Clethodim, Cyromazine, Dinotefuran, Fluprimidol, Fosthiazate, Mancozeb, Mesotrione, Metaldehyde, Naphthalene Acetates, Oxytetracycline hydrochloride, Pendimethalin, Pinoxaden, Sulfentrazone	16
	Decrease	Asulam, Carbendazim (MBC), Chlorpyrifos methyl, Clodinafop-propargyl, Diaminochlrotrizine (DACT), Dichloran, Dicrotophos, Dinocap, Fenitrothion, Imazalil, Imazapic, Methamidophos, Mevinphos, PCNB (Quintozene), Pebulate, Phorate, Phosmet, Pirimiphos-methyl, Sulfosate (Glyphosate-trimesium), Terrazole, Thiodicarb, Tribufos, Trichlorfon, Triphenyltin hydroxide (TPTH), Vinclozolin, Ziram	26

ED_001703B_00002555_3_bac81eba-32ee-b74a-4b64-13294b7b7946

Message

From: Schroeder, Kathleen [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=0DB676B2FADE4B54BEBCC7B6E664FC94-SCHROEDER,]
Sent: 12/1/2017 1:09:29 PM
To: AO-OCHP-Everyone [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=222d03d48d634481af638d4892296469-AO-OCHP-Everyone]
Subject: FW: Children's Environmental Health newsletter - November 2017/WHO
Attachments: oledata.mso; November 2017.pdf

Kathleen Schroeder, MD, MSI
Senior Environmental Employment Program
SEE Enrollee
US EPA
Office of Children's Health Protection

schroeder.kathleen@epa.gov
202-566-2279

From: HECANET [mailto:HECANET@LISTSERV.WHO.INT] **On Behalf Of** heca
Sent: Friday, December 01, 2017 3:49 AM
To: HECANET@LISTSERV.WHO.INT
Subject: Children's Environmental Health newsletter - November 2017

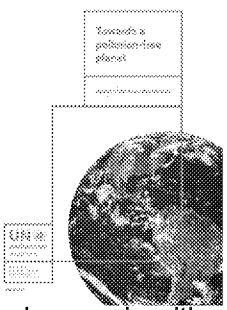
You're receiving this newsletter because you have subscribed to the Healthy Environments for Children Alliance

Children's Environmental Health International Initiatives

This is an international mailing list provided by WHO and UNEP
dedicated to promoting healthy environments for children

November 2017

TOWARDS A POLLUTION-FREE PLANET, REPORT OF THE EXECUTIVE DIRECTOR, UNEP



Every part of the planet and every person is affected by pollution – the world's largest killer – and while solutions are within reach, new policies, enhanced public and private sector leadership, redirected investments and massive funding are all desperately needed.

The 2017 Executive Director's Report: Towards a Pollution-Free Planet, presented by UNEP Executive Director Erik Solheim, analyses impacts on human health and ecosystems brought on by air, land, freshwater, marine, chemical and waste pollution.

CHILDREN'S ENVIRONMENTAL HEALT

Press Releases

WHO's Africa Nutrition Report highlights a
in Africa
A newly released nutrition report by the W
(WHO) Regional Office for Africa has reve
still persistent in the region and the numbe
increased. The Africa Nutrition Report, la
Ivory Coast also indicates that a growing
five years old are overweight. The Repo
status in relation to six global nutrition ta
have committed to achieve by 2025, and u

The report lists implementation, knowledge, infrastructure, limited financial and industry leadership, pricing and fiscal, and behavioural as five main gaps that limit the effective actions.

Full report Available in Arabic, Chinese, English, French, Russian and Spanish

UN News Release

JOURNAL ARTICLES

Air Pollution

Early-life exposure to indoor air pollution or tobacco smoke and lower respiratory tract illness and wheezing in African infants: a longitudinal birth cohort study
Indoor air pollution (IAP) and environmental tobacco smoke (ETS) are associated with lower respiratory tract illness (LRTI) or wheezing in children. However, the effect of the timing of these exposures, specifically antenatal versus postnatal, and of alternate fuel sources such as the increasingly used volatile organic compounds have not been well studied. This study longitudinally investigated the effect of antenatal or postnatal IAP and ETS on LRTI or wheezing prevalence and severity in African infants. Antenatal exposures were the predominant risk factors associated with LRTI or wheezing illness. Toluene was a novel exposure associated with severe LRTI. Urgent and effective interventions focusing on antenatal environmental factors are required, including smoking cessation programmes targeting women of childbearing age pre-conception and pregnant women.
The Lancet Planetary Health

Chemicals

Children's Lead Exposure: A Multimedia Modeling Analysis to Guide Public Health Decision-Making
The primary objective was to develop a coupled exposure–dose modeling approach that can be used to determine what drinking water lead concentrations keep children's blood lead levels (BLLs) below specified values, considering exposures from water, soil, dust, food, and air. A modeling approach using the EPA's Stochastic Human Exposure and Dose Simulation (SHEDS)-Multimedia and Integrated Exposure Uptake and Biokinetic (IEUBK) models was developed using available data. Modeled BLLs compared well with nationally representative BLLs (0–23% relative error). Analyses revealed relative importance of soil and dust ingestion exposure pathways and associated Pb intake rates; water ingestion was also a main pathway, especially for infants. *Environmental Health Perspectives*

Developmental PBDE Exposure and IQ/ADHD in Childhood: A Systematic Review and Meta-analysis
In the United States, one in six children are affected by neurodevelopmental disorders, and polybrominated diphenyl ethers (PBDEs) in flame-retardant chemicals are measured ubiquitously in children. Authors conducted a systematic review regarding

the recently released Global Nutrition
(16/11/2017)

Working Towards Citywide Inclusive Sanit
Citywide Inclusive Sanitation: Good Pra
World
[Video recordings] Citywide Inclusive San
benefits from adequate sanitation, with hu
managed at every point along the se
showcased in this video series each demo
have embraced such approaches to ensur
with sanitation services. The World Bank (

Climate change puts millions of people
insecurity, malnutrition and poverty
Emissions from the agriculture sectors a
future, further contributing to climate ch
adopts sustainable, climate-smart ways o
processing and consuming food, FAO
Graziano da Silva warned today at the
Change conference, COP 23. "Climate
people in a vicious cycle of food insecurity,
Yet, we must confront the harsh reality: we
deal with this immense threat," Graziano d
that Least Developed Countries and Small
are "particularly vulnerable" to climate cha

Launch of special initiative to address cl
health in Small Island Developing States
Today, at the United Nations Climate Char
WHO, in collaboration with the UN Climate
in partnership with the Fijian Preside
Conference of the Parties (COP23), has la
to protect people living in Small Island De
heath impacts of climate change. The vi
Small Island Developing States will have
resilient to climate change and countries
reducing their carbon emissions both to pr
from climate risks and deliver large he
emitting countries. UNFCCC/WHO (12/11/

Partnering for the health of people and pla
Climate change has far-reaching impacts o
being. Changing temperature and rainf
yield, food and water security, and n
frequency and intensity of extreme events
but also increase the risk of water-bor
disease, Hepatitis A and E, bacterial dis
diseases associated with crowding (me
respiratory infections) and vector-borne dis
as well as psychological and emotional dis
events. These impacts will be felt e
populations, including children, the e
communities. UNDP (6/11/2017)

Latin America and the Caribbean commit v

developmental exposure to PBDEs and intelligence or Attention Deficit/Hyperactivity Disorder (ADHD) and attention-related behavioral conditions in humans. The meta-analysis of four studies estimated a 10-fold increase (in other words, times 10) in PBDE exposure associated with a decrement of 3.70 IQ points (95% confidence interval: 0.83, 6.56). Authors concluded the body of evidence was of "moderate" quality for ADHD with "limited" evidence for an association with PBDEs, based on the heterogeneity of association estimates reported by a small number of studies and the fact that chance, bias, and confounding could not be ruled out with reasonable confidence.
Environmental Health Perspectives

Prenatal and postnatal bisphenol A exposure and social impairment in 4-year-old children
Prenatal and postnatal exposure to bisphenol A (BPA) may affect early brain development. Authors investigated the association between prenatal and postnatal exposure to BPA and social impairments in a sample of 4-year-old children. The relationship between prenatal BPA exposure and social communication was non-linear and statistically significant at or above the flexion point for BPA levels of 3.0 µg/g creatinine in girls (58.4%, 95% confidence interval [CI], 6.5% to 135.8%). Each 2-fold increase in postnatal BPA exposure was significantly associated with an 11.8% (95% CI, 0.6% to 24.3%) increase in impairment in social communication in 4-year old girls, as indicated by the linear regression model. Prenatal and postnatal BPA exposure is associated with social impairment at 4 years of age, particularly in girls.
Environmental Health

Gestational exposure to endocrine disrupting chemicals in relation to infant birth weight: a Bayesian analysis of the HOME Study
Gestational EDC exposures may be associated with changes in fetal growth that elevates the risk for poor health later in life, but few studies have examined the health effects of simultaneous exposure to multiple chemicals. This study aimed to examine the association of gestational exposure to five chemical classes of potential EDCs: phthalates and bisphenol A, perfluoroalkyl substances (PFAS), polychlorinated biphenyls (PCBs), polybrominated diphenyl ethers (PBDEs), and organochlorine pesticides (OCPs) with infant birth weight. For a 10-fold increase in chemical concentration, the mean differences in birth weights (95% credible intervals (CI)) were 1 g (-20, 23) for phthalates, -11 g (-52, 34) for PFAS, 0.2 g (-9, 10) for PCBs, -4 g (-30, 22) for PBDEs, and 7 g (-25, 40) for OCPs. Gestational exposure to phthalates, PFAS, PCBs, PBDEs, OCPs or OPPs had null or small associations with birth weight. Gestational OPP, Pb, and PFAS exposures were most strongly associated with lower birth weight.
Environmental Health

Perfluorooctanoic acid and low birth weight: Estimates of US attributable burden and economic costs from 2003 through 2014
Authors aimed to estimate the proportion of PFOA-attributable low birth weight (LBW) births and associated costs in the US from 2003 to 2014, a period during which there were industry-initiated and regulatory activities aimed at reducing exposure. Serum PFOA levels remained approximately constant from 2003–2004 (median: 3.3 ng/mL) to 2007–2008 (3.5 ng/mL), and declined from 2009–2010 (2.8 ng/mL) to 2013–2014 (1.6 ng/mL). In 2003–2004, an estimated 12,764 LBW cases (4%

The Latin American and Caribbean Sta
Bogotá, Colombia, their commitment wit
during a regional consultation for the thi
Nations Environment Assembly, that will ta
Nairobi. In the region, 100 million peopl
susceptible to air pollution –with the risk
diseases and other health problems-, and
are in direct contact with polluted water o
UNEP (13/10/2017)

WHO Fact Sheets

Children: reducing mortality Updated Octo

Newborns: reducing mortality Updated Oc

Preterm birth Updated November 2017

In the Media

Germany swings EU vote in favor of weed
Germany defeated its key EU ally Franc
Monday to clear the use of weed-killer gl
years after a heated debate over whethe
months of indecisive votes among the
Brussels, Germany, whose Chancellor A
form a new coalition after a September ele
after abstaining in previous meetings. It s
Commission proposal against the wish
(28/11/201)

Data shows air pollution rising to hazardou
Air pollution levels have risen once again
some respite for the residents of Lahore la
data published by the Environment Prote
(Fine Particulate Matter) PM2.5 values at J
Lahore High Court's (LHC) Smog Health
labels 'very poor' quality and calls for shut
institutions among other measures if suc
Pakistan Today (23/11/2017)

After Flint, Helping Doctors Recognize Ch
Before doctors in Flint, Mich., knew they
of lead poisoning, there were warning sig
water supply. The doctors just didn't know
including Dr. Mona Hanna-Attisha, the p
uncovering the widespread lead poisonin
said Flint was exposed to a "toxic soup
drinking water violations for nine of those m
exactly what was in the soup, or more imp
doing to the health of the people d
community's slow response to the water c
symptom of what Dr. Hanna-Attisha calls
in the field of medicine today — the or

of total for those years) were potentially preventable if PFOA exposure were reduced to the base case reference level (10,203 cases in 2009–2010 and 1,491 in 2013–2014). The total cost of PFOA-attributable LBW for 2003 through 2014 was estimated at $13.7 billion, with $2.97 billion in 2003–2004, $2.4 billion in 2009–2010 and $347 million in 2013–2014. Declines were of a magnitude expected to meaningfully reduce the estimated incidence of PFOA-attributable LBW and associated costs.
International Journal of Hygiene and Environmental Health

E-waste

Hazardous waste and health impact: a systematic review of the scientific literature
Disposal and management of hazardous waste are worldwide challenges. Authors performed a systematic review to evaluate the evidence of the health impact of hazardous waste exposure, applying transparent and a priori defined methods. Fifty-seven papers of epidemiological investigations on the health status of populations living near hazardous waste sites were selected for the evidence evaluation. The association between 95 health outcomes (diseases and disorders) and residential exposure to hazardous waste sites was evaluated. The results, although not conclusive, provide indications that more effective public health policies on hazardous waste management are urgently needed. International, national and local authorities should oppose and eliminate poor, outdated and illegal practices of waste disposal, including illegal transboundary trade, and increase support regulation and its enforcement.
Environmental Health

Decreased lung function with mediation of blood parameters linked to e-waste lead and cadmium exposure in preschool children
Blood lead (Pb) and cadmium (Cd) levels have been associated with lower lung function in adults and smokers, but whether this also holds for children from electronic waste (e-waste) recycling areas is still unknown. To investigate the contribution of blood heavy metals and lung function levels, and the relationship among living area, the blood parameter levels, and the lung function levels, a total of 206 preschool children from Guiyu (exposed area), and Haojiang and Xiashan (reference areas) were recruited and required to undergo blood tests and lung function tests during the study period. Preschool children living in e-waste exposed areas were found to have a 1.37 μg/dL increase in blood Pb, 1.18 μg/L increase in blood Cd, and a 41.00 × 109/L increase in platelet counts, while having a 2.82 g/L decrease in hemoglobin, 92 mL decrease in FVC and 86 mL decrease in FEV1. Each unit of hemoglobin (1 g/L) decline was associated with 5 mL decrease in FVC and 4 mL decrease in FEV1. Authors conclude that children living in e-waste exposed area have higher levels of blood Pb, Cd and platelets, and lower levels of hemoglobin and lung function. Hemoglobin can be a good predictor for lung function levels.
Environmental Pollution

New Publications

Keeping the vector out - Housing improvements for vector control and sustainable development

factors, like air and water quality, in the
patients about their health. New York Time

Delhi suffers second smog crisis in 12 mo
unheeded
A year ago Delhi was choking, as smog in
to 16 times the government's safe limit for
the same thing has happened again. Leve
particles, called PM2.5, have once again
levels: more than 700 micrograms per cub
the city. Experts say that prolonged exposu
is equivalent to smoking more than two p
Just 12 months after the record-breaking p
been a major wake-up call, Delhi is again
is a big embarrassment that authorities we
this year's smog season. The Conversatio

Haryana's air quality reaches dangerous le
last year
With the state engulfed in a toxic haze fo
pollution this time has reached hazardous
higher than last year's, prompting the adm
of measures to bring life back to normal.
Rohtak— one of the four districts in the sta
has set up real-time air monitoring centre
around 420 (hazardous level). On Sunda
than most parts of the national capital a
Times (14/11/2017)

Nepal yet to down phase dental amalgam
While more countries in the region are mov
dentistry, the highly-toxic metal still remain
cavity fillings in Nepal. Nepali dental profe
dental amalgam could have adverse effec
environment. "Mercury amalgam is still
cavity fillings. However, the rate of its use h
said Dr Sudin Shakya, former president of
(NDA). "Countries around the world are r
free dentistry, so we should adopt a simi
Post (14/11/2017)

Africa: Global Campaign for Mercury-Free
A vibrant global campaign to ban the use
shifting direction: moving from Europe t
Charlie Brown, Attorney & President of
Mercury-Free Dentistry, an organization w
campaign, told African and Asian delegate
late September: "When you return to you
do as the European Union has done:
children now, for one simple reason: The c
equally important as the children of Europe

'Absolutely shocking': Niger Delta oil spills
Babies in Nigeria are twice as likely to die
their mothers were living near an oil spil
researchers have found. A new study, the

This policy brief "Keeping the vector out: housing improvements for vector control and sustainable development" contributes to recognize the importance of integrated approaches of vector control and aiming at highlighting effective housing interventions to prevent vector-borne diseases. The evidence shows that poor quality housing and neglected peri-domestic environments are risk factors for the transmission of malaria, arboviral diseases (e.g. dengue, yellow fever, chikungunya, Zika virus disease), Chagas disease and leishmaniasis and that housing interventions such as screening windows, doors and eaves of houses, by fitting ceilings, and by reducing the vectors' indoor hiding and breeding places, such as cracks and crevices in walls, floors and roofs are essential for reducing morbidity, mortality, human suffering and thereby promoting economic growth, well-being and the reduction of poverty.
WHO

Protecting children's lungs by providing clean air during pregnancy?
Until a couple of decades ago, air pollution did not feature as a major determinant of ill health among infants. Since then, things have changed and the medical community has become more aware that the health of children greatly depends on breathing clean air. Thus, the 2015 UN resolution that defined the agenda for sustainable development recognises the adverse health effects caused by air pollution, which should be "substantially reduced" by 2030. Air pollution now also features more prominently than before among the risk factors that determine the global burden of disease In particular, child mortality and morbidity in low-to-middle-income countries has been shown to be strongly associated with household air pollution caused by burning solid fuels (eg, coal, charcoal, wood, dung, and crop residues) for cooking and heating.
The Lancet Planetary Health

UPCOMING EVENTS

9th Excellence in Pediatrics Conference
7-9 December 2017, Vienna, Austria

ICEHR 2018: 20th International Conference on Environmental Health and Remediation
24-25 May 2018, Prague, Czechia

INCHES Conference 2018
27-29 June 2018, Seoul, Republic of Korea

EDUCATION AND TRAINING

WHO Children's environmental Health training modules translated into Japanese
Three modules from the WHO Training Package for Health Care Providers "Why children?", "Children are not little adults" and "Chemicals" are now available in Japanese.

pollution with newborn and child mortality
shows that oil spills occurring within 10k
residence doubled neonatal mortality rate
of her surviving children. Crucially, oil spil
mother was still pregnant had no effe
mortality. But even spills that happened fiv
doubled the neonatal mortality rate from 3
every 1,000 births, the data found. The Gu

Climate change already damaging health
finds
The health of hundreds of millions of pe
already being damaged by climate char
revealed. Heatwaves are affecting many
and global warming is boosting the transm
such as dengue fever, the world's most ra
Air pollution from fossil fuel burning is also
deaths each year, while damage to crop
threatens hunger for millions of children. T
the Lancet journal, come from researchers
the world, including many universiti
Organization, World Bank and the UN
Organization (WMO). The Guardian (31/1

Call for effective enforcement of lead safe
Amid reports that public health is at risk
various sources including paints, the cou
committed to make efforts to further reduce
in paints. During an interaction program
agencies and paint manufacturers in the
private sector said paint manufacturers a
public health. Paint manufacturers in the
criticism over the years as several studies
products contain 'a very high level' of lead
effects on human health. Kathmandu Post

How has air quality been affected by the U
Urban air pollution in the U.S. ha
continuously since the 1970s. Federal regu
Air Act passed by President Nixon, to re
such as benzene, a hydrocarbon, and
effectively lowered their abundance in
progress. But about 10 years ago, the pictu
U.S. started to change. The "fracking boom
of the nation led to a new source of hydroca
affecting abundances of both toxic benzen
areas that were not previously affected m
The Conversation (31/10/2017)

Links to past issues and how to subscribe

This document is not a formal publication of the United Nations Environment Programme and the World Health Organization and featured documents are not necessarily the views of the organizations.

Have news for us?

If you would like to submit information to future HECANET issues, email us at heca@who.int with the subject line "INFORMA

Collated and distributed with the cooperation of the
Children's Health and the Environment Program, The University of Queensland, Brisbane, Australia

Message

From: Dzubow, Rebecca [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=403CA1721F3D43D38DE9189A93A95B76-DZUBOW, REBECCA]
Sent: 10/17/2016 3:22:26 PM
To: Belle, Kara [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=8db65b54e54847ddb75d5aa71387aebe-Belle, Kara]; Berger, Martha [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=58f5ef445e4d4dc694a2d4fb35951b9a-Mberger]; Reed, Khesha [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=c62327cee1fd4da29a1cc485efe546f7-Reed, Khesha]; Schroeder, Kathleen [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=0db676b2fade4b54bebcc7b6e664fc94-Schroeder,]
CC: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]
Subject: RE: Next steps - Papers for OCHP review
Attachments: PCBs Schools Transition Paper_4 October 2016 -dan OCHP.docx

Ruth,

Please use this attached version that incorporates both Kara and my comments on PCBs.

Thanks,
Rebecca

~~~
~~~

From: Berger, Martha
Sent: Friday, October 14, 2016 3:48 PM
To: Reed, Khesha <Reed.Khesha@epa.gov>; Dzubow, Rebecca <Dzubow.Rebecca@epa.gov>; Schroeder, Kathleen <Schroeder.Kathleen@epa.gov>
Cc: Etzel, Ruth <Etzel.Ruth@epa.gov>; Belle, Kara <Belle.Kara@epa.gov>
Subject: RE: Next steps - Papers for OCHP review

Re: having kara check the pcb's in schools paper

I missed this note earlier, Khesha (it's my flex day) and Kara is reviewing a lengthy ATSDR document and likely done for the day, so can this wait til Monday?

Martha

Martha Berger
Acting Director,
Program Implementation and Coordination Division
Office of Children's Health Protection
US Environmental Protection Agency
202/564-2191 or Ex. 6

From: Reed, Khesha
Sent: Friday, October 14, 2016 3:42 PM
To: Dzubow, Rebecca <Dzubow.Rebecca@epa.gov>; Schroeder, Kathleen <Schroeder.Kathleen@epa.gov>
Cc: Berger, Martha <Berger.Martha@epa.gov>; Etzel, Ruth <Etzel.Ruth@epa.gov>
Subject: RE: Next steps - Papers for OCHP review

Thanks Rebecca and Kathy. Four down, three to go.

From: Dzubow, Rebecca
Sent: Friday, October 14, 2016 3:38 PM
To: Reed, Khesha <Reed.Khesha@epa.gov>; Berger, Martha <Berger.Martha@epa.gov>
Cc: Etzel, Ruth <Etzel.Ruth@epa.gov>; Schroeder, Kathleen <Schroeder.Kathleen@epa.gov>
Subject: RE: Next steps - Papers for OCHP review

Here's what we have so far with who's in the office today.

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

~~~~~~

Rebecca C. Dzubow, MPH, MEM
Acting Division Director
U.S. EPA Office of Children's Health Protection | Regulatory Support and Science Policy Division
1200 Pennsylvania Avenue, NW (1107T) | Washington, DC 20460
(202) 564-0967

Sign up for EPA's Children's Health Listserv

From: Reed, Khesha
Sent: Friday, October 14, 2016 12:47 PM
To: Dzubow, Rebecca <Dzubow.Rebecca@epa.gov>; Berger, Martha <Berger.Martha@epa.gov>
Cc: Etzel, Ruth <Etzel.Ruth@epa.gov>
Subject: FW: Next steps - Papers for OCHP review

See email below and attachments. We have a lot to get done by Monday. There are a total of 7 transition papers to be reviewed. Since Rebecca is a one woman shop in RSSPD today, here are my thoughts on how we attack this task.

Ex. 5 - Deliberative Process

Sound like a plan?

Khesha
~~~~~~

From: Wiggins, Lanelle
Sent: Friday, October 14, 2016 12:04 PM
To: Reed, Khesha <Reed.Khesha@epa.gov>; Etzel, Ruth <Etzel.Ruth@epa.gov>
Cc: Allen, Reginald <Allen.Reginald@epa.gov>
Subject: Fw: Next steps - Papers for OCHP review

Hi,

Attached are the Transition Issue papers that OCHP requested to review (for which I am the POC). You have, or will soon, receive the others from the other respective POCs. Please forward your comments on these to me no later than **mid day Monday (10/17).**

Thanks,
Lanelle Wiggins
202-566-2372

From: "Reed, Khesha" <Reed.Khesha@epa.gov>
Date: October 13, 2016 at 5:25:26 PM EDT
To: "Gentile, Laura" <Gentile.Laura@epa.gov>
Subject: FW: DAA/DRA -- Call for Transition Issue Papers by Oct 4

Laura,

Apologies if you already received this email from me. Below is the list of Transition Papers that OCHP would like to review.

Thanks for your help.

Khesha Ex. 6 cell

On Oct 5, 2016, at 7:14 AM, Allen, Reginald <Allen.Reginald@epa.gov> wrote:

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Sorry for getting this to you late.

Reggie

Reginald E. Allen

Director, Administrative and Executive Services

Office of the Administrator

U.S. Environmental Protection Agency

Office 202-564-0444

Direct 202-564-1029

Cell Ex. 6

AO SharePoint Site

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Sent: Thursday, September 29, 2016 4:38 PM
To: Allen, Reginald <Allen.Reginald@epa.gov>
Cc: Reed, Khesha <Reed.Khesha@epa.gov>
Subject: FW: DAA/DRA -- Call for Transition Issue Papers by Oct 4

Hi Reggie,

Khesha and I appreciated the opportunity to review the list of transition issue papers. We would like you to ask that OCHP be added as a collaborator on the following issue papers:

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PCBs in schools

Zika

Climate Resilience

Tire Crumb

Emerging Drinking Water Contaminants

East Chicago

Flint

Would you happen to have a list of the point person for each issue paper? Given the short time frame, I'd like to call them directly, if possible.

Many thanks!

Ruth

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Date: September 29, 2016 at 9:56:19 AM EDT
To: "Reed, Khesha" <Reed.Khesha@epa.gov>
Subject: FW: DAA/DRA -- Call for Transition Issue Papers by Oct 4

As discussed

Reginald E. Allen

Director, Administrative and Executive Services

Office of the Administrator

U.S. Environmental Protection Agency

Office 202-564-0444

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Cell Ex. 6

AO SharePoint Site

From: Kenny, Shannon
Sent: Friday, September 16, 2016 12:11 PM
To: DAA-Career <DAACareer@epa.gov>; DRA <DRA@epa.gov>; Hull, George <Hull.George@epa.gov>; Richardson, RobinH <Richardson.RobinH@epa.gov>; Caraballo, Mario <Caraballo.Mario@epa.gov>

Cc: Transition Coordinators <Transition_Coordinators@epa.gov>; 2016OPTransitionTeam <2016OPTransitionTeam@epa.gov>; Grantham, Nancy <Grantham.Nancy@epa.gov>; Siciliano, CarolAnn <Siciliano.CarolAnn@epa.gov>
Subject: DAA/DRA -- Call for Transition Issue Papers by Oct 4

All,

Thank you again for all of your thoughtful input on the transition effort to date.

Our next step is to begin drafting short **issue papers** on key topics. Attached please find the list of 30 papers we ask that you develop - along with a lead office or region, and a suggested list of collaborating offices/regions, for each paper - by **October 4.** We have also included a **2-page template** we ask that you follow.

The list was developed based upon your input, input from your transition coordinators, OPA, OCIR, and OP, as well as information about the campaigns and our learning from previous landing teams.

My team will work through your Transition Coordinators to provide clear instructions for putting these draft papers into Sharepoint for review no later than October 4.

Ex. 5 - Deliberative Process

Please note that this is not a complete inventory of the briefing materials to be provided to the landing team. I will be in touch

with many of you soon to discuss what additional materials we want to work on.

Please give me a call anytime if you would like to discuss.

Shannon

<Issue Papers_All_Issues_Final.xlsx>

Message

From: Spire, Paul [PSpire@aap.org]
Sent: 5/9/2017 1:10:02 AM
To: Ahdoot, Samantha [Ex. 6]; John.Balbus@nih.gov [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=2c555339753d4bedb1a7a321779b25f6-John.Balbus@nih.gov]; Baum, Carl [carl.baum@yale.edu]; Bernstein, Aaron [Aaron.Bernstein@childrens.harvard.edu]; Bole, Aparna [Aparna.Bole@UHhospitals.org]; Campbell, Carla C [ccampbell3@utep.edu]; DeNicola, Nate [Ex. 6] Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Foos, Brenda [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=18b24f2f79414190852a748bf650d2b9-Bperkovi]; Gadhia, Ami [agadhia@aap.org]; Hindman, Diane [Ex. 6]; Landrigan, Philip [philip.landrigan@mssm.edu]; Laris, Zachary [zlaris@aap.org]; Jennifer Lowry [jlowry@cmh.edu]; Mortensen, Mary [zeo4@CDC.GOV]; Pacheco, Susan [Susan.E.Pacheco@uth.tmc.edu]; Spanier, Adam [aspanier@peds.umaryland.edu]; Trasande, Leo [leonardo.trasande@nyumc.org]; Ward, Mary [wardm@mail.nih.gov]; Woolf, Alan [alan.woolf@childrens.harvard.edu]
CC: Byron, Lori [Ex. 6] Marcus, Steven [Ex. 6]; Balk, Sophie [sbalk@montefiore.org]
Subject: COEH meeting: draft green book chapters and reviewer assignments
Attachments: 01 - Introduction - COEH review.docx; 02 - History of PEH - COEH review.docx; 03 - Unique Vulnerabilities - COEH review.docx; 17 - Water - COEH review.docx; 18 - Food Safety - COEH review.docx; 20 - Air Indoor - COEH review.docx; 28 - EMF - COEH review.docx; 31- Radiation - COEH review.docx; 32 - Lead - COEH review.docx; 46 - Birth Defects - COEH review.docx; 47 - Cancer - COEH review.docx; 59 - Antibiotics - COEH review.docx; AppB - Curricula - COEH review.docx

Dear COEH,

I am writing to convey the attached 13 draft Green Book chapters for discussion during the upcoming COEH meeting. Please note that our traditional meeting agenda pdf will be sent in another week or so, but we wanted to get these chapters to you in advance to provide more time for review.

We are planning to spend the morning of Tuesday, May 23 reviewing these chapters. As with our previous reviews, all meeting attendees (including liaisons) are encouraged to review all chapters. Those not able to attend the meeting are requested to send any comments on a given chapter to the respective primary reviewer in advance of the meeting.

Primary reviewers are asked to lead discussion of their assigned chapter(s) during the meeting, record and collate all input offered by others, and convey all comments/edits to me within 1 week after the meeting. Our goal is to spend approximately 15 minutes per chapter. The input collected/submitted by the primary reviewers will be conveyed to the original chapter authors as guidance to adjust their chapter.

The list of chapters and primary reviewer assignments are as follows:

Chapter #	Title	Primary Reviewer	Lead Author
03	Children's Unique Vulnerabilities to Environmental Hazards	Adam Spanier	Gitterman, Benjamin
App B	Curricula for Environmental Education and Environmental Health Science Education in Primary and Secondary Schools	Adam Spanier	Etzel, Ruth
31	Ionizing Radiation (Excluding Radon)	Alan Woolf	Ward, Mary
18	Food Safety	Aparna Bole	Nabavizadeh, Nicki

20	Air Pollutants, Indoor	Ari Bernstein	Etzel, Ruth
46	Birth Defects and Other Adverse Developmental Outcomes	Carl Baum	Rubin, I. Leslie
28	Electric and Magnetic Fields	Carla Campbell	Ward, Mary
17	Water	Carla Campbell	Goldman, Lynn
32	Lead	Jennifer Lowry	Hauptman, Marissa
47	Cancer	Phil Landrigan	Ward, Mary
59	Nontherapeutic Use of Antibiotics in Animal Agriculture	Samantha Ahdoot	Wallinga, David
01	Introduction	Susan Pacheco	Etzel, Ruth
02	History and Growth of Pediatric Environmental Health	Susan Pacheco	Etzel, Ruth

(Note: Leo has not been included in the "Primary Reviewer" assignments above as I don't yet know if he will be attending and, unfortunately, we won't have dial-in capability. If Leo is able to attend, we may have more chapters incoming.)

Many thanks,

Paul

Message

From: Belle, Kara [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8DB65B54E54847DDB75D5AA71387AEBE-BELLE, KARA]
Sent: 10/17/2016 3:19:03 PM
To: Berger, Martha [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=58f5ef445e4d4dc694a2d4fb35951b9a-Mberger]; Reed, Khesha [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=c62327cee1fd4da29a1cc485efe546f7-Reed, Khesha]; Dzubow, Rebecca [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=403ca1721f3d43d38de9189a93a95b76-Dzubow, Rebecca]; Schroeder, Kathleen [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=0db676b2fade4b54bebcc7b6e664fc94-Schroeder,]
CC: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]
Subject: RE: Next steps - Papers for OCHP review
Attachments: PCBs Schools Transition Paper_4 October 2016 -KB dan.docx

Hi Khesha and Martha,

I included my comments into the document.

Let me know if they have additional questions concerning my comments.

Thanks

Kara Belle
Office of Children's Health Protection
U.S. Environmental Protection Agency
(202)564-3284

From: Berger, Martha
Sent: Friday, October 14, 2016 3:48 PM
To: Reed, Khesha <Reed.Khesha@epa.gov>; Dzubow, Rebecca <Dzubow.Rebecca@epa.gov>; Schroeder, Kathleen <Schroeder.Kathleen@epa.gov>
Cc: Etzel, Ruth <Etzel.Ruth@epa.gov>; Belle, Kara <Belle.Kara@epa.gov>
Subject: RE: Next steps - Papers for OCHP review

Re: having kara check the pcb's in schools paper

I missed this note earlier, Khesha (it's my flex day) and Kara is reviewing a lengthy ATSDR document and likely done for the day, so can this wait til Monday?

Martha

Martha Berger
Acting Director,
Program Implementation and Coordination Division
Office of Children's Health Protection
US Environmental Protection Agency
202/564-2191 or Ex. 6

From: Reed, Khesha
Sent: Friday, October 14, 2016 3:42 PM
To: Dzubow, Rebecca <Dzubow.Rebecca@epa.gov>; Schroeder, Kathleen <Schroeder.Kathleen@epa.gov>
Cc: Berger, Martha <Berger.Martha@epa.gov>; Etzel, Ruth <Etzel.Ruth@epa.gov>
Subject: RE: Next steps - Papers for OCHP review

Thanks Rebecca and Kathy. Four down, three to go.

From: Dzubow, Rebecca
Sent: Friday, October 14, 2016 3:38 PM
To: Reed, Khesha <Reed.Khesha@epa.gov>; Berger, Martha <Berger.Martha@epa.gov>
Cc: Etzel, Ruth <Etzel.Ruth@epa.gov>; Schroeder, Kathleen <Schroeder.Kathleen@epa.gov>
Subject: RE: Next steps - Papers for OCHP review

Here's what we have so far with who's in the office today.

Ex. 5 - Deliberative Process

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Rebecca C. Dzubow, MPH, MEM
Acting Division Director
U.S. EPA Office of Children's Health Protection | Regulatory Support and Science Policy Division
1200 Pennsylvania Avenue, NW (1107T) | Washington, DC 20460
(202) 564-0967

Sign up for EPA's Children's Health Listserv
~~~~~~

From: Reed, Khesha
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To: Dzubow, Rebecca <Dzubow.Rebecca@epa.gov>; Berger, Martha <Berger.Martha@epa.gov>
Cc: Etzel, Ruth <Etzel.Ruth@epa.gov>
Subject: FW: Next steps - Papers for OCHP review

See email below and attachments. We have a lot to get done by Monday. There are a total of 7 transition papers to be reviewed. Since Rebecca is a one woman shop in RSSPD today, here are my thoughts on how we attack this task.

Ex. 5 - Deliberative Process

Sound like a plan?

Khesha

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<Issue Papers_All_Issues_Final.xlsx>

Message

From: Peter van den Hazel [pvdhazel@upcmail.nl]
Sent: 9/7/2016 8:00:03 PM
To: inches@inchesnetwork.net
Subject: presenters INCHES Conference
Attachments: layout porgramme INCHES Conference programme 5 september.doc

Dear presenters of an oral presentation,

You may check the attached programme for the location and time of your presentation.
Presentation instructions:

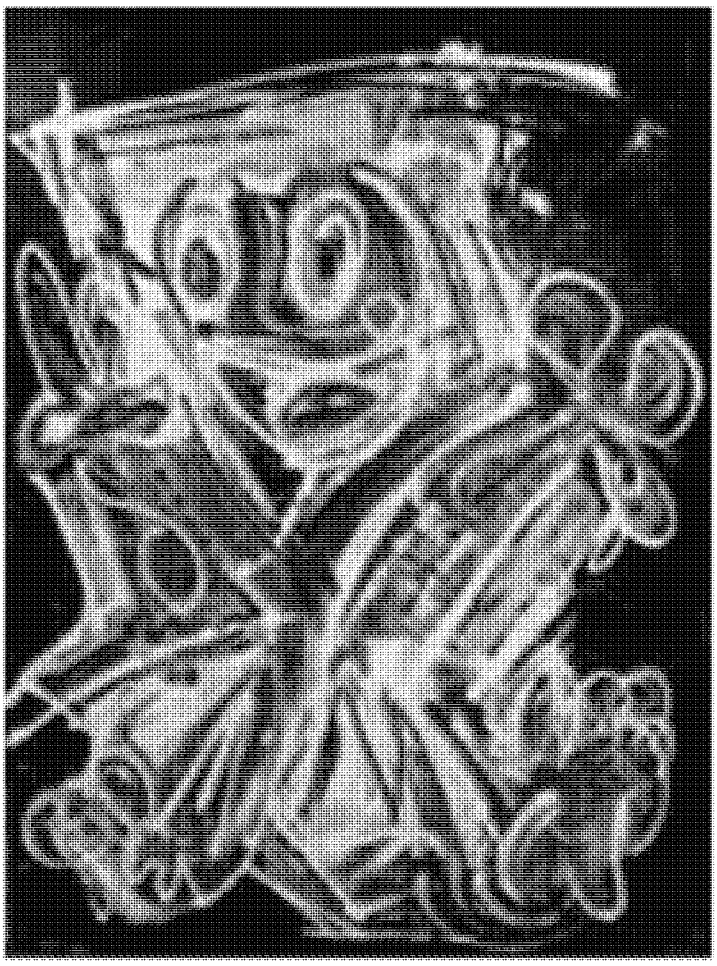
• The authors should bring their PowerPoint presentation and upload this presentation in the room of the session as early as possible. You may use the time of a break for that. You may also send us your presentation in advance and we will upload it to the computer.

• The authors will have 15 min for presentation. That will include 3 minutes of discussion.

We thank you for your cooperation and look forward to meet you next week in Barcelona.

warm regards,

Joan Grimalt
Peter van den Hazel
Organising committee



8th INTERNATIONAL CONFERENCE ON CHILDREN'S HEALTH AND THE ENVIRONMENT

14th – 16th of September 2016

Location: Parc de Recerca Biomèdica de Barcelona - PRBB
Doctor Aiguader, 88 (at CREAL), Barcelona

ED_001703B_00002752_0_e2353c60-41f8-9e0d-4f6e-8d9d72b81744

Children and all humans are under the influence of multiple environmental stressors. However, children are not little adults. Their organs and metabolism are under formation and their capacity to face pollutant stress is different. Exposure to deleterious compounds already starts in the preconceptional and fetal stage. In the first years of life children are affected by exposure to toxic chemical products present in air, water, soil, domestic dust, toys, clothes, furniture and diet. The nature of pollution is changing. In rapidly developing countries. Urbanization, climate change, increasing motor vehicle use and the wide spread of toxic chemicals use, pesticides and polluting industries, levels of ambient and indoor biomass air pollution and soil pollution are increasing sharply the exposure for the most vulnerable. Moreover, some polluting agents are incorporated together with nutrients in the same ingestion processes, e.g. during breastfeeding. Some food items such as fish, the main source of omega 3 fatty acids, also carry pollutants such as organochlorine compounds and methylmercury. Health effects of these toxic compounds may not be noticed directly or shortly after exposure. Damage in growing organisms may result in delayed disorders later in life, e.g. during adolescence, reproductive period or maturity. The effects of pollutants on children's health also depend on individual susceptibility. Full understanding of health impacts requires studies integrating gene-environment interactions. The details will provide more and more proof that we need to protect children.

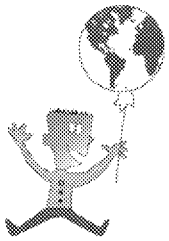
Many topics are addressed in the 8th International Conference on Children's Environment and Health, which is organized by the International Network on Children's Health, Environment and Safety (INCHES) and the Institute of Environmental Assessment and Water Research (IDAEA) and Spanish Council for Scientific Research (CSIC). The meeting provides an international forum for the latest research findings in children's environmental health. Specific attention is devoted to identify opportunities to minimize childhood prenatal and postnatal exposure to environmental contaminants, to provide insight in the field of science and policy interface and to develop a greater awareness among health professionals about children's health.

The objectives of the conference

· Provide an international forum for the latest research findings in children's environmental health;
· Define the relationship between environmental contaminants and children's health;
· Strengthen the importance of prenatal exposure to environmental factors on pregnancy outcome and children's health;
· Identify opportunities to minimize childhood prenatal and postnatal exposure to environmental contaminants;
· Provide insight in the activities in the field of science and policy interface;
· Build a platform of knowledge at an international level;
· Develop a greater awareness among health professionals about children's health, environment and safety;
· Initiate future directions and international collaborations in research in the field of children's environmental health.

The Scientific Program

The scientific program of the 8th INCHES Conference includes about 140 lectures, short oral presentations and posters presented by scientists from 34 countries covering a broad spectrum of topics. Abstracts of these presentations appear in this issue of the journal.
The topics are related to: Health effects of pollutants in children (pesticides, heavy metals, air pollution, tobacco) prenatal exposures, reproductive health, cancer, obesity, biomonitoring, Children Environmental Health Centres and Specialty Units, children's environmental rights, climate change, sustainable development, e-waste, radiology, safety and injury prevention, training for pediatricians and health policy regarding Children Environmental Health.



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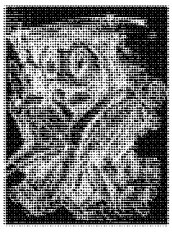
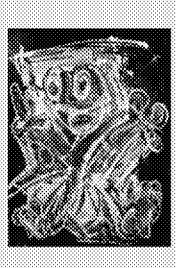
Doctor Aiguader, 88 (at CREAL), Barcelona



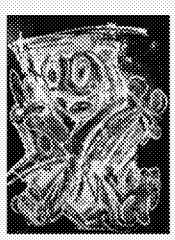
Wednesday 14th of September 2016

9:00-9:20 **Opening Session**	**Welcome and announcements** Joan Grimalt (chair organising committee) Peter van den Hazel (chair board INCHES) Mark Nieuwenhuijsen (host organization ISGLOBAL)	
09.20-10.45	**Session 1 (Auditorium) Environmental Determinants of Child Health** Chair: Stephan Bose-O'Reilly (Germany) and Mark Nieuwenhuijsen (Spain) Brainy approaches to children's environmental health – Philippe Grandjean (Denmark) Environmental Pollution and Children's Health – Phil Landrigan (USA) Pollution: the biggest killer on the planet. A summary of the upcoming Lancet report - Rich Fuller (USA) Environmental Health Issues for Spain – Joan Grimalt (Spain)	
10.45- 11.10	**Opening Ceremony (Auditorium)** Peter van den Hazel – INCHES President Joan Grimalt, chair Organising Committee **Opening speech: ms. Gemma Tarafa,** Commissioner of Health, City Hall of Barcelona	
11.10 -11.30	**Break**	
11.30-13.00	**Session 2 (Auditorium) Epidemiological longitudinal studies of child health and environment** – **birth cohorts- child cohorts** Chair: Ruth Etzel (USA) and Isabella Annesi-Maesano (France) Ambient air pollution and onset of asthma in birth cohorts. The rise and fall of evidence - Achim Heinrich (Germany) Current findings on maternal gut microbiome and PCBs concentration in birth cohort study with omics analysis: Chiba Study of Mother and Children's Health (C-MACH) - Chisato Mori (Japan) Preventing Exposure to Environmental Hazards -- Role of Primordial Prevention - Ruth Etzel (USA) Association between breastfeeding duration and cognitive development, autistic traits and ADHD symptoms: a multicenter study in Spain - Jordi Julvez (Spain) Maternal exposure to particulate matter and birth weight in Dutch children - Margot van de Bor (Netherlands) Birth Cohort Consortium of Asia (BiCCA) on Children's Environmental Health – Pau-Chung Chen (Taiwan)	**Session 3 (Darwin) Child labour** and other topics Chair: Stephan Boese- O'Reilly (Germany) and Rich Fuller (Pure earth / Blacksmith. Environmental justice) Poor education, poor job, poor health. Hanns Moshammer (Austria) Occupational injuries among child labourers: results from a cross-sectional study in Peru - Tobias Weinmann (Germany) Minamata Convention on mercury and vulnerable population - Yuyun Ismawati (Indonesia) TiPP TAPP - first steps into life – Claudia Gerken Childless , Workless, Worthless - Jürgen Bilger (Germany) Dietary Environment in Preventing Allergic Airway Diseases - H Paramesh (India) 
13.00-14.00	**Lunch** **Seminar/discussion session on ° Communicating Radiation Risks in Paediatric Imaging** organised and presenterd by Maria Perez (WHO) and Donald Frush (USA), starts at 13.15 hrs	

14.00-15.30	**Key note presentation:** Dr. Maria Neira (WHO, Switzerland) –CEH an dopportunities for action under SDG era **Session 4 (Auditorium) Developing countries and CEH: examples of action on emerging issues by WHO and partners** Chair: Marie Noel Brune Drisse (WHO, Switzerland) WHO's work on early life exposures and future health –prevention for future generation - Emiko Todaka (WHO) Radiation imaging communication in paediatric: situation in developing countries and focus on action - Donald Frush (USA) E-waste and child health WHO global initiative -Marie-Noel Bruné (WHO, Switzerland) Air pollution and CEH action in Brazil - Emerson da Silva (Brazil)	
15.30- 15.45	**Break**	
15.45 -16.30	**Poster pitch session A (Auditorium)** **Chairs:** Peter van den Hazel (Netherlands) and Merce Gari (Spain) Prenatal exposure to environmental chemicals: associations with neurotransmitter levels in cord blood - *Margot van de Bor* Cognitive effects after low - to moderate dose exposure: study plan in a cohort of childhood cancer survivors - *Elisa Pasqual* Children exposure to phthalates and bisphenol A in LIFE PERSUADED project: preliminary results on biomonitoring and case-control studies - *Cinzia La Rocca* Mercury concentrations in commercial seafood from the western Mediterranean Sea - *Rosa Maria Llull Cantallops* A review on managing and treating mercury emissions in small artisanal gold mining - *Tara Rava Zolnikov* Acotinine, cadmium and pahs levels in children's urine as a result of environmental tobacco smoke exposure in two spanish locations - *Helena Garcia* Autistic Symptoms Associated with Childhood Lead Poisoning - *Wan Nedra Komaruddin* Organohalogenated pollutants in Argentinean postpartum women living in Salta and Ushuaia - *Natalia Bravo* Considerations for policies design aimed to promote drinking water consumption in Mexican children and adolescents: Santa Fe, CDMX - *Arely Vergara-Castañeda* Prenatal early exposure to the environmental endocrine disruptors - *Joaquim Rovira*	**Poster pitch session B (Darwin)** **Chairs:** Stephan Boese-O'Reilly (Germany) and Barend van Drooge (Spain) School children exposure to particulate matter (coarse, fine, and quasi-ultrafine) around petrochemical complex. Respiratory tract dosimetry - *Joaquim Rovira* Noise prevention in kindergarten - *Takacs Katharina* Effect of diet on allergies among preschool children - *Sandra Andrusaityte* Smoking cessation consultation in pediatrics - *Miguel Felipe Sánchez Sauco* Pilot phase of TNG STUDY - *Pavel Piler* Health and safety predictors of parental attitudes towards children's school travel - *Jacques Bergeron* School environmental health: the first steps towards environmental health - *Miguel Felipe Sánchez Sauco* When parents NGOs, environmental NGOs and experts join forces to impulse actions to protect children's environmental health - *Catherine Bouland* Hazards and Risks in the Glyphosate Debate - *Karl Ernst v. Mühlendahl*
16.30 -18.00	**Session 5 (Auditorium) Toxic Metals Intoxication** Chair: Hanke Wojciech (Poland) and Mahmood Khwaja (Pakistan) High Risk for Neural Tube Defects from Arsenic in Drinking Water and Rice in Asia - Yona Amitai (Israel) Lead intoxicated children in Kabwe/ Zambia – Stephan Boese- O'Reilly (Germany) Children and ASGM in West Sumbawa Regency, Indonesia - Children and ASGM in West Sumbawa Regency, Indonesia - Baiq	**Session 6 (Darwin) Burden of disease** Chair: Peter van den Hazel (Netherlands) and Kinga Polanska (Poland) What is Environmental Burden of Disease? An animated video gives an answer - MyriamTobollik (Germany) Children's environmental burden of disease: Review of key findings - Nadine Steckling (Germany) Quantifying the burden of disease due to environmental risk factors in children and adolescents in Germany: the UKAGEP project -

	Dewi Krisnayanti (Indonesia) Low level arsenic exposure during pregnancy in the 3xG cohort in Flanders: less efficient detoxification is associated with higher oxidative stress – Nathalie Lambrechts (Belgium) Prenatal mercury exposure and fetal development and birth outcomes: results from INMA cohort – Ferran Ballester (Spain) Lead in soil; how can we reduce exposure to young children – Martin Eggens (Netherlands) Blood lead concentrations from children practicing airgun shooting - Rudolf Schierl (Germany)	Myriam Tobollik (Germany) The burden of infectious diseases on congenital malformations: the case of Zika virus and microcephalia in Brazil – Roberto Ronchetti (Italy)
20.00	**Conference Dinner**	
Thursday 15h of September 2016		
8.45 – 10.00	**Session 7 (Auditorium) Pollutants at schools and homes** Chair: Achim Heinrich (Germany) and Rudolf Schierl (Germany) Indoor air and children's health, SINPHONIE and SEARCH projects – Eva Csobod (Hungary) Engaging schoolchildren in understanding the indoor environment using citizen science - Núria Castell (Norway) Polycyclic aromatic hydrocarbons from traffic exhausts in primary schools and cognitive development of children – Barend van Drooge (Spain) Multi residue and non-target screening for characterization of organic chemicals in indoor dust – Garry Codling (Czech republic) Assessment of Indoor Air Quality in Air - Conditioned and Naturally ventilated Schools in Delhi - Pratima Singh (India)	**Session 8 (Darwin) Biomonitoring and Spatial Analysis** Chair: Hanns Moshammer (Austria) and Merce Gari (Spain) Early-life exposure to multiple environmental contaminants and birth weight: pooled analysis in four Flemish birth cohorts - Eva Govarts (Belgium) Nasal epithelial lesions and scalp hair as bio-indicators of cumulative air and water pollution health effects - Polyxeni Nicolopoulou Stamati (Greece) Spatial Pattern Analysis of Hepatitis A Cases in Children by using Geostatistical Analysis of GIS in Turkey - Ahmet Ozgur Dogru (Turkey) Prenatal exposure assessment approaches need to consider spatio-temporal variation of air pollution - Andrea Ranzi (Italy) Spatial clustering of childhood leukemia in the Region of Murcia, Spain (1998-2010) - Alberto Cárceles Álvarez (Spain)
10.00 -10.30	**Poster pitch session C (Auditorium)** Chair: Ruth Etzel (USA) and Yona Amitai (Israel) Mobile phone and other digital technology use in UK adolescents: The SCAMP Cohort - *Pippa Douglas* Quality of life of childhood brain tumor survivors: intervention, analysis and results - *Alberto Cárceles Álvarez* Transgenerational effects of treatment with antiepileptics in pregnancy: behavioural and molecular markers in a mouse study - *Gemma Calamandrei* Forests for health with the environmental midwife - *Lizbeth Álvarez Gómez* Modifiable factors related to low water intake in Mexican children and adolescents - *María de los Angeles Peña Farfán*	**Poster pitch session D (Darwin)** Chair: Jamie Pearce (UK) and David Bellinger (USA) Occupational noise exposure during pregnancy - new aspects in childs language acquisition - *Soile Jungewelter* Factors influencing breastfeeding initiation - *Lizbeth Álvarez Gómez* Neuropsychological profile of an adopted patient with Fetal Alcohol Spectrum Disorder - *Esther Tobarra Sánchez* Environmental screening on girls with early puberty disorders - *Ferran Campillo i López* Where physical environment is the major culprit: Mapping child health determinants against health-related policies and programs in an East African pastoralist community - *Lioul Berhanu Alemie* Mismatch of classroom furniture and student body dimensions in schools of Delhi - *Dr. Meghna*

10.30- 10.45	Break	
10.45 -12.00	**Session 9 (Auditorium) Cognitive development of children in relations to environmental exposures** Chair: Yona Amitai (Israel) and Phil Landrigan (USA) The impact on chemical pollution into child development from in utero to adolescence - Jordi Sunyer (Spain) Maternal lifestyle during pregnancy and child neurodevelopment - Kinga Polanska (Poland) Lifelong Exposure to Green Space and Attentional Development: A Prospective Birth Cohort Study - Payam Dadvand (Spain) The role of local natural space in children's social, emotional and behavioural development in Scotland: a longitudinal study – Jamie Pearce (United Kingdom) Prenatal exposure to outdoor airborne trace elements and cognitive and psychomotor development during childhood in four European birth cohorts - Malgorzata Joanna Lubczynska (Poland)	
12.00 -13.15	**Session 10 (Auditorium) Endocrine disruptors and epigenetics** Chair: Dr Emiko Todaka (WHO, Europe) and prof. Chisato Mori (Japan) Temporal trends of organochlorine compounds and PBDEs from utero until 4 years of age in the Asturias INMA cohort - Mercè Garí (Spain) Early life exposure to organochlorine pesticides and behavioral development in children – Margot van de Bor (Netherlands) Endocrine Disrupting Chemicals (EDCs) and children's daily exposure: Physicians, scientists, NGOs and media - working together for a better policy and more protection - Johanna Hausmann (Germany) Persistent Organic Pollutants in women's breast milk and proximity to Municipal Waste Incinerators in the UK - Phillipa Douglas (United Kingdom)	**Session 11 (Darwin) Environmental Pediatrics for Pediatric residents** Chair: Ruth Etzel (USA) and Donald Frush (USA) CEH training in Brazil - Emerson Da Silva (Brazil) Strategies for Use of medical Imaging and Radiation Risk: What the Care Provider Should Know - Donald Frush (USA) Autism Spectrum Diseases, including Asperger Syndrome. Fairy Tales and Facts about Environment and Genetics - Karl Ernst von Mühlendahl (Germany) Environmental consulting nursing : health from the beginning - Miguel Felipe Sanchez Sauco (Spain) Empowering Youth and Communities to promote health and environment- The Bangalore Experience - Elizabeth Cherian Paramesh (india)
13.15-14.15	Lunch	
14.15-15.30	**Session 12 (Auditorium) Asthma and Respiratory Diseases** Chair: Hanns Moshammer (Austria) and Martin Eggens (Netherlands) An unexpected epidemic of respiratory distress. Hanns Moshammer (Austria) Changing kindergarten practices with localized real-time information on outdoor air: The experience of CITI-SENSE project in Oslo, Norway - Núria Castell (Norway) Impact of air pollution to oxidative damage in newborns and mothers – Katerina Honkova for Radim Sram (Czech republic) Lung function growth trajectories in children in relation to prenatal exposure to particulate matter - Cracow cohort study - Renata Majewska (Poland) Rapid Urbanisation and changing Prevalance of Chronic Cough in children – H. Paramesh (India)	**Session 13 (Darwin) Environment and childhood cancer** Chair: Juan Antonio Ortega (Spain) and Elisa Pasqual (Spain) Environment and childhood cancer survivors: PLASECAP MUR - Alberto Cárceles Álvarez (Spain) How can the increase in childhood cancer be explained? The role of transplacental and ctransgenerational carcinogenesis– Ernesto Burgio (Italy) Health related quality of life of survivors of childhood extracranial neoplasms - Mayra Alejandra Orozco Llamas (Spain) presented by Alberto Cárceles Álvarez (Spain) Descriptive analysis from a hospital based childhood cancer survivors cohort: report from the project Spain-CCSS - Elisa Pasqual (Spain) Secondhand tobacco smoke and survival in children with acute lymphoblastic leukemias in the region of Murcia (SPAIN) - Alberto Cárceles Álvarez (Spain)

		Spatial clustering of childhood leukemia in the Region of Murcia, Spain (1998-2010) - Alberto Cárceles Álvarez (Spain)
15.30 -15.45	Break	
15.45 -16.30	**Poster pitch session E (Auditorium)** Chair: Joan O. Grimalt (Spain) and Joaquim Rovira (Spain) Particulate matter characterisation in the schools located around petrochemical industrial complex. Infiltration of particle from outdoor to indoor air - *Joaquim Rovira* Personal exposure to PM2.5 and benzo[a]pyrene in Ostrava, Czech Republic - *Katka Honkova* AIDS orphans in Sub-Saharan Africa: A systematic review on differences between rural and urban environments - *Tara Rava Zolnikov* Training modules for paediatricians - Health effects of climate change - *Colin O'Reilly* Reality of children's new environment and future policy needs - *Marija Jevtić* Study of childhood illness for the period 2009 - 2011 , meeting the city . Sofia and Pleven with a view to effective health promotion - *P. Karadzhova* Promoting Health: Recommendations of food consumption as a tool to minimize exposure of pollutants to the children's population - *Rosa Maria Llull Cantallops* Lead and mercury exposure are associated with low resting heart rate in community children - *Jianghong Liu* Mapping child health against health related policies and programs in East African pastoralist communities - *Lioul Berhanu Alemie* Exposure to arsenic and mercury: associated pregnancy outcomes, and early infant developmental outcomes in gold mining areas in Tanzania - *Elias Charles Nyanza* Potential Environmental Hazards on Child Health in a Prospective Mining Area in North Sumatra, Indonesia - *Levina Khoe*	**Poster pitch session F (Darwin)** Chair: Johanna Hausmann (Germnay) and Eva Junque (Spain) Birth weight in relation to cord blood levels of selected elements in Slovenian mother-child pairs - *Marta Jagodic* Birth and Growth without OH: Detection and follow up from pregnancy until the end of adolescence of children at risk of neurobehavioral disorders through exposure of alcohol and illegal drugs - *Maria Luisa Azurmendi* The mercury pollution and child birth defects - *Unursaikham Surenyah* Prenatal exposure to particulate matter and the occurrence of wheezing in chest in children - *Agnieszka Pac* The role of trace elements, antioxidants and oxidative stress in very low birth weight infants - *Beatrice Bocca* The PERSIAN birth cohort; A Work in Progress- *Payam Dadvand* Psychosocial stress and obesity in Kaunas children - *Regina Grazuleviciene* Lifestyles of survivors of childhood hematologic neoplasms - *Mayra Alejandra Orozco Llamas* Air pollutants exposure and functional repair activity in placenta - *Nurulshyha Md Yatim* The role of perinatal essential fatty acids in attention deficit and hyperactivity disorder symptoms and cognitive functions - *Mónica López-Vicente* Maternal Environmental Exposure to Organochlorine Pesticides and its Effects on Birth weight - *Madhu Anand* 
16.30 -18.00	**Session 14 (Auditorium) Exposome research in children** Chair: Mark Nieuwenhuijsen (Spain) and Denis Sarigiannis (Greece) Human biomonitoring data analysis for metals in an Italian adolescents cohort: an exposome approach – Alberto Gotti (Italy) Assessing the impact of hazardous waste on children's health: the exposome paradigm – Denis Sarigiannis (Greece) Quantitative profiling of metabolic markers to assess dietary and microbiota related exposure factors - Zdenek Spacil (Czech republic) Persistent pollutants in food items from Menorca Island - Eva Junqué (Spain)	**Session 15 (Darwin) Open session/ miscellaneous** Chair: Payam Dadvand (Spain) and Krystalia Papadaki (Greece) Heallh effects of consuming desalinated Sea water - implications for children - Yona Amitai (Israel) Maternal cell phone use during pregnancy and child behavior problems in five birth cohorts – Laura Birks (Spain) Determining the impact of smoking point of sale legislation among youth (Display) study: new findings from Scotland – Jamie Pearce (UK) Impact of prenatal exposure to environmental pollutants on autism spectrum disorder: A case report - Esther Tobarra Sánchez (Spain) BORN WITHOUT OH: an innovating model for preventing and managing the neurodevelopmental

	Prenatal exposure to perfluoroalkyl substances and cardio-metabolic risk components during early childhood - Cyntia B. Manzano-Salgado (Spain)	disorders caused by alcohol and drug prenatal exposure in a Mediterranean region - María Luisa Azurmendi Funes (Spain) Alcohol and tobacco products access to minors in Georgia - George Bakhturidze (Georgia)
Friday 16th of September 2016		
8.45-10.15	**Session 16 (Auditorium) Children's environmental health policy topics** Chair: David Bellinger (USA) and Karl Ernst von Mühlendahl (Germany) Minamata Convention on mercury vulnerable population – Mahmood Khwaja (Pakistan) Children's environmental right - Jonas Schubert (Germany) Environment exposure and neuro-development in MOCEH – Mina Ha (Korea) Improved Relationships in Eastern Kenya From Water Interventions and Access to Water - Tara Rava Zolnikov (USA) Relations between the exposure of factory air polution with asthma impacted in children who live in shelter Around the district of industrial area in Jakarta, Indonesia Trial District In Jakarta Indonesia - Wan Nedra Komaruddin (Indonesia)	
10.15 -10.30	Break	
10.30 -12.00	**Session 17 (Auditorium) Children's Health and the environment in the Mediterranean** Chair: Denis Sarigiannis (Greece) and Gemma Calamandrei (Italy) The NAC-II birth cohort in Friuli Venezia Giulia Region: prenatal and childhood exposure to metals and neuropsychological maturation at 7 years – Gemma Calamandrei (Italy) Internal dosimetry metrics for risk assessment of endocrine disruptors – the case of bisphenol A – Denis Sarigiannis (Greece) Urine total arsenic and arsenic species in children from Northern Italy – Beatrice Bocca (Italy) Neurodevelopment, low level mercury exposure and genetic polymorphisms in birth cohort from Slovenia and Croatia - Janja Snoj Tratnik (Slovenia) Children exposure to PAH and potential carcinogenic risk assessment from biomass burning incorporating internal dosimetry metrics – Spyros Karakitsios (Greece) Influence of gestational weight gain on the transfer of organochlorine pollutants into infants – Joan Grimalt (Spain)	
12.00 -13.15	**Session 18 (Auditorium) Final session** Chair: Wojtek Hanke (Poland) and Stephan Boese-O'Reilly (Germany) Protecting children's health from environmental harm - the perspective of WHO Regional Office for Europe – Dorota Jarosinska (WHO, Europe) INMA overview - Jordi Sunyer (Spain) Societal burden of children's exposures to neurotoxicants - David Bellinger (USA) Thinking of the relationship between children's health and the environment as a rights issue - The UN Committee on the Rights of the Child Day of General Discussion on Children's Rights and the Environment on 23 September 2016 - Jonas Schubert (Germany)	
13.15 -13.30	**Closing Ceremony: The Barcelona Declaration on Children Environmental Health**	

The International Network on Children's Health, Environment and Safety (INCHES) (http://www.inchesnetwork.net) was founded at a workshop meeting before the 1st International Conference on Children's Environmental Health, August 1998 in Amsterdam, the Netherlands, where WHO, European Environmental Agency (EEA) US Environmental Protection Agency (EPA) and other organisations had an active participation, stressing the growing importance of CEH as a global health issue. The WHO and INCHES have been active partners the last 16 years.

The Organisation: International Network on Children's Health, Environment and Safety (INCHES)

The International Network on children's Health, Environment and Safety (INCHES) is a global network with the following goals:

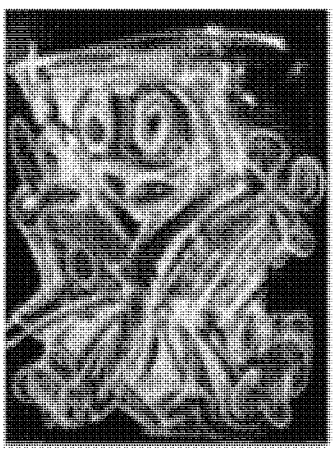
1) increase understanding of and accord on how environmental factors influence child health;
2) create a global dissemination of research and information on children's environmental health;
3) educate and facilitate information exchange on the best practices and policies in children's

environmental health;

4) identify information gaps and stimulate to new research; and
5) advocate for children's environmental health in the intergovernmental arena.

Some highlights of INCHES activities since its formation in 1998 include:

- There are now about 150 organizational members, some of which are well structured, established and active as national NGOs interested in an intensified international cooperation.
- More than 30,000 individual members (most of them health professionals) within these member organizations.
- Strong contacts in several countries where national children's environmental health networks have been founded or under creation.
- Excellent international contact in the field of children, environment and health in the intergovernmental, governmental and NGO circles.
- Some official contacts in the field (relations with WHO, EEA, membership in European Health and Environment Alliance network, International Society of Doctors for the Environment).
- Several members in the medical scientific community covering most aspects of environmental health able and ready to give foundation to the content of INCHES' work.
- Training programs in cooperation with several universities in some countries have been conducted as a project.
- INCHES initiated several projects funded by the European Union.
- INCHES organized or co-organized several conferences on children's environmental health the last two decades.
- INCHES collaborates with similar networks in North America: Children's Environmental Health Network, International Society for Children's Health and the Environment and the Canadian Institute of Child Health.



Message

From: Dzubow, Rebecca [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=403CA1721F3D43D38DE9189A93A95B76-DZUBOW, REBECCA]
Sent: 10/17/2016 3:17:04 PM
To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Berger, Martha [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=58f5ef445e4d4dc694a2d4fb35951b9a-Mberger]
CC: Reed, Khesha [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=c62327cee1fd4da29a1cc485efe546f7-Reed, Khesha]; Miller, Gregory [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=0e889cdc40224a5484182092e4824fa7-GMille03]; Mehta, Suril [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=70a0bd6e57724484aacb0e03149b548d-Mehta, Suril]
Subject: RE: Next steps - Papers for OCHP review
Attachments: TSCA Issue Paper_4 October 2016 -dan OCHP edit.docx

Ruth,

I think this is the remainder. Let me know if you have questions.

Ex. 5 - Deliberative Process

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From: Dzubow, Rebecca
Sent: Friday, October 14, 2016 3:38 PM
To: Reed, Khesha <Reed.Khesha@epa.gov>; Berger, Martha <Berger.Martha@epa.gov>
Cc: Etzel, Ruth <Etzel.Ruth@epa.gov>; Schroeder, Kathleen <Schroeder.Kathleen@epa.gov>
Subject: RE: Next steps - Papers for OCHP review

Here's what we have so far with who's in the office today.

Ex. 5 - Deliberative Process

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Rebecca C. Dzubow, MPH, MEM
Acting Division Director
U.S. EPA Office of Children's Health Protection | Regulatory Support and Science Policy Division
1200 Pennsylvania Avenue, NW (1107T) | Washington, DC 20460
(202) 564-0967

Sign up for EPA's Children's Health Listserv

From: Reed, Khesha
Sent: Friday, October 14, 2016 12:47 PM
To: Dzubow, Rebecca <Dzubow.Rebecca@epa.gov>; Berger, Martha <Berger.Martha@epa.gov>
Cc: Etzel, Ruth <Etzel.Ruth@epa.gov>
Subject: FW: Next steps - Papers for OCHP review

See email below and attachments. We have a lot to get done by Monday. There are a total of 7 transition papers to be reviewed. Since Rebecca is a one woman shop in RSSPD today, here are my thoughts on how we attack this task.
~~~~~~

Ex. 5 - Deliberative Process

Sound like a plan?

Khesha

From: Wiggins, Lanelle
Sent: Friday, October 14, 2016 12:04 PM
To: Reed, Khesha <Reed.Khesha@epa.gov>; Etzel, Ruth <Etzel.Ruth@epa.gov>
Cc: Allen, Reginald <Allen.Reginald@epa.gov>
Subject: Fw: Next steps - Papers for OCHP review

Hi,

Attached are the Transition Issue papers that OCHP requested to review (for which I am the POC). You have, or will soon, receive the others from the other respective POCs. Please forward your comments on these to me no later than **mid day Monday (10/17).**

Thanks,
Lanelle Wiggins
202-566-2372

From: "Reed, Khesha" <Reed.Khesha@epa.gov>
Date: October 13, 2016 at 5:25:26 PM EDT
To: "Gentile, Laura" <Gentile.Laura@epa.gov>
Subject: FW: DAA/DRA -- Call for Transition Issue Papers by Oct 4

Laura,

Apologies if you already received this email from me. Below is the list of Transition Papers that OCHP would like to review.

Thanks for your help.

Khesha Ex. 6 **cell**

On Oct 5, 2016, at 7:14 AM, Allen, Reginald <Allen.Reginald@epa.gov> wrote:

Here is the excel sheet with all the papers – sorry to say that most were due in yesterday.

I am checking the OP Transition POCs to determine the best wayahead to allow OCHP input.

In the mean time you or Khesha can reach out to the POC and check and maybe work it that but in any case it would have to a quick turn.

Sorry for getting this to you late.

Reggie

Reginald E. Allen

Director, Administrative and Executive Services

Office of the Administrator

U.S. Environmental Protection Agency

Office 202-564-0444

Direct 202-564-1029

Cell Ex. 6

AO SharePoint Site

From: Etzel, Ruth
Sent: Thursday, September 29, 2016 4:38 PM
To: Allen, Reginald <Allen.Reginald@epa.gov>
Cc: Reed, Khesha <Reed.Khesha@epa.gov>
Subject: FW: DAA/DRA -- Call for Transition Issue Papers by Oct 4

Hi Reggie,

Khesha and I appreciated the opportunity to review the list of transition issue papers. We would like you to ask that OCHP be added as a collaborator on the following issue papers:

Chlorpyrifos & Glyphosate

Lead

New TSCA

PCBs in schools

Zika

Climate Resilience

Tire Crumb

Emerging Drinking Water Contaminants

East Chicago

Flint

Would you happen to have a list of the point person for each issue paper? Given the short time frame, I'd like to call them directly, if possible.

Many thanks!

Ruth

From: "Allen, Reginald" <Allen.Reginald@epa.gov>
Date: September 29, 2016 at 9:56:19 AM EDT
To: "Reed, Khesha" <Reed.Khesha@epa.gov>
Subject: FW: DAA/DRA -- Call for Transition Issue Papers by Oct 4

As discussed

Reginald E. Allen

Director, Administrative and Executive Services

Office of the Administrator

U.S. Environmental Protection Agency

Office 202-564-0444

Direct 202-564-1029

Cell Ex. 6

AO SharePoint Site

From: Kenny, Shannon
Sent: Friday, September 16, 2016 12:11 PM
To: DAA-Career <DAACareer@epa.gov>; DRA <DRA@epa.gov>; Hull, George <Hull.George@epa.gov>; Richardson, RobinH <Richardson.RobinH@epa.gov>; Caraballo, Mario <Caraballo.Mario@epa.gov>
Cc: Transition Coordinators <Transition_Coordinators@epa.gov>; 2016OPTransitionTeam <2016OPTransitionTeam@epa.gov>; Grantham, Nancy <Grantham.Nancy@epa.gov>; Siciliano, CarolAnn <Siciliano.CarolAnn@epa.gov>
Subject: DAA/DRA -- Call for Transition Issue Papers by Oct 4

All,

Thank you again for all of your thoughtful input on the transition effort to date.

Our next step is to begin drafting short **issue papers** on key topics. Attached please find the list of 30 papers we ask that you develop - along with a lead office or region, and a suggested list of collaborating offices/regions, for each paper - by **October 4**. We have also included a **2-page template** we ask that you follow.

The list was developed based upon your input, input from your transition coordinators, OPA, OCIR, and OP, as well as information about the campaigns and our learning from previous landing teams.

My team will work through your Transition Coordinators to provide clear instructions for putting these draft papers into Sharepoint for review no later than October 4.

Ex. 5 - Deliberative Process

Please note that this is not a complete inventory of the briefing materials to be provided to the landing team. I will be in touch with many of you soon to discuss what additional materials we want to work on.

Please give me a call anytime if you would like to discuss.

Shannon

<Issue Papers_All_Issues_Final.xlsx>

Message

From: Lowry, Jennifer [jlowry@cmh.edu]
Sent: 6/8/2016 3:48:47 PM
To: 'Samantha Ahdoot' [Ex. 6]
CC: Spire, Paul [PSpire@aap.org]; Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Sophie Balk [SBALK@montefiore.org]
Subject: RE: Green Book Chapter Comments for author

No, I think that we suggested genetically modified foods as that was the impetus for his focus on glyphosate. But, glyphosate is not an emerging technology. GMOs are and could be a focus of the second part of the chapter. Or, he can choose nanoparticles if he wants.

Jennifer

Jennifer A. Lowry, MD
Chief, Section of Clinical Toxicology
Medical Director, Division of Clinical Pharmacology, Toxicology and Therapeutic Innovation
Medical Director, Center for Environmental Health
Children's Mercy Kansas City
Phone: [Ex. 6]
Fax: (816) 302-9943

From: Samantha Ahdoot [mailto:a[Ex. 6]
Sent: Wednesday, June 08, 2016 10:44 AM
To: Lowry, Jennifer
Cc: Spire, Paul; Etzel, Ruth; Sophie Balk
Subject: Re: Green Book Chapter Comments for author

*** This message was sent to you from an External Source. Please do not open untrusted links or attachments. ***

Thanks Jennifer.
I am not aware that he mentioned genetically modified foods. We did at the meeting. He only mentions nanoparticles.

My impression from the meeting was that we were suggesting genetically modified foods instead of glycophosphate. Is that correct? Or do we want to leave it to him what he uses to replace glycophosphate?

I appreciate your clarification.

Best
Sam

On Jun 8, 2016, at 11:37 AM, Lowry, Jennifer <jlowry@cmh.edu> wrote:

> Thanks Sam. I think that the biggest issue is the focus on glyphosate which is too much and not to the point of the chapter. If his idea was to focus on genetically modified foods, then the specific issue

should be addressed rather than calling out glyphosate alone. I can't stress that enough. I think that whole section needs to be redone.

Jennifer

Jennifer A. Lowry, MD
Chief, Section of Clinical Toxicology
Medical Director, Division of Clinical Pharmacology, Toxicology and Therapeutic Innovation
Medical Director, Center for Environmental Health
Children's Mercy Kansas City
Phone: Ex. 6
Fax: (816) 302-9943

From: Samantha Ahdoot [mailto: Ex. 6
Sent: Monday, June 06, 2016 12:00 PM
To: Lowry, Jennifer
Subject: Green Book Chapter Comments for author

*** This message was sent to you from an External Source. Please do not open untrusted links or attachments. ***

Hi Jennifer,
I have attached my rather brief comments on the "Emerging Technologies" chapter as gathered from our COEH meeting.
Please feel free to add any I missed. I had already submitted small comments in track changes to Paul.
Will then forward to Paul
Thank you
Sam

Electronic mail from Children's Mercy Kansas City. This communication is intended only for the use of the addressee. It may contain information that is privileged or confidential under applicable law. If you are not the intended recipient or the agent of the recipient, you are hereby notified that any dissemination, copy or disclosure of this communication is strictly prohibited. If you have received this communication in error, please immediately forward the message to the Children's Mercy Information Security Officer via return electronic mail at informationsecurityofficer@cmh.edu and expunge this communication without making any copies. Thank you for your cooperation.

<Green Book Chapter Emerging Technologies Comments for Author.docx>

Message

From: Landrigan, Philip [philip.landrigan@mssm.edu]
Sent: 5/6/2017 8:21:23 PM
To: Wilson, Karen [karen.wilson@mssm.edu]; Forman, Joel [joel.forman@mssm.edu]; Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; ' Ex. 6 Ex. 6
Subject: Chapter 719 - Chemical Pollutants - Nelson's Pediatrics
Attachments: Chapter 719.PJL edits.May 6.docx; Chapter 719.CLEAN.PJL edits.May 6.docx; Ch 719--Landrigan Rev.pdf

Dear Colleagues,

Here are my edits. Please look over and suggest any changes before I submit. I have attached the galley proof from the last edition, a CLEAN copy of the new version, and a copy of the new version with Track Changes

Phil

Philip J. Landrigan, MD, MSc, FAAP
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WHO Collaborating Centre in Children's Environmental Health

Message

From: Schroeder, Kathleen [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=0DB676B2FADE4B54BEBCC7B6E664FC94-SCHROEDER,]
Sent: 6/29/2016 12:37:44 PM
To: AO-OCHP-Everyone [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=222d03d48d634481af638d4892296469-AO-OCHP-Everyone]
Subject: Glyphosate/Carcinogenicitiy

Daily News

NTP Preparing To Assess Glyphosate's Carcinogenicity In Toxicology Study

June 28, 2016

The National Toxicology Program (NTP) is preparing to assess the carcinogenicity of glyphosate, the most commonly used herbicide worldwide, amid ongoing debate about EPA's process for re-registration of the chemical and following an international body's finding last year that glyphosate is probably carcinogenic.

NTP scientist Stephanie Smith-Roe said at a June 15 meeting of NTP's Board of Scientific Counselors (BSC) that she and colleagues are preparing to undertake short-term cancer related toxicology tests of glyphosate, including both the active ingredient and a formulation or multiple formulations of the finished product, with an eye to providing information quickly to unnamed decision makers.

Smith-Roe described the plan as containing "rapid screening of glyphosate and at least one formulation . . . then short-term in vivo testing. We propose a very focused approach . . . in order to provide decision makers with information very quickly, hopefully within a year."

EPA is planning to issue for public comment draft risk assessments supporting its registration review of glyphosate by the end of the year, and the agency is facing much external pressure as advocacy groups press the agency to ban the chemical's use. The groups complain that EPA relies solely -- and too heavily -- on information supplied by the manufacturers, biasing the agency's decision-making process.

Meanwhile, EPA's ongoing efforts to re-register glyphosate are under congressional scrutiny, following the agency's release in April and then subsequent withdrawal from its public electronic docket of a review finding glyphosate is unlikely to cause cancer. The move prompted House Science, Space and Technology Committee Chairman Lamar Smith (R-TX) to begin an inquiry into the agency's handling of the cancer review, seeking documents and interviews with agency scientists.

In addition to concerns that EPA relies too heavily on industry-sponsored research, advocates have questioned EPA's approach of evaluating only pesticide products' active ingredients, rather than product formulations, and failing to capture real-word exposures. As a result, EPA failed to adhere to the Federal Insecticide, Fungicide and Rodenticide Act standard precluding unreasonable risks to human health and the environment in evaluating pesticides' human health and ecological risks, the groups claim.

NTP's Evaluation

NTP's evaluation follows that program's 13-week study of glyphosate fed to rats, published in 1992, which found that lab animals "exposed to fairly high doses, presented no gross lesions. [Results were] negative in micronucleus assays and also in mutagenicity tests, Smith-Roe said.

But last year the International Agency for Research on Cancer (IARC) concluded that glyphosate probably causes cancer in people, leading NTP to reconsider whether to conduct further testing. The IARC conclusion has been widely cited by advocacy groups in their efforts to ban glyphosate's use.

Industry counters by pointing to recent evaluations by the World Health Organization (WHO) and the European Food Safety Authority, which concluded that glyphosate does not pose a public health risk. Industry groups argue that advocates' claims that glyphosate causes cancer are based on a study that has been widely criticized for using incomplete data sets.

Smith-Roe acknowledged these conflicting findings in her remarks to the BSC. "Whether glyphosate causes cancer has become a high profile issue," she told BSC members, noting the IARC determination and EPA's ongoing re-registration process. She said that the differences between conclusions by IARC and the other agencies could be due to their different processes and purposes -- IARC's purpose is hazard identification, while the regulatory agencies are conducting risk analyses with dose-response calculations.

Other differences could be the regulatory agencies' "greater access to confidential data -- these groups are looking at different data sets to make their conclusions. Risk assessments are limited to active ingredients, whereas IARC looked at glyphosate formulation," Smith-Roe added.

She continued, "We have worked to put together a work group to formulate how we might put together a problem formulation on glyphosate. There are very few studies where [the active ingredient] and formulation are compared. Turns out formulations seem to be more toxic."

'Key Factors'

"Two of the key factors used to inform the IARC classification were studies suggesting that glyphosate and various formulations were genotoxic and induced oxidative stress," according to NTP background documents. "Furthermore, where glyphosate was compared directly to glyphosate-based formulations, the formulations were generally more toxic than glyphosate alone."

Though early in the planning stages of the study, Smith-Roe said that the work group has already concluded that "while we see information related to cancer endpoints, there is very little information about other endpoints that we might be concerned about."

One of the BSC members, charged with reviewing the project, noted his interest based on the widespread use of the chemical, and the potential for residues on produce eaten by the general public. "While I have some enthusiasm for the project, it is significantly dampened by the [fact that] agencies that have more experience with the chemical and more data" reached other conclusions than IARC's, said George Corcoran, chairman of pharmaceutical sciences at Wayne State University.

Kathleen Schroeder, MD, MSI
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Message

From: Landrigan, Philip [philip.landrigan@mssm.edu]
Sent: 4/14/2016 2:45:43 PM
To: Gutierrez, Claudia [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=03e596afea504f91a6c5bb3857a6fea6-Gutierrez, Claudia]; Edward D. Freytag [edfreytag@nola.gov]; jlg23@cornell.edu [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=66db8de0199c40349a82b1308d937670-jlg23@cornell.edu]; Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Sheffield, Perry [perry.sheffield@mssm.edu]
Subject: RE: IPM conferences
Attachments: PESTICIDES.USVI.ppt

Dear Claudia

It was truly a pleasure. Here are my slides.

Phil

Philip J. Landrigan, MD, MSc, FAAP
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Icahn School of Medicine at Mount Sinai
1216 Fifth Avenue, Room 556
New York, NY 10029

Tel: Ex. 6

From: Gutierrez, Claudia [Gutierrez.Claudia@epa.gov]
Sent: Wednesday, April 13, 2016 10:09 AM
To: Edward D. Freytag; jlg23@cornell.edu; Etzel, Ruth; Landrigan, Philip; Sheffield, Perry
Cc: Fessler, Andrew
Subject: IPM conferences

Thank you again for two successful conference. We got great feedback, people were thankful for the opportunity to participate.
These types of events do not go unnoticed on the islands! Thank you!

When you get a moment, can you please send me your presentation? We'd like to post it on the site and mail it to the participants as soon as possible.

Kind regards,
Claudia

Claudia Gutierrez, Senior Advisor, EPA, Office of the Regional Administrator, 290 Broadway, New York, NY, 212-637-5036

HEALTH IMPACTS OF PESTICIDE EXPOSURE in CHILDREN AND ADULTS

Philip J. Landrigan, MD, MSc, FAAP
Dean for Global Health
Professor of Preventive Medicine and Pediatrics
Icahn School of Medicine at Mount Sinai

Reducing Pesticides in the US Virgin Islands
St Croix, USVI
April 4, 2016

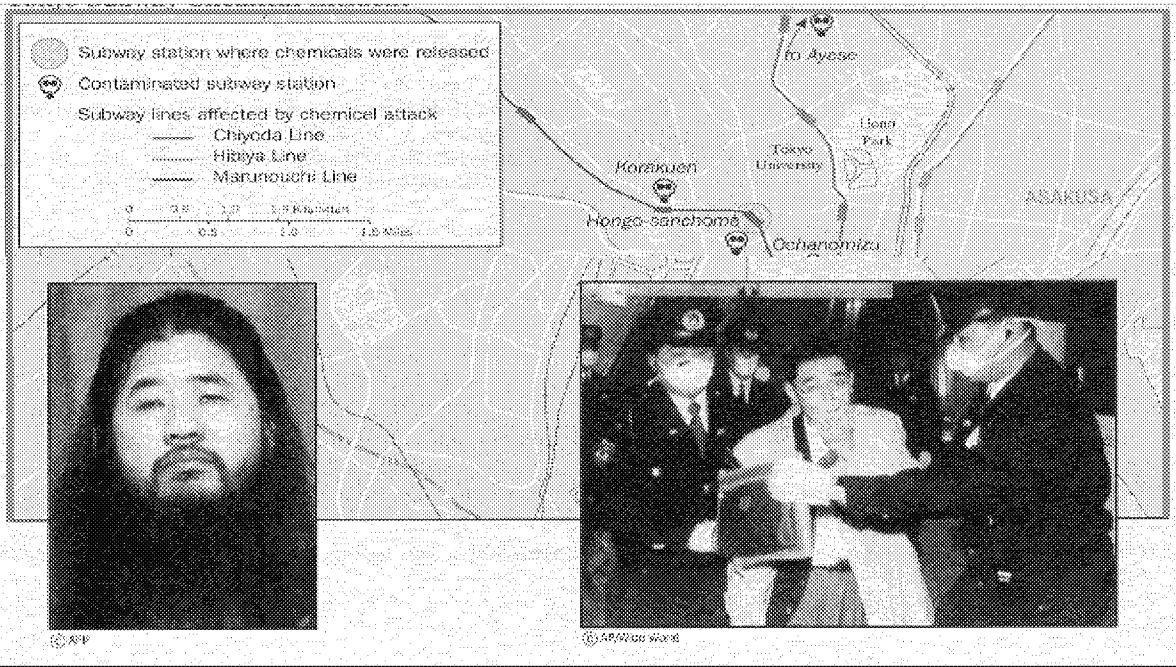
ED_001703B_00003108_00_9600fc3d-808d-61ad-8fc9-d33d72d5e17c

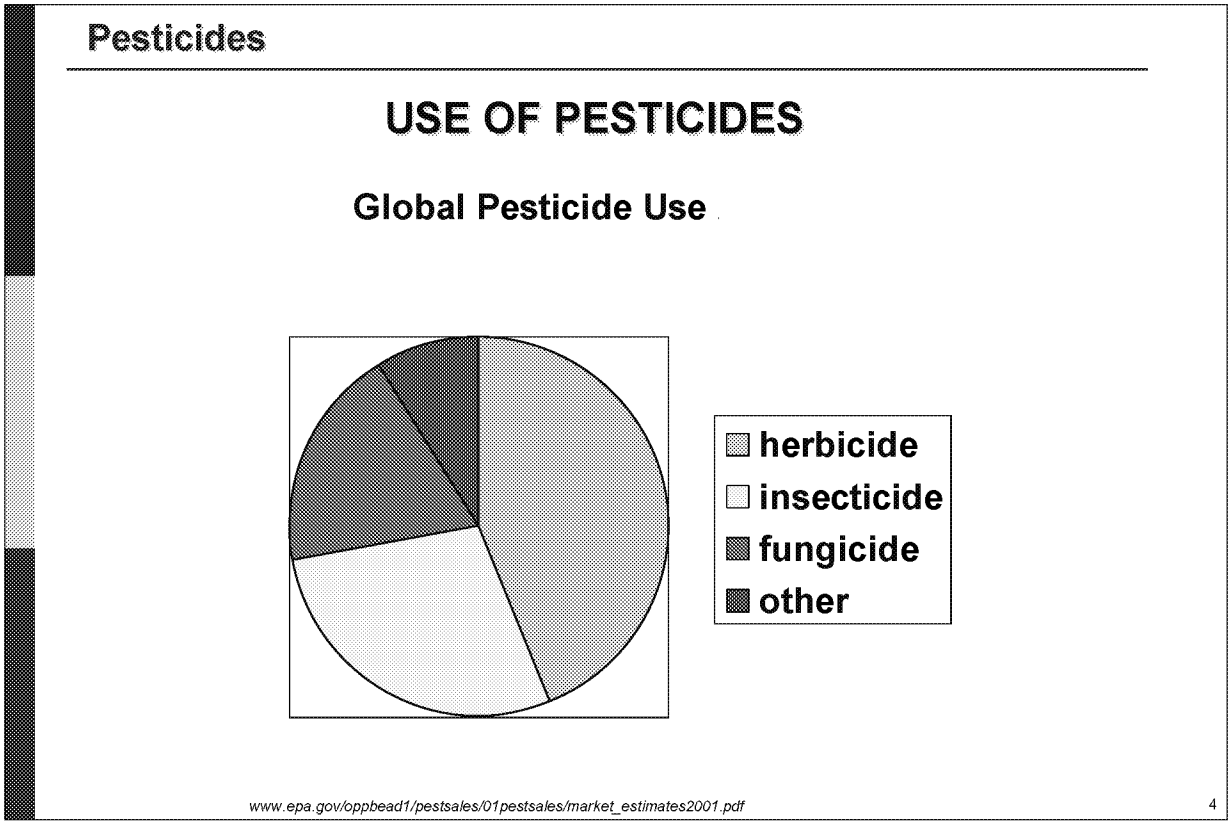
WHAT ARE PESTICIDES?

- Chemicals specifically designed to kill living things
- Include insecticides, herbicides, fungicides and rodenticides
- More than 600 individual pesticide chemicals and many thousands of commercial pesticide products with many different names are on the market
- More than 1 billion lbs. applied each year in USA alone and increasing
- Pesticides can cause acute poisoning and chronic disease. Children and pesticide applicators are at highest risk

<<READ SLIDE.>>

PESTICIDES ARE INTENDED TO BE TOXIC
War Gases are Potent Pesticides





The pie chart shows the global use of pesticides and the different types.
Insecticides are mostly used in developing countries and fungicides/herbicides in developed countries.

<<READ SLIDE.>>

Refs:

American Academy of Pediatrics Committee on Environmental Health. Pesticides. In: Etzel RA ed. Pediatric Environmental health. 2nd ed. Elk Grove Village, American Academy of Pediatrics, 2003.

Jeyaratnam. Acute pesticide poisoning: a major global health problem. World Health Stat Quarterly, 1990.

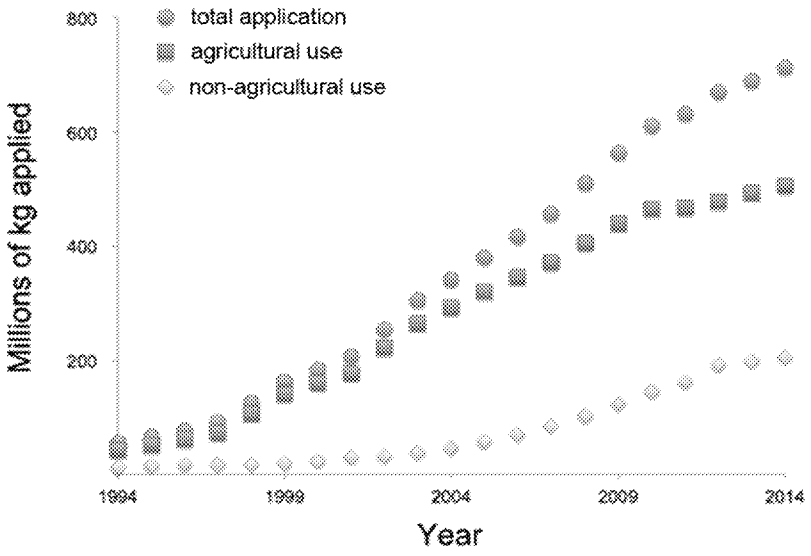
UNEP United Nations Children´s Fund and WHO. Children in the new millennium: environmental impact on health. UNEP, UNICEF, WHO, 2002.

US EPA Pesticides industry sales and usage: 2000 & 2001 market estimates: (www.epa.gov/oppbead1/pestsales/01pestsales/market_estimates2001.pdf).

Vaagt. New code of conduct on pesticide adopted. FAO Newsroom (www.fao.org/english/newsroom/news/2002/10525-en.html).

Pesticides

INCREASING USE OF GLYPHOSATE - ROUNDUP



PESTICIDES – RISKS AND BENEFITS

BENEFITS

- Crop protection
- Food preservation
- Material preservation
- Disease control – dengue and malaria

RISKS

- Toxic to humans
- Long-lasting impacts on environment and ecosystems

Pesticides have numerous beneficial effects. These include crop protection, preservation of food and materials and prevention of vector-borne diseases.
For example pesticides may be used in the prevention of malaria, which kills up to 1 million children per year, and for preventing other vector-borne diseases such as dengue, leishmaniasis and Japanese encephalitis.
Pesticides are toxic by design – they are BIOCIDES, designed to kill, reduce or repel insects, weeds, rodents, fungi or other organisms that can threaten public health and the economy.
Their mode of action is by targeting systems or enzymes in the pests which may be identical or very similar to systems or enzymes in human beings and therefore, they pose risks to human health and the environment.
Pesticides are ubiquitous in the environment and most are synthetic.
There is growing concern about children's exposure to pesticides and their special susceptibility. Children are not little adults, and may have higher exposures and greater vulnerability at both high and low levels of exposure.

Ref:
National Resource Council. Pesticides in the diets of infants and children. National Academy Press, Washington, DC, 1993.

CHILDREN'S EXPOSURE TO PESTICIDES

A cause of concern

- Multiple chemicals
- Multiple sources of exposure
- Multiple routes of exposure
- Multiple effects

WHO

Pesticides are considered an important environmental threat to children's health in rural areas. This is because:
A large variety of chemicals and mixtures are used as pesticides.
Many pesticides are used at the same time in the same place (agricultural regions).
They are ubiquitous in the environment – and in individual environments (micro-environments) of children – there may be several sources of exposure to the same or a different chemical.
Multiple exposures may occur from the preconception period throughout the child's growth into adolescence and adulthood.

Pesticides may also be heavily used indoors in urban areas, so this is not solely a rural issue.

CHILDREN'S EXPOSURES TO PESTICIDES

- **Locations:** Homes and schools, playgrounds, parks fields, hospitals and other public places
- **Activities:** Work places, farms, agricultural areas (rural setting)
- **Sources of exposure:** Air, soil, food, water, parents' clothing and shoes, other objects…

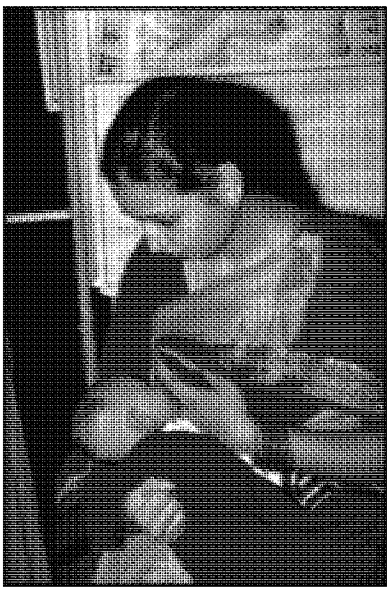
Exposure scenarios:

- ACUTE high-level exposure, overt poisoning
- CHRONIC low-level, chronic exposure, delayed efects

Children are exposed in different settings and by a variety of routes.
Pesticides may be unsafely used in the home, by parents who want to protect their children from mosquitoes, cockroaches or rodents. Different pesticides may be stored within the reach of children. They are used in schools and playgrounds (in treated wood) and in green areas (parks and playing fields) to destroy weeds. Hospitals are intended to be places of healing, yet many are using hazardous pesticides).
Living on farms or in agricultural areas, where pesticides are frequently and heavily used, is a high-risk scenario for exposure. Children may also undertake work in the agricultural industry, where they may participate in directly applying pesticides to crops or working in the field immediately after pesticide application.
Potential for "take home" of pesticides on parents'/childs clothing or shoes.
Pesticides may be present in food and water, either as residues from treatment of crops or at higher levels, as a result of contamination.
In some areas, there is a potential for release into the environment during production and formulation of pesticides (in factories).
These are the circumstances under which children may receive acute and high-level exposure leading to poisoning or chronic, low-level exposures linked to more subtle, developmental and other effects. (See next slide)

ROUTES OF PERINATAL EXPOSURE

- **Mother's intake and body burden is transferred across the placenta**
- **Breast milk may be contaminated**
  "The very top of the food chain"



WHO 9

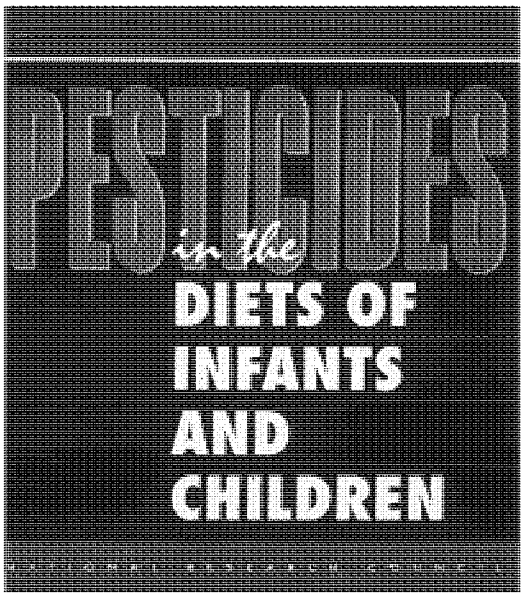
Pesticides can cross the placenta:
They have been detected in cord blood samples, amniotic fluid and body tissues of human foetuses even during early stages of prenatal life.
Pesticides have also been found in the meconium.
Measuring organophosphate compounds (OP) metabolites in meconium is considered a good biomarker of prenatal exposure because meconium starts to accumulate in the 16th week of pregnancy and is eliminated following delivery.

Breast milk may be contaminated and represents the very top of the food-chain:
Residues of organochlorine pesticides and POPs have been detected in breast milk (including DDT, HCB and HCH isomers) in contaminated areas.
There is currently no developed method to measure OPs in breast milk.
(Please see the module on Children and Chemicals.)

Refs:
Pronczuk J et al. Global perspectives in breast milk contamination infectious and toxic hazards. Environ Health Perspect, 2002, 110:A349.
Whyatt RM et al. Measurement of organophosphate metabolites in postpartum meconium as a potential biomarker of prenatal exposure. A validation study. Env Health Perspect, 2001, 109:417.

Picture: WHO, P. Virot. Portrait of a young baby breastfeeding, Delhi, India, Asia, November 2002.

CHILDREN ARE HIGHLY VULNERABLE TO PESTICIDES



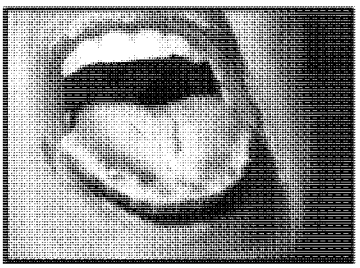
- Greater exposures pound-for-pound than adults. Exploratory behaviors.
- Reduced capacity to detoxify most pesticides.
- Developing organ systems are highly vulnerable
- More years of future life

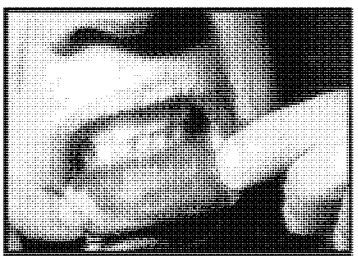
CHILDREN ARE NOT LITTLE ADULTS

Pesticides

ACUTE PESTICIDE-RELATED ILLNESSES

- Skin and eye irritation
- Upper and lower respiratory tract irritation
- Allergic responses / asthma
- Gastrointestinal symptoms
- Neurological symptoms
- Specific syndromes
  - Cholinergic crisis (organophosphorus pesticides)
  - Bleeding (warfarin-based rodenticides)
  - Caustic lesions and pulmonary fibrosis (herbicide, paraquat)





11

The signs and symptoms of pesticide poisoning depend upon the pesticide involved and the type and magnitude of exposure.
In general the signs and symptoms are:
dermal and ocular irritation (or allergic response)
upper and lower respiratory tract irritation
allergic responses and asthma
gastrointestinal symptoms: usually vomiting, diarrhoea and abdominal pain
neurological symptoms: excitatory signs in the case of exposure to organochlorines, lethargy and coma; also polyneuritis
specific syndromes:
- cholinergic crisis (organophosphorus pesticides)
- bleeding (warfarin-based rodenticides)
- caustic lesions and pulmonary fibrosis (paraquat)

<<NOTE TO USER: Refer to those pesticides commonly used in the country/area.>>
<<NOTE TO USER: insert local photo.>>
<<READ SLIDE.>>

Refs:
American Academy of Pediatrics Committee on Environmental Health. Pesticides. Chapter 24. In: Etzel RA. ed. Pediatric Environmental Health, 2nd Ed. Elk Grove Village Il. American Academy of Pediatrics, 2003.
CDC. Surveillance for acute insecticide-related illness associated with mosquito-control efforts--nine states, 1999–2002. MMWR Morb Mortal Wkly Rep, 2003, 52:629.
Salameh PR et al. Respiratory symptoms in children and exposure to pesticides. Eur Respir J , 2003, 22:507.
Sanborn MD et al. Identifying and managing adverse effects: 4 Pesticides. CMAJ, 2002, 166:1431.
Pictures: Courtesy of Dr. J. Pronczuk. Lesion caused by paraquat.

ACUTE POISONING BY "ACCIDENTAL" INGESTION

- Storage of leftover pesticide in a medicine or soft drink bottle
- Confusion with pharmaceutical
- Pesticide container reused for storing drinks or food
- Pesticide container present in the child's environment

Bottles containing pharmaceuticals and the pesticide chlorpyriphos
Laborde, CIAT, Montevideo

Acute poisoning results from "accidental" (non-intentional) exposure in toddlers and small children. Ingestion occurs, for example, when:

Pesticides have been stored in a medicine or soft drink bottle.

The pesticide bottle is similar to a bottle used for pharmaceuticals.

Pesticide containers are reused for storing drinks or food.

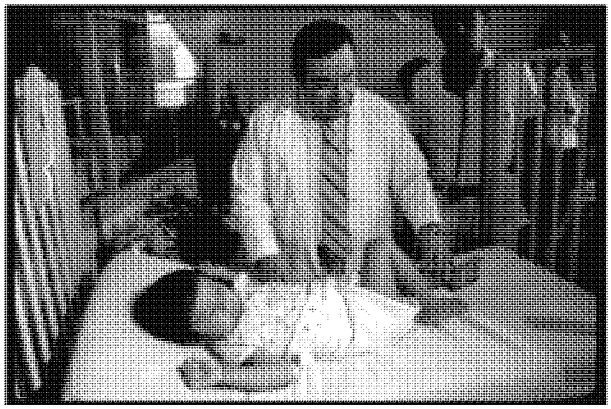
Pesticide containers are easily accessible in the child's environment.

Photo: Bottles containing pharmaceuticals and the pesticide chlorpyriphos
Courtesy of Laborde, CIAT, Montevideo

ED_001703B_00003108_12_4eecdb2d-5765-e618-14d9-baa3f7cd6e95

DIAGNOSIS OF EXPOSURE

- History of exposure
  - Availability of pesticides
  - Recent application
- Signs and symptoms
  - May be misdiagnosed!
- Laboratory tests



WHO

<<READ SLIDE.>>
The diagnosis is based upon the history of exposure (e.g. pesticides are available in the home, recently applied, or child was found playing with containers), signs and symptoms of exposure (see next slides) and laboratory measurements. Diagnosis also requires a high index of suspicion. Even after acute exposures, pesticide poisoning may be misdiagnosed as a viral illness (e.g. infectious diarrhoea rather than organophosphate poisoning) resulting in inadequate treatment and potentially returning children to a setting where exposure will be ongoing or recur.
Pesticides and/or their metabolites can be measured in samples of blood, urine, breast milk, amniotic fluid or meconium. This can confirm the diagnosis.
Laboratory tests are available to assess exposure to organophosphates, organochlorine, dicarboximide fungicides, carbamates, dipyridyl herbicides (e.g. paraquat) and pyrethroids.

Ref:
American Academy of Pediatrics Committee on Environmental Health. Pesticides. Chapter 24. In: Etzel RA. ed. Pediatric Environmental Health, 2nd Ed. Elk Grove Village Il. American Academy of Paediatrics, 2003.
Picture: WHO, C. Gaggero. Health child examination, Peru.

Pesticides

PRECONCEPTIONAL PRENATAL EXPOSURE

Pesticide exposure before or during pregnancy has been associated with increased risk of:

- **Infertility**
- **Perinatal death**
- **Spontaneous abortion**
- **Premature birth**
- **Fetal growth retardation**
- **Congenital malformations**
- **Early childhood cancer**

WHO 14

Exposure of either mother or father to pesticide before conception, or exposure of the mother during pregnancy, has been associated with an increased risk of fetal death, spontaneous abortion and early childhood cancer.
There is increasing evidence that in utero exposure increases the risk of growth retardation: a small-for-gestational age baby, low birth weight, reduced length and small head circumference (see photo).
Significant increases in the risk of congenital anomalies have also been reported. These include: eye defects, limb reduction, urogenital defects, hypospadias, cryptorchidism, orofacial clefts, central nervous system defects and heart defects.

Refs:

Bell EM et al. A case-control study of pesticides and fetal death due to congenital anomalies. Epidemiology, 2001, 12:148.
Berkowitz GS et al. In utero pesticide exposure, maternal paraoxonase activity, and head circumference. Environ Health Perspect, 2004, 112:388.
Eskenazi B et al. Association of in utero organophosphate pesticide exposure and fetal growth and length of gestation in an agricultural population, Environ Health Perspectives, 2004, 112 (10): 1116-1124.
Garcia AM et al. Parental agricultural work and selected congenital malformations. Am J Epidemiol 1999, 149:64.
Heeren GA et al. Agricultural chemical exposures and birth defects in the Eastern Cape Province, South Africa. A case - control study. Environ Health, 2003, 2:11.
Nurminen T. Maternal pesticide exposure and pregnancy outcome. J Occup Environ Med, 1995, 37:935.
Rojas A et al. Malformaciones Congenitas y exposicion a pesticidas. Rev Med Chilena, 2000, 128:399.
Schreinemachers DM. Birth malformations and other adverse perinatal outcomes in four U.S. Wheat-producing states. Environ Health Perspect , 2003, 111 :1259.
Weidner IS et al. Cryptorchidism and hypospadias in sons of gardeners and farmers. Environ Health Perspect, 1998, 106:793.
Whyatt RM et al. Prenatal insecticide exposures birth weight and length among an urban minority cohort. Environ Health Perspect , 2004, 112:1125.

CHRONIC NEUROLOGICAL EFFECTS OF ACUTE PESTICIDE EXPOSURE

- Neurological sequelae of acute poisoning
- Neurological symptoms due to high indoor levels of pesticides
- Subtle changes in memory and attention

It may be difficult to differentiate the effects of prenatal exposure from exposure in early childhood, or sequelae of non-fatal acute poisonings.
Chronic neurobehavioural and neurological effects after acute poisoning with organophosphorus pesticides have been reported in adults.
Memory and concentration problems, unusual fatigue, irritability and depression, visual difficulties and delayed polyneuropathy have been described.
In a well-documented case of chronic organophosphorus pesticide poisoning, the house of an infant with hypertonia, first diagnosed as cerebral palsy, was found to have high levels of chlorpyrifos weeks after a professional application (Wagner, 1994).
Few studies have examined the neurobehavioural effects of postnatal exposure to pesticides.
Subtle changes in short-term memory and attention may be associated with application of organophosphorus pesticides in the home.
There is increasing evidence, particularly from animal models, about neurobehavioural effects of long-term exposure to low levels of pesticides.

Refs:
American Academy of Pediatrics Committee on Environmental Health. Pesticides. Chapter 24. In: Etzel R. ed. Pediatric Environmental Health 2nd Ed Elk Grove Village Il, American Academy of Pediatrics, 2003.
Eskenazi B et al, Exposures of children to organophosphate pesticides and their potential adverse health effects. Environ Health Perspect, 1999, 107(3):409–419.
Keifer M et al. Symptoms and cholinesterase activity among rural residents living near cotton fields in Nicaragua. Occup Environ Med, 1996, 53:726.
Ruckart PZ et al. Long-term neurobehavioral health effects of methyl parathion exposure in children in Mississippi and Ohio. Environ Health Perspect, 2004, 112:46.
Wagner SL et al. Chronic organophosphate exposure associated with transient hypertonia in an infant. Pediatrics, 1994,

94:94.

PESTICIDES AND CHILDHOOD CANCER

Some studies have found an association between postnatal pesticide exposure and an increased risk of pediatric cancer

- **Brain tumors**
- **Acute lymphocytic leukaemia**
- **Non-Hodgkin lymphoma**

A number of epidemiologic studies have found a significant association between cancer and domestic exposure to pesticides.
Evidence is increasing, but still limited because of the methodological weaknesses of the research.
Investigations in children living in the rural areas of developed countries have also produced limited evidence.

Refs:
Borkhardt A et al. Congenital leukaemia after heavy abuse of permethrin during pregnancy. Arch Dis Child Fetal Neonatal Ed. 2003, 88:F436.
Daniels JL et al. Residential pesticide exposure and neuroblastoma. Epidemiology, 2001. 12:20.
Leiss JK et al. Home pesticide use and childhood cancer: a case-control study. Am J Public Health, 1995, 85:249.
Ma X et al. Critical windows of exposure to household pesticides and risk of childhood leukaemia. Environ Health Perspect, 2002, 110:955.
Pogoda JM et al. Household pesticides and risk of pediatric brain tumors. Environ Health Perspect, 1997, 105:1214.

ENDOCRINE DISRUPTION

- Low doses of certain pesticides may mimic or block hormones or trigger inappropriate hormone activity
- Endocrine disruption may alter development and reproduction and induce birth defects
- Endocrine disruption has been linked to:
  - Infertility
  - Low sperm count
  - Early puberty
  - Hormone-dependent cancers (testicular, breast, prostate)
  - Altered sex ratio

Endocrine disruption is not an effect, but a mechanism of toxicity that may have different effects.
Evidence of the effect related to this mode of toxicity in children is still limited.
There is experimental evidence of endocrine disruption. Pesticides may have:
estrogenic effects (DDT, dieldrin, endosulfan, methoxychlor)
anti-androgenic effects (DDT, vinclozilin, procymidone)
anti-thyroid effects (ethylenethiourea (ETU), maneb, zineb metabolites)
anti-progestin effects (DDT).
Synthetic pesticides may interfere with the natural process of development.

Refs:

Baskin LS et al. Hypospadias and endocrine disruption, is there a connection? Environ Health Perspect, 2001, 109:1175.
Damstra T et al. Global assessment on the state of the science of endocrine disrupters. IPCS. UNEP/ILO/WHO, 2002.
Gray LE et al. Effects of environmental antiandrogens on reproductive development in experimental animals. Hum Reprod Update, 2001, 7:248.
Landrigan P et al. Assessing the effects of endocrine disruptors in the National Children´s Study. Environ Health Perspect, 2003, 111:1678.

ACUTE OCCUPATIONAL HAZARDS TO PESTICIDE APPLICATORS

- Acute poisoning while applying pesticides as a result of inhaling aerosols
- Contamination of exterminators during the mixing of concentrated hazardous pesticides
- Skin contact or ingestion of pesticides due to contamination, splashing, or spills
- Accidental inhalation of pesticide spray (caused by a sudden change of wind
- Accidental swallowing of a liquid pesticide mistakenly thought to be water
- Bursting of overpressurized spraying vessels
- Acute intoxication as a result of release into the atmosphere of hazardous materials

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DEATH IN A PESTICIDE APPLICATOR

- A young Mexican laborer was employed by a California company that processes edible nuts. When insects got into the nuts, it was customary to fumigate under tarps with methyl bromide.
- This young man had been assisting with fumigation
- He became ill rather suddenly at home that evening and died within a few hours
- The cause of death was discovered only after the coroner's office sent specimens to the State Health Department Laboratory which detected high concentrations of bromide
- A diagnosis was made of methyl bromide poisoning

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CHRONIC OCCUPATIONAL HAZARDS TO PESTICIDE APPLICATORS

- Increased risk for chronic neurodegenerative disease – Parkinson Disease
- Increased risk of cancer – leukemia and lymphoma
- Sterility - DBCP
- Increased risk of cancer in applicators' children
  - **Leukemia**
  - **Brain cancer**
  - **Hodgkin and non-Hodgkin lymphomas**
  - **Kidney cancer**

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OBSOLETE AND BANNED PESTICIDES

Obsolete and banned pesticides are pesticides that can no longer be used for their intended purpose or any other purpose.

They may include:

- Pesticides stored in empty and contaminated pesticide containers
- Pesticides in heavily contaminated soil
- Buried pesticides
- Pesticides saved after a ban
- Pesticides imported from developing countries

Why are some pesticides obsolete and banned?:

- Use prohibited for health/environmental reasons – too toxic
- Product deteriorated as result of improper or prolonged storage
- Product not suitable for intended use and cannot be used for other purposes, nor can it easily be modified to become usable.

Obsolete, unwanted and banned pesticides are serious environmental hazards. Leaking and corroding metal drums filled with obsolete and dangerous pesticides dot urban and rural landscapes of developing countries around the world. These chemical leftovers have become villains in the agricultural world they were designed to help, affecting not only a nation's agriculture and its environment, but also fundamentally the health of its people and consequently development in general be it in rural areas or under urban conditions.

This global environmental tragedy is a direct result of several decades of mishandling and misuse, but is most dramatic in the developing world where there is no awareness of the inherent danger of pesticides. The unaware therefore draw water from contaminated site for own survival and that of their animals.

Obsolete pesticides may include: <<READ SLIDE>>

Most of the affected countries are under tropical conditions where agricultural and vector pests flourish both in diversity and numbers. Migratory pests such as locusts, grasshoppers, grain eating birds, storage pests, rodents, etc. inflict untold damage to agriculture and bring about hunger or misery when they are at their peak.

Poor nations have been led to believe that the only alternative to combat pests agricultural or otherwise effectively is only by using pesticides. The poor or the unaware never think for a moment that pesticides are poisonous and that they are dangerous to life. Most believe that pesticides are like medicines. They consider that they kill pests selectively and are therefore less harmful to humans, animals and plants. Governments save budgets to purchase pesticides on regular basis. Also constantly plead to donors and organizations for assistance either for direct supply of pesticides or for contributions of financial support for purchasing them. In response, donors and organizations supply pesticides. Recipient countries anxious to minimize pest damages to the minimum or, being less aware of the negative consequences, usually receive pesticides from every possible source and direction. This leads to uncoordinated influx of pesticide donations and trading, subsequently giving rise to excessive supply. While some of the donations are genuine, others take the opportunity to dump unwanted and illegal pesticides on the poor and unsuspecting countries. Pesticides reach individual farmers or household dwellers that value pesticides dearly. They keep them in their houses, with their food and animals. Pesticide vendors take the opportunity to promote pesticides aggressively. It is not uncommon to find pesticides being stored in the open or in heavily populated zones and usually in substandard stores and sold along with

food and drinks, etc. Children are used in advertising sales of pesticides and often get easy access to pesticides. They play with empty pesticide cans and use them for drinking water or milk. Most pesticide cans litter streets or are simply dumped in open municipality dumps for subsequent open burning leading to serious emissions of dioxins affecting child waste pickers (scavengers) working in the informal recycling sector. Obsolete pesticides found in open waste sites may also be used/sold by waste pickers and re-introduce them into the agricultural sector.

Common causes of obsolete pesticides include the following:

Use of the product has been prohibited or severely restricted for health or environmental reasons (e.g. through banning; withdrawal of registration, or policy decision by relevant government agencies)

The product has deteriorated as a result of improper or prolonged storage and can no longer be used according to its label specifications and instructions for use, nor can it easily be reformulated to become usable again.

The product is not suitable for its intended use and cannot be used for other purposes, nor can it easily be modified to become usable.

Other possible reasons for why we have obsolete pesticide include:

Banning of pesticides that are still kept in store.

Aggressive pesticide sales, promotions and distributions by the Chemical Industry.

Difficulties in forecasting outbreaks of pest.

Inappropriate assessment of pesticide requirements.

Insufficient application capacity.

Inappropriate formulations or substandard containers.

Excessive donations: these are usually inappropriate because they are not received when needed most (i.e. late arrival of donations or out of season delivery), or are uncoordinated with similar donations from various sources. Such are tantamount to dumping.

Inadequate storage facilities and lack of staff trained in storage management (i.e. poor stock taking and lack of records).

Ineffective distribution or poor marketing systems for pesticides (government or private sector or both).

Lack of awareness of the inherent dangers of pesticides.

Misuse of pesticide containers (e.g. for a variety of domestic uses, water containers, food storage, use for pot plants, etc.).

Notes from FAO: www.fao.org/WAICENT/FAOINFO/AGRICULT/AGP/AGPP/Pesticid/Disposal/index_en.htm

PREVENTION OF EXPOSURE

What can be done to prevent pesticide exposure and poisoning ?

- Take action at
  - Local level
  - National level
  - International

WHO

<<READ SLIDE.>>

Because of the potential for long-term damage to critical structures such as the nervous system, immune system and endocrine system, prevention of all acute poisoning events as well as of exposure to low doses during development is a high priority for ensuring children's environmental health. There are many steps that can be taken at the local/practice level, national/government level and international treaty/trade levels to decrease exposure to pesticides and related illnesses.

Picture: WHO, L. De Toledo. Ethiopia

Pesticides

PREVENTION – LOCAL LEVEL

Use pesticides ONLY when the benefits outweigh the risks

- Avoid cosmetic or routine use of pesticides in the home
- Use integrated pest management (IPM), non-chemical pest controls

If pesticides are necessary:

- Store in original containers with child-proof seals, out of reach, in a locked cabinet
- Educate on the safe use of pesticides
  - Follow manufacturer's instructions
  - Use protective equipment
  - Respect re-entry times
  - Pregnant women should not apply pesticides
- Use least hazardous chemicals, least dangerous mode of application
- Beware of moving day

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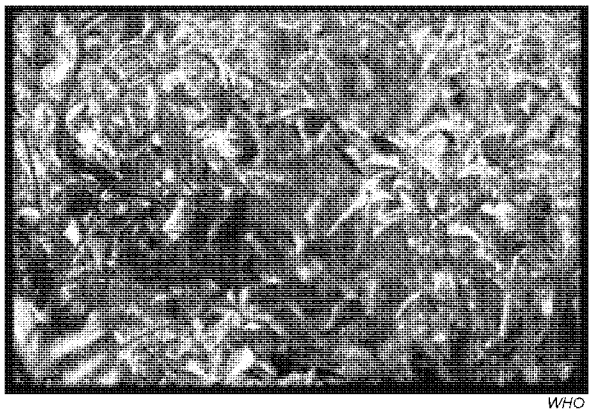
Pesticides should be used only when the benefits outweigh the risks, and non-chemical pest control procedures have failed.
Cosmetic use of pesticides, that is their use to control aesthetically unpleasant plants or non-dangerous insects such as crickets or house millipedes, should be completely avoided.
Integrated pest management (IPM) procedures which include hygiene, sealing of cracks and crevices, screening of doors and windows, and other measures should be the first line of defence for pest management.
If pesticides must be used, they should be stored only in their original containers with manufacturer's labels intact, preferably with child-proof seals, out of the reach of children and in locked cabinets or cupboards.
Users should always follow the safety precautions specified by the manufacturer and observe all safety recommendations including use of gloves, masks, protective clothing and observation of re-entry times (the time when it is safe to return to a treated area).
Pregnant women should not apply pesticides and particular care should be taken to determine appropriate re-entry times for pregnant women, infants and small children. These times may be considerably longer than for less vulnerable individuals.
If chemicals are required, the least hazardous chemical (when there is scientific evidence of less toxicity) should be used with the most contained mode of distribution considered effective. For example, fogs and bombs should not be used. Bait stations are preferable to baseboard sprays or crack and crevice treatment. Granules and bait stations should be used only if they are inaccessible to babies, toddlers and small children (and pets).

Refs:
UNEP Chemicals. Childhood Pesticides Poisoning. Information for Advocacy and Action. May 2004 (www.who.int/ceh/publications/en/pestpoisoning.pdf).
US EPA Webpage for Integrated Pest Management (www.epa.gov/pesticides/food/ipm.htm).

PREVENTION – COMMUNITY LEVEL

- **Integrated pest management (IPM)**
  - **Homes**
  - **Schools**
  - **Public buildings**
  - **Health centres**
  - **Public parks**
- **Community activities**
  - **Community campaigns**
  - **School activities**
  - **Local awards or contests**
  - **Pesticide-free "zones"**
  - **Support organic farming**



WHO

Many organizations (especially FAO and WHO) promote alternative non-chemical forms of pest-control and there is increasing engagement in non-pesticide dependent agriculture and integrated pest management (IPM).
A variety of local initiatives involving the community can help to create an environment that promotes decreased dependence on pesticides in homes, schools, public areas, health facilities and parks.

Examples of community activities include:
community campaigns and school activities
local awards or contests
pesticide-free "zones“
support for organic farming

FAO: Food and Agriculture Organization

<<READ SLIDE.>>
Picture: WHO, P. Virot. Plants at the Biofarm, Ethiopia, June 2002.

PREVENTION – NATIONAL LEVEL

- Education campaigns aimed at pesticide users, general population and children
- Restrict availability or limit use of most toxic pesticides
- Establish and monitor maximum residue limits
- Surveillance and epidemiological vigilance for acute and chronic related illness
- Build treatment capacities
  - Emergency services
  - Poison control centres
  - Education of health care providers

Education is a key component of safe pesticide use and prevention of toxic exposures. Farmers, pesticide applicators and their families need to be informed and educated on how to recognize and prevent pesticide poisonings. Trained or licensed pesticide applicators can maximize preventive measures. Educating mothers on home prevention strategies is particularly important.

Bans and restrictions on use of pesticides found to be highly toxic or persistent in the environment have been successful; severe poisonings are seen less frequently than in the past. For example, organochlorine poisoning no longer occurs in countries that restrict their uses to a specific agricultural application and have banned domestic use.

A major change in regulatory approaches to pesticides occurred when the US Congress passed the Food Quality Protection Act in 1996. This law requires the US Environmental Protection Agency to set residue levels for foods to protect the most vulnerable populations, specifically infants, children and fetuses (pregnant mothers) from harm due to cumulative exposure taking into account all routes of exposure. This law has led to the restrictions on use and voluntary withdrawal from the market by manufacturers of several previously widely used pesticides (e.g. chlorpyrifos and diazinon).

Pesticide manufacturers and governments should follow the voluntary FAO International Code of Conduct on the Distribution and Use of Pesticides.

Refs:

UNEP Chemicals. Childhood Pesticides Poisoning. Information for Advocacy and Action. May 2004 (www.who.int/ceh/publications/en/pestpoisoning.pdf).

US EPA Website Food Quality Protection Act, 1996 (www.epa.gov/oppfead1/fqpa/backgrnd.htm).

Pesticides

PREVENTION – INTERNATIONAL LEVEL

- **Persistent organic pollutants (POPs)**
  Stockholm Convention
- **Hazardous chemicals and pesticides**
  Rotterdam Convention (PIC)
- **International organizations:**
  WHO, IFCS, FAO, ILO

Pronczuk 26

Nine of the 12 persistent organic pollutants (POPs) included in the Stockholm Convention, are pesticides (aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, mirex, toxaphene and hexachlorobenzene). This convention, under the auspices of United Nations Environmental Programme became effective in May 2004, after it was signed by 50 countries. The Rotterdam Convention on the Prior Informed Consent (PIC) procedure for certain hazardous chemicals and pesticides was adopted in September 1998, and has been signed by 73 countries. The convention establishes a first line of defence against toxic chemicals, giving importing countries the power to receive information and decide which potentially hazardous chemicals they want to receive. It also covers labelling requirements. The convention includes 22 pesticides.
Other international organizations such as the Intergovernmental Forum for Chemical Safety (IFCS), the International Labour Organization (ILO) and others are working towards safer use and monitoring of pesticides at the global level.

IFCS: Intergovernmental Forum for Chemical Safety
FAO: Food and Agriculture Organization
ILO: International Labour Organization

Refs:
UNEP Chemicals. Childhood Pesticides Poisoning. Information for Advocacy and Action. May 2004 (www.who.int/ceh/publications/en/pestpoisoning.pdf).
www.pic.int

THANK YOU

Message

From: E&E News [ealerts@eenews.net]
Sent: 2/27/2018 9:09:12 PM
To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb5
Subject: February 27 -- E&E News PM is ready

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E&E NEWS PM — Tue., February 27, 2018

READ FULL EDITION

1. BIOFUELS:

White House meeting ends without deal

A meeting between President Trump and senators on opposite sides of the debate over ethanol mandates today failed to produce a compromise, participants said.

THIS AFTERNOON'S STORIES

2. INTERIOR:

Dem calls for subpoena of staff reassignment documents

3. PESTICIDES:

Judge blocks cancer warning on glyphosate in Calif.

UPCOMING HEARINGS AND MARKUPS

4. CALENDAR:

Activity for February 26 - March 4, 2018

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Message

From: Sophie Balk [SBALK@montefiore.org]
Sent: 2/28/2018 7:24:36 PM
To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; internet:r[Ex. 6]; internet:pspire@aap.org [pspire@aap.org]
CC: Sophie Balk [SBALK@montefiore.org]; Lowry, Jennifer [jlowry@cmh.edu]
Subject: Endocrine disruptor chapter with addition
Attachments: 29 - Endocrine Disrupting Chemicals for Stakeholder Review sjb022818docx.docx

Ruth and Paul,
I found Maida's response to query and added a paragraph (requested by reviewer) and references.
Ruth, please review and let us know if this is ready to go to copy editor.

Thanks

Sophie J Balk MD
Attending Pediatrician
Children's Hospital at Montefiore
Professor of Pediatrics
Albert Einstein College of Medicine
[Ex. 6]
718 405-8091 (fax)

Message

From: Peter van den Hazel [pvdhazel@upcmail.nl]
Sent: 7/19/2016 8:55:34 PM
To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; r Ex. 6
Subject: FW: INCHES abstracts
Attachments: INCHES Conference programme in progress.doc; abstracts full July11.docx

Van: Peter van den Hazel [mailto:pvdhazel@upcmail.nl]
Verzonden: woensdag 13 juli 2016 9:45
Aan: 'Joachim Heinrich' <heinrich@helmholtz-muenchen.de>
Onderwerp: FW: INCHES abstracts

Dear Ruth,

Thanks for volunteering to be a member of the Scientific Committee of the 8th International Conference on Children's Health and the Environment (INCHES) that will be celebrated in Barcelona, on 14-16th September 2016.

Please, find in the attachment a document with all the abstracts submitted to this meeting. In the box you see the numbers of abstracts that we have selected for you to judge. You should decide whether they qualify for acceptance, adjustment or rejection. You can use this box to resend your judgement. Use 1 line per abstract (so distribute them in a larger table).
We have selected mostly the abstracts that we see to fit in a session that we thought you might chair. In addition we have distributed some abstracts at random to the members of the scientific committee.
We have also added the current draft programme. You might want to suggest into which session you think the presentation fits best.

Abstract numbers			
	Accept, adjust, reject	Oral/poster	Suggested session
12,13, 46,50,55, ,81,85,86			

In the case that they could be accepted for INCHES you should also decide whether or not the described work should be accepted for oral or poster.
We tried to keep the number of abstracts to evaluate as low as possible. However, feel free to evaluate some more abstracts if you can.

Please, send us your evaluation in one week time (pvdhazel@upcmail.nl), latest 22th July.

Thanks for your collaboration and support to INCHES.

Peter van den Hazel
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1.
Lead intoxicated children in Kabwe / Zambia

Stephan Bose-O'Reilly (1,2), John Yabe (3), Joseph Makumba (4), Jack Caravanos (5, 6)

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(2) Department of Public Health, Health Services Research and Health Technology Assessment, UMIT – University for Health Sciences, Medical Informatics and Technology, Hall i.T., Austria
(3) University of Zambia, School of Veterinary Medicine, Lusaka, Zambia
(4) Misenge Environmental and Technical Services Ltd., ZCCM Investment Holdings Plc (ZCCM-IH), Kitwe, Zambia
(5) City University of New York School of Public Health, New York, USA
(6) Pure Earth / Blacksmith Institute, New York, USA

Introduction:
Kabwe was an important lead and zinc mining town in Zambia for over 90 years, leaving waste lead contaminated tailings behind. Lead is a well-known serious health hazard, causing anemia, seizures, encephalopathy and death. Soil in Kabwe's housing areas is highly contaminated with lead, especially children from neighboring townships ingest toxic lead dust.
Methods:
The environmental assessments and the health data for Kabwe's children were collected and analyzed. Data is available from three different sources: Copperbelt Environment Project; Blacksmith Institute/ Pure Earth and University of Zambia / Hokkaido University in Sapporo/ Japan.
Results:
In most housing areas the tolerable soil lead levels of 400 ppm were surpassed. Children's blood lead levels were in the most affected townships in over 95% of children increased (≥ 10 µg/dL). Most children did have blood lead levels where urgent action to reduce blood lead levels is required. Exposure to the toxics urgently needs to be reduced. Over ≥ 45 µg/dL medical treatment is recommended, in the most affected townships > 50% of the children showed such high levels. The existing data clearly proves the severity of lead exposure in Kabwe.
Conclusion:
Large proportions of children are not only highly exposed, but actually have high to extremely high levels of lead in their bodies. According to threshold levels and international recommendation they need to be treated and the exposure must be considerably reduced.

Funding by World Bank (Environment remediation and improvement project (P154683)

2.
Poor education – poor job – poor health

Hanns Moshammer
Lack of schooling during childhood leads to a vicious circle with access only to hazardous, insecure, and poorly paid jobs, with higher health risks and poorer access to health care, successively with more disease and injuries, again less income and consecutively poorer housing and even more risks. Not only does this lead to individual misfortune, but it also affects the fate of the offspring. The mechanisms are even be more visible in developing countries without a well-established welfare-system with social securities and free access to public education.
We investigated health in relation to occupational exposures in the cotton industry of Pakistan. We found that small enterprises producing for the local market mostly but also on demand for the big companies with long-standing contracts with European and American traders, not only display the highest dust exposures, poorest occupational safety measures and hygiene, but also have the longest shifts (2 shifts of 12 hours each usually), and the least educated work-force with a working history since the age of 15 usually.
These workers also fared poorest regarding several health parameters, from poorer lung function to a long list of reported symptoms not exclusively but also including respiratory symptoms, and to signs of cytotoxicity and genetic damage.
In this observational study it was not possible to disentangle the effects of longer years of exposure because of early initiation of work, the longer occupational exposure per day, and the higher exposures because of poorer occupational hygiene. Nevertheless we want to point out that all these factors were primarily caused by poor education and early termination or even lack of proper schooling.

3.
An unexpected epidemic of respiratory distress

Hanns Moshammer

In 2011 a series of severe cases of respiratory distress came to the notice of Korean officials. The index case was a young female who developed deadly bronchiolitis obliterans few weeks after an uncomplicated pregnancy. Consecutive examinations revealed that dozens of similar cases had appeared throughout the country, mostly in children and in females, the latter often either pregnant or shortly after pregnancy. Mortality rate was exceptionally high among cases and many more cases only survived after lung transplantation.
As infectious causes could not be established further studies focused on toxic exposures. Because of the characteristics of the affected persons (no common occupational exposure) indoor pollutants were suspected. It turned out that cases had used humidifiers at home and had treated these with disinfectants as advertised by industry. Several case-control studies clearly indicated the causal role of these disinfectants. Animal studies demonstrated the same severe damage of lung tissue after inhalative exposure towards a disinfectant previously deemed "safe" and "not toxic".
Further studies also revealed that similar epidemics had happened for the last couple of years, usually in the cold season, without anybody taking notice.
General implications for toxicity testing and for the application of the precautionary principle will be discussed. Of note our own working group had warned in 2012 not to use the same group of disinfectants indoors in the case of mould. We were then threatened with legal prosecution by the industry because of the stipulated "total safety" of these substances.

5.

Maternal lifestyle during pregnancy and child neurodevelopment

Polanska K[1], Krol A[1], Sobala W[1], Gromadzinska J[2], Brodzka R[2], Calamandrei G[3], Chiarotti F[3], Merecz-Kot D[4], Makowiec-Dabrowska T[5], Ligocka D[6], Wasowicz W[2], Hanke W[1]

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[6]Bureau of Quality Assurance Nofer Institute of Occupational Medicine, Lodz, Poland

Background: Substantial attention has been paid in the recent years to the impact environmental factors on child development. The objective of this study was to evaluate the association between maternal lifestyle factors and child neurodevelopment.
Material and methods: The current analysis included mother–child pairs from Polish Mother and Child Cohort study (REPRO_PL). The following factors related to maternal lifestyle were considered: smoking (based on the cotinine level), phthalate exposure based on their metabolite levels in urine, microelements levels in maternal and cord blood, alcohol consumption, leisure-time physical activity (LTPA) and stress in pregnancy, pre-pregnancy BMI and folic acid supplementation based on questionnaire data. Psychomotor development was assessed in children at the ages of one and two by the Bayley Scales of Infant and Toddler Development.
Results: Significant association was observed between prenatal exposure to tobacco constituents and a decreased child motor development in assessments performed at both ages ($\beta=-0.8$, $p=0.01$; $\beta=-1.4$, $p=0.001$). Child motor development was also inversely associated with natural log concentrations of most of the phthalate metabolites ($p<0.05$). Maternal pre-pregnancy underweight was associated with decreased child language abilities ($\beta=-5.2$, $p=0.01$). Negative impact on child cognitive development at the age of two was observed for the Perceived Stress Scale ($\beta=-0.8$, $p=0.01$) and the Social Readjustment Rating Scale ($\beta=-0.4$, $p=0.03$). The recommended level of LTPA during pregnancy was beneficial for child language development ($\beta=4.8$, $p=0.02$). Finally, a positive association between selenium levels in pregnancy and motor development ($\beta=0.2$, $p=0.002$) at one year of age, and language development ($\beta=0.2$, $p=0.03$) at two years of age was observed. For alcohol and folic acid there were no significant associations with any of the analyzed domains of child neurodevelopment.
Conclusions: These results underscore the importance of policies and public health interventions promoting healthy lifestyle among women in reproductive age and during pregnancy.

6.

Exposure of Children in Schools of India to Indoor Particulate Matter and Metals in different Seasons

Ajay Taneja
Department of Chemistry
Dr B R Ambedkar University, Agra, India
Email: Ex. 6

The concentration of particulate PM_{10}, $PM_{5.0}$, $PM_{2.5}$, $PM_{1.0}$, $PM_{0.50}$ and $PM_{0.25}$ was measured along with heavy metals (Fe, Zn, Cu, Cd, Cr, Mn, Ni and Pb) collected from settling dust in the indoor-outdoor environment of roadside and residentially located schools of Agra city in India. PM indoor/outdoor ratios at the roadside and residentially located schools were also determined along with the meteorological parameters. Metal contamination of Fe, Cd, Cr, Ni, Pb and Mn was in abundant quantity in residential and roadside soil dust of the schools. The enrichment factor was calculated using Ca as a reference to the trace metal species to identify the sources. Three factors in inside and three outside the classrooms of both types of schools were identified. These factors reflected source soil dust, road dust, vehicle emissions, industrial emissions, metal processes and incineration activities and their contributions were estimated using principle component analysis. Measurement of such exposure levels would be helpful in prevention of environmental risks to school children at a global level for better and healthy mind of children studying at schools.

prosecution by the industry because of the stipulated "total safety" of these substances.

7.

Assessing Young People's Preferences in Urban Visibility in Beijing

Oscar A. Fajardo, Jingkun Jiang, Jiming Hao

State Key Joint Laboratory of Environment Simulation and Pollution Control, School of Environment, Tsinghua University 100084, Beijing, China

Abstract

In the search for measures to address the severe air pollution problems that accelerated industrial development has caused in China, many studies have been conducted on the characterization and origin of the pollutants, but so far very little work has been done to assess the social and psychological dimensions that air pollution has. Among all of these, the effect of visual impairment is often underestimated. In this study we sought to estimate the way in which young people think about the problem of poor visibility in Beijing, and if their opinions vary compared to people accustomed to different levels of visual air quality in other urban areas. A survey was conducted with the participants all aged between 15 and 18 years old. It was found that the range of median preference value for an acceptable visibility was 34.5–45 dv (12–4 km), which was much worse than the 19–33 dv (58–14 km) reported in Northern America. An analysis of the hypotheses that could account for this observed difference was conducted. Recommendations to correct this difference were proposed.

8.

War, conflict and internecine strife what are the consequences for children?

Dr Marlene L. Martin (MTh Ethics DTh Ch Sp UNISA)
Ex. 6
Phone: Ex. 6
South Africa

We live in an age of war, conflict and internecine strife. Inevitably this has an effect on spiritual belief.

This paper examines the ways in which children cope with the strife and conflict situations with which they are confronted. War has many faces in Africa; guerilla warfare, xenophobia, ethnic cleansing, riots, massacres, uprisings and even marital conflict or war in the home. These all have severe implications for children.

In South Africa, my home, local people are fiercely religious, holding strong beliefs about the causes of manifestations of violence often believing that the causes are of a spiritual nature and they look for answers from the gods they serve, often believing that there are demonic influences or that war, death and suffering are a punishment by God. Children are impressionable and they remain deeply troubled by these situations.

As well as being victims of war, children are frequently used as soldiers in African wars and they are frequently called upon to kill women and other children which leaves deep psychological scars on them.

9.

Exposure to arsenic and mercury: associated pregnancy outcomes, and early infant developmental outcomes in gold mining areas in Tanzania

Elias Charles Nyanza

Exposure to arsenic and mercury through artisanal and small scale gold mining (ASGM) is an under-explored yet salient issue in Tanzania. Tanzania has more than 1.5 million people engaged in ASGM activities, ranking it second in Africa behind South Africa. Mining operations are known to expose the entire community including vulnerable pregnant women and children, to arsenic and mercury via the water they drink, the food they eat, the soil that their food is grown and the air they breathe. Mining activities are conducted haphazardly without regard for environmental, occupational, community exposures or gender. Perhaps even more concerning is that over 30% of ASGM miners are women, mostly of reproductive age. Women working in ASGM operations are engaged mainly in the processing of gold, which involves crushing, pulverization and amalgamation without protective gears. The use of mercury in the extraction process is very common; and most of the gold ore do consist of arsenic. Prenatal exposure to arsenic and mercury is associated with reproductive risk factors including still birth, low birth weight, and congenital anomalies, and with poorer developmental outcomes in the children. Therefore, this study uses a longitudinal prospective approach to examine an association between level of exposure prenatally to arsenic and mercury and reproductive risk, birth defects and early developmental outcomes in ASGM communities in Tanzania. The data obtained from the current study will provide important information to the public, policy makers, decision-makers and research communities on level of exposure in pregnant women and their babies to these toxicants in ASGM areas. In addition, information on the impact of this exposure on birth outcomes and children's development will be obtained. This information may be used to prioritize efforts to reduce exposure to arsenic and mercury through environmental and occupational management.

10.

Lifelong Exposure to Green Space and Attentional Development: A Prospective Birth Cohort Study

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e Department of Child and Adolescent Psychiatry/Psychology, Erasmus University Medical Centre–Sophia Children's Hospital, Rotterdam, The Netherlands.

Introduction: Natural environments including green spaces are thought to exert beneficial impacts on brain development; however, the available evidence on such impacts is still very scarce. The aim of this study was to evaluate the association between lifelong exposure to residential surrounding greenness and cognitive development during preschool and early primary school years.

Methods: A longitudinal study based on data from a well-established multi-centre population-based birth cohort in Sabadell and Valencia (Spain) following participants from pregnancy (2003-2006) till 7 years of age (2012-2013). Satellite-derived normalized difference vegetation index (NDVI) was used to quantify surrounding greenness (100 m, 300 m, and 500 m buffers) of participants' residential addresses at birth and at 4 and 7 years of age. Attentional function was assessed using Kiddie-Continuous Performance Test (K-CPT) at age 4 (N=888) and Attention Network Task (ANT) at age 7 (N=978). Mixed effects linear and negative binomial models with cohort random effect were developed to quantify the association between greenness exposure and attention adjusted for relevant covariates.

Results: Higher average residential surrounding greenness between birth and age 4 was associated with lower omission errors and lower hit reaction time standard error (HRT-SE), both indicators of inattentiveness in K-CPT. Similarly, higher average residential surrounding greenness between birth and age 7 was associated with lower HRT-SE in ANT.

Conclusions: This is the first longitudinal study to report on the impact of lifelong green space exposure on cognitive development in general and attentional development in particular. It found this exposure was associated with enhanced attentiveness in preschool and primary school children. The associations for attentiveness were consistent using different tests (K-CPT and ANT) and different exposure windows (birth to 4 years and birth to 7 years).

11.

The PERSIAN birth cohort; A Work in Progress

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Introduction: The influence of various exposures during pre- and postnatal period is not limited to reproductive and childhood outcomes and can extend over a lifetime, a corpus of knowledge embodied by the DOHaD (Developmental Origins of Health and Diseases) concept. The overarching aim of this project is to study DOHaD in the Iranian population. Towards this aim, we will evaluate the impact of socioenvironmental, psychological and genetic factors on pregnancy outcomes, child mental and physical health, growth, and development, and early- and late-onset chronic non-communicable diseases.

Methods: The PERSIAN (Prospective Epidemiological Research Studies of the Iranian Adults, Adolescents and Newborns) birth cohort is designed as a multi-centre network of population-based birth cohorts in areas representing cultural and contextual variations in Iran. Standardised protocols for data collection, maintenance, and analysis tailored for the Iranian population with the prospect of future international collaborations have been developed. The cohort will be conducted in 5 phases: periconception till birth, infancy, childhood, adolescence, and adulthood. Data collection will be based on computerized questionnaires, biological samples, physical examinations, clinical tests, hospital records, and surveys of living environment.

Results: The pilot phase will start in Shahreza (Isfahan) and Yazd in April 2016 and is expected to last 2 calendar year. In each study site, 2000 pregnant women will be recruited during their first pregnancy visit (at the end of the 1st trimester). We will utilize a combination of public and private healthcare providers in order to ensure that the participants represent the ethnic and socioeconomic distribution of the underlying population.

Conclusions: PERSIAN birth cohort will advance our knowledge of DOHaD in the Iranian population. Moreover, it will establish a platform in the Middle East open for participating in international studies of DOHaD.

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12.

Risk Assessment of Indoor Exposure to Volatile Organic Compounds in Children Homes, Ankara, Turkey

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Several researches have demonstrated that babies and children are more sensitive to environmental pollution than adults. The most important reason for that is the continuous growth of children. Babies spend about 95% of their time in indoor environment. Carbonyls
and BTX, a subset of volatile organic compounds, represent an important group of indoor air pollutants. In general, chronic health effects of VOCs can be classified as either non-carcinogenic or carcinogenic.

In this study air quality monitoring was carried out at the infants' homes in Ankara to collect data on the levels of indoor and ambient air constituents, to identify their potential sources. Sampling was conducted simultaneously indoors and outdoors at around 100 infant homes between April 2011-January 2014. The measurements were performed at four periods.

VOC samples were collected in Tenax TA sorbent filled tubes with active sampling method and analyzed with (TD-GC/MS). Higher VOC levels at the baby's room relative to other indoor environments have been identified due to the less frequent ventilation habits at the baby's room.

Important factors affecting the indoor VOC concentrations at the indoor environments were identified as proximity of the house to main road, purchasing of a new home furnishings, newly painting done, type of home heating and flooring type.

Health risk due to exposure to indoor VOC in infants were evaluated. Due to the results of risk analysis of benzene respiration, the health risk of 77% of homes are in the Class C (10^{-6}- 10^{-5}) and 17% of homes are in the B class (10^{-5}-10^{-4}), in the case of lifelong exposure to naphthalene, 98% of the homes are in the A class (>10^{-4}) cancer risk.

It is very crucial to identify and minimize the factors that result in early childhood health problems not only to grow health generations but also to minimize health expenditures.

Keywords: Indoor air, volatile organic compounds (VOCs), babies health, health risk.

13.

Effect of diet on allergies among preschool children

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Background. The prevalence of asthma and allergy has increased among children. This increase in prevalence might be related to diet. The present epidemiological study investigated the relationship between fruits, vegetables and nuts intake and the prevalence of wheezing ever, asthma, and eczema among preschool children.

Methods. This nested case-control study included 1,489 children of 4–6 year's age residing in Kaunas, Lithuania, who were recruited in 2007-2009 to the KANC newborns cohort study. Responses to the questionnaire completed by parents were used to collect information on allergic diseases, diet and other factors. Association between diet and children's allergic diseases was estimated by multivariable regression, controlling for covariate.

Results. Even 83.3% of all children ate fresh fruits (62.7% - vegetables and 6.2% - nuts) at least thrice per week. A significantly lower prevalence of wheezing ever was found among children who ate fruits at least thrice per week than among those do not ate fruits (crude odds ratio: 0.44, 95% CI 0.22 to 0.87). Adjusted odds ratio (aOR) of asthma were also lower for children ate vegetables at least thrice per week to compare with none vegetables consumption (aOR 0.70, 95% CI 0.37 to 1.35). Consumption of nuts 1-2 times per week was associated with lower prevalence of childhood asthma (aOR 0.69, 95% CI 0.44 to 1.08) and eczema (aOR 0.56 95% CI 0.35 to 0.89).

Conclusion. The results indicated beneficial effect of frequent consumption of fresh fruit and vegetables on children asthma and allergies. These results might have important implication for children health.

Keywords: allergies, children, fruit, vegetables.

14.
Psychosocial stress and obesity in Kaunas children

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Background. Recent research has found that family socioeconomic status, parenting stress and other environmental factors can have impact on child development. The aim of this study was to assess the association between the psychosocial stress in the family and risk for obesity among 4–6 year's children.
Methods. This nested case-control study included 1,489 KANC birth cohort study children followed-up for 4–6 years. We used the Parent-Child Dysfunctional Interaction subscale of the Parenting Stress Index (short form) and questionnaires on child development to assess risk factors for children obesity. The body mass index status for age was calculated and the risk factors for being overweight/obese were estimated. Logistic regression models were fitted to examine the associations as odds ratios (OR) between parent-child relationship and the risk of overweight adjusted for relevant covariates.
Results. A total of 6.8 % of the children had overweight and 5.4% were obese. Children from smoking families with lower education had almost twice higher obesity risk. The stratified multivariate model showed that, with reference to the group of high educated and normal parents-child relations, low education and pathological parents-child relations were found to be a statistically significant risk factors for overweight in 4–6 years children (OR 2.43; 95% CI 1.31–4.51). **Conclusion.** Maternal tobacco smoking and pathological parents-child relations may be predictors of overweight and obesity throughout the developmental trajectory of childhood. Abandon smoking and psychosocial stress management should be encouraged among pregnant women to decrease their children obesity risk.

Keywords: psychosocial stress, children, obesity.

15.

Prenatal early exposure to the environmental endocrine disruptors

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Endocrine disruptors (EDs) are chemicals compounds that send confusing messages causing various dysfunctions by mimicking or altering the effect of hormones in human body. Several EDs such as Bisphenol A (BPA), phthalates, organotins, among others are involved in obesity and diabetes diseases in the childhood. Recent studies have shown evidences that these chemicals can cross the placental barrier making fetal exposure closely related to maternal exposure. The aim of this research is to establish and detect early fetal exposure to different EDs. To address this issue, recently, a human biomonitoring (HBM) campaign in a cohort of pregnant women has begun, in order to predict the ED mothers' intake and also the dose of ED at which the child has been exposed in the early stage of the development. The data obtained from this cohort (biological levels of EDs and results from questionnaires regarding food frequency intake, habits, and lifestyles) will be implemented into the physiological based pharmacokinetic (PBPK) model. PBPK model assesses the absorption, distribution, metabolism and excretion (ADME) of a chemical compound into human body as well as the internal exposure to target organs estimate the early exposure of the child to EDs. For PBPK model development and parameterization data from literature were used. The integration of the data obtained from current on-going HBM campaign and PBPK model, here developed, will predict the prenatal early exposure of the child/foetus to EDs. This work is included in the frame of HEALS project (FP7-603946).

Keywords: Endocrine disruptors, PBPK, ADME, prenatal early exposure.

16.

Particulate matter characterisation in the schools located around petrochemical industrial complex. Infiltration of particle from outdoor to indoor air.

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Evidence of associations between exposure to ambient particulate matter (PM) and cardiovascular and respiratory diseases has being widely reported. In recent years, in addition to PM_{10} and $PM_{2.5}$ (particle having a diameter of less than 10 and 2.5 µm, respectively), other smaller fractions such as PM_1 and "ultrafine" particles ($PM_{0.1}$) become more relevant in the literature due to their capacity to deposit deeper in respiratory tract. With changing life style, children, same as adults, spend more of their time in indoor environments (mainly in school and homes). However compare to adults, children are more susceptible to air pollutants. The aim of this study is to characterize the composition of indoor PM fractions at schools and validate with indoor air quality model. Indoor and outdoor samples of PM_{10}, $PM_{2.5}$, PM_1 and $PM_{0.25}$ were collected in different schools close to one of the largest industrial complex of southern Europe located in Tarragona (North-east Spain). Using AIRMOD, an air dispersion model, schools were selected from the most impacted by industrial (chemical and petrochemical) and harbor emissions. PM fraction levels were measured both, indoor and outdoor environment of schools using two different samplers, high volume samplers and cascade impactors for outdoor and indoor, respectively. Chemical characterization was carried out by analyzing elements and ions content. In addition electron microscope (ESEM) analyses were done in order to assess the morphology of different particles fractions. In order to establish the amount of particles that come from outdoor air to inside the schools, an indoor air quality simulation model (IAQX 1.1) was applied. This model takes into account building parameters such as ventilation rates, room volumes in order to calculate the infiltration of outdoor particle to indoor compartments. Sensitivity analysis and calibration with real data were applied. This work is in the framework of Ultrapar project (Spanish Ministry) and HEALS project (7FP European Union).

Keywords: Particulate matter (PM), fine and ultra-fine particles, indoor and outdoor.

Topic: Pollutants in schools.

17.

School children exposure to particulate matter (coarse, fine, and quasi-ultrafine) around petrochemical complex. Respiratory tract dosimetry

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With changing life style in developed countries, children are spending more than 80% of their time indoor. Pollutants levels, as well as emission sources, could be different between inside and outside buildings and changes across heterogeneous indoor environment . Children are one of the most vulnerable population groups to environmental pollutants, including particulate matter (PM). In a previous study we measured several fractions of indoor PM ("coarse" (PM_{10}-$PM_{2.5}$), "fine" ($PM_{2.5}$-$PM_{0.25}$) and "quasi-ultrafine" ($PM_{0.25}$)) in several schools. These schools are in a highly impacted area of the largest petrochemical industrial complex in southern Europe, located in Tarragona (North-east Spain). The aims of the present study is to provide an advanced risk assessment of PMs in a vulnerable population cohort by: 1) characterizing the PM exposure of children in the schools impacted by industrial emission in Tarragona; and 2) assessment of primarily toxicity characterization of these particles fraction through MTT assay with epithelial alveolar cell.
Mechanistic exposure models can provide a valuable insight that considers human variability for risk assessment. The exposure model applied was a respiratory tract dosimetry model that assesses the dose retained in the different parts of the human respiratory tract (MPPD model). This exposure model takes into account the parameters that affect human exposure to particles such as PM concentration and size, and activity patterns of children in different environments (indoors and outdoors). The activity patterns of children were assessed using time spent surveys and physical activity questionnaires. MTT assays with human pulmonary alveolar cells were conducted to evaluate the viability of exposed cells to PM collected in the schools. This work is in the framework of Ultrapar project (Spanish Ministry) and HEALS project (7FP European Union).

Keywords: Particulate matter (PM), child exposure, health risk assessment.

Topic: Air pollution – respiratory health.

18.

Hazards and Risks in the Glyphosate Debate

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Glyphosate, a herbicide blocking an enzyme essential for all plants, but not for animals and humans, has certain advantages as compared to herbicides. It is not persistent. Due to the production and application of more than 700.000 tons per year, large portions of mankind are exposed. Therefore, the International Agency on Research on Cancer (IARC) of the World Health Organisation (WHO) has looked more closely on glyphosate and has classified it as probably carcinogenic for humans (2A). The Bundesamt für Risikobewertung (BfR) and the European Food Safety Authority (EFSA) have analysed the data and contradict the IARC classification. The process of decision finding and essential arguments for the contradictory classification require comments. BfR and EFSA should have offered more transparency regarding their evaluation, and they should have restricted their opinions and proposals to their genuine task: to propose regulations concerning the risks which follow from possible hazards, here from a questionable classification of glyphosate as probable human carcinogen. In the public debate, the meaning and implications of hazards and of risks must be clearly defined and properly used. This would avoid many unnecessary misunderstandings.

19.

Autism Spectrum Diseases, including Asperger Syndrome.
Fairy Tales and Facts about Environment and Genetics.

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Genetic factors are of paramount importance for the development of ASD. Male predominance, high rate of recurrence in families with more than one person with ASD, and high concordance in monozygotic twins show to what extent genetic and possibly also epigenetic factors play a role. They do not, however, explain completely the genesis of ASD. Hence, environmental factors are also important. Numerous studies and publications have generated many hypotis on what factors could be active.

20.

Lead in soil; how can we reduce exposure to young children

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In young children, the exposure to lead is associated with a reduced Intelligence Quotient (IQ) score even when exposure rates are low. The European Food Safety Authority concluded that there is no evidence for a threshold for critical lead-induced effects.
The Dutch public health services have set up advices for municipalities for managing health risks due to the exposure of soil lead. This advice encloses communication and education to residents, simple measures to reduce the exposure of soil lead and the removal of hot spots. The advice is based on a study by the National Institute for Public Health and the Environment (RIVM) which brought together the current knowledge about the exposure and health effects of lead contaminated soil.
On population level the loss of a few IQ-points can have large consequences. For instance, the loss of one IQ-point on population level means an estimated 2% loss of productivity. It can also lead to an increase of people with a (very) low IQ who need more care and support.
In neighborhoods with elevated levels of soil lead, a further reduction of the exposure becomes important. The main uptake pathways are through hand-mouth contact while playing in contaminated soil and through the consumption of home-grown vegetables. Therefore, the advice states that attention should be given to the soil quality of playgrounds and (vegetable) gardens of young families. The advices are based on the idea that exposure to lead should be as low as reasonably acceptable (ALARA). Examples are: let children play in specially prepared clean sand areas and grow vegetable in containers with clean soil separated from the contaminated soil. In addition, it is advised to wash the hands of the children frequently and to clean the in-home area by frequent vacuum cleaning.

21.

Occupational noise exposure during pregnancy - new aspects in child's language acquisition

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Erkko Airo (FIOH), M.Sc (Tech)
Marja-Liisa Lindbohm (FIOH), PhD, adjunct professor
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Eira Jansson-Verkasalo (UTU), PhD, professor

Introduction: Occupational noise in pregnancy may affect the child´s central auditory processing and language acquisition. There are no investigations on this topic. At present, work safety focuses on protecting maternal hearing.
Methods: We conducted a cohort study among women working in the food industry, and as kindergarten teachers, musicians, dental nurses or pharmacists. We contacted 855 women with new-born children, 578 (68%) of which responded at baseline and 423 (73%) when their children were 12 months old. The final analyses included 406 mother-child pairs.
The baseline questionnaires focused on maternal occupational exposure and family factors. Language acquisition was measured by a validated questionnaire, Esikko, evaluating social communication, speech production and language comprehension. The mother filled the questionnaire when her child was 12 months old. An occupational hygienist assessed the noise exposure on the basis of maternal profession, job tasks and noise measurements using the categories: no exposure (<70dB, n=178), low exposure (>=70dB<=80dB, n=108), moderate/high exposure (>80dB, n=120). We used linear regression, adjusted for mother's age, employment, child's gender and father's education to evaluate the association between noise exposure and children's language acquisition.

Results: The adjusted mean language acquisition scores (range 0–57) were 34.3 (95% CI 32.5–36.0) for no exposure, 34.8 (32.6–36.9) for low noise exposure, and 34.9 (32.8–37.0) for moderate/high exposure. There were no statistically significant differences among the exposure groups. This was also true in analyses of social communication, speech production and language comprehension and among food industry workers. Noise exposure was suggestively associated with lower language acquisition scores among kindergarten teachers. Reading to the child was strongly associated with high language acquisition scores in the entire data.

Discussion: We found no clear association between noise exposure during pregnancy and language acquisition among one-year old children. The study provides further results concerning two-year old toddlers.
Key words: child's language acquisition, cohort study, language delay, occupational noise exposure, pregnancy

22.

Noise prevention in kindergarten

Takacs Katharina

Summary of poster's content (in A1 format) - an oral presentation is also possible if desired

Introduction

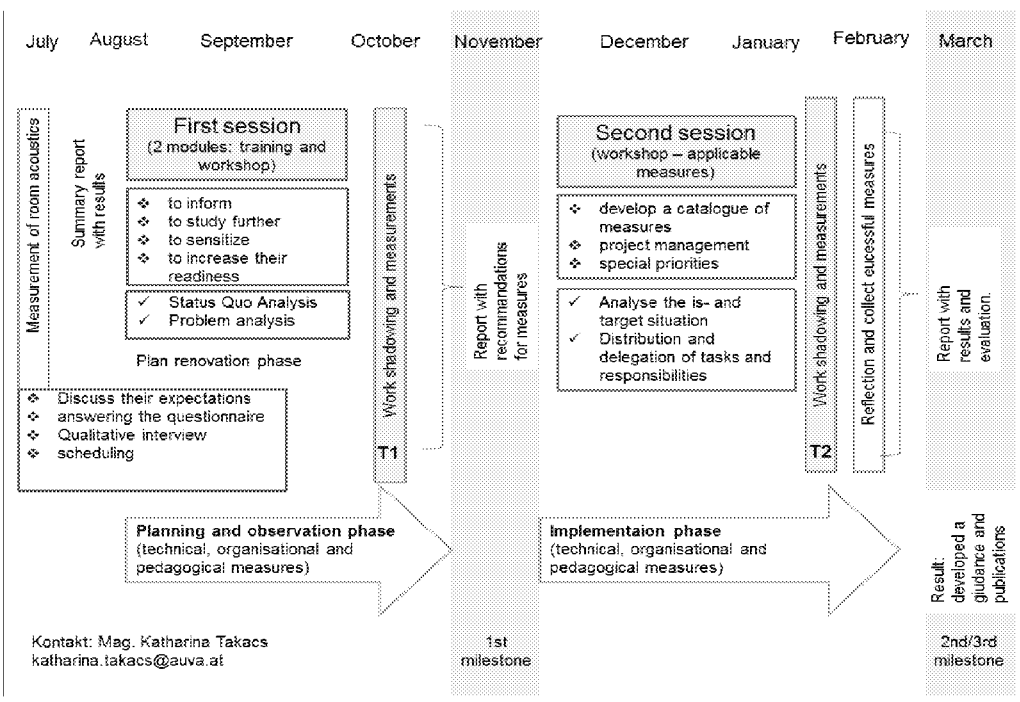
One of the most important and underestimated challenges is **high noise exposure** in kindergarten and school education. More than one of two teachers complains about the noise conditions in child development facilities. In fact, constant noise exposure affects not only the attention performance (Klatte, 2009) or the language development, but also causes psychosomatic complaints or a higher stress perception (Schönwalder, 2007).

But why are noise problems in kindergartens currently a highly topical subject?

The changing needs of parents and their children, as well as inflexible structures in kindergartens are the main reasons for an increase in noise disturbance. However, in Austrian childcare centres, individual and open room concepts are barely available. Furthermore, most legislators, architects and teachers see noise disturbance as inevitable and do not consider noise disturbance when building or renovating premises for example.

For that reason, our priority intention is to introduce, develop and evaluate noise reduction interventions, which are easy to apply and show immediate effects. This information helps affected institutions to tackle their noise problems, but also aims to sensitize policy makers and concerned stakeholders.

Method (just a small excerpt of poster's content)



Results

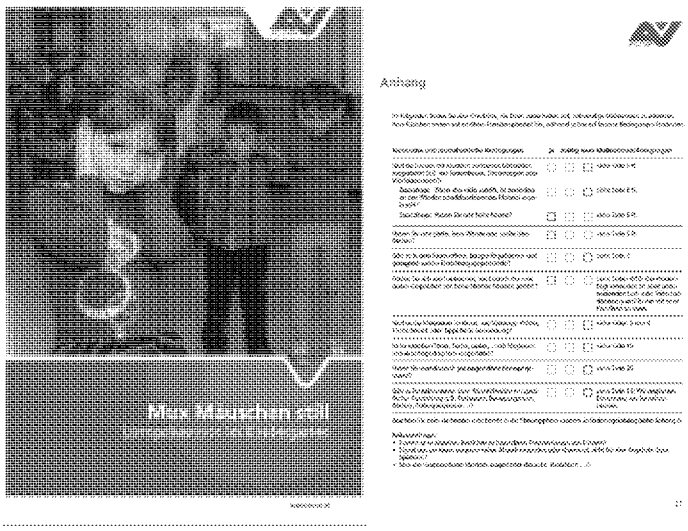
Our first research results:

- Children are more affected than pedagogues
- Interventions have to set on technical, organisational and pedagogical conditions

Our resulting projects

- Workshops for kindergarten teams to implement individual interventions together
- Noise measurements and consulting in kindergartens

- Noise Prevention Checklist (which interventions are the most useful at a specific kindergarten?)
- Guidance about noise preventions for kindergarten management and policy markers
- Cooperation with Technical University of Vienna: implementing a new course for prospective architects to sensitize them for children needs
- Further research and evaluation of technical, organisational and pedagogical interventions (most of our supports and services are free of charge)



For more information, please contact Katharina.Takacs@auva.at

About AUVA
AUVA (Allgemeine Unfallversicherungsanstalt - the Austrian Workers' Compensation Board) is the social insurance for occupational risks for more than 3.3 million employees and 1.4 million pupils and students. Its legal duties are: prevention of occupational accidents and diseases, occupational medical care, first aid for occupational accidents, post traumatic treatment, rehabilitation, financial compensation and research. The prevention of accidents of children represents a major responsibility, since the foundation for future safety awareness is laid in childhood and youth. For children as well as for their instructors we have a large selection of media for safety education: films and posters, pamphlets and comics, check lists, ideas and support for educational programmes.

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23.

Maternal Environmental Exposure to Organochlorine Pesticides and its Effects on Birth weight

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Abstract

There is growing concern that chemical agents could impair the anthropometric development of the foetus. However, epidemiological studies have reported inconsistent results. This prenatal exposure has been associated with adverse pregnancy outcomes. The aim of the present study was to assess the association between birth size and prenatal exposure to Organochlorine pesticides (metabolites of dichlorodiphenyltrichloroethane and isomers of hexachlorocyclohexane) in the population of Agra region. Total of 90 mothers and their newborns participated in this case control study, a questionnaire on maternal demographic and anthropometric characteristics as well as occurrence of several occupational hazards, including pesticide. Residues of organochlorine pesticides in placental tissues were analyzed by gas chromatography equipped with electron capture detector. Regression analyses were performed between birth weight and organochlorine pesticide concentrations. Alpha-HCH, β-HCH, γ-HCH, total-HCH and p,p-DDT were found significantly higher in pre-term group. These findings reveal that prenatal exposure to organochlorine pesticides may contribute to the slight reduction in birth weight.

Keywords: DDT (Dichlorodiphenyltrichloroethane), HCH (Hexacholorocyclohexane), organochlorine pesticides, Birth weight

24.

TiPP TAPP-first steps into life

Claudia Gerken

Since April 2008, a home visit activity was launched as part of the social space oriented work approach "TippTapp". This preventive program combines a low-threshold health counseling for families with babies and screening on youth welfare topics.
The program is currently located in disadvantaged areas of Bremen. Pediatric nurses offer to visit families and their babies at the age of 6 weeks, 6 months and 12 months. Parents decide if they would like to take part. There is no obligation talking to us.
Because of regional work, our pediatric nurses provide explicit knowledge about helpful offers in their particular region.
During our visit in the families homes, we get a chance to discover circumstances of different origin that might influence health and development of children.
In 2014 there were 46,63% visits overall . Besides many helpful hints for the families, 13 cases were reported to the youth welfare. In 4 of them help was installed although the parents didn´t agree.
We would like to present content and current results of the program. It will be interesting to discuss the effect of gained knowledge concerning urban development.

25.

Blood lead concentrations from children practicing airgun shooting

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Introduction

Elevated lead concentrations in blood samples from adult indoor shooters are well known. Children are shooting mainly with airguns, but data about blood lead concentrations are missing. Such data would be important to know because even lead concentrations from children below 100µg/l are under suspect nowadays.

Methods

For these investigation children in the age of 12 to 16 years are recruited after agreement of the local ethical committee. Blood samples (1.2 ml EDTA) were drawn from 54 shooters (67 % boys) and 48 controls (79 % boys) after written consent from children and parents. Lead was analysed by graphite furnace atomic absorbtion spectroscopy (GF-AAS) under strict internal and external quality control. All 102 samples were above the detection limit of 5.0 µg/l.

Results

The shooters reported a mean training time of 4.8 (SD 2.7) hours per month with 215 shots (SD 115). The mean lead concentration of shooters was 32.4 µg/l (SD 15.1) and somewhat higher compared to controls (mean 25.4 µg/l, SD 13.2). The difference was borderline significant ($p = 0.048$). There was no difference between results from boys and girls and there was no correlation between shooting hours and blood lead levels.

Conclusions

The results underline that shooting with airguns maybe an additional source of lead in children. Due to the known health effects of lead for children all sources of lead uptake have to be reduced. Further research is necessary to obtain more recent data of the body burden of children in Germany and to look to previously unknown sources.

26.

Temporal trends of organochlorine compounds and PBDEs from utero until 4 years of age in the Asturias INMA cohort

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Persistent organic pollutants (POPs) include a wide range of compounds typically produced for agricultural and industrial applications. These compounds have diverse deleterious health effects and are persistent in the environment. Moreover, due to their lipophilic nature, they bioaccumulate in humans already in utero and in the breastfeeding period. Assessment of the significance of these early accumulation processes is important for understanding what are the main mechanisms leading to the human body burden of these pollutants and for identification of the toxic stresses in the early life period.

Accordingly, in utero POP accumulation has been addressed in previous cases but extension of these studies to longer life periods has been rarely considered. Nevertheless, evaluation of the body burden of these pollutants at different early life stages is important for obtaining comprehensive descriptions of the processes involved in their buildup and assessment of their potential health effects.

In the present study we are describing one of these cases. Organochlorine pesticides, polychlorobiphenyls and polybromodiphenyl ethers were measured in maternal serum, placental tissue, cord blood and 4 year-old children serum from a cohort in Asturias sampled within the INMA Project.

Maternal and children serum burdens were determined. The influence of maternal breastfeeding and other socio-demographic determinants in the accumulation of these compounds through time was evaluated. At 4 years of age, formerly breast-fed children were found to have higher POP concentrations and total burdens than non-breastfed children. The significance of these general trends for each individual pollutant was identified.

27.

Training modules for paediatricians

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Health effects of climate change

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The health care systems will be increasingly faced with new challenges due to climate change-related health risks. There are several risks to be mentioned: heat-related health problems, allergies and respiratory diseases as well as a new onset of infectious diseases, increased risk of skin cancer due to strong ultraviolet radiation and accidents due to extreme weather events and as a result - mental stress.
Children, due to their vulnerability, are seen as a special risk group for numerous pollution and exposure to climate change related factors. It is therefore important for the health sector to improve knowledge about health effects of climate change.
As part of the DAS (German Strategy for Adaptation to Climate Change), the Institute of Occupational, Social and Environmental Medicine, LMU Munich receives funding for project from the Federal Ministry for Environment, Nature Conservation, Building and Nuclear Safety (grant number 03DAS073) to develop training modules for paediatricians.
The project funding was launched in April 2016 and will continue until March of 2019. With the support of a cooperation network of professional associations and stakeholders of the target group, a blended learning module is currently being developed for paediatricians. The e-learning phase will begin in spring 2017. The phase to phase teaching will take place during three paediatric annual meetings from summer to autumn 2017.
The project aims to provide scientific knowledge on climate change-related health risks for children and adolescents. It will help that paediatricians will develop necessary skills for the new challenges in diagnosis, therapy and prevention. Hopefully the project will enable adequate preventive and curative action for the children.

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based on a decision of the German Bundestag

www.klinikum.uni-muenchen.de/Institut-und-Poliklinik-fuer-Arbeits-Sozial-und-Umweltmedizin/en

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28.

Autistic Symptoms Associated with Childhood Lead Poisoning

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ABSTRACT:
Autism is known as a complex developmental disability. Experts believe that Autism presents itself during the first three years of a person's life. The condition is the result of a neurological disorder that has an effect on normal brain function, affecting development of the person's communication and social interaction skills. Lead is a neurotoxin to which the developing brain is particularly vulnerable. Moreover, lead poisoning in children is known to negatively affect brain systems implicated in cognitive, communication, and social functioning. One potential weakness of autistic children is that they are less able to remove heavy metals from the body so that the metal accumulates in the body and brain. From hair examination showed levels of heavy metals that are stacked. Observational study with cross - sectional approach, with the subject of 44 children diagnosed with Autism by Psychiatry from Mental Hospital in Grogol Jakarta and the Islamic Hospital Mental Klender Jakarta. Data were collected through interviews, blood lead levels checked by FAAS (Flame Atomic Emission Absorption Spectrophotometer). Examination of the 44 children with autism show that 16,7% high levels of heavy metals, Age 1-10 years, Boys 97 % and Girls 23 %. Patients was diagnosed since their One months of age. If the child is showing symptoms of autism, then even do detoxification, other types of therapies such as speech therapy, behavioral, occupational, etc., must still be done. If there has been damage to the brain, detoxification cannot directly fix the symptoms. Detoxification just to prevent further damage. Toxic did not the cause of autism, but it can be a trigger, or aggravate the symptoms of an existing.

Keywords: Lead, autism, detoxification

29.

Relations between exposure of factory air polution with asthma in children who living in shelter Around industrial district in Jakarta Indonesia

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Backgrounds : Exposure of hazardous environment can cause damage the respiratory tract, particularly in individuals with atopy may suffer continous inflammation causing asthma in children. The recnt study explained there are relations between eposure of traffic air pollution with respiratory tract excange, one of the relations is increasing concentration of expiratory nitrit oxide (eNO) as a marker of espiratory tract inflammation in children. The analysis shows there is strong relation between asthma attack with exposure of nitrit oxide (NO) and other toxic air.
Aims : Verify the hypotesis that said children who living in shelter araound industrial district and exposured by air pollution will have more respiratory tract irritation than children who are not living araound industrial district, that confirmed by increasing concentration of eNO. Methods : Case control, datas retrieval are done in Jakarta for investigating the effect of exposure factory environtment is increasing FeNO and datas from Lombok East Nusa Tenggara Indonesia area as control.
Results : Children who are often exposured by toxic air pollution can force inflammation process and cause decrease vital lung function. There are evidenced by increasing Concentration eNO and derivation Peak Expiratori Flow Rate (PEFR) in children who living araound industrial distric.
Conclusions : There are strong relations between asthma in children with exposure of toxic factory air pollution. Others factors that may increase asthma are includig (1) narowness home (2) home humidity (3) home lighting (4) home ventilation (5) mother's education and knowledge.

Keywords : asthma in children, eNO, factory air pollution

30.

Organohalogenated pollutants in Argentinean postpartum women living in Salta and Ushuaia

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The organohalogenated pollutants, namely organochlorine pesticides, polychlorobiphenyls (PCBs) and polybromodiphenyl ethers (PBDEs), may undergo long-range atmospheric transport because they are semi-volatile and chemically stable. They accumulate in organisms and humans as consequence of their lipophilic character. The toxic properties of most of them generate deleterious health effects in both humans and wild species.

These compounds have been mostly synthesized and used in the northern hemisphere but their strong capacity for long-range atmospheric transport has led to a global planetary distribution, including the southern hemisphere. While there is information on the occurrence of these compounds in the ecosystems of this hemisphere, the degree of information on the accumulation patterns of these compounds in southern hemisphere human populations is very limited. The present study was devoted to contribute to fill this gap by analysis of maternal serum from Argentina, representing postpartum mothers from the city of Salta (25ºS; n = 498) and Ushuaia (55ºS; n = 200). These samples were collected from April 2011 to Mars 2012 between the first and third days after delivery.

The median concentrations of the most abundant compounds were 0.33 and 0.51 ng/mL of total DDTs, next, 0.20 and 0.18 ng/mL of PCBs and 0.067 and 0.043 ng/mL of HCB in Ushuaia and Salta, respectively. These concentrations were generally low, but lower concentrations have been reported, for various compounds, in some northern hemisphere locations such as Norway. The influence of maternal age, parity, residence, and body mass index on the concentrations of these pollutants has been investigated. Differences in the serum concentrations between Salta an Ushuaia may reflect diversity in local exposure and long-range transportation.

31.

Childless-Workless-Worthless? Futures and Environments of our Children

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Abstract:
In Europe **decreasing birthrates** (additionally ageing) and **diminishing classical work and employmentrates** (i.p.. for the youth) seem to destabilise, even **devaluate** our future and our offspring (i.p. young males).The conventional solutions **"growth"** seem to be restricted **structural**ly : **Childlessness** (decreasing birthrates) as consequence of women´s good education, employment and contraception appears hardly reversible. **Joblessness (**decreasing work) too is structurally driven by innovation, capitalisation and globalisation. **Worthless** (changing old values), even ill will feel our European children (i.p. sons) if they thus grow up **isolated** with psycho-social disturbances , **marginalized** from work, economics and politics and **overburdened** by debts, entitlements and environments. "Radical Loosers" like they should cause fear similarly to that for other (islamic, over)-populations. Other **fears** : f.i. for (self-)extinction, for (islamic) colonization, for (economical) pauperisation and for loss of (material) power leads to the standard answer : **Growth** ! Nevertheless environment, sustainability and posterity would profit most from **these "natural" trends of shrinking population, work and consumption.**

Keywords: Childless, Workless, Changing Values, Environments, Economic Growth , Shrinking

32.

Lessons learned from a youth focused, environmental health educational initiative

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There is increasing evidence that exposure to environmental and chemical risks during the preconception, prenatal and early childhood periods is a risk factor for a range of brain-based disorders such as ADHD and cognitive delays as well as chronic diseases including asthma, diabetes and certain cancers. There is also evidence that early prevention – i.e. reducing exposures prior to conception, in utero and early childhood – could help stem the rising tide of these conditions and positively impact the health of young people and that of their future children. Recognizing the need for educational initiatives aimed at reducing exposures during the prenatal and early childhood periods, particularly within the health care context, we hosted the Prenatal Environmental Health Education Forum (pehe-forum.com) in Ottawa, Canada in 2014. The Forum brought together an international group of prenatal health practitioners and environmental health experts to share knowledge around priority environmental health issues, education practices, opportunities and barriers, and existing educational resources. From among the dozen recommendations that emerged from the Forum, one was to better target educational efforts towards young people in the early reproductive period and preconception period. One such effort became known as the EduTOX Video Challenge (edutox.ca) – a competition for young Canadians to produce short videos to raise awareness about exposures to environmental toxicants in their day-to-day lives and encourage actions to reduce them. This presentation will provide an overview of EduTOX, present results, and discuss lessons learned relevant to the success of future, youth focused, environmental health educational initiatives.

33.

Early life exposure to organochlorine pesticides and behavioral development in children

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ABSTRACT

Background: Although organochlorine pesticides have been banned in the Western world decades ago, bioaccumulation in younger generations still occurs. Exposure to organochlorine pesticides may be related to adverse effects on behavioral development. Exposure during early life may be particularly harmful, as rapid structural and functional changes take place.
Objective: The aim of this study therefore is to explore the association between early life exposure to the organochlorine pesticides and behavioral development at 18 months.
Methods: Data from 59 mother-child pairs from LINC, a prospective birth cohort in the Netherlands were used. The targeted compounds were the sum of polychlorinated biphenyls (ΣPCBs), hexachlorobenzene (HCB), the sum of hexachlorocyclohexane isomers (ΣHCH), heptachlor epoxide, and dieldrin; all determined in breast milk. The scales 'Attention Deficit Hyperactivity Disorder' (ADHD) and 'Externalizing Behavior' of the Child Behavior Checklist 1.5-5 were used for the behavioral assessment. Whole population and sex-stratified regression analyses were performed, in which exposure levels were classified in tertiles (T1, T2 and T3). A family history of ADHD, educational level, smoking, and alcohol or illicit drug use during pregnancy were included as confounders.
Results: Children exposed to the highest levels of ΣHCH presented higher scores on the ADHD-scale of the CBCL. After stratification for sex, significant associations were only found for girls. Positive associations were found between early life exposure to the highest levels of ΣPCBs, ΣHCH, dieldrin, and T2 levels of HCB; and ADHD symptoms. Higher scores were found on the Externalizing Behavior scale of the CBCL after exposure to dieldrin (T3) and ΣPCBs (T2 en T3).
Conclusion: Significant associations were found between early life exposure to organochlorine compounds and behavioral development at the age of 18 months. Associations were sex-specific (in girls only). Results should be seen as exploratory, as the sample size was small.

34.

Prenatal exposure to environmental chemicals: associations with neurotransmitter levels in cord blood

Marijke de Cock, PhD, Ilona Quaak, MSc, Jeroen Dudok, PhD, Raluca I. van Staden, PhD, Jacobus F. van Staden, PhD, **Margot van de Bor, MD, PhD**

Background: Neurodevelopmental disorders such as attention deficit hyperactivity disorder and autism, have been associated with exposure to environmental chemicals, including dioxins and organochlorine pesticides. Effects have been observed particularly in relation to exposure in early life. Mechanistic pathways, such as relations between chemical exposure and neurotransmitter levels, have however been studied less frequently. Our objective therefore was to study the effect of early life exposure to environmental chemicals on neurotransmitter levels in cord blood.
Methods: Data were used from 63 mother-child pairs from the LINC study, a prospective birth cohort in the Netherlands. Cord plasma was collected at birth and was used to determine both levels of environmental chemicals and neurotransmitters. Exposure to various compounds was determined, including phthalates (metabolites of di-2-ethylhexyl phthalate [DEHP]), perfluorinated alkyl acids (perfluorooctanesulfonic acid [PFOS], and perfluorooctanoic acid [PFOA]), and brominated flame retardants. The neurotransmitters included dopamine, epinephrine, norepinephrine, acetylcholine, serotonin, gamma-amino butyric acid (GABA), and glutamate. Univariate regression models were composed for each compound in tertiles, and each neurotransmitter.
Results: An overall significant effect of PFOA exposure on GABA was observed ($p = 0.049$). It appeared to be that higher levels were observed in the second tertile compared to the first, and lower levels in the third tertile compared to the first. Furthermore significant overall effects were observed for MEHHP (acetylcholine, $p = 0.039$), and MEOHP (epinephrine, $p = 0.048$). For mono(2-ethyl-5-hydroxyhexyl) phthalate (MEHHP), lower levels of acetylcholine were observed in the highest exposure tertile, whereas for mono(2-ethyl-5-carboxypentyl) phthalate (MEOHP) higher levels of epinephrine were observed in the second exposure tertile.
Conclusion: Prenatal exposure to PFOA and DEHP was associated with levels of GABA, acetylcholine, and epinephrine. Dose-response effects were non-linear. Whether these changes in neurotransmitter levels in cord blood are related to abnormal behavioral development, needs to be further explored.

35.

Maternal exposure to particulate matter and birth weight in Dutch children

Marijke de Cock, PhD, Ilona Quaak, MSc, Laura P. den Ouden, BSc, **Margot van de Bor, MD, PhD**

Background: Maternal exposure to particulate matter (PM) may cause decreased transplacental oxygen and nutrient transport to the fetus, potentially resulting in a lower birth weight (BW). Results of observational studies have however been inconsistent and because of the potential health implications, further research is needed to confirm the relation between maternal exposure to PM and BW.

Objective: To investigate the association between maternal residential exposure to fine and coarse particulate matter ($PM_{2.5}$ and PM_{10}) and BW.

Methods: Data were used from the LINC study, a prospective birth cohort study in the Netherlands (n = 223). Individual exposure estimates to $PM_{2.5}$ and PM_{10} at each participant's home address were assessed using a geographical air quality map. Data on BW, gestational age and maternal anthropometry were obtained from the midwives, and data on parental health, lifestyle and socio-demographics characteristics were collected by means of questionnaires. To estimate the impact of PM on BW as a continuous measure, linear multivariable models were used. Because the sample size, PM was converted into a dichotomous variable with the concentration groups <12 µg $PM_{2.5}/m^3$ (reference group) and 12 – 13 µg $PM_{2.5}/m^3$ for $PM_{2.5}$ and the concentration groups <19 µg PM_{10}/m^3 (reference group) and 19 – 20 µg PM_{10}/m^3 for PM_{10}.

Results: For 191 of the 223 children (85.7%), exposures were successfully estimated. The highest exposure level for $PM_{2.5}$ was 12-13 µg/m^3, to which 65.4% of participants were exposed. For PM_{10} the highest exposure level was 19-21 µg/m^3, which was observed for 52.4% of households. Only exposure to a higher concentration of $PM_{2.5}$ resulted in a statistically significant negative effect on BW (p=0.027). After adjusting for confounders, a decrease in mean BW was found for $PM_{2.5}$, with a change of -142.8 g (95% CI, -269.1 to -16.4).

Conclusions: Maternal exposure to higher levels of $PM_{2.5}$ was associated with a lower BW. The implications for public health in the Netherlands are important, as exposure levels in this study are common.

36.

Descriptive analysis from a hospital based childhood cancer survivors cohort: report from the project Spain-CCSS

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Introduction

Therapeutic advances in paediatric oncology have led to increase the number of childhood cancers survivors (CCSs). Emerging evidence shows that CCSs experience long-term morbidity due to their cancer therapy (and the cancer itself). Spain-CCSS (Spanish Childhood Cancer Survivors Study) aims to set up a childhood cancer survivor's cohort in Spain in order to join international efforts for studying long term health effects among this population and optimise treatment and follow-up.

Methods

CCSs treated between 1980 and 2009 in the paediatric hemato-oncology department of Hospital Sant Joan de Deu in Barcelona (one of the largest in Spain) were invited, via mail services and by phone call, to participate in the study and to complete a health status questionnaire (HSQ). Recruitment, disease validation and retrospective record collection (treatment) are still ongoing.

Results

Over 1568 individuals who survived more than 5 years 536 (34%) accepted to participate (509 of them returned a complete HSQ), 83 (5%) were not alive at the time of the questionnaire, 480 (30%) could not be traced and 140 (6%) refused to participate. We are still waiting a response from 340 (30%) of participants.

Among participants 285 (53 %) are male. Participants median age is 22 years (range 6-50) and the majority of them (N = 311; 58%) has been treated most recently (between 2000-2009). The median follow up is 13 years (range 5-35). The median age at diagnosis is 5 years (range 0-19).

Central nervous system tumour (N= 120, 22%) and leukaemia (N= 113, 21%) are the most prevalent primary neoplasm.

Information collected through the HSQ includes: socio-economic status, quality of life health related outcomes.

Conclusion

Though more effort is needed to increase participation rate, this cohort is an important source of information on different health outcomes among CCSs.

37.

Cognitive effects after low - to moderate dose exposure: study plan in a cohort of childhood cancer survivors

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INTRODUCTION

It is well know that brain cancer survivors are at higher risk to develop a cognitive deficit and cranial radiotherapy (RT) is one of the well known risk factor of this impairment.

However, the effect of low dose radiotherapy (such as the scatter radiation that is absorbed by the brain when the radiotherapy is delivered in another anatomical region) still needs to be clarified and more research is warranted in this area.

METHODS

We are planning to evaluate the neuro cognitive profile in a cohort of childhood cancer survivors who had received a dose below 5 mGy to the brain. Brain tumor survivors will be excluded in order to avoid confounding due to the cancer itself.

Function will be assessed in different cognitive domains (intelligence, executive function, processing speed, memory, attention and executive function among others) and the score of each test will be correlated with the dose absorbed in different anatomical brain structures (with matter, hippocampus, temporal lobe, frontal lobe and posterior fossa) as estimated from medical records.

Assuming that around 40% of survivors did not received radiotherapy, 35% received a dose below 1 Gy and 5% between 1 and 5 Gy (de Valthaire personal communication) and assuming a 4 point difference in the tests score (average 100, standard deviation 15) between dose groups, we expect to have 80 % power to find a trend among those three groups with around 100 participants. To reach 80% power to find a 4 points difference between the group who didn't received RT and the ones who received a dose below 1 Gy, we would need around 500 patients.

CONCLUsIONS

It appears to be feasible – and informative for radiation protection – to study cognitive effects due to low-to moderate doses of radiation in a cohort of childhood cancer survivors.

38.

Neurodevelopment, low level mercury exposure and genetic polymorphisms in birth cohort from Slovenia and Croatia

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The aim of the present study was to evaluate association between prenatal exposure to mercury (Hg) and neurodevelopment of a child, taking into account relevant confounders and some relevant genetic polymorphisms – apolipoprotein (Apoe) and glutathione transferase (GSTM1 and GSTT1), both genes being hypothetically involved in elimination of Hg from the body, and Apoe also in neurodevelopment. Six hundred and one mother-child pairs were recruited from the central Slovenia region and 243 from Rijeka, on the Croatian coast of the northern Adriatic. Determination of total Hg in cord blood, Bayley Scales of Infant and Toddler Development, Third Edition (Bayley III) testing at 18 months of age and Apoe genotyping was done in 361 children; 237 of them were from Slovenia and 124 from Croatia. The results showed negative association between low-to-moderate Hg exposure levels in children with normal neurodevelopmental outcome and cognitive and fine motor score at 18 months of age. The observed decrease in cognitive function was significant only in children carrying at least one Apoe ε4, while the decrease in fine motor score was independent of the Apoe genotype. Adjusting for selenium (Se) and lead (Pb) revealed positive association between Se and language and negative between Pb and motor function, but only in the subgroup of children not carrying the ε4 allele. Stratifying by the GSTT1 genotype revealed positive association between cord blood Se and cognition in children without gene deletion (β=11.8, p=0.008), but not in children with GSTT1 deletion (β=-15.1, p=0.128). Speciation analysis in biological samples will be done to differentiate between inorganic and methyl Hg exposure, which will help us to characterize the contribution of each species to the observed associations.

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40.

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41.

Children's environmental burden of disease: Review of key findings and general methodology

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Background: Children are vulnerable to environmental exposures resulting in disease burden. This can be quantified using the Environmental Burden of Disease (EBD) method. EBD method and key findings of children's EBD are presented.

Methods: Quantifying the EBD in terms of disability-adjusted life years (DALYs) is explained. Recent global studies estimating DALYs caused by environmental risk factors (ERF) for children are summarized and discussed to understand DALYs. A focus is given to global estimates from the World Health Organization (WHO) and the Institute of Health Metrics and Evaluation (IHME).

Results: EBD is a method to quantify how many DALYs in a population are lost due to health restricted life time and premature death attributable to ERF. WHO estimated that 25% of global DALYs for children (<5 years) are caused by modifiable ERF (e.g., air pollution, noise, unsafe water). In children, ERF contribute the most to the burden of infectious diseases, neonatal conditions, nutritional diseases, and injuries. E.g., 11% of 25 Mio DALYs due to neonatal conditions in children (<5 years) worldwide are assumed to be caused by ERF like indoor/outdoor air pollution, tobacco smoke during pregnancy, unsafe water/sanitation. In comparison, the environmental contribution to lower respiratory infections is with 60% of 52 Mio DALYs much higher. IHME quantified DALYs for a selection of ERF, including unsafe water/sanitation/handwashing, air pollution, radon, and lead. These ERF explain less than 5% of the total DALYs for children <5 years but more than 10% for children aged 5-9 years.

Discussion: The EBD studies differ regarding the definition of "environment" and inclusion of ERF. Moreover, data restrictions avoid the inclusion of all ERF of relevance. However, obvious is a high impact of the environment for children's health. This contains a high chance for prevention of the burden by reducing the exposure.

42.

Birth weight in relation to cord blood levels of selected elements in Slovenian mother-child pairs

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Abstract

The purpose of the present study was to evaluate the impact of cord blood and serum levels of selected toxic and potentially toxic elements (manganese (Mn), copper (Cu), zinc (Zn), arsenic (As), selenium (Se), cadmium (Cd), lead (Pb), mercury (Hg), magnesium (Mg), calcium (Ca) and iron (III) (Fe(III))) on birth weight, taking into account maternal socio-demographic characteristics and dietary habits.

Five hundred eighty-five delivering women (18-45 years) were recruited primarily from the central part of Slovenia as part of the PHIME study (2007-2011). Two hundred twenty-eight mothers were excluded from this study due to non-reporting of birth weight, delivery of twins, intrauterine growth restriction or having diabetes. Cord blood samples were collected at delivery by the Division of Obstetrics and Gynecology. One month after delivery, mothers were given a questionnaire to obtain information about their socio-demographic and health status, nutritional habits (detailed food frequency questionnaire, particularly for fish consumption), life-style (smoking) characteristics, potential exposure (to hazardous substances, and residential and occupational history. A supplementary questionnaire was administered approximately 18 months after delivery to assess changes in residence, maternal marital and occupational status, anthropometric measures and developmental milestones of the child, breastfeeding history, child intake of fish, health status, and day care attendance.

Associations between birth weight and a) predictors obtained through the questionnaires and b) levels of the selected elements in cord blood samples were tested using univariate and multiple linear regression.

This work was supported by the National Human Biomonitoring program financed by the PHIME (FOOD-CT-2006-016253) and the Slovenian Research Agency.

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43.

Birth and Growth without OH: Detection and follow up from pregnancy until the end of adolescence of children at risk of neurobehavioral disorders through exposure of alcohol and illegal drugs

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INTRODUCTION: Integrated project for the prevention and detection/follow-up of children at risk of neurobehavioral disorders associated with the prenatal and/or postnatal exposure to alcohol and illegal drugs. Includes ELIJO MAS SANO (EMS) (CHOOSE HEALTHIER): registry of children at environmental risk through these drugs.

METHODS: Descriptive study of environmental clinical history of the first 39 patients of EMS. Includes clinical, social and neurodevelopmental evaluations. EMS criteria of inclusion (one minimum): 1) >20 g/day of alcohol and/or 3 incidents of binge drinking of ≥40 g/day during periconceptional, gestational, or lactation stages. 2) Fetal exposure to any illegal drug at least once a week.

RESULTS: 19 girls and 20 boys. Gestacional week (GW) average: 38.26 (min. 30; max. 41). Premature newborns (NB) (<36 SG): 5. Birth weight (BW) (GW ≥36): 3,055 (2,433.9; 3,676.1) grams.

Average consumption of alcohol at early pregnancy in mothers: 33.55 grams (IC95% 23.7-43.2). 33% report 3 or more incidents of binge drinking. Fetal exposure to illegal drugs: 18%

Neonatal anthropometry (≥36 GW): head circumference (HC) <p10: 4, BW <p10: 9, height <p10: 3.

Major congenital malformations: 6 patients. Chromosomal comorbidities: 2 patients.

Normalization of growth curves and HC at 2 years. Typical facial features (37/39): Palpebral fissure (<-2DE): 2, philtrum (4-5): 2, upper lip (4-5): 4. Neurodevelopmental evaluation, Battelle test (30/39): personal and social, adaptive, motor, and communication domains. 28 showed delays on one domain and 21 in 3 or more.

A negative correlation exists between g/day of ethanol and months of cognitive delay (-0.37, $p<0.05$). 35% have an average cognitive delay of -8.5 months (IC95% -0.5;-16.5).

CONCLUSION: Half of the children from the EMS registry have neurodevelopmental delays before the age of 2.

44.

Study of childhood illness for the period 2009 - 2011 , meeting the city . Sofia and Pleven with a view to effective health promotion

N. Tzacheva, G.Traykova, P. Karadjova

An important place in children for their physical and mental development and for their future career takes their health status . It is determined by a number of factors of family and school environment , the organization of school health and participation of leading environmental factors . These determinants are reflected in the incidence on turnover registered by their personal physicians.

Official data of the Capital District Health Inspection / SRZI / and regional health inspection in the city. Pleven show the leading role of the respiratory diseases , infectious diseases , eye diseases , diseases of the digestive system , diseases of the ear and injuries to study three-year retrospective period 2009 -2011g . We believe that appropriate programming for targeted health promotion specifically at identified health problems in connection with leading environmental factors.

45.

Changing kindergarten practices with localized real-time information on outdoor air: The experience of CITI-SENSE project in Oslo, Norway

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In Norway, children in kindergartens spent much time outdoors in all weather, and there is thus a natural concern about the quality of outdoor air. It is well known that air pollution is associated with a wide variety of adverse health impacts in children, with greater impact on children with asthma. Especially during winter time and spring, kindergartens in Oslo that are situated close to streets with busy traffic, or in areas where wood burning is used for house heating, can experience many days with bad air quality. During these periods, updated information on air quality levels can help to plan outdoor activities and thus protect children's health.

We have tested new low-cost air quality monitoring platforms to provide air quality information to kindergartens. These platforms are smaller, cheaper and less complex to use than reference equipment. Performance evaluation shows that while they are less accurate and suffer from higher uncertainty than CEN reference equipment, they still can provide reliable coarse information about local pollution.

We have installed the monitoring platforms in 17 kindergartens in Oslo, to measure nitrogen dioxide, nitrogen dioxide, ozone, carbon monoxide and particulate matter. The data is displayed using the Air Pollution Indication (APIN) in a 5-colour scale indicating if the air pollution is very low, low, rather low, rather high and very high (http://oslo.citi-sense.eu).

We arranged a focus group with the participation of local administration, kindergarten staff and parents to understand their opinion and needs related to the air quality information that was generated in Oslo kindergartens. They expressed concern about the data quality but agree that having updated information on the air quality in the surroundings of kindergartens can help them to reduce children's exposure to air pollution or to better plan the medication to reduce asthma symptoms.

46.

Multi residue and non-target screening for characterization of organic chemicals in indoor dust

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The indoor environment can expose us to a concentrated cocktail of chemicals. Indoor dust may be a source or a sink for a range of contaminants. Most studies to date have focused on individual compounds or classes of contaminants. A review on dust indicated that a large number of different chemicals have been identified in recent years, e.g. polybrominated diphenyl ethers (PBDEs), pesticides, phthalates, polycyclic aromatic hydrocarbons, (PAHs), polychlorinated biphenyls, (PCBs), and perfluorinated compounds, (PFCs).[1] PBDE congener concentrations in serum and faeces of toddlers were significantly correlated to those in house dust and suggest that dust exposure plays a larger role in the PBDE body burden in toddlers than in their mothers,[2] this may be related to additional ingestion of dust as toddlers are apt to place toys and hands in the mouth, thus gaining additional exposure.

In understanding the hazards that contaminants in dust may pose to human health a more comprehensive non-target approach using state of the art instruments will allow the identification of legacy compounds but also identify potentially compounds not traditionally screened for. We developed a targeted multi-residue screening method to analyse a diverse array of compounds such as may be found in indoor dust and human blood. In combination with non-target screening, previously unreported compounds in dust can be tentatively identified.

Methods for screening blood and dust were tested using a mixture of >200 organic contaminants. By using different ionisation sources in positive and negative mode identification of the introduced compounds was validated and different extraction procedures tested. The aim was to primarily understand the limitations of traditional extraction techniques and to see the differences that the extraction procedures has on the screening approach.

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47.

Air pollutants exposure and functional repair activity in placenta

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Introduction: Maternal exposure to air pollutants can affect fetal development and cause adverse birth outcomes. Nitrogen oxides (NO_x) can react with amines to generate toxic alkylating agents (AAs), and their biological effects are mediated, in part, by the formation of DNA damage including the promutagenic and toxic, O^6-methylguanine. O^6-methylguanine methyl transferase (MGMT) removes O^6-alkylguanine adducts by transferring the alkyl group from the O^6 position to the cysteine residue within its active site. Aims: To quantify MGMT functional repair activity in placentas and to determine its association with air pollutant exposure over various time windows during pregnancy. Methods: Tissue samples from the middle, cord and peripheral areas of the normal placentas were collected from 10 mothers, who lived in Greater Manchester, and stored at -80˚C until processed. MGMT repair activity was quantified in cell-free sonicates of 100-120 mg tissue using a standard radioistotopic methyl transfer assay and protein levels were quantified by a Bradford assay. Postcodes of the mothers were geocoded by ArcGIS and air pollutant data obtained from the Department for Environment, Food and Rural Affairs. Results: Placental MGMT activity (mean ± SD) was 0.140 ± 0.022, 0.134 ± 0.014 and 0.124 ± 0.007 fmoles/µg for middle, cord and peripheral samples respectively and varied 4, 5 and 1.5 fold respectively. Level of pollutant exposure varied with mean nitrogen dioxide exposure was 16.2µg/m^3, NO_x 23.3µg/m^3, PM_{10} and $PM_{2.5}$ were 13.1µg/m^3 and 9.4µg/m^3 respectively. None of the pollutants were significantly associated with any time windows during the pregnancy ($p>0.05$). Conclusions: This initial study indicates that the placenta contains functional MGMT activity that may affect susceptibility to alkylating agent exposure. The biological significance of variable placental MGMT activity remains to be characterised. An association between placental MGMT activity with pregnancy outcomes need to be further studied.

48.

Association between breastfeeding duration and cognitive development, autistic traits and ADHD symptoms: a multicenter study in Spain

Jordi Julvez

Several studies have related longer breastfeeding durations to better intellectual performance in children. However, whether this relation is entirely attributable to socio-environmental factors remains debated. By contrast, few studies have investigated the potential protecting effects of breastfeeding against behavioral problems such attention deficit hyperactivity disorder (ADHD) symptoms, and even fewer on autism spectrum disorders (ASD) traits, and the extent to which these effects are mediated by cognitive function has never been explored. This study examines the association between breastfeeding duration and cognitive development, attention, ADHD symptoms, and autistic traits, using data from the Infancia y Medio Ambiente (INMA) – Environment and Childhood – Project, a Spanish multicenter birth-cohort study, and by taking into account the intensity of breastfeeding. Duration of overall, predominant, and exclusive breastfeeding was documented during infancy through maternal questionnaires. Children (N = 1,832; mean age = 4.8 years) were assessed for cognitive development (McCarthy Scales of Children's Abilities), attention (Conners' Kiddie Continuous Performance Test), ADHD symptoms (criteria of the DSM-IV form list), and autistic traits (Childhood Autism Spectrum Test). Several potential confounding factors were documented through parental interviews. After adjustment for confounders, longer duration of breastfeeding was associated with better cognitive development, reduced ADHD symptoms, and lower autistic traits. The latter effects appeared independent from each other. This study provides further confirmation of a positive association with cognitive function over socio-environmental factors, and also suggests a protecting role against ADHD symptoms and autistic traits. Results are in agreement with recommendations of prolonged breastfeeding durations to promote child development.

49.

Proposing access to urban green and blue spaces as an indicator of health inequalities among children

Nadja, Dagmar, Matilda van den Bosch

Background: Relation between social and environmental determinants of health and increasing health inequities are major public health challenges. Previous studies have demonstrated positive health effects, such as increased physical activity and reduced health inequities, from urban green spaces. This study explores the relevance of including access to green spaces in intra-urban health inequality tools, with a particular focus on children. From a life course perspective early years are critical for a healthy development and interventions directed towards inequalities should be promoted.
Methods: We used existing data on health and socioeconomic indicators from a survey of children aged 6-8 years and GIS-data to assess a possible relation to green space access, distributed per sub-districts of Berlin. Data were. We explored co-linearity between health and socioeconomic indicators and green space accessibility and used factor analyses for determining a minimal set of indicators for inclusion in a hierarchical cluster analysis to characterise the sub-districts.
Results: Indicators used for the cluster analysis included obesity, language deficits, vaccination, population density, and share of green spaces. Sub-districts with high share of obesity and poor social status contained lower shares of green spaces. These areas had high population density, high shares of immigrants and unemployed. Vaccination prevalence showed an inverse pattern with comparatively low vaccination rates in high quality, less deprived areas.
Discussion: This study suggests a relationship between area level of green spaces and health determinants, including social indicators. The results indicate a spatial intra-urban pattern of health inequalities among children. Although not controlled for selection bias this should spur further examination of including environmental indicators in health inequality tools.

50.

Engaging schoolchildren in understanding the indoor environment using citizen science

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Children spend substantial part of their childhood in school buildings. The school staff might not have the time or knowledge to investigate the indoor environment, even though they acknowledge it could be improved, nor do they have the capacity to have a dialogue with the students regarding good indoor environment.
As part of CITI-SENSE project, we used citizen science approaches to investigate how the situation can be improved. We engaged schools to study the indoor environment with help of sensor technology and support from scientists. Some schools took this as an opportunity to conduct individual student led research as part of the school curriculum, while others wanted to confirm the indoor environmental issues the school was known to have.
We provided 13 schools in Belgrade, Edinburgh, Ljubljana, Oslo and Haifa with low-cost sensor units which collect indoor environmental data in near real time, and gave them the resulting data as graphs or data tables. The students defined and conducted related research, e.g., studied how the carbon dioxide concentration changes depending on the amount of students in the classroom, or investigated variability of indoor parameters across classrooms and workshops in the schools. Others investigated why particulate matter is high when students are present in the classroom. A school with a known Radon issue was happy to investigate further which rooms are the most problematic ones. Questionnaire studies conducted by the scientists assessed learning outcomes related to general knowledge on indoor or ability to think critically about the environment.
These activities created awareness in the schools, increased the individual students' and teachers knowledge about indoor air, and sometimes led to mitigation measures at schools such as changing the cleaning practices.

51.

The role of perinatal essential fatty acids in attention deficit and hyperactivity disorder symptoms and cognitive functions

Mónica López-Vicente

Introduction

Essential fatty acids play a key role in brain development. The balance between omega-6 and omega-3 is important for an optimal nutrition pattern. We aim to assess the role of omega-6/omega-3 ratio on child attention deficit and hyperactivity disorder (ADHD) symptoms and cognitive functions.

Methods

This study was based on the population-based birth cohort INMA, including 4 different Spanish regions (Asturias, Gipuzkoa, Sabadell and Valencia). Fatty acids were collected from whole cord blood samples by using venipuncture of cord vessels before the placenta was delivered. The omega-6/omega-3 ratio was calculated by dividing arachidonic acid (AA) with the sum of docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA). The ADHD symptoms were reported by each child's teacher using the Diagnostic Manual of Mental Disorders, 4th ed. (ADHD DSM-IV) at age 4. The child cognitive functions of the children were assessed by a psychologist using McCarthy Scales of Children's Abilities (MSCA) at age 4. Pooled negative binomial regression models were used for ADHD symptoms (n=571). Pooled linear regression models were used for MSCA (mean=100, SD=15) (n=670). All models were adjusted for child gestational age, birth weight, gender, age during testing, maternal social class, smoking during pregnancy and cohort location.

Results

Omega-6/omega-3 ratio was associated with ADHD symptoms (IRR=1.23; 95%CI=0.98, 1.53) at 4 years old. Adverse associations were observed between omega-6/omega-3 ratio and different cognitive domains assessed with MSCA; general cognition (coef.: -1.34; 95%CI=-2.60, -0.09), verbal (coef.: -1.31; 95%CI=-2.63, 0.002), memory (coef.: -1.67; 95%CI=-3.06, -0.29), and executive function (coef.: -1.32; 95%CI=-2.60, -0.05).

Conclusions

Higher omega-6/omega-3 ratio on cord blood was related to more ADHD symptoms and worse cognitive functioning at 4 years of age. The identification of nutritional biomarkers that explain its effects on child cognitive development will enable the implementation of appropriate and effective nutritional recommendations as well as interventions during pregnancy.

52.

Children exposure to phthalates and bisphenol A in LIFE PERSUADED project: preliminary results on biomonitoring and case-control studies

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LIFE PERSUADED project (Phthalates and bisphenol A biomonitoring in Italian mother-child pairs: link between exposure and juvenile diseases, http://www.iss.it/lifp/) is focused on the evaluation of the children exposure to plasticizers, such as Diethylhexyl phthalate (DEHP) and Bisphenol A (BPA).
DEHP and BPA are non-persistent environmental contaminants recognized as endocrine disruptors (EDs), thus potentially affecting human health, in particular children because of their susceptible phase of development.
The internal levels are determined through the biomonitoring study (HBM) involving mother-child pairs from urban and rural areas of the Italian geographical macro-areas (North, Centre, South). Ninety family pediatricians were trained to recruit the 2160 mother-child pairs according to enrollment criteria and urine sampling methods.
Data on lifestyles, food preparation, storage and consumption are collected through a structured questionnaire and a food diary. BPA and DEHP metabolites (MEHP, 5OH-MEHP and 5oxo-MEHP) levels are determined by LC–ESI-MS in urine samples.
Besides, LIFE PERSUADED aims at evaluating potential correlation between EDs exposure and children diseases by case-control studies. Idiopathic premature thelarche and precocious puberty (30 girls for each group, aged 2-7 years) and idiopathic obesity (30 boys and 30 girls, aged 6-10 years) studies are carried out. Urine samples are analyzed for BPA, DEHP metabolite levels; clinical and toxicological biomarkers related to puberty onset and obesity are assessed in serum samples.
LIFE PERSUADED fills the data gap on DEHP and BPA exposure in Italian children by setting background levels for susceptible groups of population and implementing the EU database. Data integration for EDs risk assessment, the evaluation of determinants of exposure as well as the creation of a biobank for urine samples will represent relevant output of HBM.
The project approach and descriptive preliminary results study will be presented.

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53.

Minamata Convention on mercury and vulnerable populations

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**Presenter

Abstract

The Minamata Convention on Mercury is a global environmental health agreement, signed by 128 countries in October 2013 and currently under ratification. The treaty's objective is to protect the human health and the environment from anthropogenic releases of mercury and mercury compounds.

The mercury treaty specifically provides for and highlights the need to protect human health. Special attention to health aspects addressed in the Article 16 aims to promote the development and implementation of strategies and programmes to protect populations at risk, particularly vulnerable populations. An important requirement of the treaty is that information related to mercury and human health must not be kept confidential thereby highlight the public Right To Know about mercury impacts on their health.

UNEP's global mercury assessment 2013 identified artisanal and small-scale gold mining (ASGM) as the largest single sector that released high mercury emissions from intentional use of mercury. UNIDO identified ASGM practices using mercury found in more than 50 countries, many of them are developing and least developed countries.

Very often, gold extraction processes with mercury, operated within the residential areas in the impoverished villages. Vulnerable populations especially children, child-bearing age women and pregnant women exposed to mercury all day long and in all seasons. Children grow up in a mercury polluted environment. Exposures to mercury from the womb until the golden period, could lead to adverse health effect of the children and their cognitive as well as neurological development. Long-term impact of mercury intoxication could lead to high social-economy cost, less jobs and economic opportunity, family burden, good palliative care and lower quality of life. Countries with ASGM need to develop special health program for the impacted communities.

Keywords: Minamata Convention; ASGM; children's health; mercury; health program

54.

Quantify the burden of disease due to environmental risk factors in children and adolescents in Germany – the UKAGEP project

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Introduction: Environmental Burden of Disease (EBD) estimates are increasingly used by scientists to inform decision-makers about environmental risk factors causing ill-health. Currently no up-to-date national estimates of the EBD are available for Germany. Especially children and adolescents represent a group vulnerable to the effects of environmental risk factors. Therefore, the research project UKAGEP aims to estimate the EBD of 16 risk factors for children aged between 3 and 17 years in Germany.
Methods: The UKAGEP project uses the EBD methodology and its core measure, the disability-adjusted life year (DALY). Current exposure and human-biomonitoring data derived in the currently ongoing population-representative German Environmental Survey (GerES 2014-2017) are used to estimate the exposure of children in Germany. Combined with exposure-response functions (ERF) and data on the related health effects, DALYs will be estimated. The ERF will be derived from or updated by systematic literature reviews and meta-analyses. To take into account cumulative chronic effects, probabilistic modeling will be performed. Furthermore, it is also necessary to estimate the potential future burden, because many current exposures might affect health after a long lag-period.
Expected Results: The concentration of most environmental hazards is expected to be rather low. However, some of the risk factors might still pose a considerable threat at population level, especially if both, effects of mortality and morbidity, are considered. Furthermore, the estimated future burden will show how current exposures will impact the health of children living with today's exposures for the upcoming years.
Conclusions: The UKAGEP study will present the EBD of a set of known hazards, but will also provide insights on newly emerging risk factors. It is also envisaged to strengthen the use of human-biomonitoring data and methods of probabilistic modelling in EBD assessments.

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55.

Mobile phone and other digital technology use in UK adolescents: The SCAMP Cohort

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Introduction: Scientists remain uncertain as to whether children's developing brains are vulnerable to radiofrequency (RF) waves emitted from mobile phones and other wireless devices. The Study of Cognition, Adolescents and Mobile Phones (SCAMP) is a three-year prospective cohort study of adolescents across London, UK, which aims to investigate whether children's use of mobile phones and other wireless devices influences their neurocognitive/behavioural development.

Methods: Data on cognitive function, wireless device use and lifestyle are collected at baseline and follow-up via school-based computerised assessments and optional parent/pupil home-based questionnaires. Parents are invited to consent to linkage of their child's assessment data with routine records (e.g. health and educational records, mobile traffic data), thus allowing for comparisons between self-reported and objective mobile phone use. Biological samples (e.g. urine, saliva) are collected to provide additional information about potential confounders, such as pubertal status. A RF personal monitoring study is also being conducted in a subset of the cohort to gain an in-depth understanding of children's personal RF exposure and the relative contribution of each RF source.

Results: To date, 5,504 predominantly 11 to12-year-olds participate in SCAMP (53.2% female, mean age 12.0 (SD 0.4); 42.3% White, 20.3% South Asian, 15.9% Black, 11.5% Mixed, 9.9% Other). Preliminary analysis shows that over 80% of participants own a mobile phone. Device usage is comparable among boys and girls, apart from for gaming. Black adolescents consistently report highest use across all devices. Validating self-reported information against traffic data in a subset revealed children had underestimated call frequency, but overestimated call duration and text messages.

Conclusion: SCAMP will improve our understanding of children's RF exposures, device use, and cognitive function and will provide an evidence base to inform public health policy in this area.

58.

Impact of prenatal exposure to environmental pollutants on autism spectrum disorder: A case report

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Introduction: Autism spectrum disorder (ASD) is a problem with a high prevalence. The understanding of this disease remains a complex issue and each patient becomes an etiological challenge. Hundreds of mutations in all chromosomes have been identified related to autism. In fetal life, brain development is exquisitely susceptible to the exposure of toxic chemicals presented in the environment. With this report we aim to expose a patient with a somatic mosaicism related with parental exposure to chemicals during early pregnancy.

Case Description: 8 year old boy diagnosed of pervasive developmental disorder and attention deficit and hyperactivity disorder. Microarray hybridization identified a duplication of a segment of chromosome 19 from band p12 to q13.12. First child of healthy non consanguineous parents. The pregnancy was achieved naturally and there were no medication or drug intake. Both parents work as operators in a chemical plant. The mother stopped working at 4 weeks gestation. She had episodes of nausea and dizziness when purging fuel vapors. The affected segment includes over 160 genes that have possible association with autism. Using the NCBI and MDI database we identify the chemicals associated with these genes, and volatile organic compounds (VOCs) and metals were one of the most common mutagenic chemicals founded.

Discussion: a careful environmental history is needed to understand the etiology of ASD. In this case we describe acute symptoms of intoxication with gases derived from fossil fuels around the time of gastrulation. These gases contain VOCs and metals that are classified as mutagenic (Category 1A or 1B) and could be associated with the chromosomal duplication and the clinical picture present in the patient. Despite the limitations, there is evidence to support that environmental and genetic factors could converge in neurotoxicity.

59.

Promoting health: recommendations of food consumption as a tool to minimize exposure of pollutants to the children's population

Rosa Maria Llull Cantallops

Children comprise a very vulnerable age group to suffer from the adverse harmful effects of environmental contaminants in food. But a proper diffusion in the population of findings evidenced in scientific studies to avoid these risks isn't always achieved.

There are risk management measures that aim to reduce population exposure to contaminants, such as setting maximum limits (ML) of these substances in food in order to remove from the market products that aren't compliance.

However sometimes this measure isn't enough to protect the children health due to their lower body weight, they are in the process of development and have an immature metabolism, circumstances which altogether make that the (ML) may exceed the toxicological level for certain contaminants, as mercury (EFSA, 2012) or lead (EFSA; 2010).

Therefore public health agencies and food safety organizations as OMS, EFSA and others national agencies have released food consumption recommendations for children.

Many of these recommendations are little known by opinion leaders in health, like nurses and doctors, a fact that has been noted in the training actions aimed at this group performed at major hospitals and health centers in the Balearic Islands in 2015 (prior to training actions the correct response rates were 10%). This causes that families do not have a good knowledge of them and cannot adequately protect the health of their children.

To achieve a greater degree of protection of children health is vitally important that families know what contaminants that may be present in foods and what are the recommendations of consumption to avoid excessive exposure. To contribute to this goal is essential to conduct outreach activities and food safety training to opinion leaders in health, the health care workers.

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60.

Spatial clustering of childhood Leukemia in the region of Murcia, Spain, 1998-2010

Eduardo Ramos Elbal

Objectives
The objective of this study is to test the causal hypothesis that exposure to carcinogens in utero leads to the onset of early childhood leukemia by exploring the presence of spatial and spatial-temporal clusters within administrative divisions in the region of Murcia, Spain, while considering the residential addresses of cases during pregnancy, early childhood and diagnosis.
METHODS
The Pediatric Environmental Health Specialty Unit is carrying out an ongoing research project on the environment and pediatric cancer, collecting a Pediatric Environmental History (PEH) to create regional maps and analyze the geographical distribution of incident cancer cases in the region of Murcia. Between 1998 and 2010, 117 children were diagnosed with leukemia. Pregnancy, early childhood and diagnosis addresses were collected. Spatial and spatial-temporal clusters were then evaluated using the statistical software SatScan®.
RESULTS
Leukemia was most common in children under 5 years of age. The incidence rate was 40.1 per 1 million children in the study period. Among subtypes of leukemia, ALL (Acute Lymphoblastic Leukemia) has a greater incidence in children, occurring in 31.5 per million in comparison to LAM, affecting 8.6 in every million children. The incidence rate of all leukemias and its subtypes increased in the time frame between 1998-2004 and 2005-2010. Spatial clusters were observed for leukemia in general and ALL when considering the pregnancy addresses and the census district; however, no clusters were identified for the residential addresses during diagnosis.
CONCLUSION
The detection of spatial clusters in a localized area when examining the distribution of pregnancy addresses and census district areas lends proof to the hypothesis that fetal environmental exposure is likely implicated in the etiology of childhood leukemia.

61.

The mercury pollution and child birth defects

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Due to lack of knowledge of negative health impacts of mercury, Illegal gold miners still using mercury for the gold extraction activities in a hidden way. The mercury causes not only environmental pollution but also effects to the human health. The child health status statistics from 2006 to 2011 in South Gobi aimag presented, there had been 26 children was born with birth defects. This number has tendency to be increased by the years. In order to find connection with the causes of these defects with the parent's work environments, we implemented human bio monitoring survey of mercury exposures among 0-5 years of children who were living mining area. Over all 56 children were participated in this study, there were 22 boys and girls. We performed pediatric clinical examination for the all participants and results were as follows: 52.9% were normal, 11.8% were rachitis, 7.8% hypo oxygenated, 6% were with weight loss. Then determination of mercury in hair, urine and blood was carried out. The average mercury among participants urine was 0.215 mkg/l (CI 95% 0.045-0.477), mercury in the root of the hair was 0.075 mkg/g (CI 95% 0.042-0.108), mercury in the end of the hair was 0.111 mkg/g (CI 95% 0.011 - 0.232), and mercury in the blood was 1.401 mkg/l (CI 95% 1.179-1.623)
These results were matched to the 1st level of German human bio monitoring rates, which indicated to near normal range. It concluded that there was not significant connection between parents work environment and child birth defects.

62.

Impact of air pollution to oxidative damage in newborns and mothers

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Introduction: The aim of our study was to investigate the impact of air pollution on oxidative DNA damage and lipid peroxidation in the urine and blood from mothers and newborns from two localities with different levels of air pollution: Ceske Budejovice (CB), a locality with a clean air, and Karvina, a locality with high air pollution.

Methods: The samples from normal deliveries (38-41 week+) of nonsmoking mothers and their newborns were collected in the summer and winter seasons. Levels of 8-oxo-7,8-dihydro-2'-deoxyguanosine (8-oxodG) in urine were analyzed ELISA, levels of 15-F2t-isoprostane (15-F2t-IsoP) in blood plasma was analyzed by immunoassay kits.

Results: Higher PM2.5 (particulate matter < 2.5 μm) concentrations were found in Karvina than in CB in the summer 2013, and in the winter 2014 ($P < 0.001$). We observed significant differences in 15-F2t-IsoP levels between the summer and winter seasons in Karvina for newborns (mean±SD: 64.24 ± 26.75 vs. 104.26 ± 38.18 pg/ml plasma, respectively ($P < 0.001$). Levels of 8-oxodG differed only in the winter season between localities, they were significantly higher ($P < 0.001$) in newborns from Karvina in comparison with CB (mean±SD: 5.70 ± 2.94 vs. 4.23 ± 1.51 nmol/mmol creatinine, respectively).

Discussion: The results of multivariate regression analysis in newborns from Karvina showed PM2.5 concentrations to be a significant predictor for 8-oxodG excretion, PM2.5 and B[a]P (benzo[a]pyrene) concentrations to be a significant predictor for 15-F2t-IsoP levels. The results of multivariate regression analysis in mothers showed PM2.5 concentrations to be a significant predictor of 8-oxodG levels.

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63.

Children and ASGM in West Sumbawa Regency, Indonesia

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The high value of gold reserves in West Sumbawa (WS) Regency and West Nusa Tenggara (WNT) Province, Indonesia has resulted in an increase in small-scale gold mining activity in this area. Artisanal and small-scale gold mining (ASGM) is an attractive alternative livelihood for rural workers because it has good potential to improve the wealth of a community. Women and children are often involved in mining activities as miners usually bring their family to live close to their place of employment, thus women and children (<13 years old) are potentially highly exposed to mercury. The current study was conducted to better understand the life style, extent of mercury exposure, and the health of people living in the Taliwang ASGM area, West Sumbawa Regency, West Nusa Tenggara Province, Indonesia. The present study was designed as a purposive field sampling study conducted in the Taliwang ASGM area, WS Regency, WNT Province, Indonesia. The subjects were miners and families including their children from three different spots within the WS Regency: individuals directly exposed to mercury (Ex), indirectly exposed individuals (IEx) and non-exposed individuals (NEx). Hair samples and medical examination were obtained from the subjects and subjects were questioned about their mercury exposure over time. Hair samples were collected at the time of the study. A sub-analysis of data showed that children in Ex subgroups had highest THg in their hair (mean 4.7 mg/kg) than IEx subgroups (mean 1.5 mg/kg) and NEx subgroups (mean 0.4 mg/kg). Medical examination on children showed no symptom of mercury intoxication yet. The results indicated that AGSM activities were shown to affect the health of miners and their family in a very short time, as evidenced from the high mercury residue in their bodies above the normal level permitted by WHO. The current scale of ASGM activity in the WS Regency is predicted to rise, raising the possibility of environmental and health disasters.
Keywords: *Artisanal Gold Mining, Children, Hair, Mercury*

64.

Low level arsenic exposure during pregnancy in the 3xG cohort in Flanders: less efficient detoxification is associated with higher oxidative stress

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Increasing epidemiologic evidence indicates that even low level arsenic (As) exposure affects adverse pregnancy outcomes. On the other hand, it is known that As metabolism changes during pregnancy by means of detoxification. The adverse outcome pathways from As exposure during pregnancy need further clarification.
This study investigates whether urinary As species and As methylation efficiency are associated with oxidative stress in 151 pregnant women of the 3xG cohort in Flanders, Belgium (2012-2015).
Urine samples were collected between 25 and 35 weeks of gestation and different As species (inorganic As (iAs; As(III), As(V)), monomethylAs acid (MMA) and dimethylAs acid (DMA)) were measured using HPLC-IC-MS. Multiple linear regression analyses were performed to evaluate the associations between As exposure and oxidative stress, measured by the amount of 8-hydroxy-2'-deoxyguanosine (8-OHdG, ln-transformed) in the same urine samples (ELISA). The associations were adjusted for age and smoking before sample collection.
Increased 8-OHdG levels values were associated with higher MMA levels: for each µg/l increase in MMA, 8-OHdG increased with 24% (µg/l) (95% CI=0.5-51.7%). Further, a decreasing trend between the secondary methylation index (=DMA/MMA) and 8-OHdG was found (β=0,998 (95% CI=0.996-1.000)). No significant associations were observed for iAs, DMA and the primary methylation index (=MMA/iAS) with 8-OHdG.
The information in this study indicates that in a region with a relatively low environmental As burden, the toxic metabolite MMA is associated with increased oxidative stress in pregnant women. Furthermore, mothers with less efficient detoxification of As had higher levels of 8-OHdG.

The 3xG study is part of the cAT project, funded by NIRAS and the local partnerships MONA and STORA.

65.

Early-life exposure to multiple environmental contaminants and birth outcomes: pooled analysis in four Flemish birth cohorts

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Background:

Prenatal chemical exposure has frequently been associated with reduced fetal growth although results have been inconsistent. Most studies associate single pollutant exposure to these health outcomes, even though this does not reflect real life situations as humans are exposed to thousands pollutants during their life time.

Aim:

The objective of this study is to investigate the association between prenatal exposure to a mixture of environmental chemicals and birth weight.

Methods:

We used exposure biomarker data obtained from cord blood samples of 2033 women from three Flemish birth cohorts (FLEHS I, II & III) and a regional birth cohort (3xG). The common set of exposure measures in these cohorts are the organochlorine compounds (three PCB congeners (138, 153 and 180), HCB, *p,p'*-DDE) and the heavy metals Cd and Pb. Birth weight was assessed as a proxy for reduced fetal growth. Elastic net regression was used to assess the effect of multipollutant exposure on birth weight.

Results:

In the pooled database, birth weight ranged from 1245 to 5575 grams with a median of 3430 grams. The median contaminant levels in cord blood were: 26 ng/g lipid for PCB 153, 15 ng/g lipid for PCB 138, 18 ng/g lipid for PCB 180, 90 ng/g lipid for *p,p'*-DDE, 17 ng/g lipid for HCB, 0.045 µg/L for Cd and 9 µg/L for Pb. In single pollutant models, the three PCB congeners were significantly associated with reduced birth weight. The correlations between the different pollutants are low to moderate ($r = 0.11 – 0.59$), except for the three PCB congeners being highly correlated with Pearson correlation coefficients ranging from 0.74-0.84. From all exposure measures, the two PCB congeners PCB 153 and PCB 180 were most consistently associated to birth weight based on elastic net regression.

Conclusions:

Assessing health risk of combinations of exposure biomarkers reflects better real world situations. The findings allow more effective risk assessment as addressing the critical chemical in a mixture of pollutants is pivotal for risk assessment.

66.

Maternal cell phone use during pregnancy and child behavior problems in five birth cohorts

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Introduction: Previous studies regarding maternal cell phone use during pregnancy collected retrospectively and associations with child behavior problems at 7 years were not conclusive. Therefore, we evaluated this association with data from the previous studies together with prospective data from three other birth cohorts.

Methods: We used individual participant data from 84,077 mother-child pairs in five population-based birth cohorts in Denmark (1996-2002), Korea (2006-2010), the Netherlands (2003-2004), Norway (1999-2008), and Spain (2003-2008). We categorized cell phone use based on maternal-reported frequency of calls during pregnancy: none, low, medium, and high. Behavior problems (reported by mothers using CBCL or SDQ) were classified in the borderline/clinical and clinical ranges using validated cut-offs in children ages 5-7. Cohort specific risk estimates were meta-analyzed.

Results: In all cohorts, 7% of mothers reported no cell phone use during pregnancy, except in Denmark where 61% did not use cell phones. For all cohorts, 6% of mothers reported high cell phone use. Mothers who reported no cell phone use were less likely to have a child with overall behavior problems as compared to those who reported low use (OR 0.82, 95%CI 0.75, 0.89). High cell phone use during pregnancy was associated with an increased risk for inattention/hyperactivity problems as compared to low cell phone use during pregnancy (OR 1.29, 95%CI 1.12, 1.48). No clear associations were observed in relation to the other behavior problems.

Conclusions: Our results indicate that high cell phone use during pregnancy may be associated with hyperactivity problems and no cell phone use may be associated with a decreased risk in any behavior problems among children ages 5-7. While this is the largest study to evaluate this association, these results should be interpreted with caution, as there is possible residual confounding that may influence both cell phone use and child behavior.

67.

Prenatal exposure to perfluoroalkyl substances and cardio-metabolic risk components during early childhood

Cyntia B. Manzano-Salgado

Background: Prenatal exposure to perfluoralkyl substances (PFAS) might increase obesity and cardio-metabolic (CM) risk during childhood, but results are inconclusive. We evaluated the effect of PFAS on individual and combined CM risk components during childhood in a Spanish birth cohort.
Methods: We measured perfluorohexanesulfonic acid (PFHxS), perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), and perfluorononanoic acid (PFNA) in maternal plasma. We assessed rapid growth at 6 months of life (n=1109) and age-and sex-specific z-scores for body mass index (BMI), waist circumference (WC) and mean arterial pressure (MAP) at 4 (n=1,230) and 7 (n=1094) years. Using non-fasting blood samples at 4 years we measured lipid concentrations (n=629): total cholesterol, triglycerides (TG) and, high-density (HDL-C) and low-density (LDL-C) lipoprotein cholesterol. We calculated a continuous CM risk score at 4 years; a higher score indicated a higher CM risk.
Results: Twenty-four percent of children were rapid growers at 6 months and 30% and 35% were overweight at ages 4 and 7, respectively. At 6 months, PFOA was associated with increased weight gain in boys [β=0.22 (95%CI: 0.04, 0.40)] but not in girls [β=-0.06 (-0.21, 0.10)] (p-value for sex-interaction=0.08). We found no association between PFAS and BMI z-scores, overweight or WC at 4 and 7 years. PFAS tended to decrease MAP z-scores at 4 years of age but not statistically significant. Higher PFAS concentrations increased TG at 4 years, especially PFHxS [β=6.32 (0.96, 11.68)]. Higher PFOA concentrations increased the CM risk score at age 4, especially in boys [β=1.37 (0.03, 2.71)].
Conclusion: This is the largest study to comprehensively assess the effect of PFAS on individual and combined CM risk components during early childhood. Our results suggest that PFAS can affect some CM risk components during childhood, especially in boys. Further replication of our results is needed.

68.

Quality of life of childhood brain tumor survivors: intervention, analysis and results

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Objectives: Assess the socio-demographic and environmental factors, morbidity, and health related quality of life (HRQL) of childhood brain tumor survivors.
Methods: Cross-sectional study of pediatric survivors (diagnosed 0-14 years) out of treatment and more than 2 years since the diagnosis in a specialized unit. Evaluation: questionnaires regarding socio-demographics, environment, clinical history, scale of sequelae effects (LESS), PedsQL™ 4.0 parents and patients generic scale (2-18 years and young adult).
Results: Total population: 82. Died during the study: 3; Evaluated: 67. Male: 58.2%. Current mean age: 164.6 months (σ 76). Mean age at diagnosis: 62.1 months (σ 46). Mean follow-up: 108.1 months (σ 54.8). Low income: 28.8%. Low level of parental education: 30%. Tobacco smoke in the home: 61.2%. Physical exercise <1-2d/week < 30 min: 53%. Epilepsy: 16.84%. Neurofibromatosis-1: 11.9%. ICCC3: astrocytomas 47.7%, medulloblastomas/PNET 17.91%, craniopharyngiomas 7.4%, ependymomas 4.4%, others 5.9%. Location: supatenorial 28.35%, infratenorials 46.2%. Ventriculoperitoneal shunt: 19.4%. Surgery: 82.1%. Radiotherapy: 35.8%. Chemotherapy: 43.3%. Hematopoietic stem cell transplantation: 7.5%. Reintervention: 11.9%. LESS modified (>0p) 82.1%. Global HRQL average values: (2-18 years): reported by parents: 67.4 (normal values (NV) 81.3), reported by patient: 72.6 (NV 82.8); Reported by Young Adult: 77.0 (NV 78.1)
Conclusions: On average, this population of childhood brain tumor survivors shows socioeconomic difficulty, environmental risk, high prevalence of medical sequelae and a reduction of the HRQL compared to the healthy normative population of children.

69.

Environment and childhood cancer survivors: plasecap – mur.

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Introduction: The National Cancer Institute defines that every child with cancer is a childhood cancer survivor (CCS) from the time of diagnosis, and will continue to be one for the rest of his or her life. In the last decades pediatric cancer survival rate has increased progressively, reaching approximately 80%. The increase of survival has revealed the need for controlling late effects caused by treatments. International organizations recommend structured follow-up, and if possible, throughout lifespan, for CCS. The objective of this work is to present the Long-Term Follow-Up Program for Childhood Cancer Survivors in the Region of Murcia (PLASESCAP-MUR).
Methods: In the Region of Murcia (Spain) with an implemented public primary care health system, we have developed PLASESCAP-MUR for the follow-up of CCS, which follows a shared-care model for the transition from hospital to primary care that is tailored to the specific needs of each CCS.
Results: The first objective of PLASESCAP is the education and promotion of healthier environments and lifestyles for the survivor, their family, and community, with the goal of improving their environmental standard and quality of life. The second objective is for early detection and screening for an appropriate management of the late effects arising from disease and treatments.
Conclusions: Long-term follow-up programs for CCS based on creating healthier environments, reducing and eliminating exposure to environmental carcinogens and promoting healthy lifestyles in order to reduce the incidence of late effects and get the CCS to achieve the highest quality of life possible are necessary.

70.

Health related quality of life of survivors of childhood extracranial neoplasms

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Introduction: In the last decades pediatric cancer survival rate has increased spectacularly, reaching approximately 80%. This increase has revealed the need to control late effects arising from treatments and disease that affect the quality of life of childhood cancer survivors (CCS). The Long-Term Follow-Up Program for Childhood Cancer Survivors in the Region of Murcia (PLASESCAP-MUR) offers an integrated follow-up for CCS and among its objectives is environmental education and awareness and healthier lifestyles to improve environmental and life quality of survivors and their environment.

Objectives: Assess the health related quality of life of a group of survivors of extracranial neoplasms and evaluate certain demographic, clinical, and environmental factors on the results.

Methods: Descriptive cross-sectional study. The PedsQL™ 4.0 self-administered generic version for 4 to >18 year old survivors was completed by 85 survivors.

Results: Overall quality of life of 84.1 (81.7;86.4). Subscales: physical health = 86.8 (84.1;89.7), psychosocial health = 82.5 (79.9;84.9), emotional domain = 75.4 (71.6;78.9), social domain = 92 (89.3;94.5), and educational domain = 79.9 (76.7;83.2). The worst quality of life is reported by CCS that have been treated with radiotherapy (-9.0; p=0.007), that presented with a relapse of their disease (-9.2; p=0.033), or that have presented with some adverse effect derived from the treatments used (-8.0; p<0.001). The environmental and lifestyle factors studied do not significantly influence the results.

Conclusions: The results obtained are similar to other international work. Strategies to improve quality of life of survivors are necessary, preferably focused in the creation of healthier environments.

71.

What is Environmental Burden of Disease? – An animated video gives an answer

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Background: The Environmental Burden of Disease (EBD) method is used to quantify disability-adjusted life years (DALYs) which can be attributed to environmental risk factors. Thereby, risk factors of major concern for population health can be identified. DALYs are not easily understandable what might prevent their use in risk communication to the general public as well as in political decision-making.

Method: An animated video was produced to explain the EBD method and its possible application fields to the interested general population, scientists from other research fields and policymakers. A vivid example, outdoor air pollution, which affects everyone's health, was chosen to illustrate the quantification steps. Technical terms are used and explained in common language.

Results: The 8-minute video describes the DALY as a summary measure of population health which consists of years of life lost due to premature mortality and years lived with disability. Likewise the attribution of DALYs to the risk factor outdoor air pollution is illustrated. The video is freely available on YouTube in German and English.

Discussion: The video is designed to be understandable to a broad audience by using a balance between simplification and scientific correctness. It gives a short but comprehensive explanation of the complex EBD method and is therefore an attempt to break out of the scientific ivory tower.

72.

Lifestyles of survivors of childhood hematologic neoplasms

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Introduction: The prevention of late effects caused by treatments and the promotion of healthy environment and lifestyle are the two pillars of the Long-Term Follow-Up Program for Childhood Cancer Survivors in the Region of Murcia (Spain) (PLASESCAP-MUR) to achieve the highest levels of environmental and quality of life in childhood cancer survivors. The objective of this project is to analyze the lifestyles of survivors of childhood hematologic neoplasms.

Methods: Descriptive cross-sectional study. A total of 55 survivors were analyzed within the PLASESCAP from August 2015 to May 2016.

Results: 39 leukemias and 16 lymphomas. Mean age = 16.8 (15.6;17.9). Of these, 9.4% are smokers and 50% occasionally consume alcohol. About 52% of the survivors engaged in physical activity less than three times a week. Almost 56% and 60% of the survivors eat less than one portion of fruit and vegetables per day, respectively. Finally, 53% use electronic devices more than 2 hours a day and 44% of them never engage in activities in contact with nature or do so only in summer.

Conclusions: More than half of the survivors do not meet with the dietary and physical activity recommendations. Up to 50% of them consume alcohol with a mean age under 17. Programs that encourage the promotion of healthy lifestyles with a diet rich in fruits and vegetables, exercise, and regular contact with nature as well as avoidance of toxic habits and drugs such as alcohol or tobacco are necessary to obtain the best environmental standard and quality of life.

73.

Secondhand tobacco smoke and survival in children with acute lymphoblastic leukemias in the Region of Murcia (Spain)

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Introduction: Environmental tobacco smoke is associated with diseases and premature death in childhood. It has been associated with an increased risk of several pediatric tumors, including acute leukemias, with variable results. There are certain clinical and biological features that have prognostic influences in childhood acute lymphoblastic leukemia (ALL). However, the observed plateau in survival rates in last years suggests that there must be other unknown factors affecting prognosis. In adults there are some reports linking active smoking with decreased survival in patients with myeloblastic leukemia, but this relationship has not been studied in pediatric population. Our objective is to study the relationship between environmental tobacco smoke and overall survival in children diagnosed with ALL.

Methods: Survival analysis in the MACAPEMUR (Environment and Pediatric Cancer in the Region of Murcia) cohort of patients between 0 and 15 years with ALL diagnosed from January 1998 to December 2013 in the Region of Murcia (Spain).

Results: 60% of children with ALL live with at least one parent smoking at diagnosis and in 26% of households both parents are smokers. Environmental tobacco smoke from maternal smokers after diagnosis was significantly associated with lower overall survival (HR = 9.92; 95% CI 1.89 – 51.89).

Conclusions: Maternal smoking after diagnosis of ALL in children is an independent prognostic factor and easily adaptable in the overall survival of acute lymphoblastic leukemia. In order to increase survival and improve their environment and quality of life it is necessary to provide smoking cessation programs to parents of children with leukemia.

74.

School environmental health: the first steps towards environmental health

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The educational stage (3-18 years) is a period of life in which the environmental factors have a major impact on a child. These environmental factors shape current and future adulthood biological strengths and weaknesses. In addition, during the educational stage social and emotional interactions form personality.

Since 2006, the Pediatric Environmental Health Specialty Unit of the Hospital Clínico Universitario Virgen de la Arrixaca works along with Colegio San Jorge (Murcia) to promote school environmental health by developing knowledgeable and maintained **goals/concerns** that allow us to carry out and implement concrete activities in school.

The first step was to have the approval and commitment of the school administration to free a professor for a couple hours a month to carry out these tasks. Subsequently, a complete environmental diagnosis of the school was completed in order to understand the strengths and weaknesses of the environment of the school. Once completed, the **goals** were developed, 2 of which were implemented and one which will be implemented next year.

1st **Goal** - Tobacco: Identification of the prevalence of smoking at school, awareness activities, ephemeris celebrations (global day without tobacco), and group therapies of tobacco dishabituation for professors and parents of students.

2nd **Goal** – Ultraviolet Radiation: Including a hat for the school uniform, choosing a time during the year less hot for the most exhaustive physical activity, as well as organizing schedules so that the younger children have exposure to the sun earlier in the day.

3rd **Goal** – Pesticides: Inform parents at school of fumigation days and the products that are used, production and use of organic pesticides, awareness activities.

These **goals** are integrated into the day-to-day of the school, a school activity assumed as its own, which affects future habits and strengths of both students and the school community.

75.

Smoking cessation consultation in pediatrics

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Exposure to tobacco smoke (active or passive) is one of the leading causes of pregnancy complications and a risk factor for developing multiple pediatric diseases. Smoking cessation consultation in pediatrics is aimed at pregnant couples. The consult has a group structure (although in exceptional cases is done individually) and is divided into 5 in-person and 5 telephone sessions. The main actions developed in the consult is the control of nicotine dependence, and above all, behavioral and emotional dependence to tobacco.

During 2016, we have developed 3 therapy groups with a mean of 5 patients per group. The individuals who have not attended all sessions and also do not respond to the telephone calls are excluded from the results.

A total of 16 patients, 12 women and 4 men. Cigarettes / day average is 9.78. In the test Fagerström have an average of 4.4 (little dependence) and the Richmond test 7.5 (moderate motivation). Cessation rate today is 75%.

Emotional and behavioral control is very important during pregnancy. The inclusion of the partner in the process is very so that the cessation is long-lasting, while also promoting a smoke free childhood environments.

The strengths of group therapy are that individuals with the same characteristics (feelings, fears, motivations ...), also avoid feeling lonely during the process. The group can solve doubts and questions (fears, shyness ...) that otherwise would not be resolved. It helps us to establish pertinent emotional linkages among patients within the group. The results indicate a strong adherence to treatment.

76.

Forests for health with the environmental midwife

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Introduction: Forests for Health (FFH) is a Project within the program "Nacer sin OH" (Births without OH), promoted by the Pediatric Environmental Health Speciality Unit of the Clinical University Hospital Virgen of Arrixaca (Murcia, Spain). The aforementioned project intends that each child born and raised will be linked with a tree: incorporating a forest within each of the maternities of the Region of Murcia (Spain), creating healthy environments as protective factors during infancy thus building health equity and proposing the enjoyment of natural heritage and regional biodiversity.

Objective: To foster the linkage of pregnant partners with nature and their future children from birth through adolescence stimulating contact with nature as a preventive and therapeutic tool to achieve health, wellness and quality of life.

Methods: The environmental health midwife and various maternity healthcare professionals collaborate giving the family a pine seedling, linked with the birth of a child, and an information package, containing educational and prevention materials in line with the goals of the program. Subsequently they contact and invite parents to the replanting day, with the aim of creating forests for health.

Results: From 2015 to 2016 approximately 2000 pine seedlings were given to families. There have been 3,637 newborns. Tress planted in the FFH is approximately 450. Tons of CO2 absorbed: 4,694 CO2/year.

Conclusion: As health professionals the midwives are vital in accompanying pregnant couples and influencing the stages of: preconception, pregnancy, childbirth, postpartum, throughout the cycle of sexual and reproductive health. The simplicity of the project allows it to be feasible and transferable for families, especially during such a receptive period.

77.

Factors influencing breastfeeding initiation

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Introduction: Breastfeeding is unique and a priority nutrition during the first year of life. However, the initiation and duration of it is determined by the interaction of multiple constitutional and environmental factors (physical, chemical, biological and psychosocial). Pregnancy and lactation are the period of greatest vulnerability for children to environmental factors. Children are at greatest vulnerability to environmental factors during the periods of pregnancy and lactation.
Objective: To study the protective and risk factors related to the initiation of breastfeeding in the Murcia Region.
Methods: A cross-sectional study of 99 women from the Region of Murcia, consisting of a personalized ¨face to face¨ interview with the mothers at the time of hospital discharge, which were done by a nurse utilizing a carefully crafted questionnaire instrument called ¨the green page¨.

Results: About 90% of the mothers had the intention of exclusively breastfeeding prior to giving birth, 5% partial breastfeeding, and 5% no breastfeeding. However, what occurs during maternity is that only 51% exclusively breastfed, 36% partially breastfed, 8% predominately breastfed, and 5% did not breastfeed. It is known, especially during the immediate and early postpartum period that difficulties can arise such as the ones found during our study. About 27% of the mothers had problems breastfeeding, of those mothers 6% experienced pain in the nipple area, 5% the newborn had issues latching on, 5% had cracks in the nipple, and 5% had irritated nipples.

Conclusion: Addressing multiple factors that affect breastfeeding can positively influence the initiation and duration of breastfeeding. As health professionals we are able to promote breastfeeding and thus improving the quality of life of our children.

78.

Neuropsychological profile of an adopted patient with Fetal Alcohol Spectrum Disorder.

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Introduction:

Prenatal exposure to alcohol causes a variety of clinical manifestations known as fetal alcohol spectrum disorder (FASD), with neurodevelopmental effects, among others. Alcoholism is common among mothers of children adopted from Spanish institutions, especially from Eastern Europe, finding frequently in this group children with FASD.

Case report:

17 year old boy born in Ukraine, adopted by a Spanish family at the age of two.
Family history: unknown. Sister with psycomotor retardation.
Personal history: unknown controlled pregnancy. The presence of dysmorphic features was detected in infancy by the Medical Genetics Unit comparable to FASD. Psychomotor and pondostatural growth retardation. At the age of 7 he began with inattention and hyperactivity, as well as anxiety and depression symptoms. At school he has presented behavioral problems and poor school performance. Assessed by Team Education and Counseling: limited IQ and verbal reasoning capacity below the average. Significant curricular gaps in grammatics, mathematics and languages. Difficulties in social relationships. He does not show an adequate level of autonomy, all in context of FASD.

Discussion:

Patients with FASD may have a normal or decreased IQ, from minimum to profound mental retardation. Executive functions are the most frequently affected. In addition, they usually have poor performance in behavioral inhibition and self-control, verbal and nonverbal fluency, organization and planning. Other manifestations: difficulties in the area of mathematics, and social communication because of language disorders. Problems in socialization influenced by the understimulation, common in adopted children. Behavioral, substance use, sexual behavior and psychotic disorders, among others.
Early diagnosis and intervention, with psychopedagogical treatment seem to achieve an improvement in the neurodevelopment of these patients.

79.

Pilot phase of TNG STUDY

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TNG study (The Next Generation study) is a new prospective birth cohort initiated as a collaborative project of Masaryk University and University Hospital in Brno, Czech Republic. The study is designed to follow up 7000 children from their prenatal period to adolescence with the aim of assessing multiple factors potentially affecting children health (factors of *exposome*). A special attention is being paid to prenatal and early postnatal developmental abnormities, postnatal psychomotor development, neurobehavioral disorders and immune system disorders. Information on complex exposures will be based on on-line versions of combination of validated on-line questionnaires and biological tissue analyses will be used to estimate complex exposures. Information on the health outcomes will be taken from the psychomotor developmental screening questionnaires, medical records, and health registers. TNG study has been initiated in April 2015 with a three-stage pilot. Feasibility of the cord blood sample collection and processing protocol was assessed at the first stage on 100 mother–child pairs. The aim of the second stage was to evaluate feasibility of the protocol for recruitment of women in the in 38th week of pregnancy. That allowed for estimation of future study response rates. Samples of venous blood, urine, and saliva were collected from 150 participating mothers, and stool and saliva were taken from newborns in addition to cord blood samples. On-line versions of the self-reported questionnaires will be tested at the third stage (scheduled to start in August 2016) together with robustness of the IT systems.
A majority of the approached mothers was willing to participate in the TNG pilot study (90% of mothers were willing to donate venous blood in 38th week of pregnancy, 70% agreed to donate cord blood, to fill the questionnaire and provide health data). The sample collection and processing protocol was proven to be feasible: all types of samples were processed and stored within 180 minutes regardless the day and time. Whole blood, plasma, serum, red cells, and buffy coat will be stored at -80°C, viable cell lines from cord blood will be stored in liquid nitrogen.
Based on the results of the pilot phase the full scale TNG study is scheduled to start in January 2017.

80.

BORN WITHOUT OH: an innovating model for preventing and managing the neurodevelopmental disorders caused by alcohol and drug prenatal exposure in a Mediterranean region.

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Introduction:
Born without OH is a comprehensive program of prevention, reduction of harm and management of neurobehavioral disorders associated with prenatal exposure to alcohol and other drugs through the pediatric environmental health from the beginning of pregnancy until the end of adolescence.

Objectives:
Prevent and reduce damage from exposure to alcohol and other drugs during critical periods of development (periconceptional until the end of adolescence).

Materials and Methods:
Beginning in 2009 at the University Clinical Hospital Virgen de la Arrixaca (Murcia, Spain). Implementation in Hospital Care and Primary Care of the GREEN SHEET: a set of basic and concise questions to women in the 1st trimester of pregnancy to detect the environmental risk factors related to alcohol and other drugs in early pregnancy. Those with high-risk criteria by prenatal exposure to alcohol and other drugs pass to a follow-up program called ELIJO MAS SANO (CHOOSE HEALTHIER): early and comprehensive intervention for the management and monitoring of pregnant women and / or children at risk of Fetal Alcohol Spectrum Disorders (FASD).
Results:
3600 Green Sheets. Following-up of 200 children in the program ELIJO MÁS SANO. Significant decrease ($p < 0.05$) of women who drink some alcohol in early pregnancy and the amount of alcohol drunk by the couple. Decrease in the number of newborns with congenital heart disease associated with intrauterine exposure to ethanol controlled by the number of births and abortions. 6 children diagnosed with fetal alcohol syndrome (FAS) (in 1500 pregnant couples) estimating a prevalence of 4 cases of FAS per 1,000 newborns in the region of Murcia.

Conclusions:
Born without OH programme has been implemented with good preliminary results: reducing the consumption of alcohol during pregnancy, decreased congenital heart diseases related to intrauterine exposure to alcohol and registration of syndromes and alcohol-related birth defects.

81.

Non-Breast /Bottle Feeding and poor hygiene a risk for infantile diarrhea

Mumtaz A Khan

Introduction:

Diarrhea is common morbidity and leading causes of mortality in infants. Poor sanitation conditions and water quality makes a great risk of infantile illnesses. Breastfeeding promote overall infant health and decrease morbidity and mortality. The study was conducted to compare incidence of infantile diarrhea in bottle-fed and breastfed infants and to analyze bottle milk for any contamination.

Materials and methods:

Study conducted during Feb to April 2015 at Polyclinic hospital, Islamabad adopting lab based cross-sectional study design. Pretested questionnaire was used to interview the mothers. Infants 31-180 days were targeted. Using convenient sampling technique, assessed 250 infants, enrolled 145 and analyzed 68 bottle milk samples. Milk samples were collected in 20cc sterile syringes, transported to lab maintaining cold chain and analyzed/cultured in Microbiology lab. Pathogenic organisms identified and isolated.

Results:

Diarrhea was reported in 70% infants using animal milk, 68% mixed/formula and 7% exclusive breastfed. Diarrhea was reported among 46% infants taking bottled milk prepared in boiled water whereas 86% reported to have diarrhea who used to take milk prepared in plain/tap water. Culture of 45 (66%) samples yielded pathogens growth, where *E coli* was 45.5% (31), *Salmonella* 35% (24), *Staph. Aureus* 35% (24), *Klebsiella* 9% (6) and *shigella* 7.3% (5).

Conclusions:

Breastfeeding is protective against infectious diseases and bottle-fed infant are at risk of getting infected. Poor hygiene, mother education and water used for milk dilution is associated with outcome.

Cleaning bottle with detergents and using bottle-brush has protective effect. Use of animal's milk in infancy poses high risk.

Recommendations

Promote exclusive breast-feeding. Using appropriate milk, practicing good hygiene and combination bottle safety steps like cleaning and disinfection with detergents, water rinsing, boiling and submersion in chlorine solution along with hand washing, using clean water for feed preparation, proper storage and refrigeration are recommended.

Key words:

Microbial analysis, Non-Breast Milk /Bottle Feeding, infantile Diarrhea

82.

Nasal epithelial lesions and scalp hair as bio-indicators of cumulative air and water pollution health effects

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Introduction: Athens is situated in the Attica basin, a densely populated area in Central Greece, which is also home to industrial activity found mainly along the banks of the Kifissos River. The surrounding mountains restrict the ventilation of the area, resulting in heavy air pollution. Furthermore, the water quality of the river in the basin is impaired due to contamination with heavy metals.

Aim: This study evaluates the exposure of children living along the banks of the Kifissos River to the cumulated effects of air pollutants (such as particulate matter and ozone), heavy metals from the polluted water of the river and the ambient air by examining two endpoints of exposure, i.e. scalp hair and nasal epithelium.

Materials and Methods: Samples were taken from 50 children (aged 11 to 12 years old) living at the Municipalities of Philadelphia, Kifisia and Kryoneri. Heavy metals (arsenic, cadmium, mercury, lead and nickel) were measured in scalp hair samples using atomic absorption spectrometry with graphite furnace. Nasal specimens were assessed based on 13 cytological criteria. The nasal samples were processed using the Shandon Cytoblock Preparation System and were examined and photographed using bright-field light microscopy.

Results: Heavy metals were detected in all the hair samples in different concentrations; however, the scalp hair samples from the school in Kifisia showed higher heavy metal concentrations, which is consistent with the intense industrial activity in the area. None of the exposed children had normal nasal cytomorphological characteristics.

Conclusions: Results suggests that children living at the Attica basin have the same probability in developing nasal epithelium alterations, which can be attributed to the presence of environmental pollutants present in the air (particulate matter, ozone, nitrogen oxides and heavy metals). Also, scalp hair and nasal epithelium may serve as probable bio-indicators of air and water pollution health effects.

83.

Personal exposure to PM2.5 and benzo[a]pyrene in Ostrava, Czech Republic

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Introduction: Benzo[a]pyrene (B[a]P) is a proven human carcinogen. In the air, it is associated with particulate matter ≤ 2.5 µm ($PM_{2.5}$). High concentrations of both compounds found in the Ostrava region, CZ, have led to concern in the local population. To support the local needs for a communication platform, we started a case study of the CITI-SENSE project „Citizen Observatories for Quality of Life", with a special study on personal exposure and monitoring in schools.

Methods: Twenty non-smoking adult volunteers were recruited in the most polluted part of Ostrava to participate in three biomonitoring campaigns. All participants completed a personal questionnaire and time-location-acitivity diary. High precision personal monitors for $PM_{2.5}$ were used next to the new sensor technology for NO_x assessment. Outdoor concentrations of $PM_{2.5}$ and B[a]P were measured using High Volume Air Sampler.

Results: The campaigns were held in winter 2013, summer 2015 and winter 2016. Average two-day personal exposures to $PM_{2.5}$ were 68.8, 45.3 and 37.4 µg/m^3, respectively. In 2013 and 2015, personal exposures to B[a]P were 5.5 and 1.3 ng/m^3. The outdoor concentrations for 2013 and 2015 were 35.4 and 17.6 µg/m^3 of $PM_{2.5}$ and 5.3 and 1.2 ng/m^3 for B[a]P in two weeks period during the campaigns. The highest concentration of B[a]P was found in kindergarten Ostrava Radvanice in February 2016 of 1.8 indoor and 5.9 ng/m^3 outdoor.

Conclusions: With use of low-cost sensors, we created a Citizens' Observatory to boost the cooperation between scientists, citizens and other stakeholders, to increase opportunities for environmental health governance. To improve relevance to local population, we combined low-cost online measurements, with high precision instumentation, and with measurements and information campaigns in schools, all in cooperation with city authorities. Such activities provide context necessary for communicating the results of the biomonitoring study to citizens as well as authorities.

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Keywords

Air pollution, personal exposure, PM2.5, benzo[a]pyrene, pollutants at schools

84.

Quantitative profiling of metabolic markers to assess dietary and microbiota-related exposure factors

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Introduction:

The dietary and intestinal microbiota-related exposure factors directly influence human metabolism, thus affecting health state. Quantitative metabolic profiling by mass spectrometry (MS), specifically selected reaction monitoring (SRM) assays may be used to capture an individual's metabolic phenotype revealing potential perturbations. Biomarker levels correspond to a specific exposure factor and perhaps they are consistent with early indications of a disease. This study focuses on biochemical intermediates of tryptophan metabolism to explore the influence of dietary and microbial exposure factors on this essential biochemical pathway.

Methods:

A chemical library containing 234 standards of diverse biochemical intermediates was analyzed using UHPLC-MS system (1290 Infinity II and 6495 QqQ, both from Agilent, CA, USA) to develop SRM assays for all detectable metabolites. Urine samples (n=51) from pregnant women collected in the 38th week of gestation were lyophilized, extracted with methanol, internally standardized and assayed for a panel of metabolites relevant to tryptophan metabolism by SRM technology.

Preliminary data:

The dietary intake of tryptophan is essential in humans to maintain protein biosynthesis and synthesis of neurotransmitters (serotonin and melatonin). At the same time tryptophan is metabolized by microbiota residing in human intestine. The collective dietary and microbiota exposure was explored using highly selective, sensitive and reproducible SRM assays for 20 key intermediates of tryptophan metabolism. The levels of these intermediates were determined in urine samples from pregnant women collected in the frames of Central European Longitudinal Study for Pregnancy and Childhood (CELSPAC: TNG) in the region of South Moravia (Czech Republic). Quantitative metabotypes were compared in urine samples based on abundance levels and mutual ratios between metabolic markers. This study contributes novel data in the area of health related dietary and microbial exposure factors, particularly to emerging field of the exposome (i.e. non genetic factors affecting human health).

Novel aspect:

Innovative study ofhealth-related dietary and microbial exposure factors in emerging field of the exposome

85.

Spatial Pattern Analysis of Hepatitis A Cases in Children by using Geostatistical Analysis of GIS in Turkey

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Epidemiology is the scientific study of the spread and control of diseases as a function of time and location. Epidemiology follows the patterns of a disease on people in their healthy and un-healthy periods; and tracks their history of illness especially for understanding the nature of characteristics of it. In this context, spatial data is strongly required in order to introduce the spatial pattern (distribution and expansion) of the illness. Epidemiologists have traditionally used maps while analyzing the spatial characteristics of the illnesses in terms of relations between location, surrounding environment, and cases. Developing information technologies introduced Geographical Information Systems (GIS) as a strong tool to be used on spatial decision making applications such as surveillance and monitoring of the diseases. GIS and Geostatistical techniques are used to account for spatially varying population sizes and spatial patterns in the surveillance and monitoring of the diseases. In environmental and public health, identification and quantification of the disease patterns provide the first steps towards increased understanding and possibly, control of that particular disease. Spatial statistical methods, of which Geostatistics is a subset, offer a means for us to use such locational information to detect and quantify patterns in public health data and to investigate the degree of association between potential risk factors and disease.

This study presents a general overview of the geostatistical methods used in epidemiology, experimenting an innovative GIS-based approach to the analysis of epidemiological data. The paper additionally aims to analyze the spatial pattern of the Hepatitis A cases in children at ages under 15. In this context, province based official data including the number of measles cases and deaths by gender and age were monthly provided from the year 2000 to 2011. The stated data were classified by age considering 3 main groups as 0-4, 5-9, 10-14. Incidence rates and the morbidity of the Hepatitis A cases were considered as the main parameters for primary analysis of the cases by province. Natural Neighbor analysis were also applied for introducing the spatial pattern of the cases distribution in time. Additionally, Moran's I and Local Indicators of Spatial Association (LISA) analysis were respectively applied for introducing the characteristics of the global and local spatial pattern of cases in time. The results outlined a significant decrease in the incidences of Hepatitis A cases. Detailed evaluation of the results will be presented by country and province in the full manuscript.

Keywords: GIS, Geostatistics, Epidemiology, Public Health.

86.

Prenatal exposure to outdoor airborne trace elements and cognitive and psychomotor development during childhood in four European birth cohorts

Malgorzata Joanna Lubczynska

Background: Studies on the association between exposure to elemental composition of particulate matter in outdoor air and neuropsychological development are sparse. We aimed to investigate the association of prenatal exposure to trace elements of outdoor particulate matter with diameter of <2.5µm ($PM_{2.5}$) with cognitive and psychomotor development during childhood.
Methods: We analyzed data from 4 European population-based birth cohorts – Generation R (The Netherlands), Duisburg (Germany), GASPII (Italy) and INMA-Sabadell (Spain) – with mother–infant pairs recruited between 2000 and 2006. Monitoring campaigns measuring $PM_{2.5}$ levels were performed between 2008 and 2011 in all corresponding regions and the elemental composition of the particles was determined. Individual exposures to 8 elements (copper, iron, potassium, nickel, sulfur, silicon, vanadium and zinc) that represent major anthropogenic sources of air pollution were estimated at birth addresses using land use regression models. Cognitive (general, verbal, and non-verbal) and psychomotor (global, fine, and gross) development was assessed between ages 1 and 9. Adjusted region-specific effect estimates were combined using random-effects meta-analysis.
Results: 2904 children were included in this analysis. Prenatal exposure to vanadium and nickel was associated with a reduced verbal development (-1.71 points [95% CI = -3.06 to -0.37] per increase of 2µg/m^3 of vanadium and -1.96 points [95% CI = -3.46 to -0.46 per increase of 1µg/m^3 of nickel]). Similar tendency, although statistically not significant, was found for exposures to sulfur and silicon with verbal development; for exposure to nickel, sulfur, and silicon with general cognitive development; and for exposure to all elements with fine psychomotor development. In few cases, exposure to some elements showed a tendency towards an improved non-verbal and gross psychomotor development, although also these results were statistically non-significant.
Conclusion: Prenatal exposure to airborne trace elements vanadium and nickel of outdoor $PM_{2.5}$ was associated with an impaired verbal development during childhood.

87.

Persistent Organic Pollutants in women's breast milk and proximity to Municipal Waste Incinerators in the UK

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Introduction:

EU legislation restricting landfilled waste has led to an increase in Municipal Waste Incineration (MWI) within the UK. Persistent Organic Pollutants (POPs), including dioxins and heavy-metals, released from MWIs have been found in elevated levels in areas surrounding these sites. Due to public concern over health risks associated with MWIs this project aims to quantify POPs in human breast-milk to examine relationships between individual level POP uptake in proximity to MWIs.

Methods:

Recruitment was completed in three phases via postal invites. Primiparous women between 18-40 weeks gestation, aged >18 years and living within 20km of three MWIs were invited. Women were asked to provide up to 120ml of breast-milk and complete a questionnaire (including questions on lifestyle, diet, residential history). Breast-milk has been analysed for selected POPs, depending on the amount of milk provided.

Results:

587 women were recruited (14% recruitment rate), 329 provided milk (56% completion rate). Modelled PM_{10} emissions from MWIs have been used as a proxy for incinerator exposure gradients for other pollutants, such as POPs, which cannot be directly modelled. Modelled exposure to PM_{10} from incinerators is very low (average of incinerator postcode level concentrations varied from 8.70x10-6 to 7.72x10-3 $\mu g/m^3$). 224 (38%) women live in areas in the top tertile of modelled incinerator PM_{10} exposures and 203 (35%) women in the bottom tertile. Initial chemical analysis results will inform whether there are significant differences in POP or dioxin concentrations in women by MWI, proximity to MWI, and if any relationships are modified by lifestyle factors.

Conclusions:

This study is the first and largest in the UK to provide individual level POP exposure estimates in proximity to MWIs and improve understanding of the diverse routes of dioxin exposure. It will also aid the interpretation of findings from an ongoing national study of MWIs and risk of adverse birth outcomes.

88.

Environmental consulting nursing: health from the beginning

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Environmental consulting Nursing (Reproductive) is a clinical consultation detection, intervention and prevention of exposures to environmental hazards at critical periods of pregnancy (spermatogenesis and pregnancy) with special attention to legal and illegal drugs. The consultation complements ultrasound 12 weeks of gestation. The consultation functions are:

• Damage Reduction: Detection and management (eliminate / reduce) of environmental exposures in pregnant couple that can affect the health of the fetus (or embryo) to prevent recurrent diseases.
• Establish " environmental risk labels " in those pregnancies where the exposures have been important enough to trigger diseases related to those exposures so we can make prenatal diagnoses or in the first months of life

The working tool is the “hoja verde” is a set of basic and concise questions that allows us to identify and management environmental risk factors at critical periods of pregnancy (including spermatogenesis) and breastfeeding. The items are socioeconomic factors, reproductive history, ionizing radiation, drugs / herbolistería / homeopathy, occupational exposures, smoking, illegal drugs, alcohol, pesticides and environmental perception of their community.

these are some data collected from the first 1,500 couples with risk in early pregnancy (2009/2012): maternal smoking 34.9% , 45.4% paternal smoking, maternal alcohol consumption in early pregnancy 59.4%, parental alcohol consumption spermatogenesis 85% fetus exposed to illegal drugs in early pregnancy 10.1%.

In the years serial data presented we can see:
• decrease sustained and significant women who drink some alcohol in early pregnancy.
• Decrease the amount of alcohol that the couple take significantly.
• Decrease in the number of newborns with congenital heart disease associated with intrauterine exposure to ethanol.

89.

Prenatal exposure assessment approaches need to consider spatio-temporal variation of air pollution

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Introduction: Air pollution exposure during pregnancy may have consequences for the whole life and future generation. The time-window of exposure (intermediate between short- and long-term effects) poses a methodological problem in the choice of the most suitable exposure assessment approach.
Objective: To evaluate the effect of different prenatal exposure assessment approaches on reproductive outcomes.
Methods: In the Emilia-Romagna region (Northern Italy) two independent studies (Moniter and Sinatra projects) were conducted on air pollution and several reproductive outcomes. The first assessed the residential exposure to incinerator pollution of mothers lining in areas next to plants; the latter considered different factors of environmental pressure in an urban-industrial city (Ravenna). Each newborn was georeferenced and characterized by a specific level of exposure emissions, categorized in quartiles of PM_{10}. Modeling approaches were adopted for exposure assessment, namely ADMS-Urban dispersion model for each type of environmental determinant, to account for both spatial (residential street number) and temporal (monthly simulations) variability of exposure. Both studies showed statistical associations only with preterm births. Analyses were repeated considering poorest indicators of exposure, to verify the influence of exposure assessment approach to final results.
Results: Considering the best method of exposure (spatio-temporal variability of air-pollution) both studies showed significant association between preterm births (PTB) and exposure to incinerators and port activities, respectively. The exclusion or an inadequate assessment of the temporal variability of the exposure, led to a reduction of the associations and loss of statistical significance in RRs (from 1.30:CI95% 1.08-1.57 to 1.02:CI95%0.88;1.25 and from 1.52:CI95%1.01-2.29 to 1.01:CI95%0.66-1.55) respectively, considering the highest versus the lowest level of exposure.
Conclusions: Air pollution from industrial sources is associated with PTB. Our experience confirms the need of exposure models capable to capture both the spatial and temporal variability of air pollution exposures, in order to be able to detect associations with birth outcomes.

90.test
91. empty Abstract : lead and mercury exposure are associated with low resting heart rate
Autor : Jianghong Liu, PhD, FAAN

93.

Health and safety predictors of parental attitudes towards children's school travel

Jacques Bergeron

Abstract

Concern with low levels of physical activity and declining active school transportation (i.e., walking/biking to and from school) underlies research into the potential barriers that could explain why more children are being driven to school today than in the past (Mammen et al., 2012). The present study consists in analyzing the perceptions and motivations of parents in relation to their concerns about the health and safety of their children, before and after the implementation of a program developed in order to raise the interest of the community for active transportation. After as little as one year of exposure to the program, a shift may occur in parents' responses. In a sample of over 4500 respondents, the physical well-being of their children is seen by parents as the most important beneficial effects of walking or cycling between home and school. The development of the children autonomy is also seen as very important into the decision of parents to drive their children to school by car, or encourage them to get there walking or cycling. Regression analyses show that the distance between home and school is the main variable that predicts that children do not use active transportation. More interestingly, when distance is controlled, safety concerns appear also as an important predictor. So, participation in a program that promotes active transportation is associated with lower parents' worries about the safety of their children walking or cycling on the way to school. Moreover, when children take active forms of transportation to school, parents are able to reduce the number and length of car trips keeping neighbourhoods quiet and reducing pollution in areas near schools.

94.

Environmental screening on girls with early puberty disorders.

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3. Endocrinología Pediátrica, Hospital Clínico Universitario Virgen de la Arrixaca, Murcia, Spain.

Background: A decrease of the age of menarche and thelarche has been observed during the last decades. The cause of most of the cases of precocious puberty in girls remains unknown. Some environmental factors such as obesity and adoption have been related to early puberty.

Objective: To explore environmental factors within a sample of girls with early puberty disorders.

Methods: Cross-section study. Sample of 30 girls randomly selected who consulted to a tertiary hospital from an agricultural area of southeastern Spain with a diagnosis of precocious puberty, isolated premature thelarche, early puberty, early menarche, early adrenarche or early pubarche. Environmental factors previously described in literature studies were explored through an interview performed by a single interviewer. Auxiological parameters were measured at the moment of the interview. The body mass index (BMI) and z-scores for each parameter were calculated.

Results: Adopted girls were the 6.9% of the sample. The age of thelarche was positively and significantly correlated with the family income (r 0.738, CI95% 0.342-1.345; p0.001) being the poorest girls the ones that began puberty earlier. 12% of the sample were overweight and 11.1% obese. The BMI at the age of diagnosis was correlated but not significantly with the age of thelarche (r 0.702, CI95% -0.019 -1.423; p0.056). At least 80% of the girls were exposed to pesticides in different degrees. Another 80% of the sample were exposed to lice treatments, specially tea tree oil.

Discussion: Adoption and obesity were present in the sample. The correlation between income status and menarche has been previously reported, but this is the first time to correlate poverty with earlier thelarche. Pesticide exposure is extremely common in our sample, probably due to the fact that agriculture is one of the most important activities in the area of study. Tea tree oil exposure has been related with gynecomastia in boys. The effect on puberty among girls remains unknown.

Conclusions: An environmental approach of patients with early puberty disorders may help to create hypothesis about the etiology and draw lines on specific treatment that takes the cause on mind.

95.

Modifiable factors related to low water intake in Mexican children and adolescents.

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Introduction: Proper hydration is important for maintaining homeostasis in all physiological processes and to avoid some diseases. Some reports have suggested that 87.5% of males and 65.4% of females have water intake below the recommendations. In children there is a lack of information about hydration habits.

Objective: This study was aimed to assess modifiable factors related to low water intake in a Mexican sample of adolescents and children.

Methods: A cross sectional study was performed. Cardiovascular risk factors were determined (overweight, obesity, abdominal obesity). Physical activity (frequency and type) and dietetic habits such times of eating per day were assessed. Statistics were performed using SPSS Version 22.0.

Results: 247 children and adolescents were included; the average age was 12.5±1.9 years old, 549.1% of the sample was boys. A global prevalence of overweight ad obesity was 49.2%. The daily intake of water, including foods, was 1317.5 ± 648.8 ml with no differences between boys and girls or according to the presence of cardiovascular risk factors. Only 12.1% reach the recommendations of water intake according to Mexican recommendations. Also, water intake was not different between those who practice any physical activity more than 3 days per week compared with those physically actives (1163.3±571.3 vs 1339.6±697.9, respectively; p=0.181) and considering the type of activity (aerobic or anaerobic; p>0.05). According to times of eating, those who eat less than 3 times per day reported lower water intake (778.6±477.2 vs 1342.0±688.0; p=0.033) being more important lunch and the afternoon snack, and seems to be in risk of not accomplishing the recommendations (OR=1.148 (1.093-1.206).

Conclusion: There is a high prevalence of cardiovascular risk factors among Mexican adolescents. Also, low water consumption was reported in this population and it seemed not to be related to anthropometric indicators suggesting that environmental factors such number of times of eating could be more important than nutritional status or the practice of physical activity.

Key words: hydration, water intake, Mexican adolescents, environmental factors.

96.

Alcohol and tobacco products access to minors in Georgia

George Bakhturidze

Introduction

Tobacco and alcohol products are most affordable products in Georgia. Tobacco control law since 2003 prohibits cigarette selling to minors and by sticks, also around 50 meters from schools. The same regulation is with regard purchase of alcohol product. But most shops, mainly kiosks and small markets are located near to schools, also minors can buy cigarette or alcohol without problem. Smoking prevalence among minors is around 17-18%

Methods

Two vide-recorded focus-group discussions were organized between 7-8 and 9-12 years old children during April 2016. 8-8 children participate in the discussion. The parents signed informed consent forms. Study group used pictures and products of stores/shops where all people can buy appropriate products including cigarette and alcohol. Also were shown pictures of billboards, light-boxes with tobacco and alcohol ads.

Results

All children underlined that they have seen tobacco and alcohol products in all shops, including near to schools. Also they mentioned special shelves for tobacco products and sign that it is prohibited to sell tobacco and alcohol to minors, but most children and adolescents can buy such products without requiring ID. They underlined possibility to buy cigarette by sticks. Sometimes they fixed promo girls proposing to buy cigarettes to young people and instead they will get accessories for free. The place where seller can get change has tobacco ads. The design of cigarettes is specially made for girls, because it contains flowers and colors interesting for only women. Children mentioned that in popular TV series they see smoking habit mostly from the said of young ladies. Some participants' smokes and all of them tried alcohol.

Conclusions

Tobacco and alcohol products ads and promotion has great influence to initiate smoking and/or alcohol use. There are facts of violation of selling restriction law with regard to such products.

97.

Risk assessment for children exposed to trace elements in an urban, multi-patway exposure scenario (Madrid, Spain)

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Children are the most susceptible segment of the society to develop adverse health effects from exposure to trace elements. This greater sensitivity is due to a combination of unique factors: higher intake rates than adults on a weight basis ratio, greater vulnerability during the early stage of growth as their nervous system is under process, and their behavioural habits (playing close to the ground and frequent hand-to-mouth activities).

The aim of this study was to assess the health risk for children (from 6 months to 2 years) in urban environments. For this purpose, samples of commercial baby food (jars from four categories i.e. chicken, fish, fruit and vegetables, and powdered milk and cereal pap), soil from playground areas and household indoor dust were collected. Lyophilized infant food and dust samples collected in wet wipes were digested with HNO_3 + H_2O_2, whereas metals in playground soil were aqua regia extracted. Samples were analysed for Cr, Cu, Mn, Ni, Pb and Zn by flame or graphite-furnace AAS. Exposure pathways considered in the risk assessment included food, soil and dust ingestion, inhalation of suspended soil particles, and dermal absorption in playgrounds and at home.

Results from the risk assessment showed that the largest contribution to the overall risk was associated with the ingestion route for all three exposure media (i.e. commercial food, soil and dust). Food intake, in particular, resulted in levels of risk above the threshold of acceptability. In terms of non-carcinogenic risk, Cr was the largest contributor in playground soil, Cu in indoor dust and Zn in infant food. Several sources of uncertainty still need to be satisfactorily addressed, chief among them: inclusion of relevant toxic elements absent in our analytical suite, a more solid characterization of exposure factors, and a comparison of results for pseudo-total and bioaccessible concentrations.

98.

Where physical environment is the major culprit:
Mapping child health determinants against health-related policies and programs in an East African pastoralist community

Lioul Berhanu Alemie[1]

Afar Regional State is one of the 9 regional states in Ethiopia globally known for being the discovery site of modern humans' closest ancestors -'Lucy'/*Australopithecus afarensis and* 'Ardi' /*Ardipithecus ramidu*. The region is characterized by an increasingly drought prone arid and semi-arid climate and an annual temperature that reaches 48˚C/118 ˚F.
Afar is inhabited by nearly 1.7 million people of who 90% live on pastoralism. Children under-five years of age constitute around 10% of the total population and are affected by higher levels of mortality and malnutrition. Under-five mortality rate stood at 127/1000 live births (2011), stunting at 49.2% (2014) and wasting at 24% (2014) – all, nationally, ranked among the highest rates. This article explored studies from 2000-2015 to identify key determinants for child health in the region and reviewed health policy/strategy/programmatic documents to match congruence between the identified determinants and prioritized interventions.
Findings demonstrated that degraded physical environment, further complicated by socio-cultural factors, is the most important determinant that affects child health outcomes in the region. Recurrent droughts that result in high levels of food insecurity, water scarcity and malnutrition; poor access to health services and markets; low human resource capacity and motivation; continuous mobility of the people in search of pasture and water- all directly linked to the physical environment- are among the major contributors to dismal child health outcomes. On the other hand, review of strategic directions and ongoing health-related programs revealed that much focus is given to relieving end results than addressing the environment itself or its immediate consequences. The need to critically assess and maximize the integrated influence of health and development strategies/programs on the physical environment and its immediate- not final outcomes- is thus recommended as a vital step towards sustainable progress in child health and beyond.

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99.

Where physical environment is the major culprit:
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Lioul Berhanu Alemie[2]

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100.

Minamata Convention on Mercury and Children's Environmental Health: Study on Mercury Added Consumer Products Use in Pakistan

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Children are at an unacceptably high risk of developing neurodevelopmental disorders that affect the brain and nervous system including autism, attention deficit hyperactivity disorder, intellectual disabilities, and other learning and behavioral disabilities. Thousands of chemicals are used in material production processes (nearly 100 000 in the EU) that have not been adequately assessed for human and environmental impacts and yet are used daily in consumer products. There is ample scientific evidence to support a link between children's risks for neurodevelopmental disorders and toxic chemicals, such as Mercury, in consumer products, food, air and water.

Mercury ranked as 3rd in the hazardous list of toxic substances, is a pollutant of increasing concern, as it not only toxic to human but also to wildlife and environment. In view of Mercury and mercury added products toxicity and hazardousness, in 2013, under the United Nations Environment program (UNEP), Minamata Convention on Mercury was in-acted by over 140 countries, already signed by 128 countries (including Spain & Pakistan) and ratified by 28 countries (including USA). The main objective of this convention is to protect human health and the environment from emissions and releases of mercury and mercury compounds. Articles 4 & 16 of the convention deals, respectively, with mercury added products (including dental amalgam & skin whitening creams) and health aspects (to protect population at risk, particularly vulnerable populations – children, pregnant women & others).

Over the past few years, sustainable development policy institute (SDPI) has been actively involved in the negotiations process leading to Minamata convention on mercury, as well as research on health and environmental effects of the use of mercury added products, such as mercury dental amalgam and skin whitening creams (SWCs) in Pakistan. Measurements at 34 dental sites have indicated mercury vapors levels in outdoor/indoor air in the range 109 – 26,000 ng/m^3 of air (against reference standard = 300 ng/m^3). Survey work/interviews at 38 dentistry teaching institutions in the country and over 90 private dental clinics in 3 main cities, showed 90% of the respondents supporting review & revision of the current curriculum and inclusion of additional contents on dental mercury amalgam related health, & waste issues and mercury free dentistry, using mercury free material for dental restoration. 70% & 67% of the interviewed dental professionals supported mercury free material use for dental restoration as the first choice for pregnant women and children (under 12 years age) and ban on mercury dental amalgam use, respectively. Chemical analyses of 20 samples (others in progress) of different SWCs brands, revealed alarmingly high total mercury content in some of the analyzed samples. On the basis of total mercury contents, the studied SWCs have been categorized into 4 groups: most, (Hg > 10,000 ppm), highly (Hg > 5000), moderately (Hg < 5000) and least (Hg < 1 ppm) hazardous SWCs.

Details of the above studies carried out at SDPI, methodology employed, data obtained, results/finding and recommendations proposed would be described and discussed.

Key words: Amalgam, Dentistry, Health, Mercury, Skin Whitening Creams

101.

Determining the impact of smoking point of sale legislation among youth (Display) study: new findings from Scotland

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Abstract
Point of sale (POS) displays are one of the most important forms of tobacco marketing still permitted in many countries. POS displays have been shown to increase susceptibility to smoking, experimentation and initiation into smoking, particularly amongst adolescents. These displays may also influence perceived prevalence of smoking and the perception that tobacco products are easily obtained and are a 'normal' product. This study examines the impact of the implementation of both a partial and comprehensive ban on point of sale (POS) tobacco advertising on attitudes to smoking, brand awareness, perceived ease of access to tobacco products and youth smoking prevalence. The study has a multi-modal before and after design and uses mixed methods to collect data, at baseline and then with longitudinal follow-up for 4 years, in four purposively selected communities. In each of the four communities (school catchment areas), at baseline and in follow-up years, data collection includes: mapping and spatial analyses of tobacco retail outlets; tobacco advertising and marketing audits of tobacco retail outlets most used by young people; cross-sectional school surveys of secondary school pupils; and focus group interviews with purposive samples of secondary school pupils. The tobacco audit is supplemented by interviews and observations conducted with a panel of tobacco retailers recruited from four matched communities. The results to be presented from the initial phases of data collection consider: the changing levels of POS exposure over the study period; the degree of compliance with the new legislation post implementation; connections between PoS displays and young people's brand awareness; the emergence of e-cigarette marketing; and the connections between e-cigarette/cigarette marketing and e-cigarette use amongst young people. The results will be of considerable interest to policy makers both from the UK and other jurisdictions where they are considering the development and implementation of similar legislation.

102.

The role of local natural space in children's social, emotional and behavioural development in Scotland: a longitudinal study

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Abstract
Background: Poor mental health in childhood has implications for health, wellbeing, and productivity in later life, as well as presenting a considerable burden for families and wider society.
Objectives: Independent play is a crucial part of 4 to 6 year olds' social, emotional and behavioural development. We investigate whether total natural space, public parks and access to a private gardens enhance children's social, emotional and behavioural development.
Methods: We analysed longitudinal data for 2,909 urban-dwelling children (aged 4 at 2008/9 baseline) from the Growing Up in Scotland (GUS) survey. Social, emotional and behavioural difficulties were scored using the Strengths and Difficulties Questionnaire (SDQ) (divided into four domains), and area (%) of total natural space and parks within 500 m of the child's home was quantified using Scotland's Greenspace Map. Access to a private garden was captured at the household level. We ran repeated-measures multilevel models, then stratified by sex or household educational attainment.
Results: Prosocial Behaviour scores were higher (i.e., better) throughout for children with more total natural space but neighbourhood natural space was unrelated to change over time of any SDQ domain. Boys and girls in neighbourhoods with more total and park space, respectively, had fewer problems. Better social outcomes were found for all groups with more neighbourhood natural space. Having access to a garden was related to the largest benefits for all except those from high education households. Having access to a garden was related to mental health benefits on a par with the advantage apparent for girls over boys, children from degree-educated households over those from households without educational qualifications, or a £20,000 to £50,000 increase in equivalised household income.
Conclusions: Neighbourhood natural space may reduce social, emotional and behavioural difficulties for 4 to 6 year olds, but private garden access may be most beneficial.

103.

Persistent pollutants in food items from Menorca Island

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Organochlorine compounds (OCs) and mercury (Hg) are persistent pollutants of concern for their potential health effects. The former are synthetic products used in industrial and agricultural applications whereas the environmental occurrence of the latter has been largely enhanced by human activities. Despite their different structure, these compounds share common properties such as high toxicity (several of them), persistence in the environment and are widely distributed in the planet. Furthermore, they bioconcentrate and biomagnify along the food chain. Dietary intake is therefore a major way of incorporation of these compounds in most human populations. However, it is important to ascertain what specific food items are the most relevant. This is particularly important for children since their organs and metabolism are still under formation.
Body burden of DDTs and Hg in children from Menorca Island (western Mediterranean Sea) were considerably high when compared with cohorts from continental Europe (INMA and CROME Projects). The present study is therefore aimed to determine the content of OCs and Hg in representative food items from this Island. Foodstuffs that include seafood, meat, vegetables, fruits and dairy products were collected in 2014. Fish were captured by local fishermen and all other food stuffs were produced in the Island.
OCs analysis for the determination of pentachlorobenzene, hexachlorobenzene, hexachlorocyclohexanes, DDT and metabolites (DDD and DDE) and polychlorobiphenyls were performed by GC-ECD and GC-MS. Determination of Hg was performed by ICP-MS.
Seafood was observed to be the foodstuff with highest OC and Hg levels. The most abundant OCs were 4,4'-DDE and PCB153 with arithmetic means of 1.01 ng/g f.w and 0.69 ng/g f.w, respectively. Fruits and vegetables presented the lower concentrations. Concerning Hg most fish samples exceeded the maximum level fixed by the European Commission (0.5 and 1.0 mg/kg f.w). Small-spotted catshark presented the highest concentration with 3.8 mg/kg f.w.

104.

Polycyclic aromatic hydrocarbons from traffic exhausts in primary schools and cognitive development of children.

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Traffic air pollution is associated with slower cognitive function growth in schoolchildren (Sunyer et al. 2015; Basagaña et al. 2016). Polycyclic aromatic hydrocarbons (PAHs) impair brain development in animal studies (Saunders et al. 2006). Here, we assess the association between PAHs in urban schools (n=39) and the cognitive development (Lopez et al. 2016) in children (n=2,897) in 2nd to 4th grade (7-10 years)

Schools were sampled on $PM_{2.5}$ indoor (classroom) and outdoor (playground) twice in 2012 during one-week periods. ¼ of each $PM_{2.5}$ filter was used for PAH analysis by GC-MS (Alier et al. 2013). Furthermore, OC, EC, NO_2 and $PM_{2.5}$ from traffic origin were measured as described elsewhere (Rivas et al. 2014; Amato et al. 2014).

Indoor PAH levels were similar to outdoor levels (ratio 0.9), except for the more volatile particulate bounded PAHs, such as benz[a]anthracene and chrysene with higher indoor levels (ratio 1.5).

Higher PAH concentrations were observed in the schools from the urban centre. BaP, the only compound with an established annual limit concentration (1000 pg/m^3), ranged from 22 to 343 pg/m^3 indoors and from 17 to 301 pg/m^3 outdoors.

Correlations between outdoor PAHs and EC were high ($0.66<r<0.79$) while indoor correlations had a wider range ($0.54<r<0.84$) and were lower for benz[a]anthracene ($r=0.62$) and chrysene ($r=0.54$). A similar pattern was seen for NO_2 and traffic $PM_{2.5}$.

Outdoor PAHs were generated by traffic inputs, while indoor PAHs reflected older mixtures. The more volatile PAHs were under the influence of gas-particle partitioning in combination with high indoor OC.

Children attending schools with higher PAH levels had worse working memory and inattentiveness growth, which was statistically significant for the more volatile PAHs and benzo[ghi]perylene. The exact mechanism by which PAHs affect the developing brain remains unclear, however, it is likely to be mediated by inducing inflammation, oxidative stress, and vascular injury (Block & Calderon-Garciduenas 2009).

Acknowledgements. The research leading to these results has received funding from Fundació Obra Social "La Caixa" and the European Research Council under the ERC Grant Agreement number 268479 – the BREATHE project.

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105.

Mercury concentrations in commercial seafood from the western Mediterranean Sea

Rosa Maria Llull Cantallops

Mercury is a strong neurotoxic agent that can cause severe neurological damage to children because of their immature metabolism and organs (Grandjean et al., 1997). Mercury emissions to the atmosphere due to mining and fossil fuel burning (Hg^0) are deposited into seawaters after oxidation to Hg^{2+}. There, Hg may undergo bioaccumulation and scavenging by organic-rich particles, be eventually transported from surface to deep waters and reduced back to Hg^0 and to CH_3Hg (Lamborg et al., 2014).

Fish and shellfish consumption is the known predominant input of this metal into human populations of Mediterranean regions (Freire et al., 2010; Gari et al., 2013). Attention has been focussed on oily fish as the main group of species responsible for the incorporation of Hg into the human diet. Conversely, few studies on the potential role of lean fish regularly consumed by humans have been reported so far in the scientific literature. The present study is therefore aimed to determine what are the Hg levels in commercial seafood from the Mediterranean Sea.

Samples were caught between February 2014 and December 2015 near the Balearic Islands. Eighty-two percent of them showed detectable Hg levels. The levels found were in general higher than those reported in seafood from the Atlantic Ocean. A substantial number of samples exceeded the maximum level set forth by the European Union Maximum Limits (ML) of 0.5 and 1.0 mg/kg wet weight. Twenty-nine percent of the thirty-nine fish and shellfish species studied had average concentrations above these limits

The present study shows that not only oily fish but also lean and shell fish species from the Mediterranean Sea have mercury concentrations above the recommended European Union Maximum limits. A reassessment of the impact of fish consumption from this origin into children and general population is needed. This assessment should estimate how much mercury intake can be attributed to this source and what are the health effects.

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106.

Ambient air pollution and the onset of asthma, hay fever, and allergic sensitization in birth cohorts. A systematic review and meta-analysis

Joachim Heinrich

Background: The causal role of ambient air pollution on the onset of asthma and allergic conditions continues to be debated. We provide a systematic review and meta-analysis of birth cohort studies with follow-ups from birth to adolescence.

Methods: In a previous systematic review by Bowatte et al. (2015), 19 birth cohort studies published from 1960 to March 2014 were identified. Using the same methodology, we extended this search up to January 2016, which allowed several key new studies to be considered. Random effects meta-analysis was used to obtain combined estimates.

Results: In total, 338 references published between April 2014 and January 2016 were identified. Of these, 88 were duplicates and 216 studies did meet the inclusion criteria. Manual searches identified 4 additional papers. These new studies were added to those previously identified by Bowatte et al. (2015). Ultimately, 27 eligible papers were included in the systematic review, 15 of which could be used in meta-analyses.

Combined associations between asthma with $PM_{2.5}$ (1.24 (95% CI 0.96, 1.59) per 2μg/m^3 increment) and NO_2 (1.08 (95% CI 0.96, 1.20) per 10 μg/m^3 increment) were not significant. For wheeze, the combined association was borderline significant for $PM_{2.5}$ (1.13 (95% CI 1.00, 1.28) per 2μg/m^3 increment) but not for NO_2 (1.08 (95% CI 0.98, 1.18) per 10 μg/m^3 increment). None of the combined associations with allergen sensitization or hayfever reached statistical significance. There were too few birth cohort studies on eczema to conduct a meta-analysis.

Conclusion: Despite the existence of a wealth of high quality, large, longitudinal birth cohort studies, the epidemiological evidence supporting an association between TRAP with asthma and other allergic health outcomes remains insufficient to confirm a causal association.

107/108/109.

Reality of children's new environment and future policy needs

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We are living in an unstable period. Globalization, demographic explosion, climate change, migration, wars etc. affect our children. As professionals, we are confronted with increasing challenges in the different fields of environment and health. Attempting to find the best way to solve numerous problems, new disciplines have been established (urban health is one).

Can we really foresee what will the environment be for our children in 2050? How to make efficient policy to reduce risks and prevent harmful scenarios in the future? Some of us will still be alive and children that are five year old today, will have their own young children in 2050. Besides knowledge, do we have courage, enough imagination and effective holistic approach, to produce successful policy to preserve the environment for our children?

The big challenge of a fast changing environment due to climate changes is probably the most important. Children are growing in different environments, full of risks consequences to climate changes, different disasters (floods, hurricanes, tsunamis), as well as human migration, homelessness, discontinuation of schooling, unsecure health protection etc.

We need a new approach to prepare students, children, professors and families to climate changes, provide them with knowledge to raise their awareness. We should increase capacity to overcome all these rapid changes in the environment now, and prepare children for the future.

Future policy should be comprehensive, foster adaptation and mitigation activities and aim to include children all along their education, from nursery school to university. Policy should be established by multi-sector stakeholders, collaboration between education and health, with the primary aim to decrease health consequences on children, protect children's health and the whole population, now and in the future.

110.

AIDS orphans in Sub-Saharan Africa: A systematic review on differences between rural and urban environments

Tara Rava Zolnikov

Currently, there are more than 11 million AIDS-affected orphans that suffer from various adverse effects, most of whom reside in sub-Saharan Africa. The difference between whether a child resides in a rural or urban environment can have a significant role in a child's education, health status and access to healthcare, and social or family relationships. A systematic review was conducted in order to understand these environment-based differences on orphans directly affected by HIV/AIDS in sub-Saharan Africa. There were 233 sources used for this review; however, 164 manuscripts focused more so on a general review of orphans within a rural or urban environment. Thus, after eliminating for various factors, 69 manuscripts were used, which focused primarily on the social aspect of orphans due to HIV/AIDS. Rural environments provided more family support, while urban environments generally had more resources available to orphans (e.g. school fees). Unfortunately, both rural and urban environments were found to be fairly non-supportive of orphans and their development. This systematic review found, in general, that orphans in both urban and rural environments continue to suffer from the iatrogenic effects of low parental support due to AIDS mortality. These conclusions continue to support an increase in developmental support through school and social relationships specific to orphans throughout sub-Saharan Africa.

111.

Improved Relationships in Eastern Kenya From Water Interventions and Access to Water

Tara Rava Zolnikov and Elizabeth Blodgett Salafia
North Dakota State University

Objectives: Global health interventions focus on providing solutions to unaddressed public health issues in low- and middle-income countries. Providing nearby access to safe drinking water is a primary public health concern and a frequent public health intervention throughout sub-Saharan Africa; access to water eliminates long gathering and transport time and provides an individual with more personal time. Previous research has not reviewed the aspect of time and relationship changes after implemented water interventions. ***Method:*** A qualitative phenomenological approach used 52 semistructured interviews to examine relationship experiences among primary water gatherers and their families after receiving nearby access to water. This study took place throughout the historically semiarid eastern region in Kitui, Kenya, where community members have been beneficiaries of various water interventions.

Results:

Before the water intervention, family members experienced difficulties with irregular meal times and food availability, infrequent family conversations, irritation with lack of bathing and cleanliness, and general discontent without the availability of 1 able-bodied family member. Participants' experiences after implemented water interventions revealed enhanced relationships within household family units; additional personal time was gained and used to rebuild relationships. The newly established relationships included constructive discussions and conversations built around understanding and developing solutions to address economic or individual challenges encountered by the family.

Conclusions: This study's findings suggest that relationships significantly improved after households receive access to nearby water. Furthermore, this research provides evidence of an increased need for access to quality water for communities throughout the world to positively contribute to constructive family relationships.

112.

A review on managing and treating mercury emissions in small artisanal gold mining

TR Zolnikov and G Hilson

Small artisanal gold mining (SAGM) continues to be pervasive public health issue worldwide, affecting miners as well as both children and women. While there are various problems associated with SAGM, mercury exposure is the primary hazard contributing to adverse health effects in exposed human populations. A literature review was conducted in order to specifically assess the impact of current mercury interventions within the entire SAGM industry. To aid in this review, a resource pool of information on SAGM and mercury emissions, treatment and management of emissions, and interventions was assembled through a search conducted via multiple search engines. Mercury usage continues to be largely embedded in the handling, processing, and extraction techniques of SAGM; however, current interventions have been implemented worldwide to focus specifically on reducing or eliminating mercury emissions through education, processing centers, or mercury alternative techniques. Education focused on environment or health awareness or more specifically on alternative techniques. Processing centers offered areas of large-scale technology centers for small-scale miners. Alternative techniques included retorts, vat-leaching, magnets, direct smelting of gold, and borax. Results determined positive and negative outcomes associated with every intervention, thereby confirming the fact that a single solution managing and treating mercury currently does not exist. Ultimately, the need for novel techniques addressing mercury emissions in SAGM needs to be pushed to the forefront of critical issues in public health in order to aid in developing positive change in the industry.

113.

Influence of gestational weight gain on the transfer of organochlorine pollutants into infants

Joan O. Grimalt[1], Esther Vizcaino[1], Marta Fort[1], Berit Glomstad[1], Ana Fernandez-Somoano[2], Loreto Santa Marina[3], Jesús Ibarluzea[3], Adonina Tardón[2] and Jordi Sunyer[4]

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Transplacental transfer and breastfeeding are the main transport routes of organic pollutants into children at the beginning of life. These transmission mechanisms primarily depend on the maternal pollution burden but its impact may be modulated by physiological effects. We found that gestational weight gain (GWG) exerts a considerable influence on the content of hydrophilic and low volatile pollutants in cord blood and breast milk.

We measured levels of 14 organochlorine pesticides, 7 polychlorobiphenyls (PCBs) and 14 polybromodiphenyl ethers (PBDEs). POP neonatal concentrations were inversely associated with GWG after adjustment for age, pre-pregnancy BMI, educational level, and fish consumption. On average, neonates of women with high or recommended GWG as defined by the Institute of Medicine (IOM) had lower POP concentrations than neonates of mothers with low GWG.

Colostrum from mothers with low GWG also had significantly higher concentrations of PCBs and 4,4'-DDE than colostrum from mothers who gained weight within IOM recommendations or in those who exceeded this threshold. Statistically significant differences were also found in the colostrum:maternal serum ratios of these compounds. Women with low GWG retained higher pollutant amounts in colostrum.

The higher mobilization of stored organic pollutants observed in pregnant women with low GWG play a role for in utero pollutant exposure and during breastfeeding. The present findings suggest an association between infant exposure to POPs and inadequate GWG, encouraging pregnant women to meet the recommended IOM guidelines to reduce the accumulation of these pollutats in newborns and during breastfeeding

Message

From: Inches [info@inchesnetwork.net]
Sent: 9/5/2016 8:53:52 PM
To: retzel@earthlink.net; Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; 'יונה אמיתי'

Ex. 6

Subject: FW: INCHES conference chairs poster pitch session
Attachments: layout porgramme INCHES Conference programme 5 september.doc; JHP_ConferenceAbstracts16.pdf

Dear chairs,

We welcome you to participate at the INCHES conference. We already asked most of you to (co) chair one or more of the sessions. If not we are asking you to do it by this email.

Please, find in the attached file the abstracts of the session. You may find those of your session in it. You may also find the programme in which you may find the session we have allocated to you, including the presentations titles and presenters. We have allocated **poster pitch session C** to you.

All the oral presentations should at least be allocated 15 minutes including questions. In the sessions in which there are less presentations you could allocate more time in proportion to the total number of presentations.

The poster pitch presentations should encompass 3 to 4 slides in 3- 4 minutes. A short question can be asked as well. The total time for each poster pitch presentation will be maximum 5 minutes. Some people might be uncomfortable to present anything, they could skip their presentation.

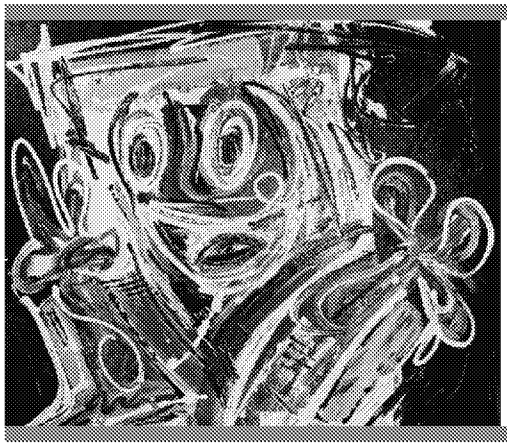
At the entrance of each poster pitch presentation we will hand out a copy of all the posters we have received in A4 format to enable the audience to better understand the poster presentation.

We ask you to keep track of the time of presentations.

If you have any questions about this procedure do not hesitate to contact us this week.

warm regards,

the Organising Committee



8th International Conference on Children's Health and the Environment

Abstracts

Conference proceedings

All sessions presented at the 8th International Conference on Children's Health and Environment

14–16 September 2016

Parc de Recerca Biomèdica de Barcelona – PRBB
Doctor Aiguader, 88 (at ISGlobal), Barcelona

Presented by

INCHES

(International Network on Children's Health and Safety)

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The 8th INCHES (International Network on Children's Health, Environment and Safety) Conference

Barcelona • 14–16 September, 2016

Overview

Children, like all humans, are under the influence of multiple environmental stressors. However, children are not little adults. Their organs and metabolism are under formation and their capacity to face pollutant stress is different. Exposure to deleterious compounds starts in the preconceptional and fetal stage. In the first years of life, children are affected by exposure to toxic chemical products present in air, water, soil, domestic dust, toys, clothes, furniture and diet. The nature of pollution is changing. In rapidly developing countries, urbanization, climate change, increasing motor vehicle use and the wide spread of toxic chemicals use, pesticides and polluting industries, levels of ambient and indoor biomass air pollution and soil pollution are sharply increasing the exposure for the most vulnerable. Moreover, some polluting agents are incorporated together with nutrients in the same ingestion processes, e.g. during breastfeeding. Some food items such as fish, the main source of omega 3 fatty acids, also carry pollutants such as organochlorine compounds and methylmercury.

The health effects of these toxic compounds may not be noticed directly or shortly after exposure. Damage in growing organisms may result in delayed disorders later in life, e.g. during adolescence, the reproductive period or maturity. The effects of pollutants on children's health also depend on individual susceptibility. A full understanding of health impacts requires studies integrating gene-environment interactions. The details will provide more and more proof that we need to protect children.

Summary of overall organization-wide achieved results

The International Network on Children's Health, Environment and Safety (INCHES) (http://www.inchesnetwork.net) was founded at a workshop meeting before the 1st International Conference on Children's Environmental Health, August 1998 in Amsterdam, the Netherlands, where the WHO, European Environmental Agency (EEA), US Environmental Protection Agency (EPA) and other organisations had an active participation, stressing the growing importance of CEH as a global health issue. The WHO and INCHES have been active partners the last 16 years.

The Organisation: International Network on Children's Health, Environment and Safety (INCHES)

The International Network on Children's Health, Environment and Safety (INCHES) is a global network with the following goals:

1) increase understanding of and accord on how environmental factors influence child health;
2) create a global dissemination of research and information on children's environmental

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health;

3) educate and facilitate information exchange on the best practices and policies in children's environmental health;
4) identify information gaps and stimulate to new research; and
5) advocate for children's environmental health in the intergovernmental arena.

Some highlights of INCHES activities since its formation in 1998 include:

- There are now about 150 organizational members, some of which are well structured, established and active as national NGOs interested in an intensified international cooperation.
- More than 30,000 individual members (most of them health professionals) within these member organizations.
- Strong contacts in several countries where national children's environmental health networks have been founded or are under creation.
- Excellent international contact in the field of children, environment and health in the intergovernmental, governmental and NGO circles.
- Some official contacts in the field (relations with WHO, EEA, membership in European Health and Environment Alliance network, International Society of Doctors for the Environment).
- Several members in the medical scientific community covering most aspects of environmental health able and ready to give foundation to the content of INCHES' work.
- Training programs in cooperation with several universities in some countries have been conducted as a project.
- INCHES initiated several projects funded by the European Union.
- INCHES organized or co-organized several conferences on children's environmental health over the last two decades.
- INCHES collaborates with similar networks in North America: the Children's Environmental Health Network, International Society for Children's Health and the Environment and the Canadian Institute of Child Health.

Many topics were addressed in the 8th International Conference on Children's Environment and Health, which was organized by INCHES on 14-16th September 2016 in Barcelona. The Conference is organized by the International Network on Children's Health, Environment and Safety (INCHES) and the Institute of Environmental Assessment and Water Research (IDAEA) and Spanish Council for Scientific Research (CSIC). The meeting provided an international forum for the latest research findings in children's environmental health. Specific attention was also devoted to identifying opportunities to minimize childhood prenatal and postnatal exposure to environmental contaminants, to provide insight in the field of science and policy interface and to develop a greater awareness among health professionals about children's health. The

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abstracts that are published in the present issue summarize the main research efforts reported at this meeting.

The objectives of the conference:

- Provide an international forum for the latest research findings in children's environmental health;
- Define the relationship between environmental contaminants and children's health;
- Strengthen the importance of prenatal exposure to environmental factors on pregnancy outcome and children's health;
- Identify opportunities to minimize childhood prenatal and postnatal exposure to environmental contaminants;
- Provide insight in the activities in the field of science and policy interface;
- Build a platform of knowledge at an international level;
- Develop a greater awareness among health professionals about children's health, environment and safety;
- Initiate future directions and international collaborations in research in the field of children's environmental health.

The Scientific Program

The scientific program of the 8th INCHES Conference includes about 140 lectures, short oral presentations and posters presented by scientists from 34 countries covering a broad spectrum of topics. Abstracts of these presentations appear in this issue of the journal. The topics are related to: Health effects of pollutants in children (pesticides, heavy metals, air pollution, tobacco) prenatal exposures, reproductive health, cancer, obesity, biomonitoring, Children Environmental Health Centres and Specialty Units, children's environmental rights, climate change, sustainable development, e-waste, radiology, safety and injury prevention, training for pediatricians and health policy regarding Children's Environmental Health.

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The following is a partially edited list of all abstracts approved for inclusion in the 8th INCHES conference, 2016. Abstracts are presented in alphabetical order by corresponding author's last name.

This list of abstracts will be finalized after the conference and formally published in an upcoming edition of the Journal of Health and Pollution as conference proceedings.

The Journal of Health and Pollution (JH&P) is a semi-annual, on-line journal of peer reviewed research and news published by Pure Earth. JH&P is grant funded—there are no charges to readers or authors. JH&P focuses on environmental contaminants and related impacts to human health, specifically in low- and middle-income countries. Further information can be found at www.journalhealthpollution.org

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Where Physical Environment is the Major Culprit: Mapping Child Health Determinants Against Health-Related Policies and Programs in an East African Pastoralist Community

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Background

Afar Regional State is one of the 9 regional states in Ethiopia globally known for being the discovery site of modern humans' closest ancestors -'Lucy'/*Australopithecus afarensis* and 'Ardi' /*Ardipithecus ramidu*. The region is characterized by an increasingly drought prone arid and semi-arid climate and an annual temperature that reaches 48°C/118°F.

Afar is inhabited by nearly 1.7 million people of whom 90% live on pastoralism. Children under-five years of age constitute around 10% of the total population and are affected by higher levels of mortality and malnutrition. Under-five mortality rate stood at 127/1000 live births (2011), stunting at 49.2% (2014) and wasting at 24% (2014) – among the highest rates nationally.

Methods

This article explored studies from 2000-2015 to identify key determinants for child health in the region and reviewed health policy/strategy/programmatic documents to match congruence between the identified determinants and prioritized interventions.

Results

Findings demonstrated that a degraded physical environment, further complicated by socio-cultural factors, is the most important determinant that affects child health outcomes in the region. Recurrent droughts that result in high levels of food insecurity, water scarcity and malnutrition; poor access to health services and markets; low human resource capacity and motivation; continuous mobility of the people in search of pasture and water- all directly linked to the physical environment- are among the major contributors to dismal child health outcomes. On the other hand, a review of strategic directions and ongoing health-related programs revealed that more focus is given to relieving end results than addressing the environment itself or its immediate consequences.

Conclusion

The need to critically assess and maximize the integrated influence of health and development strategies/programs on the physical environment and its immediate- not final outcomes- is thus recommended as a vital step towards sustainable progress in child health and beyond.

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Quality of Life of Childhood Brain Tumor Survivors: Intervention, Analysis and Results

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Background

Our aim is to assess the socio-demographic and environmental factors, morbidity, and health related quality of life (HRQL) of childhood brain tumor survivors.

Methods

Through this cross-sectional study we examined pediatric survivors (diagnosed 0-14 years) out of treatment and more than 2 years since the diagnosis in a specialized unit. Evaluations were administered though questionnaires regarding socio-demographics, environment, clinical history, scale of sequelae effects (LESS), and PedsQL™ 4.0 parents and patients generic scale (2-18 years and young adult).

Results

Total population: 82. Died during the study: 3; Evaluated: 67. Male: 58.2%. Current mean age: 164.6 months (σ 76). Mean age at diagnosis: 62.1 months (σ 46). Mean follow-up: 108.1 months (σ 54.8). Low income: 28.8%. Low level of parental education: 30%. Tobacco smoke in the home: 61.2%. Physical exercise <1-2d/week < 30 min: 53%. Epilepsy: 16.84%. Neurofibromatosis-1: 11.9%. International Classification of Childhood Cancer, Third edition: astrocytomas 47.7%, medulloblastomas/primitive neuroectodermal tumor 17.91%, craniopharyngiomas 7.4%, ependymomas 4.4%, others 5.9%. Location: supatenorial 28.35%, infratenorials 46.2%. Ventriculoperitoneal shunt: 19.4%. Surgery: 82.1%. Radiotherapy: 35.8%. Chemotherapy: 43.3%. Hematopoietic stem cell transplantation: 7.5%. Reintervention: 11.9%. LESS modified (>0p) 82.1%. Global HRQL average values: (2-18 years): reported by parents: 67.4 (normal values (NV) 81.3), reported by patient: 72.6 (NV 82.8); reported by young adult: 77.0 (NV 78.1)

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Conclusions

On average, this population of childhood brain tumor survivors shows socioeconomic difficulty, environmental risk, high prevalence of medical sequelae and a reduction of HRQL compared to the healthy normative population of children.

Environment and Childhood Cancer Survivors: PLASECAP – MUR

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Introduction

The National Cancer Institute defines that every child with cancer is a childhood cancer survivor (CCS) from the time of diagnosis, and will continue to be one for the rest of his or her life. In the last decades the pediatric cancer survival rate has increased progressively, reaching approximately 80%. The increase of survival has revealed the need for controlling late effects caused by treatments. International organizations recommend structured follow-up, and if possible, throughout their lifespan, for CCS. The objective of this work is to present the Long-Term Follow-Up Program for Childhood Cancer Survivors in the Region of Murcia (PLASESCAP-MUR).

Methods

In the Region of Murcia (Spain) with an implemented public primary care health system, we have developed PLASESCAP-MUR for the follow-up of CCS, which follows a shared-care model for the transition from hospital to primary care that is tailored to the specific needs of each CCS.

Results

The first objective of PLASESCAP is the education and promotion of healthier environments and lifestyles for the survivor, their family, and community, with the goal of improving their environmental standard and quality of life. The second objective is for early detection and screening for an appropriate management of the late effects arising from disease and treatments.

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Conclusions

Long-term follow-up programs for CCS based on creating healthier environments, reducing and eliminating exposure to environmental carcinogens and promoting healthy lifestyles in order to reduce the incidence of late effects and to help CCS to achieve the highest quality of life possible are necessary.

Health Related Quality of Life of Survivors of Childhood Extracranial Neoplasms

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Background

In the last decades, the pediatric cancer survival rate has increased spectacularly, reaching approximately 80%. This increase has revealed the need to control late effects arising from treatments and disease that affect the quality of life of childhood cancer survivors (CCS). The Long-Term Follow-Up Program for Childhood Cancer Survivors in the Region of Murcia (PLASESCAP-MUR) offers an integrated follow-up for CCS and among its objectives is environmental education and awareness and healthier lifestyles to improve environmental and life quality of survivors and their environment.

Objectives

Assess the health related quality of life of a group of survivors of extracranial neoplasms and evaluate the associations of demographic, clinical, and environmental factors with the results.

Methods

Descriptive cross-sectional study. The PedsQL™ 4.0 self-administered generic version for 4 to >18 year old survivors was completed by 85 survivors.

Results

Overall quality of life was 84.1 (81.7; 86.4). Subscales: physical health = 86.8 (84.1; 89.7), psychosocial

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health = 82.5 (79.9; 84.9), emotional domain = 75.4 (71.6; 78.9), social domain = 92 (89.3; 94.5), and educational domain = 79.9 (76.7; 83.2). The worst quality of life was reported by CCS that have been treated with radiotherapy (-9.0; p=0.007), that presented with a relapse of their disease (-9.2; p=0.033), or that presented with some adverse effect derived from the treatments used (-8.0; p<0.001). The environmental and lifestyle factors studied did not significantly influence the results.

Conclusions

The results obtained are similar to other international work. Strategies to improve quality of life of survivors are necessary, preferably focused on the creation of healthier environments.

Lifestyles of Survivors of Childhood Hematologic Neoplasms

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Introduction

The prevention of late effects caused by treatments and the promotion of healthy environment and lifestyle are the two pillars of the Long-Term Follow-Up Program for Childhood Cancer Survivors in the Region of Murcia (Spain) (PLASESCAP-MUR) to achieve the highest levels of environmental and quality of life in childhood cancer survivors. The objective of this project is to analyze the lifestyles of survivors of childhood hematologic neoplasms.

Methods

Descriptive cross-sectional study. A total of 55 survivors were analyzed within the PLASESCAP from August 2015 to May 2016.

Results

There were 39 leukemias and 16 lymphomas. Mean age = 16.8 (15.6; 17.9). Of these, 9.4% are smokers and 50% occasionally consume alcohol. About 52% of the survivors engaged in physical activity less

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than three times a week. Almost 56% and 60% of the survivors eat less than one portion of fruit and vegetables per day, respectively. Finally, 53% use electronic devices more than 2 hours a day and 44% of them never engage in activities in contact with nature or do so only in summer.

Conclusions

More than half of the survivors do not meet the dietary and physical activity recommendations. Up to 50% of them consume alcohol with a mean age under 17. Programs that encourage the promotion of healthy lifestyles with a diet rich in fruits and vegetables, exercise, and regular contact with nature as well as avoidance of toxic habits and drugs such as alcohol or tobacco are necessary to obtain the best environmental standard and quality of life.

Secondhand Tobacco Smoke and Survival in Children With Acute Lymphoblastic Leukemias in the Region of Murcia (Spain)

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Background

Environmental tobacco smoke is associated with diseases and premature death in childhood. It has been associated with an increased risk of several pediatric tumors, including acute leukemias, with variable results. There are certain clinical and biological features that have prognostic influences in childhood acute lymphoblastic leukemia (ALL). However, the observed plateau in survival rates in recent years suggests that there must be other unknown factors affecting prognosis. In adults, there are some reports linking active smoking with decreased survival in patients with myeloblastic leukemia, but this relationship has not been studied in the pediatric population. Our objective is to study the relationship between environmental tobacco smoke and overall survival in children diagnosed with ALL.

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Methods
Survival analysis in the MACAPEMUR (Environment and Pediatric Cancer in the Region of Murcia) cohort of patients between 0 and 15 years with ALL diagnosed from January 1998 to December 2013 in the Region of Murcia (Spain).

Results
Sixty percent of children with ALL live with at least one parent smoking at diagnosis and in 26% of households both parents are smokers. Environmental tobacco smoke from maternal smokers after diagnosis was significantly associated with lower overall survival (HR = 9.92; 95% CI 1.89 – 51.89).

Conclusions
Maternal smoking after diagnosis of ALL in children is an independent prognostic factor and easily adaptable in the overall survival of acute lymphoblastic leukemia. In order to increase survival and improve their environment and quality of life it is necessary to provide smoking cessation programs to parents of children with leukemia.

High Risk for Neural Tube Defects from Arsenic in Drinking Water and Rice in Asia

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Background
Neural tube defects (NTDs) affect >300,000 children annually worldwide. The incidence of NTDs in Northern India (7.7/1000), is tenfold higher than in the US (0.7/1000). Higher rates were previously reported in Northern China. The causes of these trends have not been elucidated. Arsenic is a teratogen shown in animals to induce NTDs. In India and China, the main potential sources for environmental arsenic exposure are groundwater and rice as a staple food.

Methods
Analyzing the association between high environmental arsenic exposure through drinking water and rice with high NTDs rates in these regions.

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Results

Literature review indicates that arsenic contamination of groundwater is the main source of environmental arsenic exposure. The locations of toxic arsenic regions in China and India correspond in most cases to the northern regions where the NTDs rates are high. Rice, the staple food in India and China, can absorb up to 10 times more arsenic than other crops such as wheat and might further increase arsenic exposure.

Conclusions

We hypothesize that this NTD-arsenic in drinking water and rice association may explain why these areas in the northern regions of both countries have the highest incidence of NTDs. If proven true, this has major public health implications.

Maternal Environmental Exposure to Organochlorine Pesticides and Its Effects on Birth Weight

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Background

There is growing concern that chemical agents could impair the anthropometric development of the foetus. However, epidemiological studies have reported inconsistent results. This prenatal exposure has been associated with adverse pregnancy outcomes. The aim of the present study was to assess the association between birth size and prenatal exposure to Organochlorine pesticides (metabolites of dichlorodiphenyltrichloroethane and isomers of hexachlorocyclohexane) in the population of the Agra region.

Methods

A total of 90 mothers and their newborns participated in this case control study, using a questionnaire on maternal demographic and anthropometric characteristics as well as occurrence of several occupational hazards, including pesticide. Residues of organochlorine pesticides in placental tissues were analyzed by gas chromatography equipped with electron capture detector. Regression analyses were performed between birth weight and organochlorine pesticide concentrations. Ethical approval was granted by the Institutional Human Ethics Committee.

Results

Alpha-HCH (Hexacholorocyclohexane), β-HCH, γ-HCH, total-HCH and p,p-

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Dichlorodiphenyltrichloroethane were found to be significantly higher in the pre-term group.

Conclusion

These findings reveal that prenatal exposure to organochlorine pesticides may contribute to a slight reduction in birth weight.

Effect of Diet on Allergies Among Preschool Children

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Background

The prevalence of asthma and allergy has increased among children. This increase in prevalence might be related to diet. The present epidemiological study investigated the relationship between fruits, vegetables and nuts intake and the prevalence of wheezing ever, asthma, and eczema among preschool children.

Methods

This nested case-control study included 1,489 children of 4–6 years of age residing in Kaunas, Lithuania, who were recruited in 2007-2009 to the Kaunas Cohort Newborns study. Responses to the questionnaire completed by parents were used to collect information on allergic diseases, diet and other factors. Association between diet and children's allergic diseases was estimated by multivariable regression, controlling for covariates. Ethical approval was granted by the Lithuanian Bioethics Committee.

Results

We found that 83.3% of all children ate fresh fruits (62.7% - vegetables and 6.2% - nuts) at least three times per week. A significantly lower prevalence of wheezing was found among children who ate fruits at least three times per week than among those did not eat fruits (crude odds ratio: 0.44, 95% confidence interval (CI) 0.22 to 0.87). Adjusted odds ratios (aOR) of asthma were also lower for children who ate vegetables at least three times per week compared with no vegetable consumption (aOR 0.70, 95% CI 0.37 to 1.35). Consumption of nuts 1-2 times per week was associated with lower prevalence of childhood asthma (aOR 0.69, 95% CI 0.44 to 1.08) and eczema (aOR 0.56 95% CI 0.35 to 0.89).

Conclusion

The results indicated beneficial effects of frequent consumption of fresh fruit and vegetables on asthma and allergies in children. These results might have important implications for children's health.

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Alcohol and Tobacco Products Access to Minors in Georgia

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Introduction

Tobacco and alcohol products are affordable products in Georgia. Tobacco control laws since 2003 prohibit cigarette selling to minors, by sticks, and around 50 meters from schools. The same regulation pertains to purchasing alcohol products. However, in most shops, mainly kiosks and small markets located near schools, minors are able to buy cigarettes or alcohol, illegally, without problems. The smoking prevalence among minors is around 17-18%.

Methods

Two video-recorded focus group discussions were organized with 7-8 and 9-12 year old children during April 2016. Eight children participated in the discussion. The parents signed informed consent forms. The study group used pictures and products of stores/shops where people can buy appropriate products including cigarette and alcohol. They were also shown pictures of billboards, light-boxes with tobacco and alcohol ads. Ethical approval was granted by the Georgian Health Promotion and Education Foundation's Ethic Committee.

Results

All children reported that they had seen tobacco and alcohol products in shops, including close to schools. Also, they mentioned special shelves for tobacco products and signs that prohibited the sale of tobacco and alcohol to minors, but most children and adolescents can buy such products without requiring an ID. They underlined the possibility of buying cigarettes by sticks. Sometimes they fixed promo girls proposing to buy cigarettes to young people and instead they will get accessories for free. The place where seller can get change has tobacco ads. The design of cigarettes is particularly targeted towards girls, because they contain predominantly feminine flowers and colors. Children mentioned that in popular TV series, they often see young women smoking. Some participants were smokers and all had tried alcohol.

Conclusions

Tobacco and alcohol product ads and promotion have a great influence on initiation of smoking and/or alcohol use. Laws restricting the selling of such products are often violated.

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Prenatal Mercury Exposure and Fetal Development: Results from Infancia y Medio Ambiente Cohort

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Introduction

Prenatal mercury exposure has been related to reductions in anthropometry at birth. Levels of mercury have been reported to be relatively high in the Spanish population, including vulnerable groups such as pregnant women and newborns. Our objective is to investigate the relationship between prenatal exposure to mercury, expressed as cord blood mercury levels, and fetal biometry in the Spanish Infancia y Medio Ambiente study.

Methods

The study subjects were 1867 pregnant women and their newborns participating in the Infancia y Medio Ambiente Spanish birth cohort study. Biparietal diamete, femur length, abdominal circumference and estimated fetal weight were measured by ultrasounds at 12, 20 and 34 weeks of gestation. Size and growth between these points were assessed by standard deviation scores adjusted for constitutional characteristics. Total mercury was determined in cord blood. Associations were investigated by linear regression models, adjusted by socio-demographic, nutritional – including four fish groups – and lifestyle-related variables in each area. Final estimates were obtained using meta-analysis. Ethical approval was granted by the ethical commitees of the participating health centers.

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Results

Arithmetic and geometric means of total mercury were 11.0 and 8.2 µg/L, respectively. All the estimates of the association between prenatal mercury and growth from 0 to 12 weeks showed reductions in z-scores, and were only statistically significant for BPD. A doubling of cord blood T-Hg was associated with a slight reduction in size of biparietal diameter at week 12. Conversely, coefficients were positive (but none significant) for growth from 12 to 20 weeks. Finally, results for growth from 20 to 34 weeks again showed negative estimates for all indicators except femur length.

Conclusion

This study suggests that mercury exposure is associated with changes in fetal growth at different periods of pregnancy. Further research is needed to confirm this. Due to this and other potential hazards, preventive actions should be oriented towards reducing exposure during pregnancy.

Health and Safety Predictors of Parental Attitudes Towards Children's School Travel

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Background

Concern with low levels of physical activity and declining active school transportation (i.e., walking/biking to and from school) underlies research into the potential barriers that could explain why more children are being driven to school today than in the past.

Methods

The present study analyzes the perceptions and motivations of parents in relation to their concerns about the health and safety of their children, before and after the implementation of a program developed to raise the interest of the community in active transportation.

Results

After as little as one year of exposure to the program, a shift may occur in parents' responses. In a sample of over 4500 respondents, the physical well-being of their children is seen by parents as the most important beneficial effect of walking or cycling between home and school. The development of

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children's autonomy is also seen as very important in the decision of parents to drive their children to school by car or encourage them to get there by walking or cycling. Regression analyses show that the distance between home and school is the main variable that predicts whether children use active transportation. When distance is controlled, safety concerns also appear to be an important predictor.

Conclusion

Participation in a program that promotes active transportation is associated with lower parental worries about the safety of children walking or cycling to school. Moreover, when children take active forms of transportation to school, parents are able to reduce the number and length of car trips, keeping neighbourhoods quiet and reducing pollution in areas near schools.

Childless-Workless-Worthless? Futures and Environments of our Children

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Abstract

In Europe, decreasing birthrates (additionally, aging) and diminishing classical work and employment rates (for youth) seem to destabilise, even devaluate our future and our offspring (i.e. young males). The conventional solution of "growth" seem to be restricted structurally: Childlessness (decreasing birthrates) as consequence of women´s education, employment and contraception do not appear to be reversible. Joblessness (decreasing work) is structurally driven by innovation, capitalisation and globalisation. Feelings of worthlessness (changing old values), may be felt by our European children (esp. sons) if they grow up isolated with psycho-social disturbances, marginalized from work, economics and politics and overburdened by debts, entitlements and environments. As "Radical Losers" they may experience fear similarly to that of other (Islamic, over-) populations. Other fears such as (self-) extinction, (Islamic) colonization, (economic) pauperization and loss of (material) power leads to the standard answer: Growth! Nevertheless, the environment, sustainability and posterity would profit most from these "natural" trends of shrinking population, work and consumption.

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Maternal Cell Phone Use During Pregnancy and Child Behavior Problems In Five Birth Cohorts

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Introduction

Previous studies regarding maternal cell phone use during pregnancy collected retrospectively and associations with child behavior problems at 7 years were not conclusive. Therefore, we evaluated this association with data from the previous studies together with prospective data from three other birth cohorts.

Methods

We used individual participant data from 84,077 mother-child pairs in five population-based birth cohorts in Denmark (1996-2002), Korea (2006-2010), the Netherlands (2003-2004), Norway (1999-2008), and Spain (2003-2008). We categorized cell phone use based on maternal-reported frequency of calls during pregnancy: none, low, medium, and high. Behavior problems (reported by mothers using CBCL or SDQ) were classified in the borderline/clinical and clinical ranges using validated cut-offs in children ages 5-7. Cohort specific risk estimates were meta-analyzed.

Results

In all cohorts, 7% of mothers reported no cell phone use during pregnancy, except in Denmark where 61% did not use cell phones. For all cohorts, 6% of mothers reported high cell phone use. Mothers who reported no cell phone use were less likely to have a child with overall behavior problems compared

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to those who reported low use (odds ratio (OR) 0.82, 95% confidence interval (CI) 0.75, 0.89). High cell phone use during pregnancy was associated with an increased risk for inattention/hyperactivity problems compared to low cell phone use during pregnancy (OR 1.29, 95% CI 1.12, 1.48). No clear associations were observed in relation to the other behavior problems.

Conclusions

Our results indicate that high cell phone use during pregnancy may be associated with hyperactivity problems and no cell phone use may be associated with a decreased risk in any behavior problems among children ages 5-7. While this is the largest study to evaluate this association, these results should be interpreted with caution, as there is possible residual confounding that may influence both cell phone use and child behavior.

The Role of Trace Elements, Antioxidants and Oxidative Stress in Very Low Birth Weight Infants

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Background

Reference data on trace elements concentration, antioxidants and oxidative status in very low birth weight infants are limited and need updating for use in clinical settings.

Methods

Thirteen very low birth weight infants whose mean birth weight and gestation were 1,167 g and 33.2 weeks, respectively, were enrolled in this study. Cadmium (Cd), copper (Cu), iron (Fe), mercury (Hg), manganese (Mn), selenium (Se) and zinc (Zn) were determined in serum and urine of infants at two points in the early postnatal period (24th day and 38th day). Infants were also analyzed for oxidative status and antioxidant enzyme activities determining different indicators: serum catalase; serum Cu, Zn, Fe, Mn-superoxide dismutase; urine nitrate/nitrite; serum total oxidative status (sum of lipo- and hydro-peroxides); and serum total antioxidant capacity (sum of thiols, proteins, bilirubin, uric acid, β beta-carotene, ascorbic acid, vitamin E, etc.).

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Results

A higher urinary excretion of Cu, Se and Zn was observed at the 24th day of life than at the 38th day; in serum, Zn slightly decreased after two weeks from the enrollment. These results indicated that losses of elements and incomplete body stores are more pronounced in the earlier stage of life (24th day) than later on. Moreover, an increase in urine Cd concentrations was found at the 38th day over at enrollment, but values of this element were below the safe threshold for toxic effects. Infants had significant lower catalase activity at the 38th day than at the 24th day of life and a reduction of total antioxidant barriers. Also, high values of oxidative stress were observed in very low birth weight infants, indicative of stimulated formation of lipid and oxygen radicals during the first 5 weeks of age.

Conclusion

Higher concentrations of trace elements, lower antioxidant barriers and higher levels of oxidative stress were found in very low birth weight infants.

Urine Total Arsenic and Arsenic Species in Children from Northern Italy

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Background

Arsenic (As) exposure during childhood has been associated with neurobehavioral effects in population-based cohort studies. In addition, variations in As on children health outcomes may be, to some extent, related to exposure to different As species.

Methods

Within the Cross-Mediterranean Environment and Health Network-Life project, aimed at assessing the health risk due to exposure to neurotoxic chemicals, a cohort of 200 children at 7 years (the Northern Adriatic Cohort II Public Health Impact of Long-term, Low-level Mixed Element Exposure in Susceptible Population Strata cohort) from the coastal area of Friuli Venezia Giulia Region (Italy) was analyzed for As exposure. Total As concentration was determined in children's urine by high resolution inductively

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coupled plasma mass spectroscopy. Then, the concentrations and distributions of urinary As species, including inorganic arsenic (iAs) [arsenite (iAsIII) and arsenate (iAsV)], monomethylarsonic acid (MMA), dimethylarsinic acid (DMA), arsenobetaine (AsBet) and arsenocholine (AsChol), were determined by high-performance liquid chromatography combined with inductively coupled plasma mass spectrometry. Ethical approval was granted by the Cross-Mediterranean Environment and Health Network-Life.

Results

Results indicated a good agreement between the values obtained for total As (median, 10.6 µg/L) and the sum of species. The order of As species excretion in urine of children was: AsBet > DMA > MMA □ iAsIII > iAsV (AsChol was at trace levels); moreover, the second methylation step was more active than the first one (DMA > MMA).

Conclusion

In conclusion, in children, inorganic arsenics (AsIII and AsV) were metabolized to the less toxic forms as DMA and MMA through the methylation process. In addition, a very high percentage of urine As was present as AsBet which is essentially harmless and suggestive of dietary As.

Due to the different toxicity of As compounds, speciation of As in urine was confirmed to be more convenient for health risk assessment than measuring total As concentration and it can give valuable information about the metabolism of As species within children's bodies.

Multi Residue and Non-Target Screening for Characterization of Organic Chemicals in Indoor Dust

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Background

The indoor environment can expose us to a concentrated cocktail of chemicals. Indoor dust may be a source or sink for a range of contaminants. Most studies to date have focused on individual compounds or classes of contaminants. A review on dust indicated that a large number of different chemicals have been identified in recent years, e.g. polybrominated diphenyl ethers, pesticides, phthalates, polycyclic aromatic hydrocarbons, polychlorinated biphenyls, and perfluorinated compounds. Polybrominated diphenyl ethers congener concentrations in serum and feces of toddlers were significantly correlated to

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those in house dust and suggest that dust exposure plays a larger role in the polybrominated diphenyl ethers body burden in toddlers than in their mothers, and this may be related to additional ingestion of dust as toddlers are apt to place toys and hands in the mouth, thus gaining additional exposure.
An understanding of the hazards that contaminants in dust may pose to human health, a more comprehensive non-target approach using state of the art instruments will allow the identification of legacy compounds, but also identify potentially hazardous compounds not traditionally screened for.

Methods

We developed a targeted multi-residue screening method to analyse a diverse array of compounds such as may be found in indoor dust and human blood. In combination with non-target screening, previously unreported compounds in dust can be tentatively identified. Methods for screening blood and dust were tested using a mixture of >200 organic contaminants. By using different ionisation sources in positive and negative mode, identification of the introduced compounds was validated and different extraction procedures tested. The aim was primarily to understand the limitations of traditional extraction techniques and to see the differences that the extraction procedures has on the screening approach.

Results

Using the Norman recommended extraction technique for household dust and a trial of 5 typical blood extraction techniques we identified the recovery efficiency of a wide variety of organic contaminants in dust and blood. Using different ionisation sources, we further determined electrospray in positive, combined with negative mode, was able to detect around 80% of all compounds analyzed, however other ionisation sources identify unique features. Hydrophilic-lipophilic balance extraction cartridges, out of 5 extraction methods, extracted compounds with the highest recovery in blood, although other similar solid-phase extraction methods were also effective.

Conclusion

A single extraction technique for blood and the NORMAN non-target method for dust may be applicable for the determination of a wide range of compounds. For non-target analysis, electrospray ionization in positive and negative is necessary for the broadest range of most organic contaminants measured, however other ionization sources provide unique features that must be considered for a comprehensive approach.

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Lead Intoxicated Children in Kabwe / Zambia

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Background

Kabwe was an important lead and zinc mining town in Zambia for over 90 years, which left waste and lead contaminated tailings behind. Lead is a well known serious health hazard, causing anemia, seizures, encephalopathy and death. Soil in Kabwe's housing areas is highly contaminated with lead. Children from neighboring townships are especially vulnerable by ingesting toxic lead dust.

Methods

The environmental assessments and health data for Kabwe's children were collected and analyzed. Data is available from three different sources: Copperbelt Environment Project; Pure Earth and University of Zambia; and Hokkaido University in Sapporo, Japan. Ethical approval was granted by the respective national authorities in Zambia.

Results

In most housing areas the tolerable soil lead levels of 400 ppm was surpassed. Children's blood lead levels were increased (≥ 10 µg/dL) in the most affected townships and in over 95% of children. Most children did have blood lead levels requiring urgent action to reduce blood lead levels. Exposure to toxins urgently needs to be reduced. At over ≥ 45 µg/dL, medical treatment is recommended, and in the most affected townships > 50% of the children showed such high levels. The existing data clearly prove the severity of lead exposure in Kabwe.

Conclusion

Large proportions of the children are not only highly exposed, but actually have high to extremely high levels of lead in their bodies. According to threshold levels and international recommendation, they need to be treated and the exposure must be considerably reduced.

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When Parents, NGOs, Environmental NGOs and Experts Join Forces to Spur Actions to Protect Children's Environmental Health

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Background
Involved in the international discussions on environmental health since 1994, Belgium developed its National Action Plan on the Environment and Health (NEHAP) in 2003 and launched coordinated actions. With the 4th WHO conference on environmental health in Europe, the focus was put on children. Most European states launched a specific Children, Environment and Health Action Plan (CEHAP), and Belgium decided to foster specific actions towards children within their existing NEHAP. The mid-term review in 2007 indicated a demand from parents and environmental associations to be involved. Since 2010 and the ending of the European Action Plan on Environment and Health, activities have been severely reduced.

Methods
A review of the actions taken is matched to demands from NGOs (parent's organisations and environmental associations). Ideas were collected around 3 main priorities among members of civil society and academia working together as the platform "Childproof".

Results
NEHAP actions were focused on capacity building in nurseries, research on children and cancer to integrate environmental information, and on human bio-monitoring, including towards children. The first ideas collected by the parents and environmental associations focus on chemicals and endocrine disruption, air quality, outdoor and indoor noise and inequalities. They will be discussed and presented to the NEHAP secretariat to spur specific activities and policies for the health of actual and future children.

Conclusions
Knowledge is growing and uncertainties remain. Hence, actions must be taken to enable children to

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grow and develop in good health. The whole society has a role to play to reduce children's exposure to environmental hazards and work together to encourage the implementation of laws and policies to protect children from known and potential environmental hazards.

Organohalogenated Pollutants in Argentinean Postpartum Women Living In Salta and Ushuaia

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Background

Organohalogenated pollutants, namely organochlorine pesticides, polychlorobiphenyls (PCBs) and polybromodiphenyl ethers (PBDEs), may undergo long-range atmospheric transport because they are semi-volatile and chemically stable. They accumulate in organisms and humans as consequence of their lipophilic character. The toxic properties of most of them generate deleterious health effects in both humans and wild species. These compounds have been mostly synthesized and used in the northern hemisphere, but their strong capacity for long-range atmospheric transport has led to a global planetary distribution, including the southern hemisphere. While there is information on the occurrence of these compounds in the ecosystems of this hemisphere, the degree of information on the accumulation patterns of these compounds in southern hemisphere human populations is very limited.

Method

The present study was devoted to filling this gap by analysis of maternal serum from Argentina, representing postpartum mothers from the city of Salta (25°S; n = 498) and Ushuaia (55°S; n = 200). These samples were collected from April 2011 to Mars 2012 between the first and third days after delivery. Ethical approval was granted by the Ethics Committee at the Board of Medical School of Salta and conducted in accordance with the Helsinki declaration. The Northern Norway Regional Board of Research Ethics approved the study along with the Norwegian EMASAR biobank, containing the Argentinean blood samples.

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Results

The median concentrations of the most abundant compounds were 0.33 and 0.51 ng/mL of total DDTs, 0.20 and 0.18 ng/mL of polychlorinated biphenyl, and 0.067 and 0.043 ng/mL of hexachlorobenzene in Ushuaia and Salta, respectively. These concentrations were generally low, but lower concentrations have been reported for various compounds in some northern hemisphere locations such as Norway. The influence of maternal age, parity, residence, and body mass index on the concentrations of these pollutants has been investigated.

Conclusion

Differences in the serum concentrations between Salta an Ushuaia may reflect diversity in local exposure and long-range transportation.

E-Waste and Child Health – WHO Global Initiative

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E-waste is a growing environmental concern to children's health, with 20-50 million tons created annually and expected to increase by 19% between 2014 and 2018. Much of it is shipped to low and middle income countries, where valuable parts are extracted by burning and with acid, often informally by children, exposing them to chemicals and toxicants. This can occur in e-waste recycling hotspots, where entire towns are built around e-waste operations, as seen in Ghana and China, or throughout towns and cities as reported in a recent Latin-America e-waste report by United Nations agencies. When e-waste recycling is not concentrated in a particular area, garbage pickers may collect e-waste from landfills or door to door, before bringing it home to take it apart and burn. In both of these informal sector types, modern industrial processes and worker protection are lacking, while child labor goes unseen.
A systematic review led by WHO and WHO collaborating systems found that exposure to e-waste was associated with spontaneous abortion, stillbirth, premature birth, reduced birth weight and birth length, and DNA damage. Chemical exposures from e-waste, including lead, mercury, cadmium, PCBs and dioxins are known to adversely affect neurodevelopment, even at lower levels. Thus, it is urgent to protect the health and reduce exposures of vulnerable groups of children, pregnant women, and workers in the informal sector against e-waste exposures.

The health effects of e-waste are not widely known. Informal workers lack protective equipment and occupational health services. Children are at risk from work in recycling and exposures in their home

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and living in the areas contaminated by informal recycling. The health sector is often not aware of the dangers of e-waste. WHO, WHO collaborating centres and collaborators are working on advocating for this issue and on identifying and promoting e-waste interventions that will improve child health, including communicating the problem to health actors, developing training methods and tools for health professionals, and creating community multisectoral teams to identify local needs to protect health.

How Can the Increase in Childhood Cancer be Explained? The Role of Transplacental and Transgenerational Carcinogenesis

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Background
Cancer is generally associated with old age and the explanation most clinicians (and others) advance for its continuous increase, observed throughout the 20th century in all industrialized countries, is that it results from the progressive accumulation over the time of aging of genetic oxidative/stochastic damages with an additional role for the improvement of diagnostic capacities. It is too often forgotten that this increase concerns persons of all ages and, particularly in the last decades, the youth.

Method
Literature review. The aim is to reconsider, in the light of new epigenetic models of environmental carcinogenesis and of transgenerational cancer transmission, the recent epidemiological data that confirm a substantial increase in childhood cancer throughout Europe, hardly explainable by the current stochastic mutational paradigm.

Results
Carcinogenesis is a long and complex process. As far as the increase in childhood cancer is concerned, the key factor for its occurrence should be looked for in parents (exposure of the reproductive cells) or the fetus (exposure in the very first stages of ontogenetic development).

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Conclusions

The two main possibilities that have to be considered are: 1. direct exposure of the embryo/fetus to physical agents or, through transplacental transmission, to biological (viruses) or chemical agents, capable of directly damaging the fetal DNA or of inducing epigenetic changes in the fetal tissues (fetal programming); 2. transgenerational transmission of epigenetic "signatures" through the gametes. Admitting the importance of such mechanisms would have several implications. The first would be recognizing the highly underestimated role of environmental pollution in the genesis and the progressive increase of cancer. In particular, by hypothesizing that the "initiating" stage of cancer might take place much earlier, in the fetus or even in the parents' gametes, and that the increasing trends in cancer in the very early childhood should be seen as a sentinel sign of a possible transgenerational amplification of (epi)genetic/programmatic changes with their associated pathologies.

Transgenerational Effects of Treatment with Antiepileptics in Pregnancy: Behavioural and Molecular Markers in a Mouse Study

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Background

Clinical evidence indicates that exposure to the antiepileptic agent valproic acid (VPA) during pregnancy increases the risk of congenital malformations and neurodevelopment delay in children. The mechanisms by which VPA causes neurotoxicity are still unknown, but epigenetic effects are likely implicated.

Methods

We used a rodent model to evaluate the transgenerational impact of fetal exposure to VPA on neurobehavioural development of laboratory mice, by studying F1 and F2 generations after a single injection of VPA on gestational day 10.5.

On gestational day 10.5, the F0 pregnant mice were injected subcutaneously with 500 mg/kg/ of body weight with VPA. Offspring of both sexes from each the vehicle control and VPA-treated litter were assessed for motor and somatic growth, spontaneous locomotion, ultrasonic vocalization, and nest-odour recognition from postnatal day 4 to 12. Motor activity, social abilities and cognitive functions were also analyzed at the juvenile and adult stage. At adulthood male and female mice of the F1 generation

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were mated creating three experimental groups of F2 (maternal VPA/paternal vehicle, maternal vehicle/paternal VPA, maternal vehicle/paternal vehicle) to evaluate the contribution of parental exposure to VPA to multigenerational effects on the behavioural phenotype. The same neurobehavioral assessment as in F1 was performed on the F2 generation.

Results

In F1, VPA offspring presented tail malformation ("kinky tail"), delay in somatic growth and motor development, hyperactivity and a reduced number of ultrasonic vocalizations. No prenatal treatment-induced differences were evident in adult performance. In F2, similar alterations in early motor development as in F1 were observed in VPA offspring.

Conclusion

We also analysed molecular markers of VPA effects on early brain development in both the F1 and F2 generation. Preliminary data suggest that the behavioural changes induced by VPA are paralleled by increased expression of endogenous retroviruses and neuroinflammatory biomarkers, which are possible downstream effectors of the VPA-induced epigenetic alteration.

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The Northern Adriatic Cohort II Birth Cohort in the Friuli Venezia Giulia Region: Prenatal and Childhood Exposure to Metals and Neuropsychological Maturation at 7 Years

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Background

The Northern Adriatic Cohort II is a prospective mother-child cohort established in 2007 in coastal areas of Italy, Croatia and Slovenia to investigate the association between prenatal mercury exposure from maternal fish consumption and child neurodevelopment. The Italian Northern Adriatic Cohort II refers to the coastal area of the Friuli Venezia Giulia Region. At present, a biological bank collected during pregnancy and at birth from mother-child pairs is available. The data bank has collected neuropsychological outcomes measured at different developmental stages (18 months, 40 months), as well as a wide range of potential explanatory variables (socioeconomic indicators, diet habits, child postnatal exposures, maternal lifestyle). The Cross-Mediterranean Environment and Health Network Life project has followed 200 children born within The Northern Adriatic Cohort II for follow up at 7 years.

Methods

Chemical analyses consisted of measurements of the concentration of five neurotoxic metals (mercury, lead, manganese, cadmium, arsenic) in either hair or urine of each child. The neuropsychological tests included the Wechsler Intelligence Scale for Children-IV, the Developmental Neuropsychological Assessment-II, for the assessment of reading and writing skills, and the Child Behaviour Check List to identify behavioural and emotional problems in children. Ethical approval was granted by the Burlo Garofolo Child Hospital of Trieste.

Results

Results show that total mercury exposure during pregnancy and breastfeeding did not significantly affect neuropsychological performances at 18-40 months or 7 years. At 7 years the total mercury level in urine is still strongly related to the fish consumption of the mother during pregnancy and breastfeeding; there is a positive effect of fish consumption by the child on several attentional and cognitive tasks at 7 years. We found an adverse effect of manganese as measured in children's hair on the five Wechsler Intelligence Scale for Children-II score, with statistically significant decrements of the general intelligence quotient and of verbal comprehension.

Conclusion

These results highlight the complex interaction between multiple chemical exposures, life style factors, and time of outcome assessment and support the usefulness of the integrated Cross-Mediterranean Environment and Health Network approach in risk modelling.

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Promoting Health: Recommendations of Food Consumption as a Tool to Minimize Exposure of Pollutants in Children

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Background
Health care workers (HCW) are opinion leaders in the field of food safety and their promotion in the population is very effective in public health. Food is an important exposure source for many environmental contaminants and children are the most vulnerable age group for most of them.

Methods
With the aim to improve the knowledge about food contaminants for HCW, 275 HCW in 16 of the main hospitals from the Balearic Islands attended 2 hours of lessons in 2015. A test before and after the lesson was given to assess the knowledge of HCW about how to prevent the exposure of children and pregnant women to food contaminants and to determine their opinion about the course. In addition, teaching materials for families was provided to the HCW.

Results
Of those workers, 60% answered the test correctly. The average percentage of correct responses prior the training was 10%. The most valued aspects were the high profit and the opportunity to share scientific knowledge about risks in food between HCW and public health workers. Their demands have been to extend the course contents and its duration.

Conclusions
The low percentage of tests performed was due to the difficulty of workers leaving their tasks to arrive on time at the sessions. This fact, added to their wish to receive more extended content and longer courses, requires another course format. Also, the low score of correct answers shows the necessity to provide more courses to HCW.

In 2016, a new online food safety course for HCW will be available in the Balearic Islands. The attendees will connect when they can and will have access to more extended content. To access the content they will have to take the introductory tests, and to obtain the certificate they will have to do the post test, and thus the entirety of the data will be collected. We will dtermine if better knowledge is achieved with online lessons in order to better prevent exposure of children to contaminants.

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Mercury Concentrations in Commercial Seafood from the Western Mediterranean Sea

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Background

Mercury is a strong neurotoxic agent that can cause severe neurological damage to children because of their immature metabolism and organs. Mercury (Hg) emissions in the atmosphere due to mining and fossil fuel burning (Hg^0) are deposited into seawaters after oxidation to Hg^{2+}. There, Hg may undergo bioaccumulation and scavenging by organic-rich particles, be eventually transported from surface to deep waters and reduced back to Hg^0 and to CH^3Hg.

Fish and shellfish consumption is the known predominant input of this metal into human populations of Mediterranean regions. Attention has been focussed on oily fish as the main group of species responsible for the incorporation of Hg into the human diet. Conversely, few studies on the potential role of lean fish regularly consumed by humans have been reported so far in the scientific literature. The present study is therefore aimed to determine the Hg levels in commercial seafood from the Mediterranean Sea.

Methods

Samples were caught between February 2014 and December 2015 in the Balearic Islands. The sampling plan included the most consumed and fished species in the Balearic Islands, grouping them for their study in three trophic levels with the aim to identify the species which carry the most Hg. Samples were collected in local fish markets and auction halls with validated sampling and analysis methods. Information gathering included data for each specimen of variables related with the amount of mercury in fish, as size, weight and catch location.

Results

Eighty-two percent of the samples showed detectable Hg levels. The levels were generally higher than those reported in seafood from the Atlantic Ocean. A substantial number of samples exceeded the maximum level set forth by the European Union Maximum Limits of 0.5 and 1.0 mg/kg wet weight.

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Twenty-nine percent of the thirty-nine fish and shellfish species studied had average concentrations above these limits.

Conclusion

The present study shows that not only oily fish, but also lean and shellfish species from the Mediterranean Sea have mercury concentrations above the recommended European Union Maximum limits. A reassessment of the impact of fish consumption from this region on children and the general population is needed. This assessment should estimate how much mercury intake can be attributed to this source and along with its health effects.

Changing Kindergarten Practices with Localized Real-Time Information on Outdoor Air: the Experience of the CITI-SENSE Project in Oslo, Norway

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Background

In Norway, children in kindergarten spend a lot of time outdoors in all weather, and there is a natural concern about the quality of outdoor air. It is well known that air pollution is associated with a wide variety of adverse health impacts in children, with greater impact on children with asthma. Kindergartens in Oslo that are situated close to streets with busy traffic, or in areas where wood burning is used for house heating, can experience many days with bad air quality, particularly during winter and spring. During these periods, updated information on air quality levels can help to plan outdoor activities and thus protect children's health.

Methods

We tested new low-cost air quality monitoring platforms to provide air quality information to kindergartens. These platforms are smaller, cheaper and less complex to use than reference equipment. Performance evaluation shows that while they are less accurate and suffer from higher uncertainty than European Committee for Standardization reference equipment, they still can provide reliable coarse information to the local pollution. We received approval from the Norwegian ethical committee.

Results

We installed the monitoring platforms in 17 kindergartens in Oslo to measure nitrogen dioxide, nitrogen

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dioxide, ozone, carbon monoxide and particulate matter. The data is displayed using the Air Pollution Indication in a 5-colour scale, indicating if the air pollution is very low, low, rather low, rather high and very high (http://oslo.citi-sense.eu).

Conclusion

We arranged a focus group with the participation of the local administration, kindergarten staff and parents to understand their opinion and needs related to the air quality information that was generated in Oslo kindergartens. They expressed concern about the data quality but agree that having updated information on the air quality in the surrounding kindergartens can help to reduce children's exposure to air pollution or to better plan medication to reduce asthma symptoms.

Engaging Schoolchildren in Understanding the Indoor Environment Using Citizen Science

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Background

Children spend a substantial part of their childhood in school buildings. The school staff might not have the time or knowledge to investigate the indoor environment, even though they acknowledge that it could be improved, nor do they have the capacity to have a dialogue with the students regarding a good indoor environment.

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Methods

As part of a CITI-SENSE project, we used citizen science approaches to investigate how the situation can be improved. We engaged schools to study the indoor environment with the help of sensor technology and support from scientists. Some schools took this as an opportunity to conduct individual student-led research as part of the school curriculum, while others wanted to confirm the indoor environmental issues the school was known to have.

Results

We provided 13 schools in Belgrade, Edinburgh, Ljubljana, Oslo and Haifa with low-cost sensor units, which collect indoor environmental data in near real time, and gave them the resulting data as graphs or data tables. The students defined and conducted related research, e.g., studied how the carbon dioxide concentration changes depending on the amount of students in the classroom, or investigated the variability of indoor parameters across classrooms and workshops in the schools. Others investigated why particulate matter is high when students are present in the classroom. A school with a known Radon issue was happy to investigate further which rooms were the most problematic. Questionnaires conducted by the scientists assessed learning outcomes related to general knowledge on the indoor environment or ability to think critically about the environment.

Conclusion

These activities created awareness in the schools, increased the individual students' and teachers' knowledge about indoor air, and sometimes led to mitigation measures at schools such as changing cleaning practices.

Indoor Air and Improving Children's Health, The School Indoor Pollution and Health-Observatory Network in Europe and The School Environment and Respiratory Health of Children Projects

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The School Indoor Pollution and Health-Observatory Network in Europe project, 2010-2014, established a scientific/technical network to act at the EU level with the long-term perspective of improving air quality in schools and kindergartens, thereby reducing the risk and burden of respiratory diseases among children and teachers potentially due to outdoor and indoor air pollution. At the same time, the project supports future policy actions by formulating guidelines, recommendations and risk management options for better air quality and associated health effects in schools.

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The School Indoor Pollution and Health-Observatory Network in Europe has produced guidelines for healthy school environments (www.sinphonie.eu).

The guidelines are intended to be generally applicable in most school environments in Europe. However, as each school environment is unique (in terms of design, climatic conditions, operational modes, etc.), the guidance needs to be adapted at the national or local level. The School Indoor Pollution and Health-Observatory Network in Europe was initiated and funded by the European Parliament. The Coordination Committee of the project included Éva Csobod, REC, Eduardo de Oliveira Fernandes, IDMEC-FEUP, Peter Rudnai, NIEH and Stylianos Kephalopoulos, JRC. The final reports of the project summarize the work performed by a consortium of 38 partners from 25 countries that involved around 300 people of specialized scientific and/or technical background.

The pan-European SEARCH II project (2010-2013), School Environment and Respiratory Health of Children, SEARCH II, the second phase of the SEARCH initiative, was developed in order to expand monitoring of children's health and air quality, and to assess energy use in selected schools in 10 countries. Four new countries (Belarus, Kazakhstan, Tajikistan and Ukraine) joined the six countries that participated in The School Environment and Respiratory Health of Children I (Albania, Bosnia and Herzegovina, Hungary, Italy, Serbia and Slovakia).

The extensive database containing information on 7,860 children from 388 classrooms in 100 schools in 10 countries created a unique opportunity to study a wide variety of school indoor and outdoor environments, to measure outdoor and indoor concentrations of several air pollutants, and to study the associations between the school environment and children's health.

The project was supported by the Italian Trust Fund (ITF), a targeted contribution of Italian Ministry of Land and Sea (IMELS) to the Regional Environmental Center for Central and Eastern Europe (REC).

Lifelong Exposure to Green Space and Attentional Development: A Prospective Birth Cohort Study

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Background
Natural environments including green spaces are thought to exert beneficial impacts on brain development; however, the available evidence on such impacts is still very scarce. The aim of this study was to evaluate the association between lifelong exposure to residential surrounding greenness and cognitive development during preschool and early primary school years.

Methods
A longitudinal study based on data from a well-established multi-centre population-based birth cohort in Sabadell and Valencia (Spain) followed participants from pregnancy (2003-2006) till 7 years of age (2012-2013). A satellite-derived normalized difference vegetation index was used to quantify surrounding greenness (100 m, 300 m, and 500 m buffers) of participants' residential addresses at birth and at 4 and 7 years of age. Attentional function was assessed using Kiddie-Continuous Performance Test at age 4 (N=888) and Attention Network Task at age 7 (N=978). Mixed effects linear and negative binomial models with cohort random effect were developed to quantify the association between greenness exposure and attention, adjusted for relevant covariates. Ethical approval was granted by the ethical committee of each cohort.

Results
Higher average residential surrounding greenness between birth and age 4 was associated with lower omission errors and lower hit reaction time standard error, both indicators of inattentiveness in the Kiddie-Continuous Performance Test. Similarly, higher average residential surrounding greenness between birth and age 7 was associated with lower hit reaction time standard error in the Attention Network Task.

Conclusions
This is the first longitudinal study to report on the impact of lifelong green space exposure on cognitive development in general and attentional development in particular. It found this exposure was associated with enhanced attentiveness in preschool and primary school children. The associations for attentiveness were consistent using different tests (Kiddie-Continuous Performance Test and Attention Network Task) and different exposure windows (birth to 4 years and birth to 7 years).

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The PERSIAN birth cohort: A Work in Progress

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Introduction

The influence of various exposures during the pre- and postnatal period is not limited to reproductive and childhood outcomes and can extend over a lifetime, a corpus of knowledge embodied by the Developmental Origins of Health and Diseases (DOHaD) concept. The overarching aim of this project is to study DOHaD in the Iranian population. Towards this aim, we will evaluate the impact of socioenvironmental, psychological and genetic factors on pregnancy outcomes, child mental and physical health, growth, and development, and early- and late-onset chronic non-communicable diseases.

Methods

The Prospective Epidemiological Research Studies of the Iranian Adults, Adolescents and Newborns birth cohort is designed as a multi-centre network of population-based birth cohorts in areas representing cultural and contextual variations in Iran. Standardised protocols for data collection, maintenance, and analysis tailored for the Iranian population with the prospect of future international collaborations have been developed. The cohort will be conducted in 5 phases: periconception to birth, infancy, childhood, adolescence, and adulthood. Data collection will be based on computerized questionnaires, biological samples, physical examinations, clinical tests, hospital records, and surveys of living environment.

Results

The pilot phase will start in Shahreza (Isfahan) and Yazd in April 2016 and is expected to last 2 calendar years. In each study site, 2000 pregnant women will be recruited during their first pregnancy visit (at the

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end of the 1st trimester). We will utilize a combination of public and private healthcare providers in order to ensure that the participants represent the ethnic and socioeconomic distribution of the underlying population.

Conclusions

The Prospective Epidemiological Research Studies of the Iranian Adults, Adolescents and Newborns birth cohort will advance our knowledge of DOHaD in the Iranian population. Moreover, it will establish a platform in the Middle East for participating in international studies of DOHaD.

Spatial Pattern Analysis of Hepatitis A Cases in Children by using Geostatistical Analysis of Geographical Information Systems in Turkey

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Background

Epidemiology is the scientific study of the spread and control of diseases as a function of time and location. Epidemiology follows the patterns of a disease on people in their healthy and unhealthy periods; and tracks their history of illness, especially to understand its nature and characteristics. In this context, spatial data is strongly required in order to understand the spatial pattern (distribution and expansion) of the illness. Epidemiologists have traditionally used maps to analyze the spatial characteristics of illnesses in terms of relations between location, surrounding environment, and cases. Developing information technologies introduced geographical information systems (GIS) as a strong tool to be used in spatial decision making applications such as surveillance and monitoring of diseases. Geographical information systems and geostatistical techniques are used to account for spatially varying population sizes and spatial patterns in the surveillance and monitoring of diseases. In environmental and public health, identification and quantification of the disease patterns provide the first steps towards increased understanding and possibly, control of a particular disease. Spatial statistical methods, of which geostatistics is a subset, offer a means for us to use such location information to detect and quantify patterns in public health data and to investigate the degree of association between potential risk factors and disease.

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Methods

This study presents a general overview of the geostatistical methods used in epidemiology, experimenting an innovative geographical information systems-based approach to the analysis of epidemiological data. The paper additionally aims to analyze the spatial pattern of Hepatitis A cases in children at ages under 15. In this context, province-based official data including the number of measles cases and deaths by gender and age were provided monthly from 2001 to 2011. The data were classified by age considering 3 main groups: 0-4, 5-9, and 10-14 years of age. Incidence rates and morbidity of Hepatitis A cases were considered as the main parameters for primary analysis of the cases by province. Time series maps were prepared and Natural Neighbor analysis was also applied to introduce the spatial pattern of case distribution in time. Additionally, Moran's I and Local Indicators of Spatial Association analysis were respectively applied to introduce the characteristics of the global and local spatial pattern of cases in time. Ethical approval was granted by the Human Research Ethics Committee of the Istanbul Technical University.

Results

Time series maps of Hepatitis A cases in children concluded that incidence rates of the cases children under the age of 5 were significantly lower than the other age groups, while incidence rates the highest for children in the 5-9 age group during the study period. Although the results outlined a timely decrease in the incidences of Hepatitis A in Turkey, high incidence rates occurred in 2001, 2005 and 2007 and were significant for children, especially between the ages of 5-9. Spatial pattern analysis of the cases showed that incidence rates were relatively higher in the Eastern Mediterranean and South-eastern Anatolian Regions covering Ceyhan, Asi and Southeast part of the Fırat-Dicle river basins in Turkey. Gaziantep, Kilis and Hatay provinces were the hotspots of these regions. Incidence rates of cases in children aged 5-9 were also higher in the Aegean and Central Anatolia regions, especially in Gediz and Kızılırmak river basins.

Conclusion

At the conclusion of this study, the spatial distribution of Hepatitis A cases in children from 2001 to 2011 in Turkey were mapped and analyzed using GIS technology. Since Hepatitis A is a waterborne communicable disease, spatial distribution was also examined considering the coverages of the river basins in Turkey. The study outlined the regions and specific provinces where intensive water treatment facilities were needed in Turkey during the study period.

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Persistent Organic Pollutants in Women's Breast Milk and Proximity to Municipal Waste Incinerators in the UK

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Background

EU legislation restricting landfilled waste has led to an increase in municipal waste incineration (MWI) within the UK. Persistent organic pollutants (POPs), including dioxins and heavy-metals, released from MWIs have been found in elevated levels in areas surrounding these sites. Due to public concern over health risks associated with MWIs, this project aims to quantify POPs in human breast-milk to examine relationships between individual level POP uptake in proximity to MWIs.

Methods

Recruitment was completed in three phases via postal invites. Primiparous women between 18-40 weeks gestation, aged >18 years and living within 20 km of three MWIs were invited. Women were asked to provide up to 120 ml of breast-milk and complete a questionnaire (including questions on lifestyle, diet, residential history). Breast-milk was analysed for selected POPs, depending on the amount of milk provided. Ethical approval was granted by the Research Ethics Committee under the Health Research Authority (for England).

Results

587 women were recruited (14% recruitment rate), 329 provided milk (56% completion rate). Modelled PM_{10} emissions from MWIs have been used as a proxy for incinerator exposure gradients for other pollutants, such as POPs, which cannot be directly modelled. Modelled exposure to PM_{10} from incinerators is very low (average of incinerator postcode level concentrations varied from 8.70x10-6 to 7.72x10-3 μg/m^3). A total 224 (38%) women live in areas in the top tertile of modelled incinerator PM10 exposures and 203 (35%) women in the bottom tertile. Initial chemical analysis results will inform whether there are significant differences in POP or dioxin concentrations in women by MWI, proximity to MWI, and if any relationships are modified by lifestyle factors.

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Conclusions

This study is the first and largest in the UK to provide individual level POP exposure estimates in proximity to MWIs and improve understanding of the diverse routes of dioxin exposure. It will also aid the interpretation of findings from an ongoing national study of MWIs and risk of adverse birth outcomes.

Lead in soil: Reducing Exposure to Young Children

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In young children, exposure to lead is associated with a reduced IQ (intelligence quotient) score, even when exposure rates are low. The European Food Safety Authority concluded that there is no evidence for a threshold for critical lead-induced effects.

The Dutch public health services have issued advice for municipalities for managing health risks due to exposure of lead in soil. This advice consists of communication and education to residents, simple measures to reduce the exposure of soil lead and the removal of hot spots. The advice is based on a study by the National Institute for Public Health and the Environment, which brought together the current knowledge about the exposure and health effects of lead contaminated soil.
On a population level, the loss of a few IQ points can have large consequences. For instance, the loss of one IQ point on a population level means an estimated 2% loss of productivity. It can also lead to an increase of people with a (very) low IQ who need more care and support.

In neighborhoods with elevated levels of soil lead, a further reduction of the exposure becomes important. The main uptake pathways are through hand-mouth contact while playing in contaminated soil and through the consumption of home-grown vegetables. Therefore, the advice states that attention should be given to the soil quality of playgrounds and (vegetable) gardens of young families. The advice is based on the idea that exposure to lead should be as low as reasonably acceptable. Examples are: let children play in specially prepared clean sand areas and grow vegetables in containers with clean soil separated from the contaminated soil. In addition, it is advised to wash the hands of children frequently and to clean the in-home area by frequent vacuum cleaning.

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Spatial Clustering of Childhood Leukemia in the Region of Murcia, Spain, 1998-2010

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Background

Occasionally, pediatricians and overall primary health care professionals become alert to the presence of little clusters of childhood cancer and frequently their expectations are frustrated when applying statistical methods. The study of little areas in spacial epidemiology has permitted the advance in the identification of clusters and the implicated environmental risk factors. The objective of this study is to test the causal hypothesis that exposure to carcinogens in utero leads to the onset of early childhood leukemia by exploring the presence of spatial and spatial-temporal clusters within administrative divisions in the region of Murcia, Spain, while considering the residential addresses of cases during pregnancy, early childhood and diagnosis.

Methods

The Pediatric Environmental Health Specialty Unit is carrying out an ongoing research project on the environment and pediatric cancer, collecting a pediatric environmental history (PEH) to create regional maps and analyze the geographical distribution of incident cancer cases in the region of Murcia. Between 1998 and 2010, 117 children were diagnosed with leukemia. Pregnancy, early childhood and diagnosis addresses were collected. Spatial and spatial-temporal clusters were then evaluated using the statistical software SatScan®.

Results

Leukemia was most common in children under 5 years of age. The incidence rate was 40.1 per 1 million children in the study period. Among subtypes of leukemia, ALL (Acute Lymphoblastic Leukemia) has a greater incidence in children, occurring in 31.5 per million in comparison to LAM, affecting 8.6 in every million children. The incidence rate of all leukemias and its subtypes increased in the time frame between 1998-2004 and 2005-2010. Spatial clusters were observed for leukemia in general and ALL when considering the pregnancy addresses and the census district; however, no clusters were identified for residential addresses during diagnosis.

Conclusion

The detection of spatial clusters in a localized area when examining the distribution of pregnancy addresses and census district areas lends proof to the hypothesis that fetal environmental exposure is likely implicated in the etiology of childhood leukemia.

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Cotinine, Cadmium and Polycyclic Aromatic Hydrocarbon Levels in Children's Urine as a Result of Environmental Tobacco Smoke Exposure in Two Spanish Locations

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Background

Children are especially vulnerable to secondhand smoke (SHS) due to their reduced ability to metabolize and excrete toxic chemicals. Children exposed to SHS are at increased risk of developing asthma, sudden infant death syndrome, and ear and respiratory infections.
In Spain, after 2011, a stricter anti-smoking legislation led to a reduction in the exposure in public places, however this reduction was not observed in private environments, and children are mostly exposed to SHS at home.

Methods

In the framework of the Demonstration of a Study to Coordinate and Perform Human Biomonitoring on a European Scale project (DEMOCOPHES), urinary levels of cotinine, cadmium and polycyclic aromatic hydrocarbon (PAH) metabolites (1-hydroxypyrene and hydroxyphenanthrene isomers) were studied in relation to SHS exposure. First morning urine samples corresponding to 120 children aged 6-11 years in urban (Madrid city) and rural (Añover de Tajo, Toledo) areas were collected from October 2011 to January 2012. Sociodemographic and environmental tobacco exposure data were collected by an epidemiological questionnaire. Cotinine levels were analyzed by high resolution liquid chromatography coupled to mass spectrometry in tandem mode and cadmium was determined by dynamic reaction cell inductively coupled plasma mass spectrometry. For PAH metabolites, high performance liquid chromatography-fluorimetric detection analyses were performed. Ethical approval was granted by the Ethical Committee of the Instituto de Salud Carlos III.

Results

The geometric mean for cotinine was 685.8 µg/g creatinine for smoker mothers and 0.6 µg/g creatinine for non-smoker mothers (max 3779.0 and 4.1 µg/g creatinine, respectively). In children, the geometric mean for cotinine was 4.62 µg/g (smoker mother) and 0.86 µg/g (non-smoker mother) with maximum values of 86.28 and 10.91 µg/g creatinine, respectively. For all children, the geometric mean (confidence interval 95%) for cadmium was 0.05 µg/g creatinine (0.04-0.05), for 1-hydroxypyrene 0.15 µg/g creatinine (0.10-0.24) and 0.22 µg/g creatinine (0.13-0.37) for hydroxyphenanthrene isomers. Significant differences were observed

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regarding residence area, age, number of smokers per household and their smoking habits.

Conclusion

The home environment is a significant predictor of the cotinine levels in children and therefore efforts are required to protect children from SHS exposure in scenarios out of the scope of application of the current anti-smoking legislation.

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Preventing Exposure to Environmental Hazards — Role of Primordial Prevention

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Protecting children from environmental hazards requires individual clinicians to be alert to environmental causes of disease, but it also is important to adopt broad-based societal interventions; this is considered primordial prevention. Primordial prevention aspires to establish and maintain conditions to minimize hazards to health. It consists of actions and measures that inhibit the emergence and establishment of environmental, economic, social and behavioral conditions.

In the field of environmental health, population-levels actions are needed to address, for example, the problem of global climate change. Clinicians can raise awareness and be effective advocates for action on the national and international level to promote energy efficiency and renewable energy production while decreasing incentives for continued production and consumption of carbon-intensive fuels. The American Academy of Pediatrics issued a policy statement and technical report on the health effects of climate change on children that encourage child health care professionals to engage in efforts to reduce national C02 emissions, and major medical journals and organizations have highlighted the importance of health professional involvement. In 2015 Pope Francis spoke out on the threats of global climate change to future generations in his encyclical Laudato Si, On the Urgent Need for Care of Our Common Home. When clinicians address these concerns and work to reduce the country's use of fossil fuels that

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result in C02 pollution, they are practicing primordial prevention.

The influential role child health professionals are playing in national and international efforts to reduce environmental threats to children is not new. In 1957 the American Academy of Pediatrics (AAP) launched this field when it formed a Committee to educate providers about the importance of recognizing, treating and preventing exposure to radiation, the first environmental hazard to be noted by AAP. In 1998 Pediatric Environmental Health Specialty Units were established by the Agency for Toxic Substances and Disease Registry and the U.S. Environmental Protection Agency to provide resources about children's environmental health to clinicians and communities. In 1999 the American Academy of Pediatrics published the first Handbook of Pediatric Environmental Health; a 3rd edition was published in 2012. A Textbook of Children's Environmental Health was published in 2014. Many international bodies have endorsed the need for healthier environments for children and called for actions to reduce children's exposures to environmental hazards.

Primordial prevention is an integral part of the practice of pediatrics. It is foundational to addressing the major environmental health problems facing children today.

Radiation Imaging Communication (Cooperation) in Pediatric Healthcare: Awareness, Accountability, and Action

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Background

Professional responsibilities for safe and effective diagnostic imaging consist of three A's: radiation awareness, collective accountability for protection of our patients (both adult and pediatric), and actions to achieve this end. These have been fundamental responsibilities in diagnostic imaging since the discovery of x-rays over 120 years ago. Concurrently, there have been remarkable advancements in imaging procedures that use ionizing radiation, including x-rays (radiography), fluoroscopy, and computed tomography (CT). This imaging portfolio clearly improves management and saves lives minute by minute, day by day across the world. Rapidly evolving technology affords both opportunities for improved service, but also challenges with the fundamental responsibilities for radiation safety. The principle components of radiation protection in medicine consist of justification (the imaging procedure is indicated) and optimization (the procedure is done in an appropriate fashion to balance diagnostic

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quality with risk considerations, including radiation exposure).

Methods/Results

Both justification and optimization are embodied in the action aspect of our professional responsibilities. Justification is really a shared duty between all stakeholders, including healthcare providers who request imaging procedures and members of the imaging team. While the branding using "justification" seems relatively simp, it is actually quite complicated. There are a myriad of factors which come into play in determining which of any imaging modality is appropriate. Many of these are global, and some are regional, such as in the US with defensive medicine. The fundamental success for justification requires communication between healthcare providers (e.g. decision support) as well as the children we care for and their care providers.

Conclusions

Development on both fronts requires consensus efforts (cooperation); a partnership of shaking hands rather than pointing fingers and assigning blame. Success may be more effectively and efficiently realized through a fourth A: assurance. This is exemplified through the Image Gently Alliance and the Alliance's mission for radiation education awareness as an advocate in the care of children. Such efforts can serve as global models for improved imaging care of children.

Radiation Risk and Strategies for Informed Use of Medical Imaging in Children: What Care Providers Should Know

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Background

Diagnostic imaging is lauded as one of the most important advancements in medical care for both adults and children. The benefits are accompanied by risks, such as the potential cancer risk from the incumbent exposure to ionizing radiation. Radiation risk in diagnostic imaging can be approached through a review of patterns of use, radiation dose measurements and doses delivered, potential risk, and strategies to mitigate risk.

Methods/Results

The use of medical imaging, especially CT, has increased rapidly and globally over the past three decades for a variety of reasons. In the US, CT now accounts for 25% of the per capita exposure annually, included background (natural) sources. Exposures in medical imaging are considered low level radiation although CT is a relatively greater radiation exposure than x-rays, or fluoroscopy. Approximately

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5-10% of CT examinations are performed in children. Based on data from several sources, especially atomic bomb survivors, a risk, at most small, has been attributed to medical exposures in the range of some of the higher dose procedures such as CT for children (in general a more vulnerable population). The principle components of radiation protection in medicine consist of justification (the imaging procedure is indicated) and optimization. That is, the procedure is done in an appropriate fashion to balance diagnostic quality with risk considerations including radiation exposure.

General considerations for appropriate performance consist of minimizing the exposure time or views (e.g. fluoroscopy); examining only the necessary area; and adjusting the radiation exposure to the region scanned, clinical question(s), and the size of the child. Specific measures for CT include adjustment of scan settings, restricting multiple series taken of the same area, and avoiding overlapping of scan regions. There are special considerations for children in performing CT examinations such as the use of IV contrast media that must be not be neglected. There are also new technologies to help optimize the balance between dose and quality. Recently, dose monitoring programs for all patients have become a responsibility for the medical community. Finally, informed strategies supplementing requisite regulatory, guidance and accreditation components must include education.

Conclusions

Understanding and implementing appropriate strategies when imaging children will help in optimizing the value in medical care.

Communicating Radiation Risks in Paediatric Imaging

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Background

The use of ionizing radiation diagnostic imaging procedures for children has rapidly increased globally during the past 20 years, including computed tomography as a valuable tool for assessing paediatric illness and injury, as well as paediatric image-guided procedures, which may replace more complex surgical options. While the clinical value of imaging involving the use of radiation for paediatric health-care is unquestionable, this is often juxtaposed with children's relative increased susceptibility to radiation, including the potential for cancer from low-level exposures. While individual radiation risks are

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at most quite small, radiation protection in paediatric imaging is a public health issue due to the large population exposed and public concern. This demands policies and actions that recognize, maximize, and promote the multiple health benefits that can be obtained, which at the same time minimize potential health risks of the radiation exposure with the ultimate purpose of ensuring that the benefit outweighs potential harm. Radiation risk communication has a key role to inform the appropriate risk-benefit dialogue in healthcare settings. Healthcare providers requesting and/or performing radiological imaging procedures in children have a shared responsibility to communicate radiation risks to patients, parents and other caregivers.

Methods/Results

WHO organizes this seminar to present the new document "Communicating radiation risks in paediatric imaging: information to support health care discussions about benefit and risk" available at http://www.who.int/ionizing_radiation/pub_meet/radiation-risks-paediatric-imaging/en/ . This document is intended to serve as a tool for healthcare providers to communicate risks associated with paediatric imaging procedures. The session will discuss the effective and balanced benefit-risk dialogue in paediatric imaging and how this can be achieved to improve health service.

Conclusions

This WHO communication tool will serve as a basis to further develop training packages to improve communication skills of health care providers, as well as advocacy and information materials targeting patients, parents, other caregivers and the public.

Birth and Growth Without OH: Detection and Follow-Up From Pregnancy Until the End of Adolescence of Children at Risk of Neurobehavioral Disorders Through Exposure of Alcohol and Illegal Drugs

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Introduction

This integrated study examines the prevention and detection/follow-up of children at risk of neurobehavioral disorders associated with prenatal and/or postnatal exposure to alcohol and illegal drugs. We utilized the Elijo Mas Sano (Choose Healthier) registry of children at environmental risk from drugs and alcohol.

Methods

For this descriptive study of environmental clinical history we observed the first 39 patients of Elijo Mas Sano. We included clinical, social and neurodevelopmental evaluations. The Elijo Mas Sano criteria of inclusion was a) >20 g/day of alcohol and/or 3 incidents of binge drinking of ≥40 g/day during periconceptional, gestational, or lactation stages and/or b) fetal exposure to any illegal drug at least once a week. Ethical approval was granted by the Clinical Research Ethics Committee of the University Hospital Virgen de la Arrixaca.

Results

The study group was comprised 39 subjects, 19 girls and 20 boys. The gestation period was an average of 38.26 weeks (min. 30; max. 41). There were 5 premature newborns (<36 gestation week). The average birth weight (≥36 gestation week) was 3,055 g (min. 2,433.9; max. 3,676.1). The average consumption of alcohol at early pregnancy in mothers was 33.55 g (confidence interval 95% 23.7-43.2).

In the study group, 33% reported 3 or more incidents of binge drinking. Fetal exposure to illegal drugs was 18%. Four patients had neonatal anthropometry (≥36 gestation week) with an average head circumference of <p10, a birth weight of <p10: 9, and 3 patients had a height of <p10. There were 6 patients with major congenital malformations. Two patients had chromosomal comorbidities.

We evaluated 37 of the 39 patients' facial features: palpebral fissure (<-2 standar deviation): 2, philtrum (4-5): 2, upper lip (4-5): 4. The Battelle test neurodevelopmental evaluation was given to 30 of the 39 subjects to examine personal and social, adaptive, motor, and communication domains. Twenty-eight showed delays on one domain and 21 in 3 or more. A negative correlation existed between g/day of ethanol and months of cognitive delay (-0.37, $p<0.05$). In the study, 35% had an average cognitive delay of -8.5 months (confidence interval 95% -0.5;-16.5).

For some of the study group participants, growth curves and head circumference showed normalization by 2 years.

Conclusion

Half of the children from the Elijo Mas Sano registry have neurodevelopmental delays before the age of 2. The program of prevention and harm reduction of intrauterine exposure to alcohol and other drugs has been implemented with good preliminary results: decreased alcohol consumption during pregnancy and syndromes and alcohol-related birth defects. The next step is to follow-up to children who are at risk of fetal alcohol spectrum disorders through adolescence.

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BORN WITHOUT OH: an Innovating Model for Preventing and Managing the Neurodevelopmental Disorders Caused by Alcohol and Drug Prenatal Exposure In a Mediterranean Region

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Background

Born without OH is a comprehensive program of prevention, reduction of harm and management of neurobehavioral disorders associated with prenatal exposure to alcohol and other drugs through the pediatric environmental health from the beginning of pregnancy until the end of adolescence. Our objective is to prevent and reduce damage from exposure to alcohol and other drugs during critical periods of development (periconceptional until the end of adolescence).

Methods

Beginning in 2009, at the University Clinical Hospital Virgen de la Arrixaca (Murcia, Spain), the GREEN SHEET was implemented in hospital and primary care. It is a set of basic and concise questions for women in the 1st trimester of pregnancy to detect the environmental risk factors related to alcohol and other drugs in early pregnancy. Those with high-risk criteria of prenatal exposure to alcohol and other drugs pass to a follow-up program called ELIJO MAS SANO (CHOOSE HEALTHIER): early and comprehensive intervention for the management and monitoring of pregnant women and / or children at risk of fetal alcohol spectrum disorders (FASD).

Results

In the follow-up of 200 children in the program ELIJO MÁS SANO, there was a significant decrease ($p < 0.05$) in women who drank some alcohol in early pregnancy and the amount of alcohol drunk by the couple. There was a decrease in the number of newborns with congenital heart disease associated with intrauterine exposure to ethanol controlled by the number of births and abortions. There were 6 children diagnosed with fetal alcohol syndrome (FAS) (in 1500 pregnant couples), estimating a prevalence of 4 cases of FAS per 1,000 newborns in the region of Murcia.

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Conclusions

The Born without OH programme has been implemented with good preliminary results: reducing the consumption of alcohol during pregnancy, decreased congenital heart diseases related to intrauterine exposure to alcohol and registration of syndromes and alcohol-related birth defects.

Temporal Trends of Organochlorine Compounds and Polybrominated Diphenyls from Utero until 4 Years of Age in the Asturias INfancia y Medio Ambiente Cohort

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Background

Persistent organic pollutants (POPs) include a wide range of compounds typically produced for agricultural and industrial applications. These compounds have diverse deleterious health effects and are persistent in the environment. Moreover, due to their lipophilic nature, they bioaccumulate in humans in utero and during the breastfeeding period. Assessment of the significance of these early accumulation processes is important for understanding the main mechanisms leading to the human body burden of these pollutants and for identification of toxic stresses in the early life period.
Accordingly, in utero POP accumulation has been addressed in previous cases, but extension of these studies to longer life periods has been rarely considered. Nevertheless, evaluation of the body burden of these pollutants at different early life stages is important for obtaining comprehensive descriptions of the processes involved in their build-up and assessment of their potential health effects.

Methods

In the present study we are described one of these cases. Organochlorine pesticides, polychlorobiphenyls and polybromodiphenyl ethers were measured in maternal serum, placental tissue, cord blood and the serum of 4 year-old children from a cohort in Asturias sampled within the INfancia y Medio Ambiente Project. Ethical approval was granted by the Ethics Committee of San Agustin hospital, and each participant provided informed consent.

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Results
Maternal and children serum burdens were determined. The influence of maternal breastfeeding and other socio-demographic determinants in the accumulation of these compounds through time was evaluated. At 4 years of age, formerly breast-fed children were found to have higher POP concentrations and total burdens than non-breastfed children.

Conclusion
The significance of these general trends for each individual pollutant was identified.

TiPP TAPP-First Steps Into Life

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Background
In April 2008, a home visit activity was launched as part of the social area oriented work approach "TippTapp". This preventive program combines low-threshold health counselling for families with babies and screening on youth welfare topics.

Methods
The program is currently located in disadvantaged areas of Bremen, Germany. Pediatric nurses offer to visit families and their babies at the age of 6 weeks, 6 months and 12 months. Parents decide if they would like to take part. There is no obligation to take part in the program.
Because of their regional work, our pediatric nurses provide explicit knowledge about helpful offers in their particular region. During our visit in the families' homes, we get a chance to discover circumstances of different origins that might influence the health and development of children.
A standardized documentation sheet is used. Important development and safety topics are discussed. A differentiation of subjects mentioned by parents is important to grasp the needs of the family and to initiate appropriate help.

Results
In 2014 there were visits in 46, 63% (n=2041) of 4345 invitations. Besides many helpful hints, 13 cases were reported to youth welfare. In 4 of them, help was given, although the parents did not agree.

Conclusion
The content of our work is transferable. The gained knowledge may be helpful in questions of urban

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development. Individual and general support of families can be positively influenced. In an upcoming cohort study in Bremen, TiPP TAPP is part of the set of interventions.

Forests for Health with the Environmental Midwife

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Background

Forests for Health (FFH) is a project within the program "Nacer sin OH" (Births without OH), promoted by the Pediatric Environmental Health Speciality Unit of the Clinical University Hospital Virgen of Arrixaca (Murcia, Spain). This project intends that each child born and raised will be linked with a tree: incorporating a forest within each of the maternity hospitals of the Region of Murcia (Spain), creating healthy environments as protective factors during infancy, thus building health equity and promoting the enjoyment of natural heritage and regional biodiversity.

Objective

To foster the linkage of pregnant partners with nature and their future children from birth through adolescence, stimulating contact with nature as a preventive and therapeutic tool to achieve health, wellness and quality of life.

Methods

The environmental health midwife and various maternity healthcare professionals collaborate, giving the family a pine seedling, linked with the birth of a child, and an information package containing educational and prevention materials in line with the goals of the program. Subsequently they contact and invite parents to the replanting day, with the aim of creating forests for health.

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Results

From 2015 to 2016, approximately 2000 pine seedlings were given to families. There have been 3,637 newborns. Approximately 450 trees have been planted in the FFH, with 4,694 tons CO2/year absorbed.

Conclusion

As health professionals, midwives are vital in accompanying pregnant couples and influencing the stages of preconception, pregnancy, childbirth, postpartum, throughout the cycle of sexual and reproductive health. The simplicity of the project allows it to be feasible and transferable for families, especially during such a receptive period.

Factors Influencing Breastfeeding Initiation

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Background

Breastfeeding is a unique and priority nutrition during the first year of life. However, its initiation and duration is determined by the interaction of multiple constitutional and environmental factors (physical, chemical, biological and psychosocial). Children are greatly vulnerable to environmental factors during the periods of pregnancy and lactation. Our aim is to study the protective and risk factors related to the initiation of breastfeeding in the Murcia Region.

Methods

A cross-sectional study of 99 women from the Region of Murcia, consisting of a personalized "face to face" interview with mothers at the time of hospital discharge, which were done by a nurse utilizing a carefully crafted questionnaire instrument called "the green page".

Results

About 90% ofmothers had the intention of exclusively breastfeeding prior to giving birth, 5% partial breastfeeding, and 5% no breastfeeding. However, only 51% exclusively breastfed, 36% partially breastfed, 8% predominately breastfed, and 5% did not breastfeed. Especially during the immediate and

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early postpartum period, difficulties can arise such as the ones found during our study. About 27% of the mothers had problems breastfeeding, and of those mothers, 6% experienced pain in the nipple area, in 5% the newborn had issues latching on, 5% had cracks in the nipple, and 5% had irritated nipples.

Conclusion

Addressing multiple factors that affect breastfeeding can positively influence the initiation and duration of breastfeeding. As health professionals, we are able to promote breastfeeding and thus improving the quality of life of our children.

Human Biomonitoring Data Analysis for Metals In an Italian Adolescents Cohort: an Exposome Approach

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Background

In the framework of the Cross-Mediterranean Environment and Health Network-Life (CROME-LIFE) project, a cohort of 453 adolescents aged 13-15 years living in urban (Rome) and rural (Viterbo) areas from the Italian Programme for Biomonitoring of Exposure (PROBE) was enrolled to examine metals exposure. Children are more vulnerable to environmental stressors than adults, and have less control over their environment. Although evidence indicating the impact on children's development is growing, there is still only a partial understanding of the environmental risks to children.

Methods

Non-fasting blood specimens obtained by the National Microcytemia Association during the annual screening for microcytemia in schools (2009-10) were analyzed for nineteen metals by sector field inductively coupled plasma mass spectrometry. Administered questionnaires included information such as sex, diet habits, lifestyle factors and parental occupational status. Socio economic status of the family was derived by merging the educational level and occupational status of the parents. The Ethics Committee of the National Public Health Institute of Italy (ISS) has approved the project.

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Metal concentrations in blood were statistically evaluated. Basic statistics were used to obtain reference values where the 95th percentile describes the upper value to be used in health care and environmental policy. Data on the study participants were geo-referenced on the basis of their residence address and the data were stored in a geo-database along with human biomonitoring data, dietary habits, environmental pollution and land cover data. In the frame of the Cross-Mediterranean Environment and Health Network LIFE+project, an exposome-wide analysis was performed to identify the associations between metal concentration levels in blood and several exposure determinants including land cover, milk and fish consumption, both considering them individually and in combination to explore potential synergies between covariates. Ethical approval was granted by the Ethical Committee of Istituto Superiore di Sanità, Roma, Italy.

Results

Results show robust statistical associations of chromium with the dietary pathways analysed and land cover, showing that both out-of-region and local sources can be associated with the observed human biomonitoring levels of chromium in the population. Other robust associations were found between tungsten and co-exposure to contaminated milk and proximity to industrial activities and mercury, with a more complex interaction between co-exposure to different dietary pathways (milk and fish) coupled with proximity to industrial activities. No pathway alone was dominant, but the combined effect results in statistically significant associations with blood concentration levels of mercury. The associations of nickel with dietary pathways (co-exposure to milk and fish) and platinum with fish and industrial activities and enhanced traffic, even though statistically significant ($p < 0.05$), fail to meet the statistical robustness test. None of the other metals showed statistically significant associations with dietary patterns and/or land cover information.

Conclusion

All metals analyzed in this study are environmental pollutants posing high concerns with regard to their effects on human health. Their distribution in the environment is a result of natural processes and anthropogenic activities. However, in addition to environmental sources,other factors such as individual lifestyles, diet, and socio-economic factors need to be taken into account as they contribute to the levels of metals found in the human body.

The results obtained thus far support the utility of an exposome approach to get a more accurate and holistic perspective in order to determine the association between population exposure and its determinants using human biomonitoring studies

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Early Life Exposure to Multiple Environmental Contaminants and Birth Outcomes: Pooled Analysis In Four Flemish Birth Cohorts

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Background

Prenatal chemical exposure has frequently been associated with reduced fetal growth, although results have been inconsistent. Most studies associate single pollutant exposure to these health outcomes, even though this does not reflect real life situations, as humans are exposed to thousands of pollutants during their life time. The objective of this study is to investigate the association between prenatal exposure to a mixture of environmental chemicals and birth weight.

Methods

We used exposure biomarker data obtained from cord blood samples of 2033 women from three Flemish birth cohorts (FLEHS I, II & III) and a regional birth cohort (3xG). The common set of exposure measures in these cohorts are the organochlorine compounds (three polychlorinated biphenyl (PCB) congeners (138, 153 and 180), hexachlorobenzene (HCB), p,p'-dichlorodiphenyldichloroethylene (p,p'-DDE)) and the heavy metals cadmium and lead. Birth weight was assessed as a proxy for reduced fetal growth. Elastic net regression was used to assess the effect of multipollutant exposure on birth weight. Ethical approval was granted by the ethical committee of Antwerp University (Hospital) and of the local hospitals.

Results

In the pooled database, birth weight ranged from 1245 to 5575 g with a median of 3430 g. The median

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contaminant levels in cord blood were: 26 ng/g lipid for PCB 153, 15 ng/g lipid for PCB 138, 18 ng/g lipid for PCB 180, 90 ng/g lipid for p,p'-DDE, 17 ng/g lipid for HCB, 0.045 µg/L for cadmium and 9 µg/L for lead. In single pollutant models, the three PCB congeners were significantly associated with reduced birth weight. The correlations between the different pollutants were low to moderate (r = 0.11 – 0.59), except for the three PCB congeners which were highly correlated with Pearson correlation coefficients ranging from 0.74-0.84. From all exposure measures, the two PCB congeners PCB 153 and PCB 180 were most consistently associated with birth weight based on elastic net regression.

Conclusions

Assessing the health risk of combinations of exposure biomarkers better reflects real world situations. The findings allow for more effective risk assessment as addressing the critical chemicals in a mixture of pollutants is pivotal for risk assessment.

Acknowledgements

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Psychosocial Stress and Obesity in Kaunas Children

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Background

Recent research has found that family socioeconomic status, parenting stress and other environmental factors can have impacts on child development. The aim of this study was to assess the association between psychosocial stress in the family and risk for obesity among 4–6 year old children.

Methods

This nested case-control study included 1,489 Kaunas Cohort Birth Study children followed-up for 4–6 years. We used the Parent-Child Dysfunctional Interaction subscale of the Parenting Stress Index (short form) and questionnaires on child development to assess risk factors for children obesity. The body mass index status for age was calculated and the risk factors for being overweight/obese were

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estimated. Logistic regression models were fitted to examine the associations as odds ratios (OR) between the parent-child relationship and the risk of overweight, adjusted for relevant covariates. The Kaunas Pregnant Women Birth Cohort had 3 ethical approvals conducted by the Lithuanian Bioethics Committee.

Results

A total of 6.8% of the children were overweight and 5.4% were obese. Children from smoking families with lower education faced almost double the risk of obesity. The stratified multivariate model showed that, with reference to the group of high educated and normal parent-child relations, low educated and pathological parents-child relationships were statistically significant risk factors for overweight children of 4–6 years old (OR 2.43; 95% confidence interval 1.31–4.51).

Conclusion

Maternal tobacco smoking and pathological parents-child relations may be predictors of overweight and obesity throughout the developmental trajectory of childhood. Measures to quit smoking and psychosocial stress management should be encouraged among pregnant women to decrease their children's obesity risk.

Influence of Gestational Weight Gain on the Transfer of Organochlorine Pollutants to Infants

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Background

Transplacental transfer and breastfeeding are the main transport routes of organic pollutants to children at the beginning of life. These transmission mechanisms primarily depend on the maternal pollution burden, but its impact may be modulated by physiological effects. We found that gestational weight gain (GWG) exerts a considerable influence on the content of hydrophilic and low volatile pollutants in cord blood and breast milk.

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Methods

We measured levels of 14 organochlorine pesticides, 7 polychlorobiphenyls and 14 polybromodiphenyl ethers (PBDEs). Persistent organic pollutant neonatal concentrations were inversely associated with GWG after adjustment for age, pre-pregnancy body mass index, educational level, and fish consumption. On average, neonates of women with high or recommended GWG as defined by the Institute of Medicine had lower persistent organic pollutant concentrations than neonates of mothers with low GWG. This study was approved by the ethics committees of the Clinical Research Ethical Committee of the Municipal Institute of Health Care, the Ethics Committee of the Donostia Hospital and San Agustin Hospital, and informed consent was provided by every participant.

Results

Colostrum from mothers with low GWG also had significantly higher concentrations of polychlorobiphenyls and 4,4'-dichlorodiphenyldichloroethylene than colostrum from mothers who gained weight within Institute of Medicine recommendations or in those who exceeded this threshold. Statistically significant differences were also found in the colostrum: maternal serum ratios of these compounds. Women with low GWG retained higher pollutant amounts in colostrum.

Conclusion

The higher mobilization of stored organic pollutants observed in pregnant women with low GWG plays a role for in utero pollutant exposure and during breastfeeding. The present findings suggest an association between infant exposure to persistent organic pollutants and inadequate GWG, encouraging pregnant women to meet the recommended Institute of Medicine guidelines to reduce the accumulation of these pollutants in newborns and during breastfeeding.

Environmental Health Issues for Spain

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Background

In general, children in Spain have the same environmental health conditions as other European children. However, they undergo some specific pollution stresses that must be considered for the implementation of adequate public health policies.

ED_001703B_00003277_061_03cb37b7-e44a-1c12-df93-df7e47508d41

Methods

This presentation combines relevant information from the scientific literature and the results of the studies developed at the IDAEA.

Results

One of these stresses concerns mercury exposure. With the only exception of Portugal, the concentrations of this metal in hair from children living in Spain are considerably higher than in children from other European countries, and the differences are strong. In Spain, the high mercury content observed in children's hair, and also cord blood, is rather uniform independently of location. These high mercury concentrations are likely related with high fish and seafood consumption. Often, Mediterranean fish sold in Spanish market places, both oily and lean fish, contain mercury concentrations above the EU regulations for human consumption. Impaired intellectual development due to mercury exposure has been observed in children from Granada, but not in children from other Spanish cohorts.
Another specific pollution stress of children living in Spain is exposure to hexachlorobenzene. Examination of cord blood serum concentrations of this compound shows higher levels than in European children. In this case, the differences are significant when comparing newborns from different Spanish locations. In utero exposure to hexachlorobenzene has been observed to be related with lower birth size. It has also been associated with higher incidence of overweight, alteration of thyroid hormones, attention deficit hyperactive syndrome and poorer social behavior in four-year-old children from Spanish cohorts.

Cotinine content, and therefore exposure to tobacco smoking, is also high among Spanish newborns, although when compared with other European cohorts, the difference is not as strong as in the previously mentioned pollutants.

Exposure to polychlorobiphenyls, hexachlorocyclohexanes, dichlorodiphenyltrichloroethane/ dichlorodiphenyldichloroethylene, perfluorohexane sulfonate, perfluorooctane sulfonate, perfluorooctanoate, perfluorononanoate, bisphenol A, polybromodiphenyl ethers or cadmium in children from Spanish cohorts is similar to that observed in other European countries.

In recent studies, lower development of working memory and higher inattentiveness has been observed in children from Barcelona exposed to high levels of traffic pollutants, namely nitrogen dioxide, fine aerosol particles and polycyclic aromatic hydrocarbons. These effects are probably common in all children living in urban areas under strong traffic pollution.

Conclusions

In the context of health conditions that are comparable to those of other EU children, the specific pollution stresses described in this review deserve specific attention from the health authorities.

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Environmental Exposure and Neurodevelopment in the Mothers and Children's Environment and Health Study

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Background
The Mothers and Children's Environment and Health study is a prospective multicenter cohort study of pregnant women with follow-up of their offspring in Korea.

Methods
During 2006 to 2010, 1,751 pairs of mother and child were recruited. Various environmental factors including biomarkers in blood and urine and health outcomes including neurodevelopment and allergic diseases were checked throughout periods of childhood. The Korean Bayley Scale of Infant Development, 2nd edition was performed at 6, 12, 24, and 36 months of age, and intelligence quotient was measured using the Korean version of the Wechsler Preschool and Primary Scale of Intelligence, revised edition and Korean - Wechsler Intelligence Scale for Children IV at 62 months and after.

Results
We found significant effects on children's neurodevelopment in association with maternal exposure to lead, iron, manganese, cadmium, phthalates, secondhand smoke, air pollutants such as nitrogen dioxide and PM10, as well as maternal stress and depressive symptoms, job strain during pregnancy, and postnatal breastfeeding duration.

Two preliminary studies suggested association with prenatal lead, cadmium, and iron exposure with children's cognitive development at 5 years of age. Currently, children in the Mothers and Children's Environment and Health study are between 7 to 10 years old, and are being measured on their social responsiveness and behavior using the Social Responsiveness Scale, Attention Deficit Hyperactivity Rating Scale and Child Behavior Checklist. Future analyses should consider multiple exposure factors, times of exposure, and various dimensions of neuro- behavioral- cognitive- development.

Conclusion
A new nationally representative birth cohort study, the Korean Children's Environmental Health Study, was initiated in 2015. Follow-up will be conducted at every growth stage for the following 17 years based

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on the experiences of the Mothers and Children's Environment and Health study, which is expected to provide statistically powerful and generalizable evidences in environmental and children's health.

Children's Exposure to Endocrine Disrupting Chemicals. 'Women in Europe for a Common Future - WECF' is Working with Physicians, Scientists, NGOs and Media For Better Policy and More Protection

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Background

Studies show that Endocrine Disrupting Chemicals (EDCs) play a role in disrupting human brain development, deterioration of male and female reproductive health, increased incidence of male and female hormone related cancers, and the increase in cardiovascular disease, obesity and diabetes. The most vulnerable groups are pregnant women, fetuses and children. Better regulation is urgently needed. The EDC criteria to classify EDCs for being banned/regulated under the EU pesticides and biocides regulations proposed by the European Commission in June this year are negligible, not protective and ignore precautionary principles. Since the EDC criteria should function as a blueprint for other EU regulations and probably even in countries outside the EU, pressure from all public interest groups is urgently needed now. The WHO is calling the ubiquitous presence of EDCs in daily products and food a "global threat". Scientists and scientific associations like FIGO and the Endocrine Society are calling for political action for better protection as well as on action from doctors on awareness raising. The voice of scientists and doctors is needed more urgently than ever.

Methods

Women in Europe for a Common Future is active on a national and European policy level around EDCs and on an international level within the framework of the United Nations Environment Programme chemical policy process Strategic Approach on International Chemicals Management (SAICM) to achieve better protection of children from EDC exposure. Within several projects, WECF works on different target groups to raise awareness, improve the legal situation and give concrete information to consumers. Together with other NGOs (www.edc-free-europe.org, www.ipen.org/search/node/EDCs), WECF aims to increase the pressure for policy makers to take responsibility in protecting human health and the environment from EDCs.

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Results

WECF informed thousands of people who work and live with children about hazardous chemicals in products and ways to reduce the exposure via its Nesting programme (www.projetnesting.fr). It delivers websites in several languages, a mobile phone app, workshops for parents and health and educational experts and information materials. On a policy level, WECF advocates for better regulations and for their enforcement.

Conclusion

The presentation aims to give an overview of recent EDC policy developments, EDC awareness raising and media activities, and scientific advances around EDCs, as well as political action taken so far. We will also show how strengthened cooperation between NGOs, physicians, media and policy makers is possible.

Ambient Air Pollution and the Onset of Asthma, Hay Fever, and Allergic Sensitization in Birth Cohorts: A Systematic Review and Meta-Analysis

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Background

The causal role of ambient air pollution on the onset of asthma and allergic conditions continues to be debated. We provide a systematic review and meta-analysis of birth cohort studies with follow-ups from birth to adolescence.

Methods

In a previous systematic review by Bowatte et al. (2015), 19 birth cohort studies published from 1960 to March 2014 were identified. Using the same methodology, we extended this search up to January 2016, which allowed several key new studies to be considered. Random effects meta-analysis was used to obtain combined estimates.

Results

A total of 338 references published between April 2014 and January 2016 were identified. Of these, 88 were duplicates and 216 studies did not meet the inclusion criteria. Manual searches identified 4 additional papers. These new studies were added to those previously identified by Bowatte et al. (2015). Ultimately, 27 eligible papers were included in the systematic review, 15 of which could be used in meta-analyses.

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Combined associations between asthma with particulate matter ($PM_{2.5}$ (1.11 (95% confidence interval 0.97, 1.26) per 2 µg/m³ increment) and nitrogen dioxide (1.08 (95% confidence interval 0.96, 1.20) per 10 µg/m³ increment) were not significant. Also for wheeze, the combined association was not significant neither for $PM_{2.5}$ (1.13 (95% confidence interval 1.00, 1.28) per 2 µg/m³ increment) nor for nitrogen dioxide (1.08 (95% CI 0.98, 1.18) per 10 µg/m³ increment). None of the combined associations with allergen sensitization or hayfever reached statistical significance. There were too few birth cohort studies on eczema to conduct a meta-analysis.

Conclusion

Despite the existence of a wealth of high quality, large, longitudinal birth cohort studies, the epidemiological evidence supporting an association between traffic-related air pollution with asthma and other allergic health outcomes remains insufficient to confirm a causal association.

Personal Exposure to $PM_{2.5}$ and Benzo[a]pyrene in Ostrava, Czech Republic

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Background

Benzo[a]pyrene (B[a]P) is a proven human carcinogen. In the air, it is associated with particulate matter ≤ 2.5 µm ($PM_{2.5}$). High concentrations of both compounds found in the Ostrava region, CZ, have led to concern in the local population. To support the local needs for a communication platform, we started a case study of the CITI-SENSE project "Citizen Observatories for Quality of Life", with a special study on personal exposure and monitoring in schools.

Methods

Twenty non-smoking adult volunteers were recruited in the most polluted part of Ostrava to participate in three biomonitoring campaigns. All participants completed a personal questionnaire and time-location-acitivity diary. High precision personal monitors for $PM_{2.5}$ were used next to the new sensor technology for NOx assessment. Outdoor concentrations of $PM_{2.5}$ and B[a]P were measured using a high volume air sampler.

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Results

The campaigns were held in winter 2013, summer 2015 and winter 2016. Average two-day personal exposures to $PM_{2.5}$ were 68.8, 45.3 and 37.4 µg/m^3, respectively. In 2013 and 2015, personal exposures to B[a]P were 5.5 and 1.3 ng/m^3. The outdoor concentrations for 2013 and 2015 were 35.4 and 17.6 µg/m^3 of $PM_{2.5}$ and 5.3 and 1.2 ng/m^3 for B[a]P in two weeks period during the campaigns. The highest concentration of B[a]P was found in kindergarten Ostrava Radvanice in February 2016 of 1.8 indoor and 5.9 ng/m^3 outdoor.

Conclusions

With use of low-cost sensors, we created a Citizens' Observatory to boost the cooperation between scientists, citizens and other stakeholders, to increase opportunities for environmental health governance. To improve relevance to the local population, we combined low-cost online measurements, with high precision instumentation, and with measurements and information campaigns in schools, all in cooperation with city authorities. Such activities provide the context necessary for communicating the results of the biomonitoring study to citizens as well as authorities.

Acknowledgement

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Minamata Convention on Mercury and Vulnerable Populations

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The Minamata Convention on Mercury is a global environmental health agreement, signed by 128 countries in October 2013 and currently under ratification. The treaty's objective is to protect human health and the environment from anthropogenic releases of mercury and mercury compounds.

The mercury treaty specifically provides for and highlights the need to protect human health. Special attention

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to health aspects addressed in Article 16 aims to promote the development and implementation of strategies and programmes to protect populations at risk, particularly vulnerable populations. An important requirement of the treaty is that information related to mercury and human health must not be kept confidential, thereby highlighting the public Right To Know about mercury impacts on their health.

The United Nations Environment Programme's global mercury assessment in 2013 identified artisanal and small-scale gold mining (ASGM) as the largest single sector that releases high mercury emissions from intentional use of mercury. The United Nations Industrial Development Organization identified artisanal and small-scale gold mining practices using mercury found in more than 50 countries, many of them developing and least developed countries.

Very often, gold extraction processes with mercury are operated within residential areas in the impoverished villages. Vulnerable populations, especially children, child-bearing age women and pregnant women are exposed to mercury all day long and in all seasons. Children grow up in a mercury polluted environment. Exposures to mercury from the womb and throughout life could lead to adverse health effects on children and their cognitive as well as neurological development. Long-term impact of mercury intoxication could lead to high socio-economic costs, fewer jobs and economic opportunity, family burden, less palliative care and lower quality of life. Countries with artisanal and small-scale gold mining need to develop special health programs for the impacted communities.

Birth Weight In Relation to Cord Blood Levels of Selected Elements In Slovenian Mother-Child Pairs

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Background

The purpose of the present study was to evaluate the impact of cord blood and serum levels of selected toxic and potentially toxic elements (manganese, copper, zinc, arsenic, selenium, cadmium, lead, mercury, magnesium, calcium and iron (III)) on birth weight in Slovenia, taking into account maternal socio-demographic characteristics and dietary habits due to various associations obtained in literature.

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Methods

Delivering women (18-45 years) were recruited primarily from the central part of Slovenia as part of the Public Health Impact of Long-Term, Low-Level Mixed Element Exposure in Susceptible Population Strata study (PHIME) (2007-2011). Cord blood (CB) samples were collected at delivery. Associations between birth weight and a) predictors obtained through the questionnaires and b) levels of the selected elements in CB samples were tested using univariate and multivariate analyses.

Results

In general, babies had normal birth weight (GM=3400 g), levels of selected elements did not represent health risk for the mother-child pairs. Linear regression analyses showed statistically significant positive correlations between the birth weight and number of children in family, maternal pregnancy problems, pregnancy body mass index of mothers, gestational age, level of maternal education; child's gender (boys were heavier) and negative correlations between birth weight and the number of bedrooms in their home. Among the elements tested, birth weight showed significant positive correlation with calcuim in CB serum and negative with iron (III) in CB serum.

Conclusion

The main predictors of the new-born's weight (length of baby, gender of the baby, gestational age, pregnancy and pre-pregnancy body mass, level of education) were expected, while the associations between birth weight and essential elements (calcium and iron (III)) in Slovenian birth cohort should be further evaluated in future studies.

Reality of Children's New Environment and Future Policy Needs

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Background

As professionals, we are confronted with increasing challenges in the fields of environment and health. Attempting to find the best way to solve numerous problems, new disciplines have been established. How can we make efficient policy to reduce risks and prevent harmful scenarios in the future? Some of us will still be alive and children that are five years old today will have their own young children in 2050. Besides knowledge, do we have the courage and imagination for an effective holistic approach to produce successful policy to preserve the environment for our children?

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Methods

Based on the premise that students are the decision makers of the future, this research examines and analyzes (using a questionnaire) students' opinions about public health priorities in the field of environment and health.

Results

The results present the initial phases of data collection and consider priorities in public health, especially in connection to environment. Preliminary results point to the necessity of giving priority to climate change, water safety, and other environmental challenges. The challenge of a fast changing environment due to climate changes is probably the most important. Children are growing up in different environments, full of risk consequences of climate changes and different disasters, as well as human migration, homelessness, discontinuation of schooling, unsecure health protection, etc.

Conclusion

Future policy should be comprehensive, foster adaptation and mitigation activities and aim to include children all along their education. Policy should be established by multi-sector stakeholders, in collaboration between education and health, with the primary aim to decrease health consequences on children, protect children's health and the whole population, now and in the future. We need a new approach to prepare students, children, professors and families for climate changes, and provide them with knowledge to raise their awareness. We should increase capacity to overcome all these rapid changes in the environment now, and prepare children for the future.

Association Between Breastfeeding Duration and Cognitive Development, Autistic Traits and ADHD Symptoms: a Multicenter Study In Spain

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Background

Several studies have related longer breastfeeding durations to better intellectual performance in children. However, whether this relationship is entirely attributable to socio-environmental factors remains under debate. Few studies have investigated the potential protecting effects of breastfeeding against behavioral problems such attention deficit hyperactivity disorder (ADHD) symptoms, and even fewer on autism spectrum disorders (ASD) traits, and the extent to which these effects are mediated by cognitive function has never been explored.

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Methods

This study examines the association between breastfeeding duration and cognitive development, attention, ADHD symptoms, and autistic traits using data from the Infancia y Medio Ambiente – Environment and Childhood – Project, a Spanish multicenter birth-cohort study, taking into account the intensity of breastfeeding. Duration of overall, predominant, and exclusive breastfeeding was documented during infancy through maternal questionnaires. Children (N = 1,832; mean age = 4.8 years) were assessed for cognitive development (McCarthy Scales of Children's Abilities), attention (Conners' Kiddie Continuous Performance Test), ADHD symptoms (criteria of the DSM-IV form list), and autistic traits (Childhood Autism Spectrum Test). Ethical approval was granted by the Clinical Research Ethical Committee of the Parc de Salut Mar.

Results

Several potential confounding factors were documented through parental interviews. After adjustment for confounders, longer duration of breastfeeding was associated with better cognitive development, reduced ADHD symptoms, and lower autistic traits. The latter effects appeared independent from each other.

Conclusion

This study provides further confirmation of a positive association with cognitive function over socio-environmental factors, and also suggests a protecting role against ADHD symptoms and autistic traits. Results are in agreement with recommendations of prolonged breastfeeding durations to promote child development.

Occupational Noise Exposure During Pregnancy - New Aspects in Children's Language Acquisition

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Background

Occupational noise in pregnancy may affect the child´s central auditory processing and language acquisition. There are no investigations on this topic. At present, work safety focuses on protecting maternal hearing.

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Methods

We conducted a cohort study among women working in the food industry, and as kindergarten teachers, musicians, dental nurses or pharmacists. We contacted 855 women with new-born children, 578 (68%) of which responded to baseline and 423 (73%) when their children were 12 months old. The final analyses included 406 mother-child pairs.

The baseline questionnaires focused on maternal occupational exposure and family factors. Language acquisition was measured by a validated questionnaire, Esikko, evaluating social communication, speech production and language comprehension. The mother filled out the questionnaire when her child was 12 months old. An occupational hygienist assessed noise exposure on the basis of maternal profession, job tasks and noise measurements using the categories: no exposure (<70dB, n=178), low exposure (>=70dB<=80dB, n=108), and moderate/high exposure (>80dB, n=120). We used linear regression, adjusted for mother's age, employment, child's gender and father's education to evaluate the association between noise exposure and children's language acquisition. Ethical approval was granted by the Ethics Committee of The Hospital District of Helsinki and Uusimaa.

Results

The adjusted mean language acquisition scores (range 0–57) were 34.3 (95% confidence interval (CI) 32.5–36.0) for no exposure, 34.8 (32.6–36.9) for low noise exposure, and 34.9 (32.8–37.0) for moderate/high exposure. There were no statistically significant differences among the exposure groups. This was also true in analyses of social communication, speech production and language comprehension among food industry workers' children. Noise exposure was suggestively associated with lower language acquisition scores among kindergarten teachers' children. Reading to the child was strongly associated with high language acquisition scores in the entire data.

Conclusion

We found no clear association between noise exposure during pregnancy and language acquisition among one-year old children. The study provides further results concerning two-year old toddlers.

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Persistent Pollutants in Food Items from Menorca Island

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Background

Organochlorine compounds and mercury are persistent pollutants of concern for their potential health effects. Organochlorine compounds are synthetic products used in industrial and agricultural applications whereas the environmental occurrence of mercury has been largely enhanced by human activities. Despite their different structure, these compounds share common properties such as high toxicity (several of them), persistence in the environment and are widely distributed on the planet. Furthermore, they bioconcentrate and biomagnify along the food chain. Dietary intake is therefore a major route of incorporation of these compounds in most human populations. However, it is important to ascertain what specific food items are the most relevant. This is particularly important for children since their organs and metabolism are still developing.

Body burden of dichlorodiphenyltrichloroethane and mercury in children from Menorca Island (western Mediterranean Sea) were considerably high when compared with cohorts from continental Europe (INfancia y Medio Ambiente and Cross-Mediterranean Environment and Health Network).

Methods

The present study therefore aimed to determine the content of organochlorine compounds and mercury in representative food items from Menorca Island. Foodstuffs including seafood, meat, vegetables, fruits and dairy products were collected in 2014. Fish were captured by local fishermen and all other food stuffs were produced on the island.

Organochlorine compounds analysis for the determination of pentachlorobenzene, hexachlorobenzene, hexachlorocyclohexanes, dichlorodiphenyltrichloroethaneand metabolites (Dichlorodiphenyldichloroethane and Dichlorodiphenyldichloroethylene) and polychlorobiphenyls were performed by gas chromatography–electron capture detector and gas chromatography–mass spectrometry. Determination of mercury was performed by inductively coupled plasma mass spectrometry.

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Results

Seafood was observed to be the foodstuff with highest organochlorine compounds and mercury levels. The most abundant organochlorine compounds were 4,4'-dichlorodiphenyldichloroethylene and polychlorinated biphenyl 153 with arithmetic means of 1.01 ng/g fresh weight and 0.69 ng/g fresh weight, respectively. Fruits and vegetables presented in lower concentrations. Concerning mercury most fish samples exceeded the maximum level fixed by the European Commission (0.5 and 1.0 mg/kg fresh weight). Small-spotted catshark presented the highest concentration with 3.8 mg/kg fresh weight.

Conclusion

Low concentrations of many organochlorine compounds found in the present study suggest that the population has not been exposed to these compounds.

However, high mercury levels evidence that there is a risk for children living in the Mediterranean Basin if they are consumers of large amounts of local seafood.

Proposing Access to Urban Green and Blue Spaces as an Indicator of Health Inequalities Among Children

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Background

The relationship between social and environmental determinants of health and increasing health inequities are major public health challenges. Previous studies have demonstrated positive health effects, such as increased physical activity and reduced health inequities, from urban green spaces. This study explores the relevance of including access to green spaces in intra-urban health inequality tools, with a particular focus on children. From a life course perspective, the early years are critical for a healthy development and interventions directed towards inequalities should be promoted.

Methods

We used existing data on health and socioeconomic indicators from a survey of children aged 6-8 years and GIS-data to assess a possible relation to green space access, distributed per sub-districts of Berlin.

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We explored co-linearity between health and socioeconomic indicators and green space accessibility and used factor analyses for determining a minimal set of indicators for inclusion in a hierarchical cluster analysis to characterise the sub-districts.

Results

Indicators used for the cluster analysis included obesity, language deficits, vaccination, population density, and share of green spaces. Sub-districts with a high share of obesity and poor social status contained lower shares of green spaces. These areas had high population density, high shares of immigrants and unemployment. Vaccination prevalence showed an inverse pattern with comparatively low vaccination rates in high quality, less deprived areas.

Conclusion

This study suggests a relationship between an area level of green spaces and health determinants, including social indicators. The results indicate a spatial intra-urban pattern of health inequalities among children. Although not controlled for selection bias, this should spur further examination including environmental indicators in health inequality tools.

Study of Childhood Illness For the Period 2009 - 2011, Meeting the City: Sofia and Pleven With a View to Effective Health Promotion

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Background

Health status is an important aspect of children for their physical and mental development and their future career. It is determined by a number of factors, including family and school environment, the organization of school health and environmental factors. These determinants are reflected in the incidence of turnover registered by their personal physicians.

Methods

We collected official data from the Capital District Health Inspection, SRZI, and regional health inspection in the city of Pelven over a two-year period from 2009 -2011.

Results

Pleven, Bulgaria, has a high degree of respiratory diseases, infectious diseases, eye diseases, diseases

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of the digestive system, diseases of the ear and injuries.

Conclusion

We believe that appropriate programming for targeted health promotion specifically identifying health problems in connection with leading environmental factors would be beneficial.

Potential Environmental Hazards to Child Health in a Prospective Mining Area in North Sumatra, Indonesia

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Introduction

Globally, Indonesia is well known for its natural environment and rich resources of potential mining areas. However, a number of environmental health issues have arisen due to mining activities. Human exposure could lead to various health impacts, such as kidney damage, cancer, child development, and other toxic effects. Children are most vulnerable to various heavy metal intoxications, especially in the first five years of life, since this is the critical period for brain and physical development. This study aimed to understand the potential environmental hazards in a prospective mining area in North Sumatra and to assess the heavy metals concentration on children's blood.

Methods

This is a cross-sectional study conducted in areas which may potentially be affected by future mining activities. The survey covered ten villages living in the 30 kilometer radius of the mining areas. Father-child pairs were recruited, with male adults aged 19-55 years and a young child 24-59 months old. Surveys were conducted to gather data on environment, food market, and diet patterns. Assessment of heavy metals concentration in blood was performed. Ethical approval was granted by the Committee of the Medical Research Ethics, Faculty of Medicine, University of Indonesia.

Results

The environmental survey showed the heavy metals concentration were within allowable range as sources for drinking water, while mercury and zinc level in soils were high. The mean capillary blood lead levels in children were 7.17 ± 0.23 µg/dL, whereas those of fathers were 6.01± 2.89 µg/dL. The blood concentrations of arsenic, copper, zinc, cadmium, and mercury were in the acceptable range for both children and fathers. The mean hemoglobin level of children and fathers were 11.72 ± 1.19 g/dL and 15.08 ± 1.50 g/dL, respectively. No correlation was found between lead and hemoglobin level.

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Conclusion

This study showed that the heavy metals concentration in the environment and human body were within tolerable limit. However, further research should be done when mining activities take place in the area.

Minamata Convention on Mercury and Children's Environmental Health: Study on Mercury-Added Consumer Products Use in Pakistan

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Background

Children are at an unacceptably high risk of developing neurodevelopmental disorders that affect the brain and nervous system, including autism, attention deficit hyperactivity disorder, intellectual disabilities, and other learning and behavioral disabilities. Thousands of chemicals are used in material production processes (nearly 100,000 in the EU) that have not been adequately assessed for human and environmental impacts, and yet are used daily in consumer products. There is ample scientific evidence to support a link between children's risks for neurodevelopmental disorders and toxic chemicals, such as mercury, in consumer products, food, air and water.

Mercury ranked 3rd in the hazardous list of toxic substances, and it is a pollutant of increasing concern, as it is not only toxic to humans, but also to wildlife and the environment. In view of mercury and mercury-added products' toxicity and hazardousness, in 2013, under the United Nations Environment program, Minamata Convention on Mercury was enacted by over 140 countries, already signed by 128 countries (including Spain & Pakistan) and ratified by 28 countries (including USA). The main objective of this convention is to protect human health and the environment from emissions and releases of mercury and mercury compounds. Articles 4 & 16 of the convention deal, respectively, with mercury added products (including dental amalgam & skin lightening/tanning creams) and health aspects (to protect population at risk, particularly vulnerable populations – children, pregnant women & others).

Methods

Over the past few years, the Sustainable Development Policy Institute has been actively involved in the negotiations process leading to the Minamata Convention on Mercury, as well as research on the health and environmental effects of the use of mercury-added products, such as mercury dental amalgam and skin lightening/tanning creams in Pakistan. Standard analytical methods were used for the measurement of mercury in air and semisolid skin lightening creams. For opinion sharing, interviews based on

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developed questionnaires were held with dental professionals and dermatologists/skin specialists.

Results

Measurements at 34 dental sites indicated mercury vapors levels in outdoor/indoor air in the range 109 – 26,000 ng/m^3 for air (against reference standard = 300 ng/m^3). Survey work/interviews at 38 dentistry teaching institutions in the country and over 90 private dental clinics in 3 main cities showed 90% of the respondents supported review and revision of the current curriculum and inclusion of additional contents on dental mercury amalgam related to health, waste issues and mercury free dentistry, using mercury free material for dental restoration. Of the interviewed dental professionals, 70% supported mercury free material use for dental restoration as the first choice for pregnant women and children (under 12 years age) and 67% supported a ban on mercury dental amalgam use. Chemical analyses of 20 samples (others in progress) of different skin lightening creams brands revealed alarmingly high total mercury content in some of the analyzed samples. On the basis of total mercury contents, the studied skin whitening creams have been categorized into 4 groups: most, (mercury > 10,000 ppm), highly (mercury > 5000), moderately (mercury < 5000) and least (mercury < 1 ppm) hazardous skin lightening creams.

Conclusion

Our research findings provide ample evidence of most likely mercury exposure to personnel (especially children) at dental sites and due to the use of skin lightening creams containing high levels of mercury content. We strongly recommend (i) mercury specific legislation for public/consumers daily use products, (ii) review and revision of dentistry & dermatology curriculum at medical institutions and (iii) ban on the production/use of skin lightening creams with total mercury content above one ppm (as per Minamata convention on Mercury requirement) and in the first phase, use of mercury amalgam for dental health restoration of pregnant women and children below the age of 12 years. In this regard, our awareness & advocacy activities and discussion with the stakeholders (including government) are in progress.

Children and Artisanal and Small-Scale Gold Mining in West Sumbawa Regency, Indonesia

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Background

The high value of gold reserves in West Sumbawa Regency and West Nusa Tenggara Province, Indonesia has resulted in an increase in small-scale gold mining activity in this area. Artisanal and small-scale gold mining is an attractive alternative livelihood for rural workers because it has good potential to improve the wealth of a community. Women and children are often involved in mining activities as miners usually bring their family to live close to their place of employment, thus women and children (<13 years old) are potentially highly exposed to mercury. The current study was conducted to better understand the life style, extent of mercury exposure, and the health of people living in the Taliwang artisanal and small-scale gold mining area, West Sumbawa Regency, West Nusa Tenggara Province, Indonesia. The present study was designed as a purposive field sampling study conducted in the Taliwang artisanal and small-scale gold mining area, West Sumbawa Regency, West Nusa Tenggara Province, Indonesia.

Methods

The subjects were miners and families including their children from three different areas within the West Sumbawa Regency: individuals directly exposed to mercury, indirectly exposed individuals and non-exposed individuals. Hair samples and medical examination were obtained from the subjects and subjects were questioned about their mercury exposure over time. Hair samples were collected at the time of the study. Ethical approval was granted by the Ethical Committee from Medical Faculty of University of Mataram, Indonesia.

Results

A sub-analysis of data showed that children in individuals directly exposed subgroups had highest mercury in their hair (mean 4.7 mg/kg) than indirectly exposed individuals subgroups (mean 1.5 mg/kg) and non-exposed individuals subgroups (mean 0.4 mg/kg). Medical examination on children showed no symptom of mercury intoxication yet. The results indicated that artisanal and small-scale gold mining activities were shown to affect the health of miners and their family in a very short time, as evidenced from the high mercury residue in their bodies above the normal level permitted by World Health Organization.

Conclusion

The current scale of artisanal and small-scale gold mining activity in the West Sumbawa Regency is predicted to rise, raising the possibility of environmental and health disasters.

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Environmental Pollution and Children's Health

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Background

Pollution-related disease (PRD) is a massive and growing global problem. Diseases caused by pollution are responsible for nearly 9 million premature deaths each year, almost three times as many deaths as result from AIDS, tuberculosis and malaria combined. PRD, poverty and inequity are intertwined, and PRD falls most heavily upon children, women, and the poor. More than 90% of deaths due to PRD occur in low- and middle-income countries (LMICs).

The nature of pollution is changing. In rapidly developing countries, levels of ambient air pollution, toxic chemical pollution and soil pollution are increasing sharply as a consequence of urbanization, increasing motor vehicle use and the proliferation of toxic chemicals, pesticides and polluting industries. Asthma, neurodevelopmental disorders and sudden infant death syndrome are the main health consequences for children. In adults, health effects include chronic obstructive pulmonary disease, atherosclerosis, ischemic heart disease, stroke, renal disease, lung cancer and accelerated neurological degeneration. PRD is responsible for staggering economic costs. These costs include direct medical expenses as well as the diminished productivity of people who die prematurely or are disabled by PRD. These costs are largely invisible, but they are so great that they can distort health system spending and undermine the growth of entire societies.

Pollution can be prevented. Pollution and PRD are not the unavoidable consequences of development. Cost-effective pollution control strategies have been developed and successfully deployed in countries at all levels of income. These strategies are data-driven and are based on combinations of law, policy, civil engagement, governmental institutions and technology. They provide practical tools of proven efficacy that are available today to governments and people around the world. Interventions against PRD can win economic benefits as great as those associated with other highly effective public health programs such as childhood immunization.

PRD and pollution have been neglected in the global health and international development agendas. The resources allocated to pollution control and PRD prevention have, apart from water pollution and sanitation, been meager. Pollution has continued to worsen, and PRD has quietly become the world's largest cause of avoidable premature death.

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Method

To address this great and growing global problem, we have launched the Global Commission on Pollution & Health (the Commission). The Commission is an initiative of The Lancet, the Global Alliance on Health and Pollution, and the Icahn School of Medicine at Mount Sinai. The Commission will present the first-ever analysis of the global burden of disease attributable to all types of pollution combined and the first analysis of PRD's global economic costs. It will present case studies of successful interventions against pollution.

Results

The goal is to provide world leaders and global policy-makers the data and the strategic blueprint that they need to justify decisive action against pollution. The Commission's report will be published in early 2017.

Conclusion

PRD is at a tipping point. While the problem is massive, it is now well mapped, and the tools for its control have been developed, tested and proven effective. With leadership and resources, pollution and PRD are problems than can be largely resolved within a generation.

Children Exposure to Phthalates and Bisphenol A In the Phthalates and Bisphenol A Biomonitoring In Italian Mother-Child Pairs: Link Between Exposure and Juvenile Diseases Project: Preliminary Results on Biomonitoring and Case-Control Studies

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Background

DEHP and BPA are non-persistent environmental contaminants recognized as endocrine disruptors, thus potentially affecting human health, and children in particular, because of their susceptible phase of development. The Phthalates and Bisphenol A Biomonitoring in Italian Mother-Child Pairs: Link Between Exposure and Juvenile Diseases (LIFE PERSUADED) Project is focused on the evaluation of the children exposure to plasticizers, such as Diethylhexyl phthalate (DEHP) and Bisphenol A (BPA), through the biomonitoring study. Moreover, the potential association with idiopathic premature thelarche and precocious puberty and idiopathic obesity is evaluated through case-control studies.

Methods

The whole project has been approved by the Ethics Committees of Istituto Superiore di Sanità and Bambino Gesù Children's Hospital.

In HBM, 2160 mother-child pairs from urban and rural areas of the Italian geographical macro-areas (North, Centre, South) are recruited by trained family paediatricians.

Data on lifestyles, food storage and consumption are collected through a structured questionnaire and a food diary. BPA and DEHP metabolites (mono-(2-ethylhexyl) phthalate (MEHP), 5OH-MEHP and 5oxo-MEHP) levels are determined in urine samples by electrospray ionization, liquid chromatography–mass spectrometry.

Moreover, 30 girls for each group, aged 2-7 years (idiopathic premature thelarche and precocious puberty) and 30 boys and 30 girls, aged 6-10 years (idiopathic obesity) are recruited. BPA and DEHP metabolite levels are assessed in urine samples, and clinical and toxicological biomarkers related to puberty onset and obesity in serum samples.

Results

The project approach and descriptive preliminary results on DEHP metabolites and BPA internal levels will be presented.

Conclusion

LIFE PERSUADED fills the data gap on DEHP and BPA exposure in Italian children by setting background levels for susceptible groups of population and implementing the EU database. Data integration for endocrine disruptors risk assessment, the evaluation of determinants of exposure as well as the creation of a biobank for urine samples will represent relevant output of the project.

Acknowledgement

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Risk Assessment of Indoor Exposure to Volatile Organic Compounds in Children Homes, Ankara, Turkey

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Background

Several studies have demonstrated that babies and children are more sensitive to environmental pollution than adults. The most important reason for that is the continuous growth of children. Babies spend about 95% of their time in an indoor environment. Carbonyls and benzene, toluene and xylene, a subset of volatile organic compounds, represent an important group of indoor air pollutants. In general, chronic health effects of volatile organic compounds (VOCs) can be classified as either non-carcinogenic or carcinogenic.

Methods

In this study, air quality monitoring was carried out at the infants' homes in Ankara to collect data on the levels of indoor and ambient air constituents to identify their potential sources. Sampling was conducted simultaneously indoors and outdoors at around 100 infant homes between April 2011-January 2014. The measurements were performed over four periods. VOC samples were collected in Tenax TA sorbent filled tubes with active sampling method and analyzed with thermal desorption gas chromatography mass spectrometry. Higher VOC levels in babies' rooms relative to other indoor environments were identified due to lower ventilation.

Important factors affecting the indoor VOC concentrations in the indoor environments were identified as proximity of the house to the main road, purchasing of new home furnishings, newly painted rooms, type of home heating and flooring type.

Results

Health risks due to exposure to indoor VOC in infants were evaluated. Due to the results of risk analysis of benzene respiration, the health risk of 77% of homes were in Class C (10^{-6}-10^{-5}) and 17% of homes were in Class B (10^{-5}-10^{-4}), and in the case of lifelong exposure to naphthalene, 98% of the homes were in the Class A (>10^{-4}) cancer risk.

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Conclusion

It is crucial to identify and minimize factors that result in early childhood health problems, not only to improve population health, but to minimize health expenditures.

Low Level Arsenic Exposure During Pregnancy in the 3xG Cohort In Flanders: Less Efficient Detoxification is Associated with Higher Oxidative Stress

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Background

Increasing epidemiologic evidence indicates that even low level arsenic exposure affects adverse pregnancy outcomes. On the other hand, it is known that arsenic metabolism changes during pregnancy by means of detoxification. The adverse outcome pathways from arsenic exposure during pregnancy need further clarification.

Methods

This study investigates whether urinary arsenic species and arsenic methylation efficiency are associated with oxidative stress in 151 pregnant women of the 3xG cohort in Flanders, Belgium (2012-2015). Urine samples were collected between 25 and 35 weeks of gestation and different arsenic species (inorganic arsenic (inorganic arsenic; arsenic (III), arsenic (V)), monomethyl arsenic acid (MMA) and dimethyl arsenic acid) were measured using liquid chromatography–mass spectrometry. Multiple linear regression analyses were performed to evaluate the associations between arsenic exposure and oxidative stress, measured by the amount of 8-hydroxy-2′-deoxyguanosine (8-OHdG, ln-transformed) in the same urine samples (enzyme-linked immunosorbent assay). The associations were adjusted for age and smoking before sample collection. Ethical approval was granted by the Ethical Committee of Antwerp University (Hospital) and of the local hospitals.

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Results

Increased 8-OHdG levels values were associated with higher MMA levels: for each µg/l increase in MMA, 8-OHdG increased with 24% (µg/l) (95% confidence interval =0.5-51.7%). Furthermore, a decreasing trend between the secondary methylation index (=dimethyl arsenic acid/MMA) and 8-OHdG was found (β=0,998 (95% confidence interval =0.996-1.000)). No significant associations were observed for inorganic arsenic, dimethyl arsenic acid and the primary methylation index (=MMA/ inorganic arsenic) with 8-OHdG.

Conclusion

The information in this study indicates that in a region with a relatively low environmental arsenic burden, the toxic metabolite MMA is associated with increased oxidative stress in pregnant women. Furthermore, mothers with less efficient detoxification of arsenic had higher levels of 8-OHdG.

The 3xG study is part of the cAT project, funded by NIRAS and the local partnerships MONA and STORA.

Lead and Mercury Exposure Associated with Low Resting Heart Rate in Community Children

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Background

Few studies have examined the neurotoxic influence of heavy metals on the autonomic nervous system. Previously, one study showed that occupational chronic lead exposure decreased resting heart rate (RHR). The purpose of our study is to test whether environmental lead and mercury exposure is associated with decreased RHR in community children.

Methods

As part of the China Jintan Cohort Study, 564 children aged 12 years (standard deviation=0.6) were tested for blood levels of lead (BLL) and mercury (BML) and RHR. RHR was recorded using electrocardiography placed axially on the left and right ribs. Generalized linear models (GLMs) were conducted to test the relationship between BLL and BML and the RHR controlling for children's sex, age, and socioeconomic status. Analysis was clustered at the preschool level when the children were recruited to adjust for standard error. Ethical approval was granted by the University of Pennsylvania Institutional Review Board.

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Results

The mean (standard deviation) BLL and BML was 3.1 (1.2) µg/dL, with a median value of 2.9 µg/dL and 0.1 (0.07) µg/dL and a median value of 0.1, respectively. GLMs results showed that after adjusting confounders, children with BLL (B=-1.23, p=0.010) or BML (B=-1.86, p=0.013) higher than the median level showed decreased RHR. Particularly, compared with girls, boys were more likely to have decreased RHR when their BML exceeded the median level (i.e. 0.1 ug/dL) (B=-3.33, p<0.001). No gender differences were observed for BLL and RHR. A further analysis showed that RHR was the lowest among children with both high BLL and BML (B= -3.30, p<0.001), and this combined effect was greater among boys (B=-4.09, p<0.001) than among girls (b=-2.64, p=0.147).

Conclusion

Low RHR is an indication of chronic under-arousal and has been implicated to psychopathology, particularly for externalizing behavior. We previously reported that lead exposure was associated with increased behavioral problems in community children. Our finding of the relationship between heavy metal exposure and low RHR provides the direction for our future study testing the possible mediating role of low RHR on the relationship between heavy metals and behavioral problems in children.

Maternal Lifestyle During Pregnancy and Child Neurodevelopment

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Background

Substantial attention has been paid in recent years to the impact of environmental factors on child development. The objective of this study was to evaluate the association between maternal lifestyle factors and child neurodevelopment.

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Methods

The current analysis included mother–child pairs from the Polish Mother and Child Cohort study (REPRO_PL). The following factors related to maternal lifestyle were considered: smoking (based on cotinine level), phthalate exposure based on their metabolite levels in urine, microelements levels in maternal and cord blood, alcohol consumption, leisure-time physical activity and stress in pregnancy, pre-pregnancy body mass index and folic acid supplementation based on questionnaire data. Psychomotor development was assessed in children at the ages of one and two by the Bayley Scales of Infant and Toddler Development. Ethical approval was granted by the Ethical Committee of the Nofer Institute of Occupational Medicine, Łódź, Poland and written consent was obtained from all subjects.

Results

A significant association was observed between prenatal exposure to tobacco constituents and decreased child motor development in assessments performed at both ages ($\beta=-0.8$, $p=0.01$; $\beta=-1.4$, $p=0.001$). Child motor development was also inversely associated with natural log concentrations of most of the phthalate metabolites ($p<0.05$). Maternal pre-pregnancy underweight was associated with decreased child language abilities ($\beta=-5.2$, $p=0.01$). Negative impact on child cognitive development at the age of two was observed for the Perceived Stress Scale ($\beta=-0.8$, $p=0.01$) and the Social Readjustment Rating Scale ($\beta=-0.4$, $p=0.03$). The recommended level of leisure-time physical activity during pregnancy was beneficial for child language development ($\beta=4.8$, $p=0.02$). Finally, a positive association between selenium levels in pregnancy and motor development ($\beta=0.2$, $p=0.002$) at one year of age and language development ($\beta=0.2$, $p=0.03$) at two years of age was observed. For alcohol and folic acid there were no significant associations with any of the analyzed domains of child neurodevelopment.

Conclusion

These results underscore the importance of policies and public health interventions promoting healthy lifestyle among women in reproductive age and during pregnancy.

Environmental Screening of Girls with Early Puberty Disorder

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Background

A decrease of the age of menarche and thelarche has been observed during the last decades. The cause of most cases of precocious puberty in girls remains unknown. Some environmental factors such as obesity and adoption have been related to early puberty. Our objective is to explore environmental factors within a sample of girls with early puberty disorders.

Methods

We performed a cross-sectional study with a sample of 30 randomly selected girls who consulted at a tertiary hospital in an agricultural area of southeastern Spain with a diagnosis of precocious puberty, isolated premature thelarche, early puberty, early menarche, early adrenarche or early pubarche. Environmental factors previously described in literature studies were explored through an interview performed by a single interviewer. Auxiological parameters were measured at the moment of the interview. The body mass index and z-scores for each parameter were calculated. Written informed consent was obtained from all participants.

Results

Adopted girls were 6.9% of the sample. The age of thelarche was positively and significantly correlated with family income (r 0.738, CI95% 0.342-1.345; p0.001), with the poorest girls being the ones that began puberty earlier. Of the total sample, 12% of the girls were overweight and 11.1% obese. Body mass index at the age of diagnosis was correlated, but not significantly, with the age of thelarche (r 0.702, CI95% -0.019 -1.423; p0.056). At least 80% of the girls were exposed to pesticides in different degrees. Another 80% of the sample was exposed to lice treatments, especially tea tree oil.

Conclusions

Adoption and obesity were present in the sample. The correlation between income status and menarche has been previously reported, but this is the first study to correlate poverty with earlier thelarche. Pesticide exposure is extremely common in our sample, probably due to the fact that agriculture is one of the most important activities in the area of study. Tea tree oil exposure has been related with gynecomastia in boys. The effect on puberty among girls remains unknown. An environmental approach of patients with early puberty disorders may help to create a hypothesis about the etiology and develop specific treatments.

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The Role of Perinatal Essential Fatty Acids In Attention Deficit and Hyperactivity Disorder Symptoms and Cognitive Functions

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Introduction

Essential fatty acids play a key role in brain development. The balance between omega-6 and omega-3 is important for an optimal nutrition pattern. We aim to assess the role of omega-6/omega-3 ratio on child attention deficit and hyperactivity disorder (ADHD) symptoms and cognitive functions.

Methods

This study was based on the population-based birth cohort INMA, including 4 different Spanish regions (Asturias, Gipuzkoa, Sabadell and Valencia). Fatty acids were collected from whole cord blood samples by using venipuncture of cord vessels before the placenta was delivered. The omega-6/omega-3 ratio was calculated by dividing arachidonic acid (AA) with the sum of docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA). The ADHD symptoms were reported by each child's teacher using the Diagnostic Manual of Mental Disorders, 4th ed. (ADHD DSM-IV) at age 4. The child cognitive functions of the children were assessed by a psychologist using McCarthy Scales of Children's Abilities (MSCA) at age 4. Pooled negative binomial regression models were used for ADHD symptoms (n=571). Pooled linear regression models were used for MSCA (mean=100, SD=15) (n=670). All models were adjusted for child gestational age, birth weight, gender, age during testing, maternal social class, smoking during pregnancy and cohort location. The study was approved by the ethics committees of participating hospitals in Valencia and Sabadell (Spain).

Results

Omega-6/omega-3 ratio was associated with ADHD symptoms (IRR=1.23; 95%CI=0.98, 1.53) at 4 years old. Adverse associations were observed between omega-6/omega-3 ratio and different cognitive domains assessed with MSCA; general cognition (coef.: -1.34; 95%CI=-2.60, -0.09), verbal (coef.: -1.31; 95%CI=-2.63, 0.002), memory (coef.: -1.67; 95%CI=-3.06, -0.29), and executive function (coef.: -1.32; 95%CI=-2.60, -0.05).

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Conclusions

Higher omega-6/omega-3 ratio on cord blood was related to more ADHD symptoms and worse cognitive functioning at 4 years of age. The identification of nutritional biomarkers that explain its effects on child cognitive development will enable the implementation of appropriate and effective nutritional recommendations as well as interventions during pregnancy.

Prenatal Exposure to Outdoor Airborne Trace Elements and Cognitive and Psychomotor Development During Childhood In Four European Birth Cohorts

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Background

Studies on the association between exposure to elemental composition of particulate matter in outdoor air and neuropsychological development are sparse. We aimed to investigate the association of prenatal exposure to trace elements of outdoor particulate matter with diameter of <2.5 µm ($PM_{2.5}$) with cognitive and psychomotor development during childhood.

Methods

We analyzed data from 4 European population-based birth cohorts – Generation R (The Netherlands), Duisburg (Germany), GASPII (Italy) and INMA-Sabadell (Spain) – with mother–infant pairs recruited between 2000 and 2006. Monitoring campaigns measuring $PM_{2.5}$ levels were performed between 2008 and 2011 in all corresponding regions and the elemental composition of the particles was determined. Individual exposures to 8 elements (copper, iron, potassium, nickel, sulfur, silicon, vanadium and zinc) that represent major anthropogenic sources of air pollution were estimated at birth addresses using land use regression models. Cognitive (general, verbal, and non-verbal) and psychomotor (global, fine, and gross) development was assessed between ages 1 and 9. Adjusted region-specific effect estimates were combined using random-effects meta-analysis. Ethical approval was granted by local authorized institutional review boards.

Results

There were 2904 children included in this analysis. Prenatal exposure to vanadium and nickel was associated with a reduced verbal development (-1.71 points [95% CI = -3.06 to -0.37] per increase of 2 µg/m^3 of vanadium and -1.96 points [95% CI = -3.46 to -0.46 per increase of 1 µg/m^3 of nickel]). A similar tendency, although statistically not significant, was found for exposures to sulfur and silicon with verbal development; for exposure to nickel, sulfur, and silicon with general cognitive development; and

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for exposure to all elements with fine psychomotor development. In a few cases, exposure to some elements showed a tendency towards improved non-verbal and gross psychomotor development, although these results were statistically non-significant as well.

Conclusion

Prenatal exposure to airborne trace elements vanadium and nickel of outdoor $PM_{2.5}$ was associated with an impaired verbal development during childhood.

Lung Function Growth Trajectories in Children in Relation to Prenatal Exposure to Particulate Matter — Cracow Cohort Study

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Background

Patterns of early life function development during childhood may be helpful in understanding the pathogenesis of respiratory diseases throughout life. The aim was to investigate the individual growth trajectories of children's lung functions as they get older by gender and prenatal personal level of exposure to airborne particulate matter 2.5 ($PM_{2.5}$), which was hypnotized to decline studied parameters. Both the shape of trajectories and the degree of variability in growth among children were of interest.

Methods

The study sample was comprised of 322 children from a Cracow birth cohort who annually underwent standard lung function testing (forced volume capacity, forced expiratory volume in 1 s and forced expiratory flow 25–75%) between 4 and 9 years of age. Personal measurements of $PM_{2.5}$ were performed over 48 hours in the second trimester of pregnancy among pregnant women recruited prenatally to the study. Data on child development and health status as well as exposure assessment were collected regularly based on standardized questionnaire. Growth trajectories of children's lung functions were adjusted by polynomial multilevel linear mixed models. The parents of all children involved in the study gave their informed consent and the Ethical Committee of the Jagiellonian University in Krakow and Columbia Presbyterian Medical Center approved the research.

Results

Lung function trajectories differed significantly for boys and girls for FVC and FEV1. Boys had a higher increase than girls (mean annual difference: 23.1ml (95% confidence interval: 8.8;37.1), p=0.002

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and 22.6 ml (95% confidence interval: 10.0;35.2), p<0.001), respectively). In cases of FEF25-75%, trajectories had similar shape for boys and girls. Significant lung function impairment (decrease in FVC and FEV1) was observed from 4 through 9 years among subjects prenatally exposed to higher levels of $PM_{2.5}$, but not in the case of FEF25-75%.

Conclusion

High levels of prenatal exposure to $PM_{2.5}$ might be related to diminishing lung function growth in children.

Prenatal Exposure to Perfluoroalkyl Substances and Cardio-Metabolic Risk Components During Early Childhood

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Background

Prenatal exposure to perfluoralkyl substances (PFAS) might increase obesity and cardio-metabolic (CM) risk during childhood, but results are inconclusive. We evaluated the effect of PFAS on individual and combined CM risk components during childhood in a Spanish birth cohort.

Methods

We measured perfluorohexanesulfonic acid (PFHxS), perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), and perfluorononanoic acid (PFNA) in maternal plasma. We assessed rapid growth at 6 months of life (n=1109) and age-and sex-specific z-scores for body mass index, waist circumference and mean arterial pressure at 4 (n=1,230) and 7 (n=1094) years. Using non-fasting blood samples at 4 years we measured lipid concentrations (n=629): total cholesterol, triglycerides and, high-density and low-density lipoprotein cholesterol. We calculated a continuous CM risk score at 4 years; a higher score indicated a higher CM risk. All participating women signed written informed consent before beginning the study. The study was approved by the regional ethical committees of each cohort.

Results

Twenty-four percent of children were rapid growers at 6 months and 30% and 35% were overweight at ages 4 and 7, respectively. At 6 months, PFOA was associated with increased weight gain in boys [β=0.22 (95% confidence interval: 0.04, 0.40)] but not in girls [β=-0.06 (-0.21, 0.10)] (p-value for sex-interaction=0.08). We found no association between PFAS and body mass index z-scores, overweight or waist circumference at 4 and 7 years. PFAS tended to decrease mean arterial pressure z-scores at 4

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years of age, but was not statistically significant. Higher PFAS concentrations increased total cholesterol and triglycerides at 4 years, especially PFHxS [β=6.32 (0.96, 11.68)]. Higher PFOA concentrations increased the CM risk score at age 4, especially in boys [β=1.37 (0.03, 2.71)].

Conclusion

This is one of the largest studies to comprehensively assess the effect of PFAS on individual and combined CM risk components during early childhood. Our results suggest that PFAS can affect some CM risk components during childhood, especially in boys. Further replication of our results is needed.

Mobile Phone and Other Digital Technology Use In UK Adolescents: The SCAMP Cohort

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Introduction

Scientists remain uncertain as to whether children's developing brains are vulnerable to radiofrequency (RF) waves emitted from mobile phones and other wireless devices. The Study of Cognition, Adolescents and Mobile Phones (SCAMP) is a three-year prospective cohort study of adolescents across London, UK, which aims to investigate whether children's use of mobile phones and other wireless devices influences their neurocognitive/behavioural development.

Methods

Data on cognitive function, wireless device use and lifestyle are collected at baseline and follow-up via school-based computerised assessments and optional parent/pupil home-based questionnaires. Parents are invited to consent to linkage of their child's assessment data with routine records (e.g. health and educational records, mobile traffic data), thus allowing for comparisons between self-reported and objective mobile phone use. Biological samples (e.g. urine, saliva) are collected to provide additional information about potential confounders, such as pubertal status. A RF personal monitoring study is also being conducted in a subset of the cohort to gain an in-depth understanding of children's personal RF exposure and the relative contribution of each RF source. Ethical approval was granted by the North West Haydock Research Ethics Committee.

Results

To date, 5,504 predominantly 11 to12-year-olds participate in SCAMP (53.2% female, mean age 12.0

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(SD 0.4); 42.3% White, 20.3% South Asian, 15.9% Black, 11.5% Mixed, 9.9% Other). Preliminary analysis shows that over 80% of participants own a mobile phone. Device usage is comparable among boys and girls, apart from gaming. Black adolescents consistently report highest use across all devices. Validating self-reported information against traffic data in a subset revealed children had underestimated call frequency, but overestimated call duration and text messages.

Conclusion

SCAMP will improve our understanding of children's RF exposures, device use, and cognitive function and will provide an evidence base to inform public health policy in this area.

Current Findings on Maternal Gut Microbiome and Polychlorinated Biphenyls Concentration in Birth Cohort Study With Omics Analysis: Chiba Study of Mother and Children's Health

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Background

In previous studies, we have reported that environmental contaminants such as polychlorinated biphenyls (PCBs) were detected in maternal blood, umbilical cord and cord blood. On the other hand, in animal studies, it has been reported that intake of PCBs induced the alteration of microbiome. Moreover, several studies have reported that the gut microbiome influence the balance between health and disease. A birth cohort study, the Chiba Study of Mother and Children's Health, focusing on environmental health effects on foetuses and involves multiomics analysis has been conducted since 2014. Currently, the correlation between maternal blood PCB levels and microbiome status is being investigated. The associations between changes in the maternal gut microbiome and alteration of differentially methylated regions of diabetes-associated genes in umbilical cord samples are also examined.

Methods

The Chiba Study of Mother and Children's Health consists of three hospital-based cohorts. Ethical approval was taken by the Biomedical Research Ethics Committee of the Graduate School of Medicine, Chiba University. Consent to participate was obtained from 433 pregnant women. Among those, 376 women answered the questionnaires regarding their characteristics and life style during the early gestational period. The mean age was 32.5 (± 4.4) years old. Blood PCBs concentration level in 93 women was measured by gas chromatography–mass spectrometry. The microbiome of 10 participants

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was studied. The 16S rRNA metagenome analysis of maternal stool samples and deoxyribonucleic acid methylation assays of umbilical cord samples were performed.

Results

The mean concentration of blood total PCBs was 420 pg g−1 wet wt, in which chlorinated biphenyl (CB)153 (mean: 100 pg g−1 wet wt), CB138 (mean: 70 pg g−1 wet wt), and CB180 (mean: 58 pg g−1 wet wt) contributing the most of the total PCB. In our preliminary analysis, total PCB level and one genus of gut microbiome showed positive correlation. Additionally, the proportion of *Firmicutes* in the maternal gut were associated with deoxyribonucleic acid methylation levels of some diabetes-associated genes in umbilical cord samples.

Conclusion

These findings suggest that PCB exposure of mothers might affect the microbiota components of mothers and epigenetic change in fetuses. Further detailed studies are needed to reveal whether maternal exposure will affect meternal microbiota components or epigenetic statues in fetuses.

Poor Education – Poor Jobs – Poor Health

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Background

Lack of schooling during childhood leads to a vicious circle with access only to hazardous, insecure, and poorly paid jobs, with higher health risks and poorer access to health care, successively with more disease and injuries, again less income and consecutively poorer housing and even more risks. Not only does this lead to individual misfortune, but also affects the fate of offspring. The mechanisms are even more visible in developing countries without a well-established welfare-system with social securities and free access to public education.

Methods

We investigated health in relation to occupational exposures in the cotton industry of Pakistan. A random sample of plants in the area of Faisalabad was selected, stratified by plant size. Most workers present at the plant at the day of visit received and answered a questionnaire about job history and health complaints. A random sample of workers in each plant was further examined by spirometry and buccal cell test. Dust measures were performed during each visit. Ethical approval was granted by the Ethical Review Committee of the Health Services Academy, Ministry of National Health Services, Regulation and Coordination in Islamabad, Pakistan.

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Results

We found that small enterprises producing for the local market generally, but also on demand for big companies with long-standing contracts with European and American traders, not only displayed the highest dust exposures, poorest occupational safety measures and hygiene, but also had the longest shifts (typically 2 shifts of 12 hours each), and the least educated work-force, typicallywith a working history from the age of 15. These workers also fared poorest on several health parameters, from poorer lung function to a long list of reported symptoms not exclusively but also including respiratory symptoms, along with signs of cytotoxicity and genetic damage.

Conclusion

In this observational study it was not possible to disentangle the effects of longer years of exposure because of early initiation of work, longer occupational exposure per day, and higher exposures due to poorer occupational hygiene. Nevertheless we want to point out that all these factors were primarily caused by poor education and early termination or even lack of proper schooling.

An Unexpected Epidemic of Respiratory Distress

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Background

In 2011, a series of severe cases of respiratory distress came to the notice of Korean officials. The index case was a young female who developed deadly bronchiolitis obliterans a few weeks after an uncomplicated pregnancy. Consecutive examinations revealed that dozens of similar cases had appeared throughout the country, mostly in children and in females, the latter often either pregnant or shortly after pregnancy. The mortality rate was exceptionally high among cases and many more cases only survived after lung transplantation. We will summarize the findings of other authors reported in the literature. The aim is to draw attention to a highly instructive episode.

Methods

As infectious causes could not be established, further studies focused on toxic exposures. Because of the characteristics of the affected persons (no common occupational exposure), indoor pollutants were suspected.

Results

It turned out that cases had used humidifiers at home and had treated these with disinfectants

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as advertised by industry. Several case-control studies clearly indicated the causal role of these disinfectants. Animal studies demonstrated the same severe damage of lung tissue after inhalative exposure towards a disinfectant previously deemed "safe" and "not toxic".
Further studies also revealed that similar epidemics had happened for the last couple of years, usually in the cold season, without anyone taking notice.

Conclusion
General implications for toxicity testing and for the application of the precautionary principle will be discussed.

Hazards and Risks in the Glyphosate Debate

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Glyphosate, a herbicide blocking an enzyme essential for all plants, but not for animals and humans, has certain advantages as compared to herbicides. It is not persistent. Due to the production and application of more than 700.000 tons per year, a large proportions of humans are exposed. Therefore, the International Agency on Research on Cancer (IARC) of the World Health Organisation (WHO) has looked more closely at glyphosate and has classified it as probably carcinogenic for humans (2A). The Bundesamt für Risikobewertung (BfR) and the European Food Safety Authority (EFSA) have analysed the data and contradict the IARC classification. The process of decision finding and essential arguments for the contradictory classification require comments. BfR and EFSA should have offered more transparency regarding their evaluation, and they should have restricted their opinions and proposals to their genuine task: to propose regulations concerning the risks which follow from possible hazards, here from a questionable classification of glyphosate as probable human carcinogen. In the public debate, the meaning and implications of hazards and of risks must be clearly defined and properly used. This would avoid many unnecessary misunderstandings.

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Autism Spectrum Diseases, including Asperger Syndrome: Fairy Tales and Facts about Environment and Genetics

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Genetic factors are of paramount importance for the development of autism spectrum diseases (ASD). Male predominance, high rate of recurrence in families with more than one person with ASD, and high concordance in monozygotic twins show to what extent genetic and possibly also epigenetic factors play a role. They do not, however, explain completely the genesis of ASD. Hence, environmental factors are also important. Numerous studies and publications have generated many hypotheses on what factors could be active.

Autistic Symptoms Associated with Childhood Lead Poisoning

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Background

Autism is known as a complex developmental disability. Experts believe that autism presents itself during the first three years of a person's life. The condition is the result of a neurological disorder that has an effect on normal brain function, affecting development of the person's communication and social interaction skills. Lead is a neurotoxin to which the developing brain is particularly vulnerable. Moreover, lead poisoning in children is known to negatively affect brain systems implicated in cognitive, communication, and social functioning. One potential weakness of autistic children is that they are less able to remove heavy metals from the body so that the metal accumulates in the body and brain.

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Methods

This observational study with a cross-sectional approach, examined 44 children diagnosed with autism n Grogol Jakarta and the Islamic Hospital Mental Klender Jakarta. Data were collected through interviews, and blood lead levels were checked by flame atomic emission absorption spectrophotometer. Ethical approval was granted by YARSI University.

Results

Hair examination of children with autism showed elevated levels of heavy metals. Examination of the 44 children with autism, ages 1-10 years old, 97% boys and 23% girls, showed that 16.7% had high levels of heavy metals. Patients were diagnosed since one-month-old.

Conclusion

If a child is showing symptoms of autism, then detoxification and other types of therapies, such as speech therapy, behavioral, occupational must be done. If there has been damage to the brain, detoxification cannot directly fix the symptoms. Detoxification is just to prevent further damage. Toxic metals are not the cause of autism, but can be a trigger, or aggravate the symptoms of autism.

Relationships Between the Exposure of Factory Air Pollution with Asthma Impacted In Children Who Live in Shelters in an Industrial Area in Jakarta, Indonesia

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Background

Exposure to hazardous environments can cause damage to the respiratory tract, particularly in individuals who have atopy who may suffer from continuous inflammation and can also cause asthma in children. A recent study describes the correlation between exposures to traffic air pollution with the respiratory tract exchanges. One evidence of this correlation is the increasing concentration of nitric oxide (eNO) expiration as a sign of inflammation of the respiratory tract in children. The analysis showed a strong correlation between asthma with the exposure to nitric oxide (NO) and other toxic air. Our objective is to verify the hypothesis which stated that children who live in shelters around industrial areas and are exposed to air pollution will experience more respiratory tract irritation than children who do not live in the surrounding district of the industrial area, confirmed by increased concentrations of eNO.

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Methods

Case controls and data collection were held in Jakarta to investigate the effects of the environment around the plant with increased exposure of FeNO, and data from the area of East Nusa Tenggara, Lombok, Indonesia were used as a control.

Results

Children whom are often exposed to toxic air pollutants can undergo an inflammatory process and this may cause a decrease in vital lung function. This was supported by evidence found from the increasing eNO concentrations and derivation of expiratory peak flow rate (PEFR) in children who live around industrial areas under study.

Conclusions

There are strong correlations between asthma in children with the exposure of toxic factory air pollution. Others factors that may increase asthma include (1) the size and width of the house, (2) the humidity of the house, (3) the lighting of the house, (4) the ventilation of the house, and (5) mother's education and knowledge.

Prenatal Exposure to Particulate Matter and the Occurrence of Wheezing in the Chest in Children

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Background

Several studies have found associations between air pollution levels and respiratory symptoms occurrence. We hypothesized that prenatal exposure to particulate matter ($PM_{2.5}$) may be associated with respiratory symptom (especially wheezing) occurrence in children.

Material and methods

The subjects come from the birth cohort study from Krakow, Poland. Air pollution was measured with personal samplers for $PM_{2.5}$ over a 48 hour period in the end of second trimester of pregnancy. The newborns and later children were examined regularly up to age of 9 years. Parents were concerned about their child's heath, especially about symptoms related to the respiratory tract. Overall, the data for full 9-years of follow-up were available for 272 children (135 were boys).

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The impact of $PM_{2.5}$ on the number of days of wheezing symptoms was adjusted for other known factors of respiratory diseases, using a zero-inflated Poisson regression model. Ethical approval was granted by the Bioethical Committee of the Jagiellonian University.

Results

Wheezing symptoms were present for 18.8% of children during the first year of their life, and was decreased for the next years to 4.8% for nine year olds. The risk of wheezing episodes was significantly related to $PM_{2.5}$ level during the first four years of life: during the first year incidence rate ratio =1.010; 95% confidence interval: 1.007-1.013 for 1 ug/m^3 of $PM_{2.5}$; and this impact was decreased to an incidence rate ratio =1.0006 (95% confidence interval: 1.0003-1.0009). Later, this impact was no longer significant.

Conclusions

Prenatal exposure to $PM_{2.5}$ pollution can lead to higher occurrence of wheezing symptoms among children. However, this association is weaker with time.

Dietary Environment in Preventing Allergic Airway Diseases

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Background

Allergic airway disease increasing in prevalence globally, Asthma is a global health epidemic and over 1 billion people suffer now and it is anticipated to go about 4 billion in 2050. Air pollution is causing 8 million deaths globally.

Methods

Over the years our concepts were to control the symptoms of allergic disease and improve the quality of life like: Bronchoconstriction □ Airway Hyper-responsiveness □ Inflammation and remodelling □ United Airway concept □ Phenotypes and genetics. □ Now we are considering Dietary habits to prevent the airway allergies and reduce the morbidity, mortality and socioeconomic burden of the diseases.

Results

Diet and Airway allergies: Diet play a multifaceted role in shaping the observed world-wide trends of childhood allergies in particular airway diseases. Sensitivity can occur by ingestion or inhalation of allergens. It is both IgE and non IgE mediated immune response and both early and late phase reactions

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are observed.

Dietary measures to prevent airway allergies:
The dietary measures are reviewed in
1. Diet in pregnant mothers
2. Breast feeding in infants and their diet
3. Diet in children with allergic airway disease
4. Dietary restriction
5. Obesity and asthma

Maternal Dietary Intention: Maternal diet rich in antioxidants during pregnancy has the potential to influence postnatal susceptibility to allergic diseases by modulatory T cell response. But strict elimination of essential foods like milk, egg etc. may have an adverse effect on maternal and fetal nutrition. Meta-analysis is not conducive to recommend at this stage.

Diet of infants and Breast feeding: It is recommended to continue breast feeds for 6 months and add solids after 6 months. Emerging data suggest that early introduction of allergic foods may reduce the risk of food allergy.

Diet for allergic Children: Diet rich in antioxidants like fruits, vegetables, vitamins, curds, butter, fish and diet rich in Omega 3 fatty acids and home-made food are the best.

Diet to be avoided in allergic children: Salty food snacks, take away food consumption, soft drink containing preservatives or colorants.

Obesity and asthma: Obesity is increasing in India. Between, 2002-2011 it increased from 15-20% in boys and 13.7-18.1% in girls. The decrease lung function is proportionately related to obesity. Asthmatic children should reduce the intake of gas producing food items like – Asparagus, broccoli, cabbage, garlic, melons, peppers, radish, cauliflower, cucumbers, raw onions, beans etc.

Conclusion

Epidemiology and tradition is strongly suggest the association of nutrition and airway allergy but we lack robust scientific data to make national policy and traditional local food habits are always encouraged and disease guideline to be followed to manage the diseases where one can cut the cost by two thirds. For better compliance a link between patient, parent and other health provider is essential and science to progress the link between, practitioners, academicians, researches and pharmaceutical companies is also essential.

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Rapid Urbanization and Changing Prevalence of Chronic Cough

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Background

Cough is a reflex response to mechanical, inflammatory or chemical irritation of respiratory tract predominantly and also a social signal as well.
Depending on duration we call it as chronic and it is variable from 2weeks to 8weeks in different countries. We use cough more than 2weeks as chronic cough.

The impact of cough on child and family: The chronic cough has tremendous impact on socio-economically on Children, it produces sleep disturbance, exhaustion, nausea, vomiting, urinary incontinence, rectal prolapse, fecal soiling, subconjunctival hemorrhage, hernia, cerebral hypoxic encephalopathy, cough syncope. Parents feel frustrated, upset, stressed, helplessness, feeling sorry, along with sleepless night have financial burden. 80% of the children had five consultation.

Method

Aim of our study is
a. To find out the prevalence and spectrum of chronic cough
b. Correlate with earlier data and change of demography of our city

Maternal method: We analysed the 510 patients referred for pulmonary problem between Jan 2015 to March 2016 in 15months. In them 106 patients came just for cough over 2weeks of duration. A detail history including environmental history, clinical examination and laboratory, imaging, pulmonary function as needed according to clinical judgement and patient capacity to perform P.F.T were preferred.

Results

Percentages are given about the prevalence of chronic cough of 105 out of 510 cases (20.78 %). Age distribution and associated clinicalfeatures are presented.
Wet cough and night/early morning cough were prevalent in respectively 80 and 84%.
Majority are due to allergic rhinosinusitis and asthma, 3 cases of Bronchiectesis, pertussis, psychogenic each.

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Discussion

The chronic cough in children was 8% in 1999 and now it is gone up to 20.78%. A community survey by same group in the year 2010 on point prevalence of Chronic cough was 10.5%
The Bangalore city population was 2.92 million in the year 1981 it is gone up to 8.5 million in the year 2011.

The traffic congestion is increased. We have 58,75,237 vehicles in Oct 2015. In them 406456 are two wheelers, 11,44,196 are cars, 5,69,579 buses. Now we add 1600 new vehicles every single day. Earlier in the year 2009-2010 it was 600 vehicles per day. We need 13,000Km length of roads to park our vehicles bumper to bumper. The speed of vehicles now is 9.6 Km per hour.

The slow vehicles emit 5½ times more emission to the atmosphere than vehicles at 70 Km/hr speed. In summer time there is more production of ozone in bright sun, slow wind velocity and higher automobile emission. The air pollution does produce oxidative stress on airways causing airway smooth muscles contraction, epithelial damage, excess mucus production, decreased ciliary movement, increased permeability of vessels, altered release of inflammatory mediators and produce airway hyper-reactivity and chronic cough.

Conclusion

Rapid urbanisation change in demography increased number of slow moving vehicles, emit 5½ times more emission producing oxidative stress on airway hyper-reactivity leading to chronic cough. The chronic cough is increased from 8% to 20.78% in 17years between 1999 to 2016. Along with the proper medication, measures to mitigate the air pollution should be taken with all the stake holders.

Descriptive Analysis From a Hospital-Based Childhood Cancer Survivors Cohort: Report From the Project Spain-CCSS

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Introduction

Therapeutic advances in paediatric oncology have led to increase the number of childhood cancers survivors (CCSs). Emerging evidence shows that CCSs experience long-term morbidity due to their cancer therapy (and the cancer itself). The Spain-CCSS (Spanish Childhood Cancer Survivors Study) aims to set up a childhood cancer survivor's cohort in Spain in order to join international efforts for studying long term health effects among this population and optimise treatment and follow-up.

Methods

CCSs treated between 1980 and 2009 in the paediatric hemato-oncology department of Hospital Sant Joan de Deu in Barcelona (one of the largest in Spain) were invited, via mail services and by phone call, to participate in the study and to complete a health status questionnaire (HSQ). Recruitment, disease validation and retrospective record collection (treatment) are still ongoing. Ethical approval was granted by the ethical committees of Hospital Sant Joan de Dèu and Parc de Salut Mar.

Results

Of over 1568 individuals who survived more than 5 years, 536 (34%) consented to participate (509 returned a complete HSQ), 83 (5%) were not alive at the time of the questionnaire, 480 (30%) could not be traced, and 140 (6%) refused to participate. We are still waiting for a response from 340 (30%) participants.

Among the total participants, 285 (53 %) are male. Participants' median age is 22 years (range 6-50) and the majority (N = 311; 58%) have been treated recently (from 2000-2009). The median follow up is 13 years (range 5-35). The median age at diagnosis is 5 years (range 0-19).

Central nervous system tumour (N= 120, 22%) and leukaemia (N= 113, 21%) are the most prevalent primary neoplasm.

Information collected through the HSQ includes socio-economic status and quality of life health related outcomes.

Conclusion

Though more effort is needed to increase the participation rate, this cohort is an important source of information on different health outcomes among CCSs.

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Cognitive Effects After Low- to Moderate Dose Exposure: Study Plan in a Cohort of Childhood Cancer Survivors

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Introduction

Brain cancer survivors are at higher risk to develop a cognitive deficit and cranial radiotherapy (RT) is one of the well-known risk factors of this impairment.
However, the effect of low dose radiotherapy (such as the scatter radiation that is absorbed by the brain when the radiotherapy is delivered in another anatomical region) still needs to be clarified and more research is warranted in this area.

Methods

We are planning to evaluate the neuro cognitive profile in a cohort of childhood cancer survivors who received a dose below 5 mGy to the brain. Brain tumor survivors will be excluded in order to avoid confounding due to the cancer itself.

Function will be assessed in different cognitive domains (intelligence, executive function, processing speed, memory, attention and executive function among others) and the score of each test will be correlated with the dose absorbed in different anatomical brain structures (with matter, hippocampus, temporal lobe, frontal lobe and posterior fossa) as estimated from medical records. We haven't yet submitted the protocol to an ethics committee, as we are still designing the study.

Results

Assuming that around 40% of survivors did not received radiotherapy, 35% received a dose below 1 Gy and 5% between 1 and 5 Gy (de Valthaire personal communication) and assuming a 4 point difference in the test score (average 100, standard deviation 15) between dose groups, we expect to have 80% power to find a trend among those three groups with around 100 participants.
To reach 80% power to find a 4 point difference between the group who did not receive RT and the ones who received a dose below 1 Gy, we would need around 500 patients.

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Conclusion

It appears to be feasible – and informative for radiation protection – to study cognitive effects due to low-to moderate doses of radiation in a cohort of childhood cancer survivors.

Determining the Impact of Smoking Point of Sale Legislation Among Youth (Display) Study: New Findings From Scotland

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Background

Point of sale displays are one of the most important forms of tobacco marketing still permitted in many countries. Point of sale displays have been shown to increase susceptibility to smoking, experimentation and initiation into smoking, particularly amongst adolescents. These displays may also influence perceived prevalence of smoking and the perception that tobacco products are easily obtained and are a 'normal' product.

Methods

This study examines the impact of the implementation of both a partial and comprehensive ban on point of sale tobacco advertising on attitudes to smoking, brand awareness, perceived ease of access to tobacco products and youth smoking prevalence. The study has a multi-modal before and after design and uses mixed methods to collect data, at baseline and then with longitudinal follow-up for 4 years, in four purposively selected communities. In each of the four communities (school catchment areas), at baseline and in follow-up years, data collection includes: mapping and spatial analyses of tobacco retail outlets; tobacco advertising and marketing audits of tobacco retail outlets most used by young people; cross-sectional school surveys of secondary school pupils; and focus group interviews with purposive samples of secondary school pupils. The tobacco audit is supplemented by interviews and observations conducted with a panel of tobacco retailers recruited from four matched communities.

Results

The results to be presented from the initial phases of data collection consider: the changing levels of point of sale exposure over the study period; the degree of compliance with the new legislation post implementation; connections between point of sale displays and young people's brand awareness; the emergence of e-cigarette marketing; and the connections between e-cigarette/cigarette marketing and e-cigarette use amongst young people.

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Conclusion

The results will be of considerable interest to policy makers both from the UK and other jurisdictions where they are considering the development and implementation of similar legislation.

The Role of Local Natural Space in Children's Social, Emotional and Behavioural Development in Scotland: a Longitudinal Study

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Background

Poor mental health in childhood has implications for health, wellbeing, and productivity in later life, as well as presenting a considerable burden for families and wider society. Independent play is a crucial part of 4 to 6 year olds' social, emotional and behavioural development. We investigate whether total natural space, public parks and access to a private gardens enhance children's social, emotional and behavioural development.

Methods

We analysed longitudinal data for 2,909 urban-dwelling children (aged 4 at 2008/9 baseline) from the Growing Up in Scotland survey. Social, emotional and behavioural difficulties were scored using the Strengths and Difficulties Questionnaire (divided into four domains), and area (%) of total natural space and parks within 500 m of the child's home was quantified using Scotland's Greenspace Map. Access to a private garden was captured at the household level. We ran repeated-measures multilevel models, then stratified by sex or household educational attainment.

Results

Prosocial Behaviour scores were higher (i.e., better) throughout for children with more total natural space, but neighbourhood natural space was unrelated to change over time of any Strengths and Difficulties Questionnaire domain. Boys and girls in neighbourhoods with more total and park space, respectively, had fewer problems. Better social outcomes were found for all groups with more neighbourhood natural space. Having access to a garden was related to the largest benefits for all except those from high education households. Having access to a garden was related to mental health benefits on a par with the advantage apparent for girls over boys, children from degree-educated households over those from households without educational qualifications, or a £20,000 to £50,000

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increase in equivalised household income.

Conclusions

Neighbourhood natural space may reduce social, emotional and behavioural difficulties for 4 to 6 year olds, but private garden access may be most beneficial.

Modifiable Factors Related to Low Water Intake In Mexican Children and Adolescents

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Introduction

Proper hydration is important for maintaining homeostasis in all physiological processes and to avoid some diseases. Some reports have suggested that 87.5% of males and 65.4% of females have water intake below the recommendations. In children, there is a lack of information about hydration habits. This study was aimed to assess modifiable factors related to low water intake in a Mexican sample of adolescents and children.

Methods

A cross sectional study was performed. Cardiovascular risk factors were determined (overweight, obesity, abdominal obesity). Physical activity (frequency and type) and dietetic habits such times of eating per day were assessed. Statistics were performed using SPSS Version 22.0. Ethical approval was granted by Ethics Committee and Research from Mexican School of Medicine, Univesity La Salle.

Results

247 children and adolescents were included; the average age was 12.5±1.9 years old, and 54.91% of the sample was boys. The global prevalence of overweight and obesity was 49.2%. The daily intake of water, including foods, was 1317.5 ± 648.8 ml, with no differences between boys and girls or according to the presence of cardiovascular risk factors. Only 12.1% reach the recommendations of water intake according to Mexican recommendations. Also, water intake was not different between those who practice any physical activity more than 3 days per week compared with those physically actives (1163.3±571.3 vs 1339.6±697.9, respectively; $p=0.181$) and considering the type of activity (aerobic or anaerobic; $p>0.05$). According to times of eating, those who eat less than 3 times per day reported lower water intake (778.6±477.2 vs 1342.0±688.0; $p=0.033$) lunch and the afternoon snack being most

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important, and seem to risk of not accomplishing the recommendations (odds ratio=1.148 (1.093-1.206).

Conclusion

There is a high prevalence of cardiovascular risk factors among Mexican adolescents. Also, low water consumption was reported in this population and it seemed not to be related to anthropometric indicators, suggesting that environmental factors such number of times of eating could be more important than nutritional status or the practice of physical activity.

Pilot Phase of the Next Generation Study

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Background

The Next Generation Study is a new prospective birth cohort initiated as a collaborative project of Masaryk University and the University Hospital in Brno, Czech Republic. The study is designed to follow up 7000 children from their prenatal period to adolescence with the aim of assessing multiple factors potentially affecting children health (factors of exposome).

Methods

Special attention is being paid to prenatal and early postnatal developmental abnormities, postnatal psychomotor development, neurobehavioral disorders and immune system disorders. Information on complex exposures will be based on on-line versions of combination of validated on-line questionnaires and biological tissue analyses will be used to estimate complex exposures. Information on health outcomes will be taken from the psychomotor developmental screening questionnaires, medical records, and health registers. Ethical approval was granted by The University Hospital Brno.

Results

The Next Generation Study was initiated in April 2015 with a three-stage pilot. Feasibility of the cord blood sample collection and processing protocol was assessed at the first stage on 100 mother–child pairs. The aim of the second stage was to evaluate feasibility of the protocol for recruitment of women in the in 38th week of pregnancy. That allowed for estimation of future study response rates. Samples of venous blood, urine, and saliva were collected from 150 participating mothers, and stool and saliva

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were taken from newborns in addition to cord blood samples. On-line versions of the self-reported questionnaires will be tested at the third stage (scheduled to start in August 2016) together with robustness of the IT systems.

A majority of the approached mothers was willing to participate in the Next Generation pilot study (90% of mothers were willing to donate venous blood in 38th week of pregnancy, 70% agreed to donate cord blood, to fill the questionnaire and provide health data). The sample collection and processing protocol were proven to be feasible: all types of samples were processed and stored within 180 minutes regardless the day and time. Whole blood, plasma, serum, red cells, and buffy coat will be stored at -80°C, viable cell lines from cord blood will be stored in liquid nitrogen.

Conclusion

Based on the results of the pilot phase the full scale TNG study is scheduled to start in January 2017.

Prenatal Exposure Assessment Approaches Need to Consider Spatio-Temporal Variation of Air Pollution

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Background

Air pollution exposure during pregnancy may have consequences for the whole life and future generation. The time-window of exposure (intermediate between short- and long-term effects) poses a methodological problem in the choice of the most suitable exposure assessment approach.
Objective: To evaluate the effect of different prenatal exposure assessment approaches on reproductive outcomes.

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Methods

In the Emilia-Romagna region (Northern Italy) two independent studies (Moniter and Sinatra projects) were conducted on air pollution and several reproductive outcomes. The first assessed the residential exposure to incinerator pollution of mothers living in areas next to plants; the latter considered different factors of environmental pressure in an urban-industrial city (Ravenna). Each newborn was georeferenced and characterized by a specific level of exposure emissions, categorized in quartiles of PM_{10}. Modeling approaches were adopted for exposure assessment, namely an ADMS-Urban dispersion model for each type of environmental determinant, to account for both spatial (residential street number) and temporal (monthly simulations) variability of exposure. Both studies showed statistical associations only with preterm births. Analyses were repeated considering poorest indicators of exposure, to verify the influence of exposure assessment approach to final results.

Results

Considering the best method of exposure (spatio-temporal variability of air-pollution), both studies showed a significant association between preterm births (PTB) and exposure to incinerators and port activities, respectively. The exclusion or an inadequate assessment of the temporal variability of the exposure, led to a reduction of the associations and loss of statistical significance in RRs (from 1.30: CI95% 1.08-1.57 to 1.02: CI95% 0.88; 1.25 and from 1.52: CI95% 1.01-2.29 to 1.01: CI95% 0.66-1.55) respectively, considering the highest versus the lowest level of exposure.

Conclusions

Air pollution from industrial sources is associated with PTB. Our experience confirms the need of exposure models capable to capture both the spatial and temporal variability of air pollution exposures, in order to be able to detect associations with birth outcomes.

Air Pollution and Children's Environmental Health action in Brazil

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Background

Air pollution is estimated to cause around 800 deaths in children under 5 in low- and middle-income countries of the Americas. Although it is not the worst scenario compared to regions like Africa or Eastern Mediterranean region, this rate may be underestimated because environmental awareness and air pollution monitoring are extremely scarce, even in middle-income countries like Brazil.

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Methods
A quick review of children's environmental health in Brazil is presented, highlighting some issues regarding risk awareness and current environmental threats.

Results
Around 19 million people use biomass for cooking or heating purposes in Brazil, and the country has one of the highest rates of pediatric asthma as eveidenced in worldwide epidemiologic studies. The lack of awareness about children's environmental health in low- and middle-income countries is not exclusive of air pollution: children's access to unsafe water, the emergence of vector-borne diseases (like the triad Zika / Dengue / Chikungunya viruses), manmade disasters, and unsafe buildings in landslide areas are problems that keep happening frequently, mostly due to the lack of proper risk perception. Another example is the fact that Brazil has led the use of pesticides in the world since 2008 and yet concerns about children's ingestion of pesticides are rare. Efforts to increase awareness (not only about air pollution) are urgently needed, not only in Brazil, but probably in most low- and middle-income countries. On the other hand, children's exposure to indoor pollution due to second-hand tobacco smoke has reduced consistently in Brazil over the last 2 decades, after a strong action of all stakeholders and a long-lasting governmental campaign. This successful case shows that it is indeed possible to increase awareness about other children's environmental health issues as long as all players work together.

Conclusion
In an effort to collect data, help policy makers, increase research possibilities, and create training programs for health workers, WHO has recently set a Collaborating Center for Children's Environmental Health in the South of Brazil with the goal of helping improve this scenario in the country.

Children's Environmental Health Training in Brazil

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Background
Due to their unique characteristics, children are more vulnerable to environmental hazards than adults and the environment is responsible for one third of the global burden of disease in children but there is a lack of proper awareness of such risks in many countries.

Methods
To highlight the current state of environmental pediatric training in Brazil, and describe ongoing strategies to address problems.

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Results

The environmental burden of disease in children is not equally distributed through the world: the heaviest burden lies in low- and middle-income countries. To prevent, assess and treat environmental problems, it is essential to understand the hazards and physiologic characteristics particular to children. Unfortunately, many pediatricians still lack knowledge and awareness regarding environmental health issues in low- and middle-income countries. In Brazil, for example, 79% of pediatricians have never received any kind of training regarding children's environmental health. Only 17% declared they knew about the risks of lead intoxication in children, a concern included long ago in the routine pediatric care in developed countries.

In Brazil, the inclusion of children's environmental health in the pediatric curricula during residency is rare. Pediatric departments of universities lack specific divisions or even pediatricians able to share information and promote environmental health. The Brazilian Society of Pediatrics, is the third largest in the world, with 22.000 affiliates. It has 33 different departments, but no one dedicated to children's environmental health (although some of them are in related areas,, like toxicology).

Conclusion

The pediatric curricula in residency programs in Brazil have a giant gap that needs to be fixed urgently. To help this, WHO and the Collaborating Center for children's environmental health in the south of Brazil are working to disseminate training programs in the country, based on 29 training modules developed by WHO and translated into Portuguese by the Collaborating Center. Also, partnerships with governmental administrators and pediatrics societies are being established. The subject was formally introduced in some post-graduating and residency programs in the south of Brazil.

The Many Doubts About the Existence In Brazil of an Epidemic of Microcephalia Caused By the Zika Virus

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During the last few years Zika virus rapidly spread: across central and south America. An international alarm was created by the hypothesis that the virus could be the cause of an epidemic of microcephalia in Brazil: but recently many doubts have been expressed on the existence of this epidemic.

Certainly the Zika virus, as many other viruses, has the capacity to induce severe cerebral lesions in fetuses of women infected during the first months of pregnancy.

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It must be said however that the number and the geographical distribution of cases of craniostenosys reported in Brazil from September 2015 up to now suggest:

1) The incidence of microcephaly in Brazil is not higher than the incidence expected on the base of international global epidemiology;
2) More than 80% of Brazilian cases of microcephaly were registered in few states of the North-East where peaks of this malformation were registered several years ago, before the appearance of the Zika virus;
3) In none of the other countries (more than 60) where the Zika virus is epidemiologically active an increase of the incidence of microcephalia has been reported: the only exception is represented by the French Polynesia where in the course of a Zika epidemic, unexpectedly, eight cases of the malformation were reported.

Prenatal Early Exposure to the Environmental Endocrine Disruptors

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Background

Endocrine disruptors (EDs) are chemicals compounds that send confusing messages causing various dysfunctions by mimicking or altering the effect of hormones in the human body. Several EDs such as Bisphenol A, phthalates, organotins, among others are involved in obesity and diabetes diseases in children. Recent studies have shown evidences that these chemicals can cross the placental barrier making fetal exposure closely related to maternal exposure. The aim of this research is to establish and detect early fetal exposure to different EDs.

Methods

To address this issue, recently, a human biomonitoring campaign in a cohort of pregnant women has begun, in order to predict the ED mothers' intake and also the dose of ED at which the child has been exposed in the early stage of the development. The data obtained from this cohort (biological levels of EDs and results from questionnaires regarding food frequency intake, habits, and lifestyles) will be implemented into the physiological based pharmacokinetic model. For the physiological based pharmacokinetic model development and parameterization data from literature were used. Approval of the hospital ethical committee was received.

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Results

Regarding the human biomonitoring campaign, complete data are expected to be analyzed by April 2018. Development of PBPK models and parameterisation for selected EDs are in progress. Initial validation of these models is performed using literature data. Biomonitoring data obtained during this study will be cross validated and further analysed to understand early fetal exposure of selected EDs.

Conclusion

The integration of the data obtained from current on-going human biomonitoring campaign and the physiological based pharmacokinetic model, here developed, will predict the prenatal early exposure of the child/foetus to EDs. This work is included in the frame of HEALS project (FP7-603946).

Particulate Matter Characterisation in the Schools Located Around Petrochemical Industrial Complex: Infiltration of Particle From Outdoor to Indoor Air

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Background

Evidence of associations between exposure to ambient particulate matter (PM) and cardiovascular and respiratory diseases has being widely reported. In recent years, in addition to PM_{10} and $PM_{2.5}$ (particle having a diameter of less than 10 and 2.5 µm, respectively), other smaller fractions such as PM_1 and "ultrafine" particles ($PM_{0.1}$) become more relevant in the literature due to their capacity to deposit deeper in respiratory tract. With the changing lifestyle, children, same as adults, spend more of their time in indoor environments (mainly in school and homes). However compared to adults, children are more susceptible to air pollutants. The aim of this study is to characterize the composition of indoor PM fractions at schools and validate with indoor air quality model.

Methods

Indoor and outdoor samples of PM_{10}, $PM_{2.5}$, PM_1 and $PM_{0.25}$ were collected in different schools close to one of the largest industrial complex of southern Europe located in Tarragona (North-east Spain). Using

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AIRMOD, an air dispersion model, schools were selected from the most impacted by industrial (chemical and petrochemical) and harbor emissions. PM fraction levels were measured both, indoor and outdoor environment of schools using two different samplers, high volume samplers and cascade impactors for outdoor and indoor, respectively. Chemical characterization was carried out by analyzing elements and ions content. In addition electron microscope analyses were done in order to assess the morphology of different particles fractions. In order to establish the amount of particles that come from outdoor air to inside the schools, an indoor air quality simulation model (IAQX 1.1) was applied. This model takes into account building parameters such as ventilation rates, room volumes in order to calculate the infiltration of outdoor particle to indoor compartments. Sensitivity analysis and calibration with real data were applied. This work is in the framework of Ultrapar project (Spanish Ministry) and HEALS project (7FP European Union).

Results

Despite the absence of indoor PM sources, indoor PM levels were higher than outdoor. The gym was the environment where highest levels of PM were reached. These results are related with the phenomena of resuspension. For that reason, the lack of a module to introduce resuspension is the main limitation of indoor air quality simulation. As a result, modelled indoor PM levels were about 10% of measured levels. To correct this, resuspension was introduced into the model as an indoor source, having thus a higher similitude between modelled and measured PM levels. Chemical characterization of outdoor PM show a higher contribution from every component in $PM_{2.5}$ fraction, except for Secondary inorganic aerosols Regarding morphology, four main types of particles were found in our samples: fly ash, mineral, soot and undetermined.

Conclusion

Higher levels of PM were experienced in indoor environments, mainly by the effect of resuspension. IAQX model results are improved having into account the phenomena of resuspension as an indoor particle source. Characterization of outdoor PM shows that playground playing could act as a source of fine mineral matter. Future research with more samples is needed to improve present results.

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School Children Exposure to Particulate Matter (Coarse, Fine, and Quasi-Ultrafine) Around Petrochemical Complex: Respiratory Tract Dosimetry

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Background

With the changing lifestyle in developed countries, children are spending more than 80% of their time indoor. Pollutants levels, as well as emission sources, could be different between inside and outside buildings and changes across heterogeneous indoor environments. Children are one of the most vulnerable population groups to environmental pollutants, including particulate matter (PM). In a previous study we measured several fractions of indoor PM ("coarse" (PM_{10}-$PM_{2.5}$), "fine" ($PM_{2.5}$-$PM_{0.25}$) and "quasi-ultrafine" ($PM_{0.25}$)) in several schools. These schools are in a highly impacted area of the largest petrochemical industrial complex in southern Europe, located in Tarragona (North-east Spain). The aims of the present study is to provide an advanced risk assessment of PMs in a vulnerable population cohort by: 1) characterizing the PM exposure of children in the schools impacted by industrial emission in Tarragona; and 2) assessment of primarily toxicity characterization of these particles fraction through 3-(4,5-Dimethylthiazol-2-yl)-2,5-Diphenyltetrazolium Bromide assay with epithelial alveolar cell. Mechanistic exposure models can provide a valuable insight that considers human variability for risk assessment.

Methods

The exposure model applied was a respiratory tract dosimetry model that assesses the dose retained in the different parts of the human respiratory tract (Multiple-Path Particle Dosimetry Model). This exposure model takes into account the parameters that affect human exposure to particles such as PM concentration and size, and activity patterns of children in different environments (indoors and outdoors). The activity patterns of children were assessed using time spent surveys and physical activity questionnaires. 3-(4,5-Dimethylthiazol-2-yl)-2,5-Diphenyltetrazolium Bromide assays with human pulmonary alveolar cells were conducted to evaluate the viability of exposed cells to PM collected in the schools. This work is in the framework of Ultrapar project (Spanish Ministry) and HEALS project (7FP European Union).

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Results

A total mass of 198 µg was retained daily by children in the respiratory tract as a whole. More than half of this mass was retained in the Head region. Maximum deposition fractions for every PM fraction were reached in this region. Similar mass of PM was retained in tracheobronchial (41.1 µg) and pulmonary (37.5 µg) regions. However, most of the mass retained in tracheobronchial region is composed by $PM_{10-2.5}$, while deposition in lungs is composed almost exclusively by $PM_{2.5-0.25}$ and $PM_{0.25}$. Since most of the particles reaching the alveolar region were the fractions $PM_{0.25}$ and $PM_{2.5-0.25}$, we performed the cytotoxicity assay for these two fractions. At low doses, $PM_{0.25}$ show bigger toxicity, while doses equal or higher than 50 µg/mL show similar damage for both fractions.

Conclusion

The approach, here described, provides an assessment for the evaluation of PM exposure and toxicological assay. Principal advantages of this methodology when evaluating exposure are the ability of working with different microenvironments, activities, and population collectives, instead of using only PM levels in one environment (usually outdoor) and physiological parameters of one population group (usually adult males).This methodology also provides a powerful tool to join toxicological assays with real PM exposures.

Impact of Prenatal Exposure to Environmental Pollutants on Autism Spectrum Disorder: A Case Report

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Background

Autism spectrum disorder is a problem with a high prevalence. The understanding of this disease remains a complex issue and each patient becomes an etiological challenge. Hundreds of mutations in all chromosomes have been identified related to autism. In fetal life, brain development is exquisitely susceptible to the exposure of toxic chemicals presented in the environment. With this report we aim to expose a patient with a somatic mosaicism related with parental exposure to chemicals during early pregnancy.

Method

We examined the case of an 8-year-old boy diagnosed of pervasive developmental disorder and attention deficit and hyperactivity disorder. Microarray hybridization identified a duplication of a segment

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of chromosome 19 from band p12 to q13.12. He was the first child of healthy non consanguineous parents. The pregnancy was achieved naturally and there were no medication or drug intake. Both parents work as operators in a chemical plant. The mother stopped working at 4 weeks gestation. She had episodes of nausea and dizziness when purging fuel vapors.

Results

The affected segment includes over 160 genes that have possible association with autism. Using the National Center for Biotechnology Information and Medical Data Institute database we identified the chemicals associated with these genes, and volatile organic compounds, in addition metals were one of the most common mutagenic chemicals founded.

Conclusion

A careful environmental history is needed to understand the etiology of Autism spectrum disorder. In this case we describe acute symptoms of intoxication with gases derived from fossil fuels around the time of gastrulation. These gases contain volatile organic compounds and metals that are classified as mutagenic and could be associated with the chromosomal duplication and the clinical picture present in the patient. Despite the limitations, there is evidence to support that environmental and genetic factors could converge in neurotoxicity.

Neuropsychological profile of an adopted patient with Fetal Alcohol Spectrum Disorder.

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Background

Prenatal exposure to alcohol causes a variety of clinical manifestations known as fetal alcohol spectrum disorder (FASD), with neurodevelopmental effects, among others. Alcoholism is common among mothers of children adopted from Spanish institutions, especially from Eastern Europe.

Methods

A 17 year old boy, born in Ukraine and adopted by a Spanish family at the age of two was referred

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to the Genetics Unit because of psychomotor delay and facial dysmorphia. He is the product of an unknown controlled pregnancy, and had a sister with psychomotor retardation. The presence of dysmorphic features was detected in infancy by the Medical Genetics Unit, as well as psychomotor and pondostatural growth retardation. At the age of 7 he began with inattention and hyperactivity, as well as anxiety and depression symptoms. The child was evaluated by the Neuropediatrics and Psychiatry Unit. After that the child was evaluated at school and by Environmental Pediatric Service.

Results

He presented with behavioral problems and poor school performance, limited IQ and verbal reasoning capacity below average. Significant curricular gaps in grammatics, mathematics and languages. Difficulties in social relationships. He does not show an adequate level of autonomy, all in the context of FASD. The child was diagnosed with FASD.

Conclusion

Patients with FASD may have a normal or decreased IQ, from minimum to profound mental retardation. Executive functions are the most frequently affected. In addition, they usually have poor performance in behavioral inhibition and self-control, verbal and nonverbal fluency, organization and planning. Other manifestations: difficulties in the area of mathematics, and social communication because of language disorders. Problems in socialization influenced by the understimulation, common in adopted children. Behavioral, substance use, sexual behavior and psychotic disorders, among others.
Early diagnosis and intervention, with psychopedagogical treatment seem to achieve an improvement in the neurodevelopment of these patients.

Children Exposure to Polycyclic Aromatic Hydrocarbons and Potential Carcinogenic Risk Assessment From Biomass Burning Incorporating Internal Dosimetry Metrics

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Background

The current study deals with the assessment of the children cancer risk attributable to exposure to polycyclic aromatic hydrocarbons (PAHs), under an increased use of biomass for space heating in Greece since the winter of 2012-2013.

Methods

The study incorporated ambient air particulate matter (PM) sampling in several sites, as well as chemical analysis of PAHs and levoglucosan, as the most specific tracer of biomass combustion. External exposure was estimated accounting for PAHs concentration variability among the various locations and the use of personal sensors providing information on location, temperature and intensity of activity. Internal exposure to PAHs was estimated taking into account the deposition of the respective PM fractions across the human respiratory tract and the respective PAHs concentration of the respective PM fractions. Deposition at different regions of the human respiratory tract was estimated using the Multiple-Path Particle Dosimetry model. Potential cancer risk due to exposure to the mixture of urban ambient air PAHs was calculated using the toxicity equivalence factor approach using as basis the benzo(a)pyrene cancer potency. Cancer risk was estimated from the integral of the toxic equivalent quotient of the different size of PM daily deposited across different human respiratory tract regions, by a slope-factor equal to $0.25 \cdot 10^{-6}$ ng/kg body weight/day) function, initially derived by the benzo(a)pyrene Inhalation Unit Risk (equal to $0.88 \cdot 10^{-6}$ $(ng/m^3)^{-1}$).

This refined exposure and risk characterization methodology allowed us to identify the significant differences experiencing the several age groups, as well as people living in different areas within an urban agglomeration.

Results

The human respiratory tract deposition results indicated that the lower respiratory tract of infants and children (up to 14 years old) can retain up to 74% higher mass fraction of PM_1 particles than that of adults. The maximum difference in the thoracic deposition between adults and children (referring to children between 3 and 8 years old) is that of 68% and 230% for the $PM_{2.5-1}$ and $PM_{10-2.5}$ fractions respectively. Thus, the $PM_{2.5}$ and PM_1 fractions rather than PM_{10} contribute to a greater extent to the absorption of PAHs by the respiratory tract in younger individuals than in adults. Estimate lung cancer risk was above 10-6 for the areas affected by biomass combustion. Age dependent differences in the estimated risk were mainly attributed to the respiratory physiology differences and the increased intensity of activity characterizing children, favoring the deposition of smaller (and more toxic particles) in children. In addition, biomass emitted particles, were found to be more toxic (in term of PAHs content) than the ones emitted from traffic sources.

Conclusion

Hence, age dependent differences in human physiology, combined with the increased intensity of activity characterizing children, resulted in 2-3 times higher risk estimates from exposure to PAHs compared to adults.

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Internal Dosimetry Metrics for Risk Assessment of Endocrine Disruptors – The Case of Bisphenol A

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Background
Bisphenol A (BPA) remains one of the most controversial industrial chemicals with respect to early developmental stages exposure and effects.

Methods
The current study aims at a comprehensive exposure analysis of BPA, using an integrated exposure modelling framework that comprises far field and near field exposure modelling coupled to a dynamic lifetime physiologically based pharmacokinetic model. Exposure analysis was applied in European data, largely based on literature review of BPA food residues, as well as exposure reconstruction of human biomonitoring data. The latter were further assimilated through an advanced exposure reconstruction modelling framework. Special attention was paid on the assessment of BPA internal exposure through critical developmental stages such as gestation, by modelling the mother-fetus toxicokinetic interaction.

Results
The analysis indicated that current exposure levels in Europe are below the temporary tolerable daily intake of 4 μg/kg bodyweight/day proposed by the European Food Safety Authority. For chemicals with widespread consumer applications such as BPA, environmental pathways contribute insignificantly to BPA intake, while overall exposure is dominated by specific consumer behaviors. For BPA these pertain to consumption of canned food and beverages and the use of medical products, found in neonatal intensive care units, such as bags containing intravenous fluids and total parenteral nutrition and tubing associated with their administration. Premature neonates hosted in intensive care units have been also identified as the only population group that potentially faces some risk related to BPA exposure, especially when accounting for the immaturity of the detoxification pathway. In principle,

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health risks might be underestimated for specific population groups (e.g. neonates and infants) if the assessment does not take into account the variability in internal exposure due to genetic, physiological and developmental factors. In utero exposure was found to be highly associated to maternal exposure; actually fetal exposure was higher than maternal by almost 20% due to the presence of β–glucuronidase in the placenta. Nevertheless, at the current levels of maternal exposure to BPA, in utero exposure is also very low, and significantly below the respective biologically effective dose derived from the European Food Safety Authority temporary tolerable daily intake.

Exposure reconstruction of literature available human biomonitoring data resulted in very low intake estimates, similar to the ones estimated from the exposure models. Using biological pathway altering dose derived from in vitro BPA toxicity assessment as the internal exposure reference value, the maximum derived internal exposure values of the worst-case exposure scenarios (premature neonates) are 10 times lower to the lower 99th percentile of the Biological Pathway Activating dose, indicating that there is no reason for concern for individual or aggregate scenarios of BPA exposure.

Conclusion

In addition, the use of the internal dosimetry module allowed the translation of the European Food Safety Authority temporary tolerable daily intake into a biomonitoring equivalent urinary BPA-Glu concentration of320 μg/L. Comparison of this value to the collected biomonitoring data shows that the current existing levels of BPA in EU are 2 orders of magnitude below the European Food Safety Authority temporary tolerable daily intake; this margin of safety is in the same magnitude of order to the one estimated when daily intake is estimated from human biomonitoring data.

Assessing the Impact of Hazardous Waste on Children's Health: The Exposome Paradigm

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Background

Assessment of the health impacts (e.g. cancer, neurodevelopmental disorders and congenital anomalies) related to hazardous waste is an emerging scientific challenge with multiple societal implications. Most

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studies on the links between hazardous waste and health are based on proxies of exposure to waste-related toxicants. They do not provide established mechanistic links between environmental exposure and disease burden prohibiting the exploration of cost-effective waste management options.

Methods

The exposome paradigm embraces dynamic interactions between environmental and endogenous exposures and genetic expression in humans, with a special focus on early developmental stages that have been proven determining for later life health status. Thus, it provides a novel tool for holistic hazardous waste management taking into account their adverse effects on children's health. Waste streams are associated with a broad range of contaminants, such as PCDDs and PCDFs, toxic metals (Cd, As, Cr(VI), Hg), VOCs, PAHs, H_2S, particulate matter, CH4, pesticides, phthalates, and PCBs. All these compounds form a complex mixture of highly variable composition in space and time—accounting for differences in multimedia environmental transfer, persistence and bioaccumulation among the mixture components—to which children are exposed through multiple pathways and routes. Waste streams and the related contamination of environmental media are not viewed in isolation, but rather as components of the expotype, the vector of exposures an individual is exposed to over time.

An array of sensors including in situ systems for regulatory monitoring of environmental media, remote and personal sensors and human biomonitoring were used to provide the data necessary for determining the external exposome associated with hazardous waste contamination. Advanced data and model fusion algorithms were designed to integrate functionally these different environmental datasets taking into account and filling adequately data gaps in space and time. External exposures were translated into internal dose through the use of physiology-based biokinetic models and they were assimilated with the biomonitoring data. Biological perturbations were identified through the use of multi-omics technologies. According to our paradigm, starting from untargeted transcriptomics and metabolomics we proceed with joint analysis of biological processes induced by exposure to waste-related xenobiotics at the molecular level and of metabolic processes induced in parallel. Dynamic flux balance analysis is used to interpret jointly gene expression data and metabolite profiles. Thus putative pathways of toxicity are identified; they need to be verified by targeted multi-omics and functional assays to confirm the causal association of waste components with adverse health outcomes. Advanced bioinformatics deep learning algorithms allow us to identify the functional links among the data derived from high throughput testing platforms and disease phenotypes providing thus phenotypic anchoring of the mechanistic hypotheses made earlier. Waste management practices are thus assessed with regard to their effects on children's health at the individual and community level, taking into account intra-subject variability.

Results

The health risk associated with exposure to potential contaminants from recycling waste streams and recycled waste processing under normal and accidental conditions was assessed. Experimental data were obtained for the case of a disastrous fire at the waste recycling facility in Aspropyrgos. Greece. Based on agnostic metabolome analysis, inhibition of de novo fatty acid biosynthesis was manifested by down-regulation of acetyl-CoA, malonyl-CoA, palmitoyl-CoA metabolites and related mRNA levels. Results strongly support the important role of the AhR in mediating the metabolic effects seen following PCDDs/PCDFs exposure. This additional evidence on the AhR perturbation, allowed the use of the well-

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established slope factor for TCDDs and to translate this into an internal exposure slope factor. The latter was used to estimate risk for the exposed and the non-exposed population. The risk of chronic exposure was estimated (mean value) equal to $2.57 \cdot 10^{-7}$, while the exposed population risk (mean value) was up to $2.91 \cdot 10^{-7}$. The respective risk is expected to be higher for neonates (almost 20%) and even higher to neonates that are also breast fed (up to 32%).

Conclusion

There is sufficient evidence that the various waste management options contribute to potential health effects; yet it is obvious that a more systematic approach is required. Exposome research proposes a paradigm shift that goes far beyond the proxy of exposure and macroscopic health effects association, enhancing our understanding of (a) what are the type of compounds released from the waste management sites, (b) the environmental fate of these compounds, (c) how population space-time lines cross with the space-time lines of these compounds and (d) the effects at the multiple biological organization levels as a result of this cross.

School Environmental Health: the First Steps Towards Environmental Health

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Background

The educational stage (3-18 years) is a period of life in which the environmental factors have a major impact on a child. Environmental factors shape current and future adulthood biological strengths and weaknesses. In addition, during the educational stage social and emotional interactions form personality.

Methods

Since 2006, the Pediatric Environmental Health Specialty Unit of the Hospital Clínico Universitario Virgen de la Arrixaca works along with Colegio San Jorge (Murcia) to promote school environmental health by developing knowledge and maintained goals/concerns that allow us to carry out and implement

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concrete activities in school.

The first step was to have the approval and commitment of the school administration to free a professor for a couple hours a month to carry out these tasks. Subsequently, a complete environmental diagnosis of the school was completed in order to understand the strengths and weaknesses of the environment of the school. Once completed, the goals were developed, 2 of which were implemented and one which will be implemented next year.

Results

1st Goal – Tobacco: Identification of the prevalence of smoking at school, awareness activities, ephemeris celebrations (global day without tobacco), and group therapies of tobacco dishabituation for professors and parents of students.

2nd Goal – Ultraviolet Radiation: Including a hat for the school uniform, choosing a time during the year less hot for the most exhaustive physical activity, as well as organizing schedules so that the younger children have exposure to the sun earlier in the day.

3rd Goal – Pesticides: Inform parents at school of fumigation days and the products that are used, production and use of organic pesticides, awareness activities.

Conclusion

These goals are integrated into the day-to-day of the school, a school activity assumed as its own, which affects future habits and strengths of both students and the school community.

Smoking Cessation Consultation In Pediatrics

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Background

Exposure to tobacco smoke (active or passive) is one of the leading causes of pregnancy complications

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and a risk factor for developing multiple pediatric diseases. Smoking cessation consultation in pediatrics is aimed at pregnant couples. The consult has a group structure (although in exceptional cases is done individually) and is divided into 5 in-person and 5 telephone sessions. The main action developed in the consult is the control of nicotine dependence, and above all, behavioral and emotional dependence to tobacco.

Methods

During 2016, we have developed 3 therapy groups with a mean of 5 patients per group. The individuals who did not attended all sessions and also do not respond to the telephone calls are excluded from the results. There were a total of 16 patients, 12 women and 4 men. The average consumption of cigarettes/ day average was 9.78.

Results

For the Fagerström Test there was an average of 4.4 (little dependence) and for the Richmond Test there was an average of 7.5 (moderate motivation). Cessation rate today is 75%.
Emotional and behavioral control is very important during pregnancy. The inclusion of the partner in the process is so that the cessation is long-lasting, while also promoting a smoke free childhood environments.

Conclusion

The strengths of group therapy are that individuals with the same characteristics (feelings, fears, motivations, etc.), also avoid feeling lonely during the process. The group can solve doubts and questions (fears, shyness, etc.) that otherwise would not be resolved. It helps us to establish pertinent emotional linkages among patients within the group. The results indicate a strong adherence to treatment.

Environmental Reproductive Nursing Consultation: Health From the Beginning

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Background

The Environmental Reproductive Nursing consultation involves a clinical consultation focused on detection, intervention and prevention of exposures to environmental hazards during the critical periods of fetus development (spermatogenesis and pregnancy) that pays special attention to legal and illegal drugs.

Methods

The consultation is supplemented with an ultrasound at 12 weeks of gestation. The goals of the consultation are to detect and reduce environmental exposures that can negatively affect the health of the fetus (or embryo) and to prevent recurrent diseases. In addition, to establish " environmental risk labels " in those pregnancies where the exposures have been severe enough to trigger diseases related to those exposures and allow us to make diagnoses prenatally or in the first months of life
The working tool is called the "hoja verde" and consists of a set of basic and concise questions that allow us to identify and manage/reduce environmental risk factors at critical periods of pregnancy (including spermatogenesis) and breastfeeding. We examine socioeconomic factors, reproductive history, ionizing radiation, drugs/herbalism/homeopathy, occupational exposures, smoking, illegal drugs, alcohol, pesticides and environmental perception of their community.Ethical approval was granted by the La Hoja Verde's ethics committee.

Results

Of the first 1,500 couples with risk during early pregnancy (2009/2012), we found 34.9% of maternal smoking, 45.4% of paternal smoking, 59.4% of maternal alcohol consumption during early pregnancy, 85% of paternal alcohol consumption during spermatogenesis, and 10.1% of fetuses exposed to illegal drugs during early pregnancy.
In the successive years, the data presented a significant decrease in women who drink some alcohol in early pregnancy, a significant decrease in the amount of alcohol that the couples consume and a decrease in the number of newborns with congenital heart disease associated with intrauterine exposure to ethanol.

Conclusion

The Environmental Reproductive Nursing consultation is a clinical consultation/practice that allows us to identify, address and prevent environmental risk factors, that would be otherwise go unnoticed. The training in this type of discipline/consultation is critical in order to increase the quality of pregnancy, health of the pregnant couple as well as the health of the upcoming newborn.

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Blood Lead Concentrations From Children Practicing Airgun Shooting

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Background

Elevated lead concentrations in blood samples from adult indoor shooters are well known. Children are shooting mainly with airguns, but data about blood lead concentrations is missing. Such data would be important to know because even lead concentrations from children below 100µg/l are under suspect nowadays.

Methods

For this investigation children between the ages of 12 and 16 years were recruited after agreement of the local ethical committee. Blood samples (1.2 ml ethylenediaminetetraacetic acid) were drawn from 54 shooters (67 % boys) and 48 controls (79 % boys) after written consent from children and parents. Lead was analysed by graphite furnace atomic absorption spectroscopy (GF-AAS) under strict internal and external quality control. All 102 samples were above the detection limit of 5.0 µg/l. Ethical approval was granted by the Hospital of University Munich, Munich, Germany.

Results

The shooters reported a mean training time of 4.8 (SD 2.7) hours per month with 215 shots (SD 115). The mean lead concentration of shooters was 32.4 µg/l (SD 15.1) and somewhat higher compared to controls (mean 25.4 µg/l, SD 13.2). The difference was borderline significant ($p = 0.048$). There was no difference between results from boys and girls and there was no correlation between shooting hours and blood lead levels.

Conclusions

The results underline that shooting with airguns maybe an additional source of lead in children. Due to the known health effects of lead for children all sources of lead uptake have to be reduced. Further research is necessary to obtain more recent data of the body burden of children in Germany and to look to previously unknown sources.

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Training Modules for Paediatricians
Health effects of climate change

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Background
Health care systems will be increasingly faced with new challenges due to climate change-related health risks. There are several risks to be mentioned: heat-related health problems, allergies and respiratory diseases as well as a new onset of infectious diseases, increased risk of skin cancer due to strong ultraviolet radiation and accidents due to extreme weather events and as a result - mental stress. Children, due to their vulnerability, are seen as a special risk group for numerous pollution and exposure to climate change related factors. It is therefore important for the health sector to improve knowledge about health effects of climate change.

Methods
As part of the German Strategy for Adaptation to Climate Change (DAS), the Institute of Occupational, Social and Environmental Medicine, at the Ludwig Maximilian University of Munich, receives funding for project from the Federal Ministry for Environment, Nature Conservation, Building and Nuclear Safety (grant number 03DAS073) to develop training modules for paediatricians.

Results
The project funding was launched in April 2016 and will continue until March of 2019.
With the support of a cooperation network of professional associations and stakeholders of the target group, a blended learning module is currently being developed for paediatricians. The e-learning phase will begin in spring 2017. The phase to phase teaching will take place during three paediatric annual meetings from summer to autumn 2017.

Conclusion
The project aims to provide scientific knowledge on climate change-related health risks for children and adolescents. It will help that paediatricians will develop necessary skills for the new challenges in diagnosis, therapy and prevention. Hopefully the project will enable adequate preventive and curative action for children.

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Thinking of the Relationship Between Children's Health and the Environment as a Rights Issue — the UN Committee on the Rights of the Child Day of General Discussion on Children's Rights and the Environment on 23 September 2016

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Background

In recent years, it has become increasingly clear that environmental harm is one of the most pressing human rights challenges facing humanity in the twenty-first century. A vast range of human rights, including the rights to life, health, food, water, and housing, depend on a healthy environment. Children are particularly vulnerable to environmental harm. Nevertheless, the effect of environmental degradation on their lives is rarely addressed as a rights issue. The UN Convention on the Rights of the Child (CRC) is often overlooked in setting and implementing environmental policies and standards even though the Convention specifically identifies "the dangers and risks of environmental pollution" as a threat to the right to health. States rarely address environmental issues in their periodic reports to the Committee on the Rights of the Child, which monitors the implementation of the CRC, and while many NGOs (and academics) have started working on human rights and the environment, only a few of them cover issues related to children in particular.

Methods

The Committee on the Rights of the Child (CRC) periodically devotes one Day of General Discussion (DGD) to a specific article of the UN Convention on the Rights of the Child (CRC) or to a child rights issue. The purpose of the DGD is to foster a deeper understanding of the contents and implications of the UN Convention. The 2016 Day of General Discussion (DGD) on 23 September will be on the topic of children's rights and the environment. Local and global experts from different fields will participate in it.

Results

The presentation will provide an overview of the main objectives and scope of the UN conference and highlight key aspects of the current debate, including the potential added value of a rights – based approach to children's environmental health.

Conclusion

The Day of General Discussion is an important first step to promote understanding of the relationship between children's rights and the environment and identify what needs to be done for environment-related law, policy and practice to be rights-based.

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Mismatch of Classroom Furniture and Student Body Dimensions in Schools of Delhi

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Introduction

Children (aged 10-19) in India represent about 20% adolescents as proportion of total population of the whole population. The classroom is a formal environment for learning. A conducive and comfortable classroom environment motivates the students to perform better and encourage the learning process. Furniture has an important role in the maintenance of good sitting posture. Using furniture that promotes proper posture is more important as sitting habits acquired in childhood that is very difficult to change later in adolescence or adulthood. Anthropometric measurements are an important factor that should be taken into account in classroom furniture design. The function of the furniture should be to facilitate learning through providing a comfortable and stress free workstation. Hence, the classroom furniture needs to be designed to allow the children to move about in their seats, as it's unnatural to keep still for long periods.

Methodology

To fulfill this objective, an observation based study was undertaken in public schools of New Delhi for devising suitable furniture measurements for a sample size of 450 school children in relation to their anthropometric measurements. In the study only the school furniture measurements were compared with the Bureau of Indian Standards given for children of 10-13 years and > 13 yrs age group but no comparison was made for the anthropometric measurements for the children. However, correlation between the anthropometric measurements with age was found along with comparing the findings between the boys and girls.

Results

The results showed that none of the schools conformed to the standards given by Bureau of Indian Standards for the school furniture. Also the majority of the students were getting injured because of certain defects in the classroom furniture. It was reported by 49.5% of school children that the classroom seat on which they were sitting for continuous durations was not comfortable to them. Also 34.5% of school children from 10-11 years had found the classroom seat to be uncomfortable to them whereas 31.4% children from 12-13 years and 34.1% from >13 years age group reported the same. Furthermore, the furniture dimensions are one of the main aspects and, amongst these, the seat height is typically the starting point for the design of this type of furniture. The study also indicated the potential relationship between anthropometric data of children and the furniture dimensions. Further we reported,

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based on the rules adopted from Parcells et al.(1999), the children's anthropometric measurements and furniture dimensions were mismatched.

Conclusion

This highlights the fact that students in the sample schools could not find the existing seats and desks adequately fitting their body dimensions which indicates an urgent problem for school children in Delhi.

Assessment of Indoor Air Quality in Air -Conditioned and Naturally Ventilated Schools in Delhi, India

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Background

Understanding the impact of the indoor environment on children is important as they spend most of their time indoors (approximately 80-90%), either at school or at home. Within a school, students spend most of their time inside classrooms, engaging in varied activities which require considerable amount of concentration and attention. Several research studies have indicated that the air quality inside classrooms is often poor and carbon dioxide (CO_2) concentration exceeds recommended levels prescribed by the American Society of Heating, Refrigerating and Air-Conditioning Engineers for indoor environments in majority of schools; which might be due to high student density or poor facilities at schools. If the air inside classrooms is deteriorated, it may cause several health effects that may directly impair concentration or memory of students– e.g., neurological effects – or cause other health effects that indirectly affect learning of children – e.g., absenteeism, poor concentration, restlessness or dizziness. Hence the present research was designed to assess the quality of air inside air-conditioned (AC) and naturally ventilated (NV) schools in Delhi, India.

Methods

The present research was exploratory in nature. The research was conducted in four private schools (two Ac and two NV) located in Delhi, India. The design features of the selected classrooms were studied using a checklist and observation tool. The indoor-air quality parameters namely CO_2, temperature and relative humidity (rH) were monitored at continuous 5 minutes interval from 7:30 am to 2:00 pm for three working days and 8:00 am to 2 pm for one non-working day in each school using air quality monitor Testo 435-2.

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Results

The results of the research study indicated that the measured CO_2 concentrations varied among school classrooms based on type of ventilation, windows, room occupancy and student movement. The average CO_2 concentration in naturally ventilated classrooms were within recommended limits (472.97 ppm to 718.02 ppm) on all the working days i.e less than 1000-ppm CO_2 limit prescribed by the American Society of Heating, Refrigerating and Air-Conditioning Engineers 62-2001 standards. However, the average CO_2 concentrations frequently exceeded the limits in the AC classrooms on all working days (1674.51 ppm to 3298.12 ppm). The CO2 concentrations were within limits in all classrooms irrespective of ventilation type on all non-working days (minimum 386.08 ppm and maximum 478.37 ppm). The average temperature and rH ranged between 24.22°C to 26.29°C and 53.68% to 63.72% respectively in AC classrooms on working days providing adequate thermal comfort to occupants. Whereas, the same was found to be ranging from 30.6°C to 33.01°C and 66.5% and 82.92% respectively in NV schools; exceeding the limits of comfortable temperature (approx. 20°C to 28°C) and rH (less than 65%) suggested by the American Society of Heating, Refrigerating and Air-Conditioning Engineers. The Analysis of the data highlighted the degraded indoor air quality in the air-conditioned school on all the working days.

Conclusion

The elevated indoor carbon dioxide concentrations in AC schools may indicate inadequate ventilation per occupant, which may lead to Sick Building Syndrome symptoms in students affecting their health and performance in schools. On contrary to this, students in NV schools often experienced thermal discomfort due to higher temperature and relative humidity in class.

Quantitative Profiling of Metabolic Markers to Assess Dietary and Microbiota Related Exposure Factors

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Introduction

The dietary and intestinal microbiota related exposure factors directly influence human metabolism, thus affecting health state. Quantitative metabolic profiling by mass spectrometry, specifically selected reaction monitoring (SRM) assays may be used to capture an individual's metabolic phenotype revealing potential perturbations. Biomarker levels correspond to a specific exposure factor and perhaps they

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are consistent with early indications of a disease. This study focuses on biochemical intermediates of tryptophan metabolism to explore the influence of dietary and microbial exposure factors on this essential biochemical pathway.

Methods

A chemical library containing 234 standards of diverse biochemical intermediates was analyzed using ultra-high pressure liquid chromatography- mass spectrometry system (1290 Infinity II and 6495 QqQ, both from Agilent, CA, USA) to develop SRM assays for all detectable metabolites. Urine samples (n=51) from pregnant women collected in the 38th week of gestation were lyophilized, extracted with methanol, internally standardized and assayed for a panel of metabolites relevant to tryptophan metabolism by SRM technology. Ethical approval was granted by the Ethics Committee of Central European Longitudinal Study of Pregnancy and Childhood.

Results

The dietary intake of tryptophan is essential in humans to maintain protein biosynthesis and synthesis of neurotransmitters (serotonin and melatonin). At the same time tryptophan is metabolized by microbiota residing in human intestine. The collective dietary and microbiota exposure was explored using highly selective, sensitive and reproducible SRM assays for 20 key intermediates of tryptophan metabolism. The levels of these intermediates were determined in urine samples from pregnant women collected in the frames of Central European Longitudinal Study for Pregnancy and Childhood in the region of South Moravia, Czech Republic. Quantitative metabotypes were compared in urine samples based on abundance levels and mutual ratios between metabolic markers. This study contributes novel data in the area of health related dietary and microbial exposure factors, particularly to emerging field of the exposome (i.e. non genetic factors affecting human health).

Conclusion

Innovative study of health related dietary and microbial exposure factors in emerging field of the exposome

Acknowledgements

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Impact of Air Pollution to Oxidative Damage In Newborns and Mothers

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Introduction

The aim of our study was to investigate the impact of air pollution on oxidative DNA damage and lipid peroxidation in the urine and blood from mothers and newborns from two localities with different levels of air pollution: Ceske Budejovice (CB), a locality with a clean air, and Karvina, a locality with high air pollution.

Methods

The samples from normal deliveries (38-41 week+) of nonsmoking mothers and their newborns were collected in the summer and winter seasons. Levels of 8-oxo-7,8-dihydro-2'-deoxyguanosine (8-oxodG) in urine were analyzed ELISA, levels of 15-F2t-isoprostane (15-F2t-IsoP) in blood plasma was analyzed by immunoassay kits. Ethical approval was granted by the Ethical Committee of The Institute of Experimental Medicine, Academy of Sciences of the Czech Republic, the Polyclinic Hospital Karvina-Raj, and by the Hospital Czech Budejovice.

Results

Higher $PM_{2.5}$ (particulate matter < 2.5 mm) concentrations were found in Karvina than in CB in the summer 2013, and in the winter 2014 ($P < 0.001$). We observed significant differences in 15-F2t-IsoP levels between the summer and winter seasons in Karvina for newborns (mean±SD: 64.24 ± 26.75 vs. 104.26 ± 38.18 pg/ml plasma, respectively ($P < 0.001$). Levels of 8-oxodG differed only in the winter season between localities, they were significantly higher ($P < 0.001$) in newborns from Karvina in comparison with CB (mean±SD: 5.70 ± 2.94 vs. 4.23 ± 1.51 nmol/mmol creatinine, respectively).

Conclusion

The results of multivariate regression analysis in newborns from Karvina showed $PM_{2.5}$ concentrations to be a significant predictor for 8-oxodG excretion, $PM_{2.5}$ and benzo[a]pyrene concentrations to be a significant predictor for 15-F2t-IsoP levels. The results of multivariate regression analysis in mothers showed $PM_{2.5}$ concentrations to be a significant predictor of 8-oxodG levels.

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Nasal Epithelial Lesions and Scalp Hair as Bio-Indicators of Cumulative Air and Water Pollution Health Effects

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Background

Athens is situated in the Attica basin, a densely populated area in Central Greece, which is also home to industrial activity found mainly along the banks of the Kifissos River. The surrounding mountains restrict the ventilation of the area, resulting in heavy air pollution. Furthermore, the water quality of the river in the basin is impaired due to contamination with heavy metals.

Aim: This study evaluates the exposure of children living along the banks of the Kifissos River to the cumulated effects of air pollutants (such as particulate matter and ozone), heavy metals from the polluted water of the river and the ambient air by examining two endpoints of exposure, i.e. scalp hair and nasal epithelium.

Methods

Samples were taken from 50 children (aged 11 to 12 years old) living at the Municipalities of Philadelphia, Kifisia and Kryoneri. Heavy metals (arsenic, cadmium, mercury, lead and nickel) were measured in scalp hair samples using atomic absorption spectrometry with graphite furnace. Nasal specimens were assessed based on 13 cytological criteria. The nasal samples were processed using the Shandon Cytoblock Preparation System and were examined and photographed using bright-field light microscopy. Ethical approval was granted by the Bioethics Committee of Medical School of the University of Athens. In addition, the Ministry of Education, Lifelong Learning and Religious Affairs provided written permission for the research as well as the parents of the children, after being informed about the objectives of the research.

Results

Heavy metals were detected in all the hair samples in different concentrations; however, the scalp hair samples from the school in Kifisia showed higher heavy metal concentrations, which is consistent

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with the intense industrial activity in the area. None of the exposed children had normal nasal cytomorphological characteristics (distorted orientation, patchy loss of cilia. alteration of epithelial cell orientation, high lack of cellular cohesion, squamous metaplasia and nuclear disorder were observed).

Conclusions

Results suggests that children living at the Attica basin have the same probability in developing nasal epithelium alterations, which can be attributed to the presence of environmental pollutants present in the air (particulate matter, ozone, nitrogen oxides and heavy metals). Also, scalp hair and nasal epithelium may serve as probable bio-indicators of air and water pollution health effects.

Children's Environmental Burden of Disease: Review of Key Findings and General Methodology

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Background

Children are vulnerable to environmental exposures resulting in disease burden. This can be quantified using the Environmental Burden of Disease (EBD) method. EBD method and key findings of children's EBD are presented.

Methods

Quantifying the EBD in terms of disability-adjusted life years (DALYs) is explained. Recent global studies estimating DALYs caused by environmental risk factors (ERF) for children are summarized and discussed to understand DALYs. A focus is given to global estimates from the World Health Organization (WHO) and the Institute of Health Metrics and Evaluation (IHME).

Results

EBD is a method to quantify how many DALYs in a population are lost due to health restricted life time and premature death attributable to ERF. WHO estimated that 25% of global DALYs for children (<5

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years) are caused by modifiable ERF (e.g., air pollution, noise, unsafe water). In children, ERF contribute the most to the burden of infectious diseases, neonatal conditions, nutritional diseases, and injuries. E.g., 11% of 25 Mio DALYs due to neonatal conditions in children (<5 years) worldwide are assumed to be caused by ERF like indoor/outdoor air pollution, tobacco smoke during pregnancy, unsafe water/ sanitation. In comparison, the environmental contribution to lower respiratory infections is with 60% of 52 Mio DALYs much higher. IHME quantified DALYs for a selection of ERF, including unsafe water/ sanitation/handwashing, air pollution, radon, and lead. These ERF explain less than 5% of the total DALYs for children <5 years but more than 10% for children aged 5-9 years.

Conclusion

The EBD studies differ regarding the definition of "environment" and inclusion of ERF. Moreover, data restrictions avoid the inclusion of all ERF of relevance. However, obvious is a high impact of the environment for children's health. This contains a high chance for prevention of the burden by reducing the exposure.

The Study on Relation Between Mercury Exposure and Child Birth Defects

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Background

Due to lack of knowledge of negative health impacts of mercury, illegal gold miners still using mercury for the gold extraction activities. The mercury causes not only environmental pollution but also effects human health. The child health status statistics from 2006 to 2011 in South Gobi province presented, there had been 26 children born with birth defects. This number has a tendency to increase each year.

Methods

The Scientific Review Board of Public Health Institute has reviewed the methodology of this study and The Ethical Review Board of Ministry of Health gave permission to conduct study. In order to find a connection with the causes of these defects with the parent's work environments, we implemented human bio monitoring survey of mercury exposures among 0-5 years of children who were living mining area. Over all 56 children participated in this study, there were 22 boys and 34 girls. We performed pediatric clinical examination for the all of the participants.

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Results

We found that 52.9% were normal, 11.8% had rachitis, 7.8% were hypo oxygenated, and 6% had weight loss. We examined the mercury content in hair, urine and blood. The average mercury among participants urine was 0.215 µg/l (confidence interval (CI) 95% 0.045-0.477), mercury in the root of the hair was 0.075 µg/g (CI 95% 0.042-0.108), mercury in the end of the hair was 0.111 µg/g (CI 95% 0.011 - 0.232), and mercury in the blood was 1.401 µg/l (CI 95% 1.179-1.623).

Conclusion

The results of mercury analysis were matched to the below the threshold of the Human Bio monitoring I limit. It concluded that no statistically significant differences were observed between mercury levels in biological samples of children and their parent's work which related to gold mining with mercury. Parents working condition of the children who involved in the study did not influence on the children's health status and has been proven by statistics (p=0.130, p=0.619).

Noise Prevention In Kindergarten

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Introduction

One of the most important and underestimated challenges is high noise exposure in kindergarten. More than 50 percent of teachers complain about the unfavourable noise conditions in child development facilities. In fact, constant noise exposure affects not only attention performance and the development of language; it also may cause psychosomatic complaints or a higher stress perception. Furthermore, legislative authorities, architects and teachers see noise pollution as an inevitable fact and do not consider noise protection or current needs, like children's exercise, when building or renovating premises for example. Our priority intention is to introduce, develop and evaluate noise reducing interventions, easily to apply and with immediate effects.

Methods

We carried out a 10-months longitudinal case-study in a kindergarten of high noise exposure, which had been selected regarding a set of criteria. Our selection criteria were poor structural technical conditions, at least two groups with similar situations like floorplans, number and age of children. Two similar groups were considered, one group of intervention (IG) and one of control (CG) without any interventions. In the presented project qualitative and also explorative – interpretative – methods were used (open-

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nonparticipating observation, interviews, survey tools, quantitative determination of individual sound levels (n=12) and also reverberation time of the rooms), because an authenticity and natural setting seemed to be of outstanding interest. In addition there were two observers in each group, observing and documenting near misses, conflict rate and also the daily routine respective confounding variables, for example children shouting into their dosimeters. After the first measurement all involved people developed a specific action plan for noise prevention.
After implementation we had the second measurement.

Results

The evaluation was carried out by comparing inter- and intra-individual differences between noise exposure levels in both groups (IG and CG) before and after implementation of measures.
At the first survey IG shows an average sound level of 76,3 dB and after the implementation the sound level reduced to 70,9 dB (compared to CG: 71,5-72,7). Hence, it can be concluded that noise prevention measures were successful. If the analysis of the observed conflicts and near misses rate in both groups beyond the two times of measurements is considered, a reduction was also achieved. The difference between CG and IG suggests a correlation between conflicts (IG: 23-9/CG: 18-16) or near misses (IG: 14-0) and high noise exposure. As the baselines of both groups aren't similar, we don't want to interpret without any further research. Looking at the individual sound exposure levels of adults and children, it appears that children are more affected than pedagogues, which matches to our observations.

Conclusion

On basis of these results it can be assumed that high noise exposure seems to have a negative impact to kindergartens. Construction, organisational or educational measures are able to reduce stressful sound volume and as a consequence the conflict and near misses rate as well. Noise measurements and consulting interventions in kindergartens should be put into practice. A Noise Prevention Checklist ("Which interventions are the most useful at a specific kindergarten?") and guidance about noise preventions for kindergarten management and policy makers is needed.
Further research and evaluation of technical, organisational and pedagogical interventions should be developed in order to make policy makers and other stakeholders, like architects aware of noise problems and its negative impacts.

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Quantify the Burden of Disease Due to Environmental Risk Factors In Children and Adolescents In Germany – the UKAGEP Project

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Introduction

Environmental Burden of Disease (EBD) estimates are increasingly used by scientists to inform decision-makers about environmental risk factors causing ill-health. Currently no up-to-date national estimates of the EBD are available for Germany. Especially children and adolescents represent a group vulnerable to the effects of environmental risk factors. Therefore, the research project UKAGEP aims to estimate the EBD of 16 risk factors for children aged between 3 and 17 years in Germany.

Methods

The UKAGEP project uses the EBD methodology and its core measure, the disability-adjusted life year (DALY). Current exposure and human-biomonitoring data derived in the currently ongoing population-representative German Environmental Survey (GerES 2014-2017) are used to estimate the exposure of children in Germany. Combined with exposure-response functions (ERF) and data on the related health effects, DALYs will be estimated. The ERF will be derived from or updated by systematic literature reviews and meta-analyses. To take into account cumulative chronic effects, probabilistic modeling will be performed. Furthermore, it is also necessary to estimate the potential future burden, because many current exposures might affect health after a long lag-period.

Results

The concentration of most environmental hazards is expected to be rather low. However, some of the risk factors might still pose a considerable threat at population level, especially if both, effects of mortality and morbidity, are considered. Furthermore, the estimated future burden will show how current exposures will impact the health of children living with today's exposures for the upcoming years.

Conclusions

The UKAGEP study will present the EBD of a set of known hazards, but will also provide insights on newly emerging risk factors. It is also envisaged to strengthen the use of human-biomonitoring data and methods of probabilistic modelling in EBD assessments.

Financial support of the GerES by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety and the German Federal Ministry of Education and Research, and financial support of the KiGGS study by the German Federal Ministry of Health is gratefully acknowledged. We also thank the Robert Koch Institute for its support in this collaborative study.

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What is Environmental Burden of Disease? – An animated video gives an answer

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Background
The Environmental Burden of Disease (EBD) method is used to quantify disability-adjusted life years (DALYs) which can be attributed to environmental risk factors. Thereby, risk factors of major concern for population health can be identified. DALYs are not easily understandable what might prevent their use in risk communication to the general public as well as in political decision-making.

Method
An animated video was produced to explain the EBD method and its possible application fields to the interested general population, scientists from other research fields and policymakers. A vivid example, outdoor air pollution, which affects everyone's health, was chosen to illustrate the quantification steps. Technical terms are used and explained in common language.

Results
The 8-minute video describes the DALY as a summary measure of population health which consists of years of life lost due to premature mortality and years lived with disability. Likewise the attribution of DALYs to the risk factor outdoor air pollution is illustrated. The video is freely available on YouTube in German and English.

Conclusion
The video is designed to be understandable to a broad audience by using a balance between simplification and scientific correctness. It gives a short but comprehensive explanation of the complex EBD method and is therefore an attempt to break out of the scientific ivory tower.

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Neurodevelopment, Low Level Mercury Exposure and Genetic Polymorphisms In Birth Cohort From Slovenia and Croatia

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Background

The aim of the present study was to evaluate association between prenatal exposure to mercury and neurodevelopment of a child, taking into account relevant confounders and some relevant genetic polymorphisms. We examined apolipoprotein E (*Apoe*) and glutathione transferase (GSTM1 and GSTT1), the genes that are hypothetically involved in elimination of mercury from the body, and *Apoe* also in neurodevelopment.

Method

The study population was comprised of 601 mother-child pairs recruited from the central Slovenia region and 243 from Rijeka, on the Croatian coast of the northern Adriatic. Determination of total mercury in cord blood, neurodevelopment assessment using Bayley Scales of Infant and Toddler Development, Third Edition (Bayley III) at 18 months of age and genotyping was done in 361 children; 237 of them were from Slovenia and 124 from Croatia. The National Ethics Committees of Slovenia and Croatia approved this study.

Results

The results showed negative association between low-to-moderate mercury exposure levels and cognitive outcomes and with fine motor scores at 18 months of age. The observed decrease in cognitive function was significant only in children carrying at least one *Apoe* ε4, while the decrease in fine motor score was independent of the *Apoe* genotype. Adjusting for selenium and lead revealed positive association between selenium and language and negative between lead and motor function, but only in the subgroup of children not carrying the ε4 allele. The GSTT1 genotype revealed positive association

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between cord blood selenium and cognition in children without gene deletion (β=11.8, p=0.008), but not in children with GSTT1 deletion (β=-15.1, p=0.128).

Conclusion

The present study indicates that even low-to-moderate mercury exposure in children with normal neurodevelopmental outcome can be associated with lower cognitive and fine motor Bayley III scores and that stratifying for specific genotypes and accounting for beneficial and other potentially neurotoxic substances is crucial in assessing such associations.

Early Life Exposure to Organochlorine Pesticides and Behavioral Development In Children

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Background

Although organochlorine pesticides have been banned in the Western world decades ago, bioaccumulation in younger generations still occurs. Exposure to organochlorine pesticides may be related to adverse effects on behavioral development. Exposure during early life may be particularly harmful, as rapid structural and functional changes take place. The aim of this study therefore is to explore the association between early life exposure to the organochlorine pesticides and behavioral development at 18 months.

Methods

Data from 59 mother-child pairs from LINC, a prospective birth cohort in the Netherlands were used. The targeted compounds were the sum of polychlorinated biphenyls (ΣPCBs), hexachlorobenzene (HCB),

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the sum of hexachlorocyclohexane isomers (ΣHCH), heptachlor epoxide, and dieldrin; all determined in breast milk. The scales 'Attention Deficit Hyperactivity Disorder' (ADHD) and 'Externalizing Behavior' of the Child Behavior Checklist 1.5-5 were used for the behavioral assessment. Whole population and sex-stratified regression analyses were performed, in which exposure levels were classified in tertiles (T1, T2 and T3). A family history of ADHD, educational level, smoking, and alcohol or illicit drug use during pregnancy were included as confounders. Ethical approval was granted by the Vrije University Medical Center.

Results

Children exposed to the highest levels of ΣHCH presented higher scores on the ADHD-scale of the CBCL. After stratification for sex, significant associations were only found for girls. Positive associations were found between early life exposure to the highest levels of ΣPCBs, ΣHCH, dieldrin, and T2 levels of HCB; and ADHD symptoms. Higher scores were found on the Externalizing Behavior scale of the CBCL after exposure to dieldrin (T3) and ΣPCBs (T2 en T3).

Conclusion

Significant associations were found between early life exposure to organochlorine compounds and behavioral development at the age of 18 months. Associations were sex-specific (in girls only). Results should be seen as exploratory, as the sample size was small.

Prenatal Exposure to Environmental Chemicals: Associations With Neurotransmitter Levels In Cord Blood

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Background

Neurodevelopmental disorders such as attention deficit hyperactivity disorder and autism, have been associated with exposure to environmental chemicals, including dioxins and organochlorine pesticides. Effects have been observed particularly in relation to exposure in early life. Mechanistic pathways, such as relations between chemical exposure and neurotransmitter levels, have however been studied less frequently. Our objective therefore was to study the effect of early life exposure to environmental chemicals on neurotransmitter levels in cord blood.

Methods

Data were used from 63 mother-child pairs from the LINC study, a prospective birth cohort in the Netherlands. Cord plasma was collected at birth and was used to determine both levels of environmental chemicals and neurotransmitters. Exposure to various compounds was determined, including phthalates (metabolites of di-2-ethylhexyl phthalate [DEHP]), perfluorinated alkyl acids (perfluorooctanesulfonic acid [PFOS], and perfluorooctanoic acid [PFOA]), and brominated flame retardants. The neurotransmitters included dopamine, epinephrine, norepinephrine, acetylcholine, serotonin, gamma-amino butyric acid (GABA), and glutamate. Univariate regression models were composed for each compound in tertiles, and each neurotransmitter. Ethical approval was granted by the Vrije University Medical Center.

Results

An overall significant effect of PFOA exposure on GABA was observed ($p = 0.049$). It appeared to be that higher levels were observed in the second tertile compared to the first, and lower levels in the third tertile compared to the first. Furthermore significant overall effects were observed for MEHHP (acetylcholine, $p = 0.039$), and MEOHP (epinephrine, $p = 0.048$). For mono(2-ethyl-5-hydroxyhexyl) phthalate (MEHHP), lower levels of acetylcholine were observed in the highest exposure tertile, whereas for mono(2-ethyl-5-carboxypentyl) phthalate (MEOHP) higher levels of epinephrine were observed in the second exposure tertile.

Conclusion

Prenatal exposure to PFOA and DEHP was associated with levels of GABA, acetylcholine, and epinephrine. Dose-response effects were non-linear. Whether these changes in neurotransmitter levels in cord blood are related to abnormal behavioral development, needs to be further explored.

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Maternal Exposure to Particulate Matter and Birth Weight In Dutch Children

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Background

Maternal exposure to particulate matter (PM) may cause decreased transplacental oxygen and nutrient transport to the fetus, potentially resulting in a lower birth weight (BW). Results of observational studies have however been inconsistent and because of the potential health implications, further research is needed to confirm the relation between maternal exposure to PM and BW.

Objective

To investigate the association between maternal residential exposure to fine and coarse particulate matter ($PM_{2.5}$ and PM_{10}) and BW.

Methods

Data were used from the LINC study, a prospective birth cohort study in the Netherlands (n = 223). Individual exposure estimates to $PM_{2.5}$ and PM_{10} at each participant's home address were assessed using a geographical air quality map. Data on BW, gestational age and maternal anthropometry were obtained from the midwives, and data on parental health, lifestyle and socio-demographics characteristics were collected by means of questionnaires. To estimate the impact of PM on BW as a continuous measure, linear multivariable models were used. Because the sample size, PM was converted into a dichotomous variable with the concentration groups <12 µg $PM_{2.5}/m^3$ (reference group) and 12 – 13 µg $PM_{2.5}/m^3$ for $PM_{2.5}$ and the concentration groups <19 µg PM_{10}/m^3 (reference group) and 19 – 20 µg PM_{10}/m^3 for PM_{10}. Ethical approval was granted by the Vrije University Medical Center.

Results

For 191 of the 223 children (85.7%), exposures were successfully estimated. The highest exposure level for $PM_{2.5}$ was 12-13 µg/m³, to which 65.4% of participants were exposed. For PM_{10} the highest exposure level was 19-21 µg/m³, which was observed for 52.4% of households. Only exposure to a higher concentration of $PM_{2.5}$ resulted in a statistically significant negative effect on BW (p=0.027). After adjusting for confounders, a decrease in mean BW was found for $PM_{2.5}$, with a change of -142.8 g (95% CI, -269.1 to -16.4).

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Conclusions

Maternal exposure to higher levels of $PM_{2.5}$ was associated with a lower BW. The implications for public health in the Netherlands are important, as exposure levels in this study are common.

Polycyclic Aromatic Hydrocarbons From Traffic Exhausts In Primary Schools and Cognitive Development of Children

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Background

Traffic air pollution is associated with slower cognitive function growth in schoolchildren. Polycyclic aromatic hydrocarbons (PAHs) impair brain development in animal studies. Here, we assess the association between PAHs in urban schools (n=39) and the cognitive development in children (n=2,897) from 2nd to 4th grade (7-10 years).

Methods

Cognitive development was assessed through 12-month change in working memory and attention. All parents or guardians signed the informed consent form approved by the Clinical Research Ethical Committee of the IInstitut Hospital del Mar d'Investigacions Mèdiques-Parc de Salut MAR, Barcelona, Spain.

Schools were sampled on particulate matter 2.5 ($PM_{2.5}$) indoor (classroom) and outdoor (playground) twice in 2012 during one-week periods. One fourth of each $PM_{2.5}$ filter was used for PAH analysis by gas chromatography–mass spectrometry. Furthermore, organic carbon, elemental carbon, nitrogen dioxide and $PM_{2.5}$ from traffic origin were measured.

Results

Indoor PAH levels were similar to outdoor levels (ratio 0.9), except for the more volatile particulate

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bounded PAHs, such as benz[a]nthracene and chrysene with higher indoor levels (ratio 1.5). Higher PAH concentrations were observed in the schools from the urban centre. BaP, the only compound with an established annual limit concentration (1000 pg/m^3), ranged from 22 to 343 pg/m^3 indoors and from 17 to 301 pg/m^3 outdoors. Correlations between outdoor PAHs and EC were high ($0.66<r<0.79$) while indoor correlations had a wider range ($0.54<r<0.84$) and were lower for benz[a]anthracene ($r=0.62$) and chrysene ($r=0.54$). A similar pattern was seen for NO2 and traffic $PM_{2.5}$.

Outdoor PAHs were generated by traffic inputs, while indoor PAHs reflected older mixtures. The more volatile PAHs were under the influence of gas-particle partitioning in combination with high indoor organic carbon. Children attending schools with higher PAH levels had worse working memory and inattentiveness growth, which was statistically significant for the more volatile PAHs and benzo[ghi] perylene. The exact mechanism by which PAHs affect the developing brain remains unclear, however, it is likely to be mediated by inducing inflammation, oxidative stress, and vascular injury.

Conclusion

This study point towards the role of motorized vehicle exhausts in air pollution in schools on cognitive development in a modern world urban area. Although stronger associations to effects were observed in the outdoor PAH distribution, and thus, fresh vehicle exhaust, the effects were also reflected in the indoor air, which receives outdoor contamination.

Acknowledgements

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Considerations For Policies Design Aimed to Promote Drinking Water Consumption In Mexican Children and Adolescents: Santa Fe, CDMX

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Background

Water is the major constituent of the human body and drinking water is the most important source to fulfil its needs. There are some choices to get water (e.g., bottled water consumption, home-based water treatment or installation of water storage facilities) to adapt to the existing water supply system there

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are several urban communities where we cannot ensure the access to potable water. The World Health Organization considerers that social welfare and not only physical environmental biological or chemical factors can affect human health, in this sense, environmental factors such as little or no availability of drinking water could contributed to the figures of low water consumption as well as related psychosocial factors.

The aim of this analysis is to emphasize the need of multicomponent strategies (access, social campaigns, social empowerment and psychosocial factors) that might contribute to accomplish the recommendations of water consumption in Mexican children and adolescents living in Santa Fe, CDMX.

Analysis

In Mexico, one sixth of the population has no chance of getting drinking water (1100 million) and almost 40% lacks of sanitation. These figures are worse in marginalized vulnerable urban communities as Santa Fe in CDMX where only 18% of children and adolescents reach water recommendations. As this population spends most of their time in schools and at home, these places should been considered as key places to promote and ensure water consumption, there is some evidence suggesting an underscore of the importance that children have access to water in and outside the schools. Current polices to promote drinking water are focused only on the installation of water fountains in schools (some reports estimated that 55% of public elementary schools have this service) without considering availability at home and the fact that it has been recognized that confidence about water quality of filters affect water consumption. Psychosocial factors such as intent, knowledge, beliefs, attitudes, subjective norms and self-efficacy, which are associated factors to the low water consumption, have not been considered as part of environmental modifications.

Conclusion

Polices aimed to increase water consumption in children and adolescents should be through multicomponent environmental modifications aimed to ensure access to drinking water not only in schools and access, but considering psychosocial factors.

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Occupational Injuries Among Child Labourers: Results From a Cross-Sectional Study in Peru

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Background

Although there is a considerable number of children involved in child labour worldwide, data on occupational hazards and injuries is limited. Thus, the objective of this study was to investigate the lifetime prevalence of and risk factors for occupational injuries in child labourers in Peru.

Methods

Between August and December 2010, a cross-sectional study was conducted at five public night schools in Cusco Province. 375 students (response 91.5%) aged 10 to 17 years completed an interview-based questionnaire on socio-demographic factors (age, sex, place of birth, education, residential status, minority status, health care coverage), work-related factors (income, working days per week, occupational sector) as well as lifetime prevalence of occupational injuries. Multiple logistic regression analyses were performed to estimate risk factors for different types of occupational injuries. Ethical approval was granted by the Medical Faculty of the University of Munich and the Ministerio de la Mujer y Desarrollo Social (Ministry of Women und Social Development) in Peru.

Results

We found falls (11%), car accidents (9%) and physical violence (3%) were common causes of injuries in this population. Severe injuries (fractures, luxation or amputations) were reported by three percent of the study sample. Participants with high daily income (≥20 PEN, ~15 USD) showed increased odds for falls (odds ratio 2.8; 95% confidence interval 1.2-6.5) and physical violence at work (odds ratio 12.1; 95% confidence interval 1.3-116.0). Children working in the service sector were at higher risk of injuries

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caused by car accidents (odds ratio 4.2; 95% confidence interval 1.2-15.3).

Conclusions

Occupational accidents among child workers attending public night schools are common in Cusco with a lifetime prevalence of three percent for severe injuries. High income seems to convince child labourers to accept poor working conditions.

Air Pollutants Exposure and Functional Repair Activity In Placenta

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Introduction

Maternal exposure to air pollutants can affect fetal development and cause adverse birth outcomes. Nitrogen oxides (NOx) can react with amines to generate toxic alkylating agents (AAs), and their biological effects are mediated, in part, by the formation of DNA damage including the promutagenic and toxic, O6-methylguanine. O6-methylguanine methyl transferase (MGMT) removes O6-alkylguanine adducts by transferring the alkyl group from the O6 position to the cysteine residue within its active site. The aim of this study is to quantify MGMT functional repair activity in placentas and to determine its association with air pollutant exposure over various time windows during pregnancy.

Methods

Tissue samples from the middle, cord and peripheral areas of the normal placentas were collected from 10 mothers, who lived in Greater Manchester, and stored at -80°C until processed. MGMT repair activity was quantified in cell-free sonicates of 100-120 mg tissue using a standard radioistotopic methyl transfer assay and protein levels were quantified by a Bradford assay. Postcodes of the mothers were geocoded by ArcGIS and air pollutant data obtained from the Department for Environment, Food and Rural Affairs. Ethical approval was granted by the Central Manchester University Hospitals NHS Foundation Trust.

Results

Placental MGMT activity (mean ± standard deviation) was 0.140 ± 0.022, 0.134 ± 0.014 and 0.124 ± 0.007 fmoles/μg for middle, cord and peripheral samples respectively and varied 4, 5 and 1.5 fold respectively. Level of pollutant exposure varied with mean nitrogen dioxide exposure was 16.2μg/m^3,

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NOx 23.3μg/m^3, PM_{10} and $PM_{2.5}$ were 13.1μg/m^3 and 9.4μg/m^3 respectively. None of the pollutants were significantly associated with any time windows during the pregnancy ($p>0.05$).

Conclusions

This initial study indicates that the placenta contains functional MGMT activity that may affect susceptibility to alkylating agent exposure. The biological significance of variable placental MGMT activity remains to be characterised. An association between placental MGMT activity with pregnancy outcomes need to be further studied.

Acquired Immune Deficiency syndrome Orphans in Sub-Saharan Africa: A systematic Review on Differences Between Rural and Urban Environments

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Background

Currently, there are more than 11 million acquired immune deficiency syndrome (AIDS)-affected orphans that suffer from various adverse effects, most of whom reside in sub-Saharan Africa. The difference between whether a child resides in a rural or urban environment can have a significant role in a child's education, health status and access to healthcare, and social or family relationships.

Methods

A systematic review was conducted in order to understand these environment-based differences on orphans directly affected by human immunodeficiency virus infection (HIV)/AIDS in sub-Saharan Africa. There were 233 sources used for this review; however, 164 manuscripts focused more on a general review of orphans within a rural or urban environment. Thus, after eliminating for various factors, 69 manuscripts were used, which focused primarily on the social aspect of orphans due to HIV/AIDS.

Results

Rural environments provided more family support, while urban environments generally had more resources available to orphans (e.g. school fees). Unfortunately, both rural and urban environments were found to be fairly non-supportive of orphans and their development. This systematic review found, in general, that orphans in both urban and rural environments continue to suffer from the iatrogenic effects of low parental support due to AIDS mortality.

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Conclusion

These conclusions continue to support an increase in developmental support through school and social relationships specific to orphans throughout sub-Saharan Africa.

Improved Relationships in Eastern Kenya From Water Interventions and Access to Water

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Objectives

Global health interventions focus on providing solutions to unaddressed public health issues in low- and middle-income countries. Providing nearby access to safe drinking water is a primary public health concern and a frequent public health intervention throughout sub-Saharan Africa; access to water eliminates long gathering and transport time and provides an individual with more personal time. Previous research has not reviewed the aspect of time and relationship changes after implemented water interventions.

Method

A qualitative phenomenological approach used 52 semistructured interviews to examine relationship experiences among primary water gatherers and their families after receiving nearby access to water. The study group consisted of men and women from approximately 7 years old to 75 years old. This study took place throughout the historically semiarid eastern region in Kitui, Kenya, where community members have been beneficiaries of various water interventions. Ethical approval was granted by both North Dakota State University and Moi University.

Results

Before the water intervention, family members experienced difficulties with irregular meal times and food availability, infrequent family conversations, irritation with lack of bathing and cleanliness, and general discontent without the availability of 1 able-bodied family member. Participants' experiences after implemented water interventions revealed enhanced relationships within household family units; additional personal time was gained and used to rebuild relationships. The newly established relationships included constructive discussions and conversations built around understanding and

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developing solutions to address economic or individual challenges encountered by the family.

Conclusions

This study's findings suggest that relationships significantly improved after households receive access to nearby water. Furthermore, this research provides evidence of an increased need for access to quality water for communities throughout the world to positively contribute to constructive family relationships.

A Review on Managing and Treating Mercury Emissions In Small Artisanal Gold Mining

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Background

Small artisanal gold mining (SAGM) continues to be a pervasive public health issue worldwide, affecting miners as well as both children and women. While there are various problems associated with SAGM, mercury exposure is the primary hazard contributing to adverse health effects in exposed human populations.

Methods

A literature review was conducted in order to specifically assess the impact of current mercury interventions within the entire SAGM industry. To aid in this review, a resource pool of information on SAGM and mercury emissions, treatment and management of emissions, and interventions was assembled through a search conducted via multiple search engines.

Results

Mercury usage continues to be largely embedded in the handling, processing, and extraction techniques of SAGM; however, current interventions have been implemented worldwide to focus specifically on reducing or eliminating mercury emissions through education, processing centers, or mercury alternative techniques. Education focused on environment or health awareness or more specifically on alternative techniques. Processing centers offered areas of large-scale technology centers for small-scale miners. Alternative techniques included retorts, vat-leaching, magnets, direct smelting of gold, and borax. Results determined positive and negative outcomes associated with every intervention, thereby

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confirming the fact that a single solution managing and treating mercury currently does not exist.

Conclusion

Ultimately, the need for novel techniques addressing mercury emissions in SAGM needs to be pushed to the forefront of critical issues in public health in order to aid in developing positive change in the industry.

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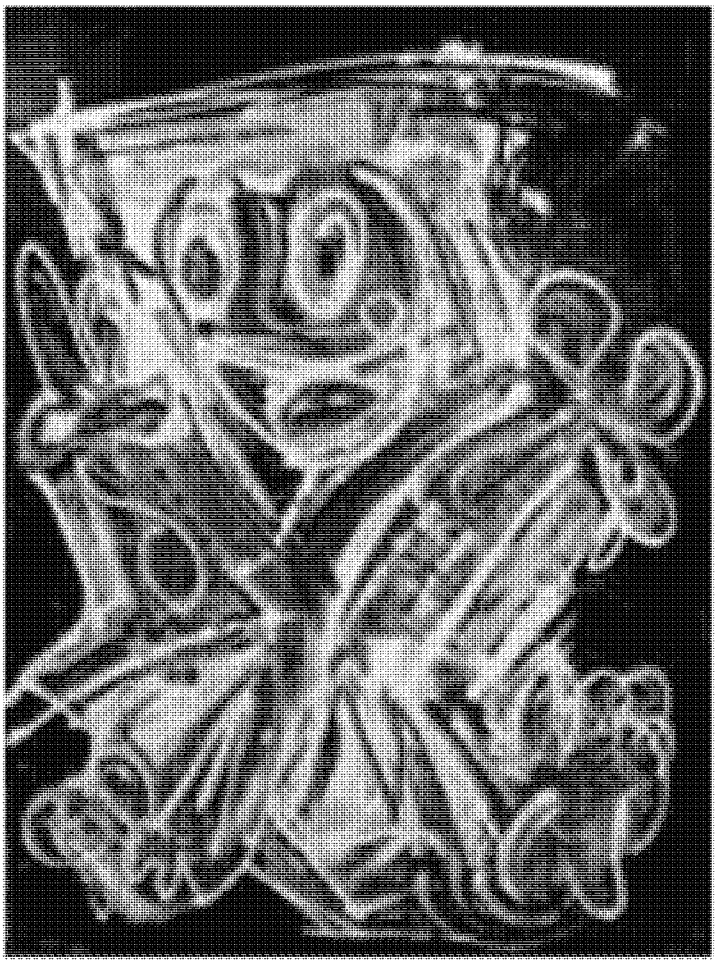

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Doctor Aiguader, 88 (at CREAL), Barcelona

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Children and all humans are under the influence of multiple environmental stressors. However, children are not little adults. Their organs and metabolism are under formation and their capacity to face pollutant stress is different. Exposure to deleterious compounds already starts in the preconceptional and fetal stage. In the first years of life children are affected by exposure to toxic chemical products present in air, water, soil, domestic dust, toys, clothes, furniture and diet. The nature of pollution is changing. In rapidly developing countries. Urbanization, climate change, increasing motor vehicle use and the wide spread of toxic chemicals use, pesticides and polluting industries, levels of ambient and indoor biomass air pollution and soil pollution are increasing sharply the exposure for the most vulnerable. Moreover, some polluting agents are incorporated together with nutrients in the same ingestion processes, e.g. during breastfeeding. Some food items such as fish, the main source of omega 3 fatty acids, also carry pollutants such as organochlorine compounds and methylmercury. Health effects of these toxic compounds may not be noticed directly or shortly after exposure. Damage in growing organisms may result in delayed disorders later in life, e.g. during adolescence, reproductive period or maturity. The effects of pollutants on children's health also depend on individual susceptibility. Full understanding of health impacts requires studies integrating gene-environment interactions. The details will provide more and more proof that we need to protect children.

Many topics are addressed in the 8th International Conference on Children's Environment and Health, which is organized by the International Network on Children's Health, Environment and Safety (INCHES) and the Institute of Environmental Assessment and Water Research (IDAEA) and Spanish Council for Scientific Research (CSIC). The meeting provides an international forum for the latest research findings in children's environmental health. Specific attention is devoted to identify opportunities to minimize childhood prenatal and postnatal exposure to environmental contaminants, to provide insight in the field of science and policy interface and to develop a greater awareness among health professionals about children's health.

The objectives of the conference

· Provide an international forum for the latest research findings in children's environmental health;
· Define the relationship between environmental contaminants and children's health;
· Strengthen the importance of prenatal exposure to environmental factors on pregnancy outcome and children's health;
· Identify opportunities to minimize childhood prenatal and postnatal exposure to environmental contaminants;
· Provide insight in the activities in the field of science and policy interface;
· Build a platform of knowledge at an international level;
· Develop a greater awareness among health professionals about children's health, environment and safety;
· Initiate future directions and international collaborations in research in the field of children's environmental health.

The Scientific Program

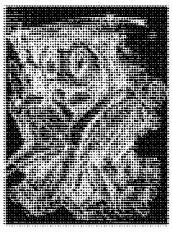
The scientific program of the 8th INCHES Conference includes about 140 lectures, short oral presentations and posters presented by scientists from 34 countries covering a broad spectrum of topics. Abstracts of these presentations appear in this issue of the journal.
The topics are related to: Health effects of pollutants in children (pesticides, heavy metals, air pollution, tobacco) prenatal exposures, reproductive health, cancer, obesity, biomonitoring, Children Environmental Health Centres and Specialty Units, children's environmental rights, climate change, sustainable development, e-waste, radiology, safety and injury prevention, training for pediatricians and health policy regarding Children Environmental Health.

8th INTERNATIONAL CONFERENCE ON CHILDREN'S HEALTH AND THE ENVIRONMENT

14th – 16th of September 2016

Location: **Parc de Recerca Biomèdica de Barcelona - PRBB**

Doctor Aiguader, 88 (at CREAL), Barcelona



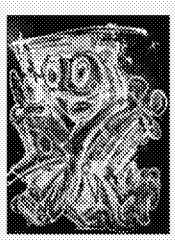
Wednesday 14th of September 2016

9:00-9:20 **Opening Session**	**Welcome and announcements** Joan Grimalt (chair organising committee) Peter van den Hazel (chair board INCHES) Mark Nieuwenhuijsen (host organization ISGLOBAL)	
09.20-10.45	**Session 1 (Auditorium) Environmental Determinants of Child Health** Chair: Stephan Bose-O'Reilly (Germany) and Mark Nieuwenhuijsen (Spain) Brainy approaches to children's environmental health – Philippe Grandjean (Denmark) Environmental Pollution and Children's Health – Phil Landrigan (USA) Pollution: the biggest killer on the planet. A summary of the upcoming Lancet report - Rich Fuller (USA) Environmental Health Issues for Spain – Joan Grimalt (Spain)	
10.45- 11.10	**Opening Ceremony (Auditorium)** Peter van den Hazel – INCHES President Joan Grimalt, chair Organising Committee **Opening speech: ms. Gemma Tarafa,** Commissioner of Health, City Hall of Barcelona	
11.10 -11.30	**Break**	
11.30-13.00	**Session 2 (Auditorium) Epidemiological longitudinal studies of child health and environment** – **birth cohorts- child cohorts** Chair: Ruth Etzel (USA) and Isabella Annesi-Maesano (France) Ambient air pollution and onset of asthma in birth cohorts. The rise and fall of evidence - Achim Heinrich (Germany) Current findings on maternal gut microbiome and PCBs concentration in birth cohort study with omics analysis: Chiba Study of Mother and Children's Health (C-MACH) - Chisato Mori (Japan) Preventing Exposure to Environmental Hazards -- Role of Primordial Prevention - Ruth Etzel (USA) Association between breastfeeding duration and cognitive development, autistic traits and ADHD symptoms: a multicenter study in Spain - Jordi Julvez (Spain) Maternal exposure to particulate matter and birth weight in Dutch children - Margot van de Bor (Netherlands) Birth Cohort Consortium of Asia (BiCCA) on Children's Environmental Health – Pau-Chung Chen (Taiwan)	**Session 3 (Darwin) Child labour** and other topics Chair: Stephan Boese- O'Reilly (Germany) and Rich Fuller (Pure earth / Blacksmith. Environmental justice) Poor education, poor job, poor health. Hanns Moshammer (Austria) Occupational injuries among child labourers: results from a cross-sectional study in Peru - Tobias Weinmann (Germany) Minamata Convention on mercury and vulnerable population - Yuyun Ismawati (Indonesia) TiPP TAPP - first steps into life – Claudia Gerken Childless , Workless, Worthless - Jürgen Bilger (Germany)
13.00-14.00	**Lunch** **Seminar/discussion session on ° Communicating Radiation Risks in Paediatric Imaging** organised and presenterd by Maria Perez (WHO) and Donald Frush (USA), starts at 13.15 hrs	

14.00-15.30	**Key note presentation:** Dr. Maria Neira (WHO, Switzerland) –CEH an dopportunities for action under SDG era **Session 4 (Auditorium) Developing countries and CEH: examples of action on emerging issues by WHO and partners** Chair: Marie Noel Brune Drisse (WHO, Switzerland) WHO's work on early life exposures and future health –prevention for future generation - Emiko Todaka (WHO) Radiation imaging communication in paediatric: situation in developing countries and focus on action - Donald Frush (USA) E-waste and child health WHO global initiative -Marie-Noel Bruné (WHO, Switzerland) Air pollution and CEH action in Brazil - Emerson da Silva (Brazil)	
15.30- 15.45	**Break**	
15.45 -16.30	**Poster pitch session A (Auditorium)** **Chairs:** Peter van den Hazel (Netherlands) and Merce Gari (Spain) Prenatal exposure to environmental chemicals: associations with neurotransmitter levels in cord blood - *Margot van de Bor* Cognitive effects after low - to moderate dose exposure: study plan in a cohort of childhood cancer survivors - *Elisa Pasqual* Children exposure to phthalates and bisphenol A in LIFE PERSUADED project: preliminary results on biomonitoring and case-control studies - *Cinzia La Rocca* Mercury concentrations in commercial seafood from the western Mediterranean Sea - *Rosa Maria Llull Cantallops* A review on managing and treating mercury emissions in small artisanal gold mining - *Tara Rava Zolnikov* Acotinine, cadmium and pahs levels in children's urine as a result of environmental tobacco smoke exposure in two spanish locations - *Helena Garcia* Autistic Symptoms Associated with Childhood Lead Poisoning - *Wan Nedra Komaruddin* Organohalogenated pollutants in Argentinean postpartum women living in Salta and Ushuaia - *Natalia Bravo* Considerations for policies design aimed to promote drinking water consumption in Mexican children and adolescents: Santa Fe, CDMX - *Arely Vergara-Castañeda* Prenatal early exposure to the environmental endocrine disruptors - *Joaquim Rovira*	**Poster pitch session B (Darwin)** **Chairs:** Stephan Boese-O'Reilly (Germany) and Barend van Drooge (Spain) School children exposure to particulate matter (coarse, fine, and quasi-ultrafine) around petrochemical complex. Respiratory tract dosimetry - *Joaquim Rovira* Noise prevention in kindergarten - *Takacs Katharina* Effect of diet on allergies among preschool children - *Sandra Andrusaityte* Smoking cessation consultation in pediatrics - *Miguel Felipe Sánchez Sauco* Pilot phase of TNG STUDY - *Pavel Piler* Health and safety predictors of parental attitudes towards children's school travel - *Jacques Bergeron* School environmental health: the first steps towards environmental health - *Miguel Felipe Sánchez Sauco* When parents NGOs, environmental NGOs and experts join forces to impulse actions to protect children's environmental health - *Catherine Bouland* Hazards and Risks in the Glyphosate Debate - *Karl Ernst v. Mühlendahl*
16.30 -18.00	**Session 5 (Auditorium) Toxic Metals Intoxication** Chair: Hanke Wojciech (Poland) and Philippe Grandjean (Denmark) High Risk for Neural Tube Defects from Arsenic in Drinking Water and Rice in Asia - Yona Amitai (Israel) Lead intoxicated children in Kabwe/ Zambia – Stephan Boese- O'Reilly (Germany) Children and ASGM in West Sumbawa Regency, Indonesia - Children and ASGM in West Sumbawa Regency, Indonesia - Baiq	**Session 6 (Darwin) Burden of disease** Chair: Peter van den Hazel (Netherlands) and Marie Noel Brune Drisse (WHO, Switzerland) What is Environmental Burden of Disease? An animated video gives an answer - MyriamTobollik (Germany) Children's environmental burden of disease: Review of key findings - Nadine Steckling (Germany) Quantifying the burden of disease due to environmental risk factors in children and adolescents in Germany: the UKAGEP project -

	Dewi Krisnayanti (Indonesia) Low level arsenic exposure during pregnancy in the 3xG cohort in Flanders: less efficient detoxification is associated with higher oxidative stress – Nathalie Lambrechts (Belgium) Prenatal mercury exposure and fetal development and birth outcomes: results from INMA cohort – Ferran Ballester (Spain) Lead in soil; how can we reduce exposure to young children – Martin Eggens (Netherlands) Blood lead concentrations from children practicing airgun shooting - Rudolf Schierl (Germany)	Myriam Tobollik (Germany) The burden of infectious diseases on congenital malformations: the case of Zika virus and microcephalia in Brazil – Roberto Ronchetti (Italy)
20.00	**Conference Dinner**	
Thursday 15h of September 2016		
8.45 – 10.00	**Session 7 (Auditorium) Pollutants at schools and homes** Chair: Achim Heinrich (Germany) and Rudolf Schierl (Germany) Indoor air and children's health, SINPHONIE and SEARCH projects – Eva Csobod (Hungary) Engaging schoolchildren in understanding the indoor environment using citizen science - Núria Castell (Norway) Polycyclic aromatic hydrocarbons from traffic exhausts in primary schools and cognitive development of children – Barend van Drooge (Spain) Multi residue and non-target screening for characterization of organic chemicals in indoor dust – Garry Codling (Czech republic) Assessment of Indoor Air Quality in Air - Conditioned and Naturally ventilated Schools in Delhi - Pratima Singh (India)	**Session 8 (Darwin) Biomonitoring and Spatial Analysis** Chair: Hanns Moshammer (Austria) and Merce Gari (Spain) Early-life exposure to multiple environmental contaminants and birth weight: pooled analysis in four Flemish birth cohorts - Eva Govarts (Belgium) Nasal epithelial lesions and scalp hair as bio-indicators of cumulative air and water pollution health effects - Polyxeni Nicolopoulou Stamati (Greece) Persistent Organic Pollutants in women's breast milk and proximity to Municipal Waste Incinerators in the UK - Phillipa Douglas (United Kingdom) Spatial Pattern Analysis of Hepatitis A Cases in Children by using Geostatistical Analysis of GIS in Turkey - Ahmet Ozgur Dogru (Turkey) Prenatal exposure assessment approaches need to consider spatio-temporal variation of air pollution - Andrea Ranzi (Italy)
10.00 -10.30	**Poster pitch session C (Auditorium)** Chair: Ruth Etzel (USA) and Yona Amitai (Israel) Mobile phone and other digital technology use in UK adolescents: The SCAMP Cohort - *Pippa Douglas* Quality of life of childhood brain tumor survivors: intervention, analysis and results - *Alberto Cárceles Álvarez* Transgenerational effects of treatment with antiepileptics in pregnancy: behavioural and molecular markers in a mouse study - *Gemma Calamandrei* Forests for health with the environmental midwife - *Lizbeth Álvarez Gómez* Modifiable factors related to low water intake in Mexican children and adolescents - *María de los Angeles Peña Farfán*	**Poster pitch session D (Darwin)** Chair: Jamie Pearce (UK) and David Bellinger (USA) Occupational noise exposure during pregnancy - new aspects in childs language acquisition - *Soile Jungewelter* Factors influencing breastfeeding initiation - *Lizbeth Álvarez Gómez* Neuropsychological profile of an adopted patient with Fetal Alcohol Spectrum Disorder - *Esther Tobarra Sánchez* Environmental screening on girls with early puberty disorders - *Ferran Campillo i López* Where physical environment is the major culprit: Mapping child health determinants against health-related policies and programs in an East African pastoralist community - *Lioul Berhanu Alemie* Mismatch of classroom furniture and student body dimensions in schools of Delhi - *Dr. Meghna*

10.30- 10.45	Break	
10.45 -12.00	**Session 9 (Auditorium) Cognitive development of children in relations to environmental exposures** Chair: Yona Amitai (Israel) and Phil Landrigan (USA) The impact on chemical pollution into child development from in utero to adolescence - Jordi Sunyer (Spain) Maternal lifestyle during pregnancy and child neurodevelopment - Kinga Polanska (Poland) Lifelong Exposure to Green Space and Attentional Development: A Prospective Birth Cohort Study - Payam Dadvand (Spain) The role of local natural space in children's social, emotional and behavioural development in Scotland: a longitudinal study – Jamie Pearce (United Kingdom) Prenatal exposure to outdoor airborne trace elements and cognitive and psychomotor development during childhood in four European birth cohorts - Malgorzata Joanna Lubczynska (Poland)	
12.00 -13.15	**Session 10 (Auditorium) Endocrine disruptors and epigenetics** Chair: Dr Emiko Todaka (WHO, Europe) and prof. Chisato Mori (Japan) Temporal trends of organochlorine compounds and PBDEs from utero until 4 years of age in the Asturias INMA cohort - Mercè Garí (Spain) Early life exposure to organochlorine pesticides and behavioral development in children – Margot van de Bor (Netherlands) Endocrine Disrupting Chemicals (EDCs) and children's daily exposure: Physicians, scientists, NGOs and media - working together for a better policy and more protection - Johanna Hausmann (Germany) How can the increase in childhood cancer be explained? The role of transplacental and ctransgenerational carcinogenesis– Ernesto Burgio (Italy)	**Session 11 (Darwin) Environmental Pediatrics for Pediatric residents** Chair: Ruth Etzel (USA) and Donald Frush (USA) CEH training in Brazil - Emerson Da Silva (Brazil) Strategies for Use of medical Imaging and Radiation Risk: What the Care Provider Should Know - Donald Frush (USA) Autism Spectrum Diseases, including Asperger Syndrome. Fairy Tales and Facts about Environment and Genetics - Karl Ernst von Mühlendahl (Germany) Environmental consulting nursing : health from the beginning - Miguel Felipe Sanchez Sauco (Spain) Empowering Youth and Communities to promote health and environment- The Bangalore Experience - Elizabeth Cherian Paramesh (india)
13.15-14.15	Lunch	
14.15-15.30	**Session 12 (Auditorium) Asthma and Respiratory Diseases** Chair: Hanns Moshammer (Austria) and Martin Eggens (Netherlands) An unexpected epidemic of respiratory distress. Hanns Moshammer (Austria) Changing kindergarten practices with localized real-time information on outdoor air: The experience of CITI-SENSE project in Oslo, Norway - Núria Castell (Norway) Impact of air pollution to oxidative damage in newborns and mothers – Katerina Honkova for Radim Sram (Czech republic) Lung function growth trajectories in children in relation to prenatal exposure to particulate matter - Cracow cohort study - Renata Majewska (Poland) Rapid Urbanisation and changing Prevalance of Chronic Cough in children – H. Paramesh (India)	**Session 13 (Darwin) Environment and survival of childhood cancer** Chair: Juan Antonio Ortega (Spain) and Elisa Pasqual (Spain) Environment and childhood cancer survivors: PLASECAP MUR - Alberto Cárceles Álvarez (Spain) Health related quality of life of survivors of childhood extracranial neoplasms - Mayra Alejandra Orozco Llamas (Spain) Secondhand tobacco smoke and survival in children with acute lymphoblastic leukemias in the region of Murcia (SPAIN) - Alberto Cárceles Álvarez (Spain) Descriptive analysis from a hospital based childhood cancer survivors cohort: report from the project Spain-CCSS - Elisa Pasqual (Spain) Spatial clustering of childhood leukemia in the Region of Murcia, Spain (1998-2010) - Alberto Cárceles Álvarez (Spain)
15.30 -15.45	Break	

15.45 -16.30	**Poster pitch session E (Auditorium)** Chair: Joan O. Grimalt (Spain) and Joaquim Rovira (Spain) Particulate matter characterisation in the schools located around petrochemical industrial complex. Infiltration of particle from outdoor to indoor air - *Joaquim Rovira* Personal exposure to PM2.5 and benzo[a]pyrene in Ostrava, Czech Republic - *Katka Honkova* AIDS orphans in Sub-Saharan Africa: A systematic review on differences between rural and urban environments - *Tara Rava Zolnikov* Training modules for paediatricians - Health effects of climate change - *Colin O'Reilly* Reality of children's new environment and future policy needs - *Marija Jevtić* Study of childhood illness for the period 2009 - 2011 , meeting the city . Sofia and Pleven with a view to effective health promotion - *P. Karadzhova* Promoting Health: Recommendations of food consumption as a tool to minimize exposure of pollutants to the children's population - *Rosa Maria Llull Cantallops* Lead and mercury exposure are associated with low resting heart rate in community children - *Jianghong Liu* Mapping child health against health related policies and programs in East African pastoralist communities - *Lioul Berhanu Alemie* Exposure to arsenic and mercury: associated pregnancy outcomes, and early infant developmental outcomes in gold mining areas in Tanzania - *Elias Charles Nyanza* Potential Environmental Hazards on Child Health in a Prospective Mining Area in North Sumatra, Indonesia - *Levina Khoe*	**Poster pitch session F (Darwin)** Chair: Marta Schuhmacher (Spain) and Eva Junque (Spain) Birth weight in relation to cord blood levels of selected elements in Slovenian mother-child pairs - *Marta Jagodic* Birth and Growth without OH: Detection and follow up from pregnancy until the end of adolescence of children at risk of neurobehavioral disorders through exposure of alcohol and illegal drugs - *Maria Luisa Azurmendi* The mercury pollution and child birth defects - *Unursaikham Surenyah* Prenatal exposure to particulate matter and the occurrence of wheezing in chest in children - *Agnieszka Pac* The role of trace elements, antioxidants and oxidative stress in very low birth weight infants - *Beatrice Bocca* The PERSIAN birth cohort; A Work in Progress- *Payam Dadvand* Psychosocial stress and obesity in Kaunas children - *Regina Grazuleviciene* Lifestyles of survivors of childhood hematologic neoplasms - *Mayra Alejandra Orozco Llamas* Air pollutants exposure and functional repair activity in placenta - *Nurulshyha Md Yatim* The role of perinatal essential fatty acids in attention deficit and hyperactivity disorder symptoms and cognitive functions - *Mónica López-Vicente* Maternal Environmental Exposure to Organochlorine Pesticides and its Effects on Birth weight - *Madhu Anand* 
16.30 -18.00	**Session 14 (Auditorium) Exposome research in children** Chair: Mark Nieuwenhuijsen (Spain) and Denis Sarigiannis (Greece) Human biomonitoring data analysis for metals in an Italian adolescents cohort: an exposome approach – Alberto Gotti (Italy) Assessing the impact of hazardous waste on children's health: the exposome paradigm – Denis Sarigiannis (Greece) Quantitative profiling of metabolic markers to assess dietary and microbiota related exposure factors - Zdenek Spacil (Czech republic) Persistent pollutants in food items from Menorca Island - Eva Junqué (Spain) Prenatal exposure to perfluoroalkyl substances and cardio-metabolic risk components during early childhood - Cyntia B. Manzano-Salgado (Spain)	**Session 15 (Darwin) Open session/ miscellaneous** Chair: Marta Schuhmacher Spain) and Krystalia Papadaki Heallh effects of consuming desalinated Sea water - implications for children - Yona Amitai (Israel) Maternal cell phone use during pregnancy and child behavior problems in five birth cohorts – Laura Birks (Spain) Determining the impact of smoking point of sale legislation among youth (Display) study: new findings from Scotland – Jamie Pearce (UK) Impact of prenatal exposure to environmental pollutants on autism spectrum disorder: A case report - Esther Tobarra Sánchez (Spain) BORN WITHOUT OH: an innovating model for preventing and managing the neurodevelopmental disorders caused by alcohol and drug prenatal exposure in a Mediterranean region - María Luisa Azurmendi Funes (Spain) Alcohol and tobacco products access to minors in Georgia - George Bakhturidze (Georgia)

Friday 16th of September 2016	
8.45-10.15	**Session 16 (Auditorium) Children's environmental health policy topics** Chair: David Bellinger (USA) and Karl Ernst von Mühlendahl (Germany) Minamata Convention on mercury vulnerable population – Mahmood Khwaja (Pakistan) Children's environmental right - Jonas Schubert (Germany) Environment exposure and neuro-development in MOCEH – Mina Ha (Korea) Improved Relationships in Eastern Kenya From Water Interventions and Access to Water - Tara Rava Zolnikov (USA) Relations between the exposure of factory air polution with asthma impacted in children who live in shelter Around the district of industrial area in Jakarta, Indonesia Trial District In Jakarta Indonesia - Wan Nedra Komaruddin (Indonesia)
10.15 -10.30	Break
10.30 -12.00	**Session 17 (Auditorium) Children's Health and the environment in the Mediterranean** Chair: Denis Sarigiannis (Greece) and Gemma Calamandrei (Italy) The NAC-II birth cohort in Friuli Venezia Giulia Region: prenatal and childhood exposure to metals and neuropsychological maturation at 7 years – Gemma Calamandrei (Italy) Internal dosimetry metrics for risk assessment of endocrine disruptors – the case of bisphenol A – Denis Sarigiannis (Greece) Urine total arsenic and arsenic species in children from Northern Italy – Beatrice Bocca (Italy) Neurodevelopment, low level mercury exposure and genetic polymorphisms in birth cohort from Slovenia and Croatia - Janja Snoj Tratnik (Slovenia) Children exposure to PAH and potential carcinogenic risk assessment from biomass burning incorporating internal dosimetry metrics – Spyros Karakitsios (Greece) Influence of gestational weight gain on the transfer of organochlorine pollutants into infants – Joan Grimalt (Spain)
12.00 -13.15	**Session 18 (Auditorium) Final session** Chair: Wojtek Hanke (Poland) and Stephan Boese-O'Reilly (Germany) Protecting children's health from environmental harm - the perspective of WHO Regional Office for Europe – Dorota Jarosinska (WHO, Europe) INMA overview - Jordi Sunyer (Spain) Societal burden of children's exposures to neurotoxicants - David Bellinger (USA) Thinking of the relationship between children's health and the environment as a rights issue - The UN Committee on the Rights of the Child Day of General Discussion on Children's Rights and the Environment on 23 September 2016 - Jonas Schubert (Germany)
13.15 -13.30	**Closing Ceremony: The Barcelona Declaration on Children Environmental Health**

The International Network on Children's Health, Environment and Safety (INCHES) (http://www.inchesnetwork.net) was founded at a workshop meeting before the 1st International Conference on Children's Environmental Health, August 1998 in Amsterdam, the Netherlands, where WHO, European Environmental Agency (EEA) US Environmental Protection Agency (EPA) and other organisations had an active participation, stressing the growing importance of CEH as a global health issue. The WHO and INCHES have been active partners the last 16 years.

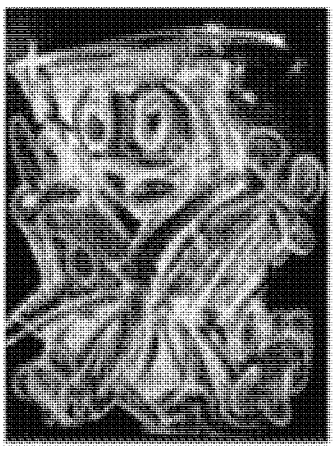
The Organisation: International Network on Children's Health, Environment and Safety (INCHES)

The International Network on children's Health, Environment and Safety (INCHES) is a global network with the following goals:

1) increase understanding of and accord on how environmental factors influence child health;
2) create a global dissemination of research and information on children's environmental health;
3) educate and facilitate information exchange on the best practices and policies in children's environmental health;
4) identify information gaps and stimulate to new research; and
5) advocate for children's environmental health in the intergovernmental arena.

Some highlights of INCHES activities since its formation in 1998 include:

- There are now about 150 organizational members, some of which are well structured, established and active as national NGOs interested in an intensified international cooperation.
- More than 30,000 individual members (most of them health professionals) within these member organizations.
- Strong contacts in several countries where national children's environmental health networks have been founded or under creation.
- Excellent international contact in the field of children, environment and health in the intergovernmental, governmental and NGO circles.
- Some official contacts in the field (relations with WHO, EEA, membership in European Health and Environment Alliance network, International Society of Doctors for the Environment).
- Several members in the medical scientific community covering most aspects of environmental health able and ready to give foundation to the content of INCHES' work.
- Training programs in cooperation with several universities in some countries have been conducted as a project.
- INCHES initiated several projects funded by the European Union.
- INCHES organized or co-organized several conferences on children's environmental health the last two decades.
- INCHES collaborates with similar networks in North America: Children's Environmental Health Network, International Society for Children's Health and the Environment and the Canadian Institute of Child Health.



Message

From: Gentile, Laura [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=D0699F8839E745D480E503E1BCF9046C-LGENTILE]
Sent: 10/20/2016 8:01:19 PM
To: Reed, Khesha [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=c62327cee1fd4da29a1cc485efe546f7-Reed, Khesha]
CC: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Grantham, Nancy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=12a3c2ed7158417fb0bb1b1b72a8cfb0-Grantham, Nancy]
Subject: RE: DAA/DRA -- Call for Transition Issue Papers by Oct 4

Got it, thanks much, will incorporate the comments.

Nancy Grantham is working on making edits to Tire Crumb (copied above) and can share when she has the latest draft ready

Will forward climate resilience in next email.
Thanks
Laura

Laura L. Gentile
Office of Policy, U.S EPA
202.564.3158 Desk
Ex. 6 Cell
gentile.laura@epa.gov

From: Reed, Khesha
Sent: Thursday, October 20, 2016 3:34 PM
To: Gentile, Laura <Gentile.Laura@epa.gov>
Cc: Etzel, Ruth <Etzel.Ruth@epa.gov>
Subject: RE: DAA/DRA -- Call for Transition Issue Papers by Oct 4

Laura,

I have attached redline versions of the Flint and East Chicago transition papers. We made the same edits to both documents...

- Added language about the interagency task force work on lead,
- Added local agencies to list of key external stakeholders, and
- Added OCHP to other key offices lists.

Let me know if you have any questions. I look forward to seeing the Climate Resilience and Tire Crumb papers when they are ready.

Thanks,
Khesha Reed
Associate Director
Office of Children's Health Protection
202-566-0594

From: Gentile, Laura
Sent: Friday, October 14, 2016 9:18 AM
To: Reed, Khesha <Reed.Khesha@epa.gov>
Cc: Etzel, Ruth <Etzel.Ruth@epa.gov>
Subject: Re: DAA/DRA -- Call for Transition Issue Papers by Oct 4

Hi Kheesha,
Thanks for sharing the list. We are nearing the end of the collaboration and need to send papers over to OGC for review soon. That said, we will share the current drafts with both of you by today or early Monday. These will need to be turned around by mid-day on Monday.

Thanks, let me know if any questions. You will be hearing from the lead people in charge of these papers shortly (Tim Torma, Lanelle Wiggins, and me).

The Flint, East Chicago, and Tire Crumb are being revised now -- as soon as available, we will send.
Laura

Laura Gentile
Ex. 6

Sent from my iPhone

On Oct 13, 2016, at 5:25 PM, Reed, Khesha <Reed.Khesha@epa.gov> wrote:

> **Laura,**
>
> **Apologies if you already received this email from me. Below is the list of Transition Papers that OCHP would like to review.**
>
> **Thanks for your help.**
>
> **Khesha** Ex. 6 **- cell**

On Oct 5, 2016, at 7:14 AM, Allen, Reginald <Allen.Reginald@epa.gov> wrote:

> Here is the excel sheet with all the papers – sorry to say that most were due in yesterday.
>
> I am checking the OP Transition POCs to determine the best wayahead to allow OCHP input.
>
> In the mean time you or Khesha can reach out to the POC and check and maybe work it that but in any case it would have to a quick turn.
>
> Sorry for getting this to you late.
>
> Reggie
>
> ***Reginald E. Allen***
> *Director, Administrative and Executive Services*
> *Office of the Administrator*
> *U.S. Environmental Protection Agency*

Office 202-564-0444
Direct 202-564-1029
Cell Ex. 6
AO SharePoint Site

From: Etzel, Ruth
Sent: Thursday, September 29, 2016 4:38 PM
To: Allen, Reginald <Allen.Reginald@epa.gov>
Cc: Reed, Khesha <Reed.Khesha@epa.gov>
Subject: FW: DAA/DRA -- Call for Transition Issue Papers by Oct 4

Hi Reggie,

Khesha and I appreciated the opportunity to review the list of transition issue papers. We would like you to ask that OCHP be added as a collaborator on the following issue papers:

Chlorpyrifos & Glyphosate

Lead

New TSCA

PCBs in schools

Zika

Climate Resilience

Tire Crumb

Emerging Drinking Water Contaminants

East Chicago

Flint

Would you happen to have a list of the point person for each issue paper? Given the short time frame, I'd like to call them directly, if possible.

Many thanks!

Ruth

From: "Allen, Reginald" <Allen.Reginald@epa.gov>
Date: September 29, 2016 at 9:56:19 AM EDT
To: "Reed, Khesha" <Reed.Khesha@epa.gov>
Subject: FW: DAA/DRA -- Call for Transition Issue Papers by Oct 4

As discussed

Reginald E. Allen
Director, Administrative and Executive Services
Office of the Administrator
U.S. Environmental Protection Agency
Office 202-564-0444
Direct 202-564-1029
Cell Ex. 6
AO SharePoint Site

From: Kenny, Shannon
Sent: Friday, September 16, 2016 12:11 PM
To: DAA-Career <DAACareer@epa.gov>; DRA <DRA@epa.gov>; Hull, George <Hull.George@epa.gov>; Richardson, RobinH <Richardson.RobinH@epa.gov>; Caraballo, Mario <Caraballo.Mario@epa.gov>
Cc: Transition Coordinators <Transition_Coordinators@epa.gov>; 2016OPTransitionTeam <2016OPTransitionTeam@epa.gov>; Grantham, Nancy <Grantham.Nancy@epa.gov>; Siciliano, CarolAnn <Siciliano.CarolAnn@epa.gov>
Subject: DAA/DRA -- Call for Transition Issue Papers by Oct 4

All,

Thank you again for all of your thoughtful input on the transition effort to date.

Our next step is to begin drafting short **issue papers** on key topics. Attached please find the list of 30 papers we ask that you develop - along with a lead office or region, and a suggested list of collaborating offices/regions, for each paper - by **October 4**. We have also included a **2-page template** we ask that you follow.

The list was developed based upon your input, input from your transition coordinators, OPA, OCIR, and OP, as well as information about the campaigns and our learning from previous landing teams.

My team will work through your Transition Coordinators to provide clear instructions for putting these draft papers into Sharepoint for review no later than October 4.

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Please note that this is not a complete inventory of the briefing materials to be provided to the landing team. I will be in touch with many of you soon to discuss what additional materials we want to work on.

Please give me a call anytime if you would like to discuss.

Shannon

<Issue Papers_All_Issues_Final.xlsx>

Message

From: Reed, Khesha [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=C62327CEE1FD4DA29A1CC485EFE546F7-REED, KHESHA]
Sent: 10/20/2016 7:33:49 PM
To: Gentile, Laura [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=d0699f8839e745d480e503e1bcf9046c-LGENTILE]
CC: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]
Subject: RE: DAA/DRA -- Call for Transition Issue Papers by Oct 4
Attachments: transition-issue-east-chicago 10-20-2016 OCHP.docx; transition-issue-flint 10-20-2016 OCHP.docx

Laura,

I have attached redline versions of the Flint and East Chicago transition papers. We made the same edits to both documents...

- Added language about the interagency task force work on lead,
- Added local agencies to list of key external stakeholders, and
- Added OCHP to other key offices lists.

Let me know if you have any questions. I look forward to seeing the Climate Resilience and Tire Crumb papers when they are ready.

Thanks,
Khesha Reed
Associate Director
Office of Children's Health Protection
202-566-0594

From: Gentile, Laura
Sent: Friday, October 14, 2016 9:18 AM
To: Reed, Khesha <Reed.Khesha@epa.gov>
Cc: Etzel, Ruth <Etzel.Ruth@epa.gov>
Subject: Re: DAA/DRA -- Call for Transition Issue Papers by Oct 4

Hi Kheesha,
Thanks for sharing the list. We are nearing the end of the collaboration and need to send papers over to OGC for review soon. That said, we will share the current drafts with both of you by today or early Monday. These will need to be turned around by mid-day on Monday.

Thanks, let me know if any questions. You will be hearing from the lead people in charge of these papers shortly (Tim Torma, Lanelle Wiggins, and me).

The Flint, East Chicago, and Tire Crumb are being revised now -- as soon as available, we will send.
Laura

Laura Gentile
Ex. 6

Sent from my iPhone

On Oct 13, 2016, at 5:25 PM, Reed, Khesha <Reed.Khesha@epa.gov> wrote:

Laura,

Apologies if you already received this email from me. Below is the list of Transition Papers that OCHP would like to review.

Thanks for your help.

Khesha Ex. 6 **- cell**

On Oct 5, 2016, at 7:14 AM, Allen, Reginald <Allen.Reginald@epa.gov> wrote:

Here is the excel sheet with all the papers – sorry to say that most were due in yesterday.

I am checking the OP Transition POCs to determine the best wayahead to allow OCHP input.

In the mean time you or Khesha can reach out to the POC and check and maybe work it that but in any case it would have to a quick turn.

Sorry for getting this to you late.

Reggie

Reginald E. Allen
Director, Administrative and Executive Services
Office of the Administrator
U.S. Environmental Protection Agency
Office 202-564-0444
Direct 202-564-1029
Cell Ex. 6
AO SharePoint Site

From: Etzel, Ruth
Sent: Thursday, September 29, 2016 4:38 PM
To: Allen, Reginald <Allen.Reginald@epa.gov>
Cc: Reed, Khesha <Reed.Khesha@epa.gov>
Subject: FW: DAA/DRA -- Call for Transition Issue Papers by Oct 4

Hi Reggie,

Khesha and I appreciated the opportunity to review the list of transition issue papers. We would like you to ask that OCHP be added as a collaborator on the following issue papers:

Chlorpyrifos & Glyphosate

Lead

New TSCA

PCBs in schools

Zika

Climate Resilience

Tire Crumb

Emerging Drinking Water Contaminants

East Chicago

Flint

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Many thanks!

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Date: September 29, 2016 at 9:56:19 AM EDT
To: "Reed, Khesha" <Reed.Khesha@epa.gov>
Subject: FW: DAA/DRA -- Call for Transition Issue Papers by Oct 4

As discussed

Reginald E. Allen
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Cc: Transition Coordinators <Transition_Coordinators@epa.gov>; 2016OPTransitionTeam <2016OPTransitionTeam@epa.gov>; Grantham, Nancy <Grantham.Nancy@epa.gov>; Siciliano, CarolAnn <Siciliano.CarolAnn@epa.gov>
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Please give me a call anytime if you would like to discuss.

Shannon

<Issue Papers_All_Issues_Final.xlsx>

Message

From: Sandy Page-Cook [sandy@pureearth.org]
Sent: 10/27/2016 7:42:09 PM
To: Etzel Ruth [retzel@who.int]; Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]
Subject: Fwd: INCHES conference proceedings - approval for abstract to be published
Attachments: JHP_ConferenceAbstracts_Oct15.pdf; ATT00001.htm

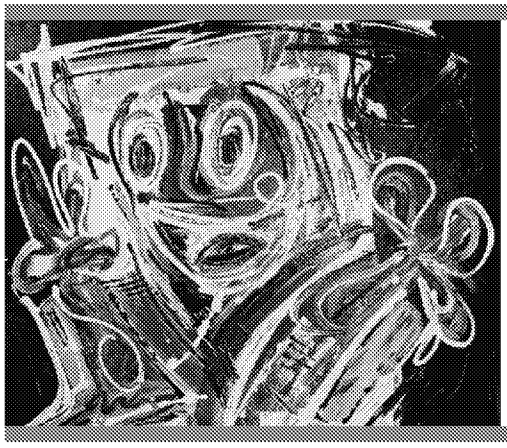
Hello Dr Etzel,

In December, the Journal of Health and Pollution (JH&P) will publish the conference proceedings from the 8th International Conference on Children's Heath and the Environment (INCHES), that was held in Barcelona on September 14-16.

Can you please confirm that the abstract for which you are the corresponding author found on page 40 of the attached is OK to be published as it appears here? Please double check the spelling of your name - Bose-O'Reilly vs Boese O'Reilly?

Thanks so much!

Sandy



8th International Conference on Children's Health and the Environment

Abstracts

Conference proceedings

All sessions presented at the 8th International Conference on Children's Health and Environment

14–16 September 2016

Parc de Recerca Biomèdica de Barcelona – PRBB
Doctor Aiguader, 88 (at ISGlobal), Barcelona

Presented by

INCHES

(International Network on Children's Health and Safety)

JOURNAL OF HEALTH AND POLLUTION

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The 8th INCHES (International Network on Children's Health, Environment and Safety) Conference

Barcelona • 14–16 September, 2016

Overview

Children, like all humans, are under the influence of multiple environmental stressors. However, children are not little adults. Their organs and metabolism are under formation and their capacity to face pollutant stress is different. Exposure to deleterious compounds starts in the preconceptional and fetal stage. In the first years of life, children are affected by exposure to toxic chemical products present in air, water, soil, domestic dust, toys, clothes, furniture and diet. The nature of pollution is changing. In rapidly developing countries, urbanization, climate change, increasing motor vehicle use and the wide spread of toxic chemicals use, pesticides and polluting industries, levels of ambient and indoor biomass air pollution and soil pollution are sharply increasing the exposure for the most vulnerable. Moreover, some polluting agents are incorporated together with nutrients in the same ingestion processes, e.g. during breastfeeding. Some food items such as fish, the main source of omega 3 fatty acids, also carry pollutants such as organochlorine compounds and methylmercury.

The health effects of these toxic compounds may not be noticed directly or shortly after exposure. Damage in growing organisms may result in delayed disorders later in life, e.g. during adolescence, the reproductive period or maturity. The effects of pollutants on children's health also depend on individual susceptibility. A full understanding of health impacts requires studies integrating gene-environment interactions. The details will provide more and more proof that we need to protect children.

Summary of overall organization-wide achieved results

The International Network on Children's Health, Environment and Safety (INCHES) (http://www.inchesnetwork.net) was founded at a workshop meeting before the 1st International Conference on Children's Environmental Health, August 1998 in Amsterdam, the Netherlands, where the WHO, European Environmental Agency (EEA), US Environmental Protection Agency (EPA) and other organisations had an active participation, stressing the growing importance of CEH as a global health issue. The WHO and INCHES have been active partners the last 16 years.

The Organisation: International Network on Children's Health, Environment and Safety (INCHES)

The International Network on Children's Health, Environment and Safety (INCHES) is a global network with the following goals:

1) increase understanding of and accord on how environmental factors influence child health;
2) create a global dissemination of research and information on children's environmental

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health;

3) educate and facilitate information exchange on the best practices and policies in children's environmental health;
4) identify information gaps and stimulate to new research; and
5) advocate for children's environmental health in the intergovernmental arena.

Some highlights of INCHES activities since its formation in 1998 include:

- There are now about 150 organizational members, some of which are well structured, established and active as national NGOs interested in an intensified international cooperation.
- More than 30,000 individual members (most of them health professionals) within these member organizations.
- Strong contacts in several countries where national children's environmental health networks have been founded or are under creation.
- Excellent international contact in the field of children, environment and health in the intergovernmental, governmental and NGO circles.
- Some official contacts in the field (relations with WHO, EEA, membership in European Health and Environment Alliance network, International Society of Doctors for the Environment).
- Several members in the medical scientific community covering most aspects of environmental health able and ready to give foundation to the content of INCHES' work.
- Training programs in cooperation with several universities in some countries have been conducted as a project.
- INCHES initiated several projects funded by the European Union.
- INCHES organized or co-organized several conferences on children's environmental health over the last two decades.
- INCHES collaborates with similar networks in North America: the Children's Environmental Health Network, International Society for Children's Health and the Environment and the Canadian Institute of Child Health.

Many topics were addressed in the 8th International Conference on Children's Environment and Health, which was organized by INCHES on 14-16th September 2016 in Barcelona. The Conference is organized by the International Network on Children's Health, Environment and Safety (INCHES) and the Institute of Environmental Assessment and Water Research (IDAEA) and Spanish Council for Scientific Research (CSIC). The meeting provided an international forum for the latest research findings in children's environmental health. Specific attention was also devoted to identifying opportunities to minimize childhood prenatal and postnatal exposure to environmental contaminants, to provide insight in the field of science and policy interface and to develop a greater awareness among health professionals about children's health. The

ED_001703B_00003475_002_0d98478a-f0bc-3849-c06a-e7987452bbd7

abstracts that are published in the present issue summarize the main research efforts reported at this meeting.

The objectives of the conference:

- Provide an international forum for the latest research findings in children's environmental health;
- Define the relationship between environmental contaminants and children's health;
- Strengthen the importance of prenatal exposure to environmental factors on pregnancy outcome and children's health;
- Identify opportunities to minimize childhood prenatal and postnatal exposure to environmental contaminants;
- Provide insight in the activities in the field of science and policy interface;
- Build a platform of knowledge at an international level;
- Develop a greater awareness among health professionals about children's health, environment and safety;
- Initiate future directions and international collaborations in research in the field of children's environmental health.

The Scientific Program

The scientific program of the 8th INCHES Conference includes about 140 lectures, short oral presentations and posters presented by scientists from 34 countries covering a broad spectrum of topics. Abstracts of these presentations appear in this issue of the journal. The topics are related to: Health effects of pollutants in children (pesticides, heavy metals, air pollution, tobacco) prenatal exposures, reproductive health, cancer, obesity, biomonitoring, Children Environmental Health Centres and Specialty Units, children's environmental rights, climate change, sustainable development, e-waste, radiology, safety and injury prevention, training for pediatricians and health policy regarding Children's Environmental Health.

ED_001703B_00003475_003_85d3f999-c080-d221-a3ad-7c5f550dd222

The following is a partially edited list of all abstracts approved for inclusion in the 8th INCHES conference, 2016. Abstracts are presented in alphabetical order by corresponding author's last name.

This list of abstracts will be finalized after the conference and formally published in an upcoming edition of the Journal of Health and Pollution as conference proceedings.

The Journal of Health and Pollution (JH&P) is a semi-annual, on-line journal of peer reviewed research and news published by Pure Earth. JH&P is grant funded—there are no charges to readers or authors. JH&P focuses on environmental contaminants and related impacts to human health, specifically in low- and middle-income countries. Further information can be found at www.journalhealthpollution.org

Please contact Sandy Page-Cook, Managing Editor at sandy@purearth.org with any questions, comments or corrections.

Neither the conference organizers nor the Journal of Health and Pollution can be held responsible for any inaccuracies or errors in this document.

High Risk for Neural Tube Defects from Arsenic in Drinking Water and Rice in Asia

Yona Amitai (1,2), Gideon Koren (3)

(1) Department of Management, Bar Ilan University, Ramat Gan, Israel
(2) Meuhedet Health Services, Jerusalem, Israel
(3) Faculty of Pharmacy, University of Toronto, Toronto, Canada

Corresponding author:
Amitai, Yona
Israel
yonaamitai89@gmail.com

Background

Neural tube defects (NTDs) affect >300,000 children annually worldwide. The incidence of NTDs in Northern India (7.7/1000) is tenfold higher than in the US (0.7/1000). Higher rates were previously reported in Northern China. The causes of these trends have not been elucidated. Arsenic is a teratogen shown in animals to induce NTDs. In India and China, the main potential sources for environmental arsenic exposure are groundwater and rice as a staple food.

Methods

Analyzing the association between high environmental arsenic exposure through drinking water and rice with high NTDs rates in these regions.

Results

Literature review indicates that arsenic contamination of groundwater is the main source of environmental arsenic exposure. The locations of toxic arsenic regions in China and India correspond in most cases to the northern regions where the NTDs rates are high. Rice, the staple food in India and China, can absorb up to 10 times more arsenic than other crops such as wheat and might further increase arsenic exposure.

Conclusions

We hypothesize that this NTD-arsenic in drinking water and rice association may explain why these areas in the northern regions of both countries have the highest incidence of NTDs. If proven true, this has major public health implications.

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Effect of Diet on Allergies Among Preschool Children

Sandra Andrusaityte, Regina Grazuleviciene
Department of Environmental Sciences, Vytauto Didžiojo Universitetas, Kaunas, Lithuania

Corresponding author:
Andrusaityte, Sandra
Kaunas, Lithuania
s.andrusaityte@gmf.vdu.lt

Background

The prevalence of asthma and allergy has increased among children. This increase in prevalence might be related to diet. The present epidemiological study investigated the relationship between fruits, vegetables and nuts intake and the prevalence of wheezing ever, asthma, and eczema among preschool children.

Methods

This nested case-control study included 1,489 children of 4–6 years of age residing in Kaunas, Lithuania, who were recruited in 2007-2009 to the Kaunas Cohort Newborns study. Responses to the questionnaire completed by parents were used to collect information on allergic diseases, diet and other factors. Association between diet and children's allergic diseases was estimated by multivariable regression, controlling for covariates. Ethical approval was granted by the Lithuanian Bioethics Committee.

Results

We found that 83.3% of all children ate fresh fruits (62.7% - vegetables and 6.2% - nuts) at least three times per week. A significantly lower prevalence of wheezing was found among children who ate fruits at least three times per week than among those did not eat fruits (crude odds ratio: 0.44, 95% confidence interval (CI) 0.22 to 0.87). Adjusted odds ratios (aOR) of asthma were also lower for children who ate vegetables at least three times per week compared with no vegetable consumption (aOR 0.70, 95% CI 0.37 to 1.35). Consumption of nuts 1-2 times per week was associated with lower prevalence of childhood asthma (aOR 0.69, 95% CI 0.44 to 1.08) and eczema (aOR 0.56 95% CI 0.35 to 0.89).

Conclusions

The results indicated beneficial effects of frequent consumption of fresh fruit and vegetables on asthma and allergies in children. These results might have important implications for children's health.

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Prenatal Mercury Exposure and Fetal Development: Results from Infancia y Medio Ambiente Cohort

Ferran Ballester (1,2,3), Carmen Iñiguez (1,2), Mario Murcia (1,2), Ana Fernandez-Somoano (2,4), Mònica Guxens (2,6,9), Mikel Basterrechea (2,5,7), Aitana Lertxundi (2,8), Adonina Tardon (2,4), Jordi Sunyer (2,6), Sabrina Llop (1,2)

(1) Epidemiology and Environmental Health Joint Research Unit, FISABIO-Universitat Jaume I-Universitat de València, Valencia, Spain
(2) Spanish Consortium for Research on Epidemiology and Public Health, Spain
(3) Nursing School, Universitat de València, València, Spain
(4) Universidad de Oviedo, Oviedo, Spain
(5) Subdirección de Salud Pública y Adicciones, Gipuzkoa, Spain
(6) ISGlobal, Centre for Research on Environmental Epidemiology, Barcelona, Catalonia, Spain
(7) Health Research Institute, San Sebastián, Spain
(8) Universidad del País Vasco, Spain
(9) Department of Child and Adolescent Psychiatry/Psychology, Erasmus University Medical Centre–Sophia Children's Hospital, Rotterdam, The Netherlands

Corresponding author:
Ballester, Ferran
Valencia, Spain
ballester_fer@gva.es

Background

Prenatal mercury exposure has been related to reductions in anthropometry at birth. Levels of mercury have been reported to be relatively high in the Spanish population, including vulnerable groups such as pregnant women and newborns. Our objective is to investigate the relationship between prenatal exposure to mercury, expressed as cord blood mercury levels, and fetal biometry in the Spanish Infancia y Medio Ambiente study.

Methods

The study subjects were 1867 pregnant women and their newborns participating in the Infancia y Medio Ambiente Spanish birth cohort study. Biparietal diamete, femur length, abdominal circumference and estimated fetal weight were measured by ultrasounds at 12, 20 and 34 weeks of gestation. Size and growth between these points were assessed by standard deviation scores adjusted for constitutional characteristics. Total mercury was determined in cord blood. Associations were investigated by linear regression models, adjusted by socio-demographic, nutritional – including four fish groups – and lifestyle-related variables in each area. Final estimates were obtained using meta-analysis. Ethical approval was granted by the ethical commitees of the participating health centers.

ED_001703B_00003475_007_5951f8a6-8208-a20b-ac67-abe8fa9928c9

Results

Arithmetic and geometric means of total mercury were 11.0 and 8.2 µg/L, respectively. All the estimates of the association between prenatal mercury and growth from 0 to 12 weeks showed reductions in z-scores, and were only statistically significant for BPD. A doubling of cord blood T-Hg was associated with a slight reduction in size of biparietal diameter at week 12. Conversely, coefficients were positive (but none significant) for growth from 12 to 20 weeks. Finally, results for growth from 20 to 34 weeks again showed negative estimates for all indicators except femur length.

Conclusions

This study suggests that mercury exposure is associated with changes in fetal growth at different periods of pregnancy. Further research is needed to confirm this. Due to this and other potential hazards, preventive actions should be oriented towards reducing exposure during pregnancy.

Maternal Cell Phone Use During Pregnancy and Child Behavior Problems In Five Birth Cohorts

Laura Birks (1,2,3), Mònica Guxens (1,2,3,4), Eleni Papadopoulou (5), Jan Alexander (5), Mina Ha (6), Anke Huss (7), Leeka Kheifets (8), Hyung-ryul Lim (6), Jorn Olsen (9), Madhuri Sudan (8,9), Roel Vermeulen (7,10), Elisabeth Cardis (1,2,3), Martine Vrijheid (1,2,3)

(1) Barcelona Institute for Global Health, Centre for Research in Environmental Epidemiology, Barcelona, Spain
(2) Pompeu Fabra University, Barcelona, Spain
(3) Centro de Investigación Biomédica en Red de Epidemiología y Salud Pública, Instituto de Salud Carlos III, Madrid, Spain
(4) Department of Child and Adolescent Psychiatry/Psychology, Erasmus University Medical Centre–Sophia Children's Hospital, Rotterdam, the Netherlands
(5) Domain of infection control and environmental health, Norwegian Institute of Public Health, Oslo, Norway
(6) Department of Preventive Medicine, Dankook University, College of Medicine, Cheonan, Korea
(7) Institute for Risk Assessment Sciences, Utrecht University, the Netherlands
(8) Department of Epidemiology, School of Public Health, University of California, Los Angeles, California, USA
(9) Danish Epidemiology Science Centre, Department of Public Health, Aarhus University, Aarhus, Denmark
(10) Julius Center for Health Sciences and Primary Care, University Medical Center, Utrecht, the Netherlands

Corresponding author:
Birks, Laura
Barcelona, Spain
lbirks@creal.cat

Background

Previous studies regarding maternal cell phone use during pregnancy collected retrospectively and associations with child behavior problems at 7 years were not conclusive. Therefore, we evaluated this association with data from the previous studies together with prospective data from three other birth cohorts.

ED_001703B_00003475_008_09b4ed51-16d9-85a2-8793-88e52bfd0f06

Methods

We used individual participant data from 84,077 mother-child pairs in five population-based birth cohorts in Denmark (1996-2002), Korea (2006-2010), the Netherlands (2003-2004), Norway (1999-2008), and Spain (2003-2008). We categorized cell phone use based on maternal-reported frequency of calls during pregnancy: none, low, medium, and high. Behavior problems (reported by mothers using CBCL or SDQ) were classified in the borderline/clinical and clinical ranges using validated cut-offs in children aged 5-7. Cohort specific risk estimates were meta-analyzed.

Results

In all cohorts, 7% of mothers reported no cell phone use during pregnancy, except in Denmark where 61% did not use cell phones. For all cohorts, 6% of mothers reported high cell phone use. Mothers who reported no cell phone use were less likely to have a child with overall behavior problems compared to those who reported low use (odds ratio (OR) 0.82, 95% confidence interval (CI) 0.75, 0.89). High cell phone use during pregnancy was associated with an increased risk for inattention/hyperactivity problems compared to low cell phone use during pregnancy (OR 1.29, 95% CI 1.12, 1.48). No clear associations were observed in relation to the other behavior problems.

Conclusions

Our results indicate that high cell phone use during pregnancy may be associated with hyperactivity problems and no cell phone use may be associated with a decreased risk in any behavior problems among children aged 5-7. While this is the largest study to evaluate this association, these results should be interpreted with caution, as there is possible residual confounding that may influence both cell phone use and child behavior.

The Role of Trace Elements, Antioxidants and Oxidative Stress in Very Low Birth Weight Infants

Beatrice Bocca (1), Simona Ciccarelli (2), Rocco Agostino (3), Alessandro Alimonti (1)

(1) Department of Environment and Health, Istituto Superiore di Sanità, Rome, Italy
(2) Neonatal Intensive Care Unit and Neonatal Pathology, St. John Calibita-Fatebenefratelli Hospital, Rome, Italy
(3) Member of Ethics Committee, Bambino Gesù Paediatric Hospital, Rome, Italy

Corresponding author:
Bocca, Beatrice
Rome, Italy
Beatrice.bocca@iss.it

Background

Reference data on trace elements concentration, antioxidants and oxidative status in very low birth weight infants are limited and need updating for use in clinical settings.

ED_001703B_00003475_009_0313e3cd-362e-e3f9-241a-3b2a7d6ebdb5

Methods

Thirteen very low birth weight infants whose mean birth weight and gestation were 1,167 g and 33.2 weeks, respectively, were enrolled in this study. Cadmium (Cd), copper (Cu), iron (Fe), mercury (Hg), manganese (Mn), selenium (Se) and zinc (Zn) were determined in serum and urine of infants at two points in the early postnatal period (24th day and 38th day). Infants were also analyzed for oxidative status and antioxidant enzyme activities determining different indicators: serum catalase; serum Cu, Zn, Fe, Mn-superoxide dismutase; urine nitrate/nitrite; serum total oxidative status (sum of lipo- and hydro-peroxides); and serum total antioxidant capacity (sum of thiols, proteins, bilirubin, uric acid, β beta-carotene, ascorbic acid, vitamin E, etc.).

Results

A higher urinary excretion of Cu, Se and Zn was observed at the 24th day of life than at the 38th day; in serum, Zn slightly decreased after two weeks from the enrollment. These results indicated that losses of elements and incomplete body stores are more pronounced in the earlier stage of life (24th day) than later on. Moreover, an increase in urine Cd concentrations was found at the 38th day over at enrollment, but values of this element were below the safe threshold for toxic effects. Infants had significant lower catalase activity at the 38th day than at the 24th day of life and a reduction of total antioxidant barriers. Also, high values of oxidative stress were observed in very low birth weight infants, indicative of stimulated formation of lipid and oxygen radicals during the first 5 weeks of age. Higher concentrations of trace elements, lower antioxidant barriers and higher levels of oxidative stress were found in very low birth weight infants.

Conclusions

Early diagnosis of essential and toxic elements and oxidant/antioxidant status in very low birth weight infants is essential for contributing to avoid severe postnatal health consequences in these patients and it is a key result in order to balance from the diet and/or by micronutrient supplementation the impact of free radicals.

Urine Total Arsenic and Arsenic Species in Children from Northern Italy

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Background

Arsenic (As) exposure during childhood has been associated with neurobehavioral effects in population-based cohort studies. In addition, variations in As on children health outcomes may be, to some extent, related to exposure to different As species.

Methods

Within the Cross-Mediterranean Environment and Health Network-Life project, aimed at assessing the health risk due to exposure to neurotoxic chemicals, a cohort of 200 children at 7 years (the Northern Adriatic Cohort II Public Health Impact of Long-term, Low-level Mixed Element Exposure in Susceptible Population Strata cohort) from the coastal area of Friuli Venezia Giulia Region (Italy) was analyzed for As exposure. Total As concentration was determined in children's urine by high resolution inductively coupled plasma mass spectroscopy. Then, the concentrations and distributions of urinary As species, including inorganic arsenic (iAs) [arsenite (iAsIII) and arsenate (iAsV)], monomethylarsonic acid (MMA), dimethylarsinic acid (DMA), arsenobetaine (AsBet) and arsenocholine (AsChol), were determined by high-performance liquid chromatography combined with inductively coupled plasma mass spectrometry. Ethical approval was granted by the Cross-Mediterranean Environment and Health Network-Life.

Results

Results indicated a good agreement between the values obtained for total As (median, 10.6 µg/L) and the sum of species. The order of As species excretion in urine of children was: AsBet > DMA > MMA ≈ iAsIII > iAsV (AsChol was at trace levels); moreover, the second methylation step was more active than the first one (DMA > MMA).

Conclusions

In conclusion, in children, inorganic arsenics (AsIII and AsV) were metabolized to the less toxic forms as DMA and MMA through the methylation process. In addition, a very high percentage of urine As was present as AsBet which is essentially harmless and suggestive of dietary As. Due to the different toxicity of As compounds, speciation of As in urine was confirmed to be more convenient for health risk assessment than measuring total As concentration and it can give valuable information about the metabolism of As species within children's bodies.

Multi Residue and Non-Target Screening for Characterization of Organic Chemicals in Indoor Dust

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Background

The indoor environment can expose us to a concentrated cocktail of chemicals. Indoor dust may be a source or sink for a range of contaminants. Most studies to date have focused on individual compounds or classes of contaminants. A review on dust indicated that a large number of different chemicals have been identified in recent years, e.g. polybrominated diphenyl ethers, pesticides, phthalates, polycyclic aromatic hydrocarbons, polychlorinated biphenyls, and perfluorinated compounds. Polybrominated diphenyl ethers congener concentrations in serum and feces of toddlers were significantly correlated to those in house dust and suggest that dust exposure plays a larger role in the polybrominated diphenyl ethers body burden in toddlers than in their mothers, and this may be related to additional ingestion of dust as toddlers are apt to place toys and hands in the mouth, thus gaining additional exposure.
An understanding of the hazards that contaminants in dust may pose to human health, a more comprehensive non-target approach using state of the art instruments will allow the identification of legacy compounds, but also identify potentially hazardous compounds not traditionally screened for.

Methods

We developed a targeted multi-residue screening method to analyse a diverse array of compounds such as may be found in indoor dust and human blood. In combination with non-target screening, previously unreported compounds in dust can be tentatively identified. Methods for screening blood and dust were tested using a mixture of >200 organic contaminants. By using different ionisation sources in positive and negative mode, identification of the introduced compounds was validated and different extraction procedures tested. The aim was primarily to understand the limitations of traditional extraction techniques and to see the differences that the extraction procedures has on the screening approach.

Results

Using the Norman recommended extraction technique for household dust and a trial of 5 typical blood extraction techniques we identified the recovery efficiency of a wide variety of organic contaminants in dust and blood. Using different ionisation sources, we further determined electrospray in positive, combined with negative mode, was able to detect around 80% of all compounds analyzed, however other ionisation sources identify unique features. Hydrophilic-lipophilic balance extraction cartridges, out of 5 extraction methods, extracted compounds with the highest recovery in blood, although other similar solid-phase extraction methods were also effective.

Conclusions

A single extraction technique for blood and the NORMAN non-target method for dust may be applicable for the determination of a wide range of compounds. For non-target analysis, electrospray ionization in positive and negative is necessary for the broadest range of most organic contaminants measured, however other ionization sources provide unique features that must be considered for a comprehensive approach.

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Lead Intoxicated Children in Kabwe / Zambia

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Background

Kabwe was an important lead and zinc mining town in Zambia for over 90 years, which left waste and lead contaminated tailings behind. Lead is a well known serious health hazard, causing anemia, seizures, encephalopathy and death. Soil in Kabwe's housing areas is highly contaminated with lead. Children from neighboring townships are especially vulnerable by ingesting toxic lead dust.

Methods

The environmental assessments and health data for Kabwe's children were collected and analyzed. Data is available from three different sources: Copperbelt Environment Project; Pure Earth and University of Zambia; and Hokkaido University in Sapporo, Japan. Ethical approval was granted by the respective national authorities in Zambia.

Results

In most housing areas the tolerable soil lead levels of 400 ppm was surpassed. Children's blood lead levels were increased (≥ 10 µg/dL) in the most affected townships and in over 95% of children. Most children did have blood lead levels requiring urgent action to reduce blood lead levels. Exposure to toxins urgently needs to be reduced. At over ≥ 45 µg/dL, medical treatment is recommended, and in the most affected townships > 50% of the children showed such high levels. The existing data clearly prove the severity of lead exposure in Kabwe.

Conclusions

Large proportions of the children are not only highly exposed, but actually have high to extremely high levels of lead in their bodies. According to threshold levels and international recommendation, they need to be treated and their exposure must be considerably reduced.

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When Parents, NGOs, Environmental NGOs and Experts Join Forces to Spur Actions to Protect Children's Environmental Health

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Background
Involved in the international discussions on environmental health since 1994, Belgium developed its National Action Plan on the Environment and Health (NEHAP) in 2003 and launched coordinated actions. With the 4th WHO conference on environmental health in Europe, the focus was put on children. Most European states launched a specific Children, Environment and Health Action Plan (CEHAP), and Belgium decided to foster specific actions towards children within their existing NEHAP. The mid-term review in 2007 indicated a demand from parents and environmental associations to be involved. Since 2010 and the ending of the European Action Plan on Environment and Health, activities have been severely reduced.

Methods
A review of the actions taken is matched to demands from NGOs (parent's organisations and environmental associations). Ideas were collected around 3 main priorities among members of civil society and academia working together as the platform "Childproof".

Results
NEHAP actions were focused on capacity building in nurseries, research on children and cancer to integrate environmental information, and on human bio-monitoring, including towards children. The first ideas collected by the parents and environmental associations focus on chemicals and endocrine disruption, air quality, outdoor and indoor noise and inequalities. They will be discussed and presented to the NEHAP secretariat to spur specific activities and policies for the health of actual and future children.

Conclusions
Knowledge is growing and uncertainties remain. Hence, actions must be taken to enable children to grow and develop in good health. The whole society has a role to play to reduce children's exposure to environmental hazards and work together to encourage the implementation of laws and policies to protect children from known and potential environmental hazards.

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Organohalogenated Pollutants in Argentinean Postpartum Women Living In Salta and Ushuaia

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Background

Organohalogenated pollutants, namely organochlorine pesticides, polychlorobiphenyls (PCBs) and polybromodiphenyl ethers (PBDEs), may undergo long-range atmospheric transport because they are semi-volatile and chemically stable. They accumulate in organisms and humans as consequence of their lipophilic character. The toxic properties of most of them generate deleterious health effects in both humans and wild species. These compounds have been mostly synthesized and used in the northern hemisphere, but their strong capacity for long-range atmospheric transport has led to a global planetary distribution, including the southern hemisphere. While there is information on the occurrence of these compounds in the ecosystems of this hemisphere, the degree of information on the accumulation patterns of these compounds in southern hemisphere human populations is very limited.

Method

The present study was devoted to filling this gap by analysis of maternal serum from Argentina, representing postpartum mothers from the city of Salta (25°S; n = 498) and Ushuaia (55°S; n = 200). These samples were collected from April 2011 to March 2012 between the first and third days after delivery. Ethical approval was granted by the Ethics Committee at the Board of Medical School of Salta and conducted in accordance with the Helsinki declaration. The Northern Norway Regional Board of Research Ethics approved the study along with the Norwegian EMASAR biobank, containing the Argentinean blood samples.

Results

The median concentrations of the most abundant compounds were 0.33 and 0.51 ng/mL of total DDTs, 0.20 and 0.18 ng/mL of polychlorinated biphenyl, and 0.067 and 0.043 ng/mL of hexachlorobenzene in Ushuaia and Salta, respectively. These concentrations were generally low, but lower concentrations have been reported for various compounds in some northern hemisphere locations such as Norway.

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The influence of maternal age, parity, residence, and body mass index on the concentrations of these pollutants has been investigated.

Conclusions

Differences in the serum concentrations between Salta an Ushuaia may reflect diversity in local exposure and long-range transportation.

E-Waste and Child Health – WHO Global Initiative

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E-waste is a growing environmental concern to children's health, with 20-50 million tons created annually and expected to increase by 19% between 2014 and 2018. Much of it is shipped to low and middle income countries, where valuable parts are extracted by burning and with acid, often informally by children, exposing them to chemicals and toxicants. This can occur in e-waste recycling hotspots, where entire towns are built around e-waste operations, as seen in Ghana and China, or throughout towns and cities as reported in a recent Latin-America e-waste report by United Nations agencies. When e-waste recycling is not concentrated in a particular area, garbage pickers may collect e-waste from landfills or door to door, before bringing it home to take it apart and burn. In both of these informal sector types, modern industrial processes and worker protection are lacking, while child labor goes unseen.
A systematic review led by WHO and WHO collaborating systems found that exposure to e-waste was associated with spontaneous abortion, stillbirth, premature birth, reduced birth weight and birth length, and DNA damage. Chemical exposures from e-waste, including lead, mercury, cadmium, PCBs and dioxins are known to adversely affect neurodevelopment, even at lower levels. Thus, it is urgent to protect the health and reduce exposures of vulnerable groups of children, pregnant women, and workers in the informal sector against e-waste exposures.

The health effects of e-waste are not widely known. Informal workers lack protective equipment and occupational health services. Children are at risk from work in recycling and exposures in their home and living in the areas contaminated by informal recycling. The health sector is often not aware of the dangers of e-waste. WHO, WHO collaborating centres and collaborators are working on advocating for this issue and on identifying and promoting e-waste interventions that will improve child health, including communicating the problem to health actors, developing training methods and tools for health professionals, and creating community multisectoral teams to identify local needs to protect health.

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How Can the Increase in Childhood Cancer be Explained? The Role of Transplacental and Transgenerational Carcinogenesis

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Background

Cancer is generally associated with old age and the explanation most clinicians (and others) advance for its continuous increase, observed throughout the 20th century in all industrialized countries, is that it results from the progressive accumulation over the time of aging of genetic oxidative/stochastic damages with an additional role for the improvement of diagnostic capacities. It is too often forgotten that this increase concerns persons of all ages and, particularly in the last decades, the youth.

Method

Through literature review, the aim of this study is to reconsider, in the light of new epigenetic models of environmental carcinogenesis and of transgenerational cancer transmission, the recent epidemiological data that confirm a substantial increase in childhood cancer throughout Europe, hardly explainable by the current stochastic mutational paradigm.

Results

Carcinogenesis is a long and complex process. As far as the increase in childhood cancer is concerned, the key factor for its occurrence should be looked for in parents (exposure of the reproductive cells) or the fetus (exposure in the very first stages of ontogenetic development).

Conclusions

The two main possibilities that have to be considered are: 1) direct exposure of the embryo/fetus to physical agents or, through transplacental transmission, to biological (viruses) or chemical agents, capable of directly damaging the fetal DNA or of inducing epigenetic changes in the fetal tissues (fetal programming); 2) transgenerational transmission of epigenetic "signatures" through the gametes. Admitting the importance of such mechanisms would have several implications. The first would be recognizing the highly underestimated role of environmental pollution in the genesis and the progressive increase of cancer. In particular, by hypothesizing that the "initiating" stage of cancer might take place much earlier, in the fetus or even in the parents' gametes, and that the increasing trends in cancer in the very early childhood should be seen as a sentinel sign of a possible transgenerational amplification of (epi)genetic/programmatic changes with their associated pathologies.

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Transgenerational Effects of Treatment with Antiepileptics in Pregnancy: Behavioural and Molecular Markers in a Mouse Study

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Background

Clinical evidence indicates that exposure to the antiepileptic agent valproic acid (VPA) during pregnancy increases the risk of congenital malformations and neurodevelopment delay in children. The mechanisms by which VPA causes neurotoxicity are still unknown, but epigenetic effects are likely implicated.

Methods

We used a rodent model to evaluate the transgenerational impact of fetal exposure to VPA on neurobehavioural development of laboratory mice, by studying F1 and F2 generations after a single injection of VPA on gestational day 10.5.

On gestational day 10.5, the F0 pregnant mice were injected subcutaneously with 500 mg/kg/ of body weight with VPA. Offspring of both sexes from the vehicle control and VPA-treated litter were assessed for motor and somatic growth, spontaneous locomotion, ultrasonic vocalization, and nest-odour recognition from postnatal day 4 to 12. Motor activity, social abilities and cognitive functions were also analyzed at the juvenile and adult stage. At adulthood male and female mice of the F1 generation were mated creating three experimental groups of F2 (maternal VPA/paternal vehicle, maternal vehicle/ paternal VPA, maternal vehicle/paternal vehicle) to evaluate the contribution of parental exposure to VPA to multigenerational effects on the behavioural phenotype. The same neurobehavioral assessment as in F1 was performed on the F2 generation.

Results

In F1, VPA offspring presented tail malformation ("kinky tail"), delay in somatic growth and motor development, hyperactivity and a reduced number of ultrasonic vocalizations. No prenatal treatment-induced differences were evident in adult performance. In F2, similar alterations in early motor development as in F1 were observed in VPA offspring.

Conclusions

We also analysed molecular markers of VPA effects on early brain development in both the F1 and F2 generation. Preliminary data suggest that the behavioural changes induced by VPA are paralleled by

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increased expression of endogenous retroviruses and neuroinflammatory biomarkers, which are possible downstream effectors of the VPA-induced epigenetic alteration.

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The Northern Adriatic Cohort II Birth Cohort in the Friuli Venezia Giulia Region: Prenatal and Childhood Exposure to Metals and Neuropsychological Maturation at 7 Years

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Background
The Northern Adriatic Cohort II is a prospective mother-child cohort established in 2007 in coastal areas of Italy, Croatia and Slovenia to investigate the association between prenatal mercury exposure from maternal fish consumption and child neurodevelopment. The Italian Northern Adriatic Cohort II refers to the coastal area of the Friuli Venezia Giulia Region. At present, a biological bank collected during pregnancy and at birth from mother-child pairs is available. The data bank has collected neuropsychological outcomes measured at different developmental stages (18 months, 40 months), as well as a wide range of potential explanatory variables (socioeconomic indicators, diet habits, child postnatal exposures, maternal lifestyle). The Cross-Mediterranean Environment and Health Network Life project has followed 200 children born within The Northern Adriatic Cohort II for follow up at 7 years.

Methods
Chemical analyses consisted of measurements of the concentration of five neurotoxic metals (mercury, lead, manganese, cadmium, arsenic) in either hair or urine of each child. The neuropsychological

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tests included the Wechsler Intelligence Scale for Children-IV, the Developmental Neuropsychological Assessment-II, for the assessment of reading and writing skills, and the Child Behaviour Check List to identify behavioural and emotional problems in children. Ethical approval was granted by the Burlo Garofolo Child Hospital of Trieste.

Results

Results show that total mercury exposure during pregnancy and breastfeeding did not significantly affect neuropsychological performances at 18-40 months or 7 years. At 7 years the total mercury level in urine is still strongly related to the fish consumption of the mother during pregnancy and breastfeeding; there is a positive effect of fish consumption by the child on several attentional and cognitive tasks at 7 years. We found an adverse effect of manganese as measured in children's hair on the five Wechsler Intelligence Scale for Children-II score, with statistically significant decrements of the general intelligence quotient and of verbal comprehension.

Conclusions

These results highlight the complex interaction between multiple chemical exposures, life style factors, and time of outcome assessment and support the usefulness of the integrated Cross-Mediterranean Environment and Health Network approach in risk modelling.

Quality of Life of Childhood Brain Tumor Survivors: Intervention, Analysis and Results

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Background

Our aim is to assess the socio-demographic and environmental factors, morbidity, and health related quality of life (HRQL) of childhood brain tumor survivors.

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Methods

Through this cross-sectional study we examined pediatric survivors (diagnosed 0-14 years of age) out of treatment and more than 2 years since the diagnosis in a specialized unit. Evaluations were administered though questionnaires regarding socio-demographics, environment, clinical history, scale of sequelae effects (LESS), and PedsQL™ 4.0 parents and patients generic scale (2-18 years and young adult).

Results

Total population: 82. Died during the study: 3; Evaluated: 67. Male: 58.2%. Current mean age: 164.6 months (σ 76). Mean age at diagnosis: 62.1 months (σ 46). Mean follow-up: 108.1 months (σ 54.8). Low income: 28.8%. Low level of parental education: 30%. Tobacco smoke in the home: 61.2%. Physical exercise <1-2 d/week < 30 min: 53%. Epilepsy: 16.84%. Neurofibromatosis-1: 11.9%. International Classification of Childhood Cancer, Third edition: astrocytomas 47.7%, medulloblastomas/primitive neuroectodermal tumor 17.91%, craniopharyngiomas 7.4%, ependymomas 4.4%, others 5.9%. Location: supatenorial 28.35%, infratenorials 46.2%. Ventriculoperitoneal shunt: 19.4%. Surgery: 82.1%. Radiotherapy: 35.8%. Chemotherapy: 43.3%. Hematopoietic stem cell transplantation: 7.5%. Reintervention: 11.9%. LESS modified (>0p) 82.1%. Global HRQL average values: (2-18 years): reported by parents: 67.4 (normal values (NV) 81.3), reported by patient: 72.6 (NV 82.8); reported by young adult: 77.0 (NV 78.1)

Conclusions

On average, this population of childhood brain tumor survivors shows socioeconomic difficulty, environmental risk, high prevalence of medical sequelae and a reduction of HRQL compared to the healthy normative population of children.

Environment and Childhood Cancer Survivors: PLASECAP – MUR

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Background
The National Cancer Institute considers that every child with cancer is a childhood cancer survivor (CCS) from the time of diagnosis, and will continue to be one for the rest of his or her life. In the last decades the pediatric cancer survival rate has increased progressively, reaching approximately 80%. The increase of survival has revealed the need for controlling late effects caused by treatments. International organizations recommend structured follow-up, and if possible, throughout their lifespan, for CCS. The objective of this work is to present the Long-Term Follow-Up Program for Childhood Cancer Survivors in the Region of Murcia (PLASESCAP-MUR).

Methods
In the Region of Murcia (Spain) with an implemented public primary care health system, we have developed PLASESCAP-MUR for the follow-up of CCS, which follows a shared-care model for the transition from hospital to primary care that is tailored to the specific needs of each CCS.

Results
The first objective of PLASESCAP is the education and promotion of healthier environments and lifestyles for the survivor, their family, and community, with the goal of improving their environmental standard and quality of life. The second objective is for early detection and screening for an appropriate management of the late effects arising from disease and treatments.

Conclusions
Long-term follow-up programs for CCS based on creating healthier environments, reducing and eliminating exposure to environmental carcinogens and promoting healthy lifestyles in order to reduce the incidence of late effects and to help CCS to achieve the highest quality of life possible are necessary.

Health Related Quality of Life of Survivors of Childhood Extracranial Neoplasms

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Background

In the last decades, the pediatric cancer survival rate has increased spectacularly, reaching approximately 80%. This increase has revealed the need to control late effects arising from treatments and disease that affect the quality of life of childhood cancer survivors (CCS). The Long-Term Follow-Up Program for Childhood Cancer Survivors in the Region of Murcia (PLASESCAP-MUR) offers an integrated follow-up for CCS and among its objectives is environmental education and awareness and healthier lifestyles to improve environmental and life quality of survivors and their environment.

Objectives

Assess the health related quality of life of a group of survivors of extracranial neoplasms and evaluate the associations of demographic, clinical, and environmental factors with the results.

Methods

Descriptive cross-sectional study. The PedsQL™ 4.0 self-administered generic version for 4 to >18 year old survivors was completed by 85 survivors.

Results

Overall quality of life was 84.1 (81.7; 86.4). Subscales: physical health = 86.8 (84.1; 89.7), psychosocial health = 82.5 (79.9; 84.9), emotional domain = 75.4 (71.6; 78.9), social domain = 92 (89.3; 94.5), and educational domain = 79.9 (76.7; 83.2). The worst quality of life was reported by CCS that have been treated with radiotherapy (-9.0; p=0.007), that presented with a relapse of their disease (-9.2; p=0.033), or that presented with some adverse effect derived from the treatments used (-8.0; p<0.001). The environmental and lifestyle factors studied did not significantly influence the results.

Conclusions

The results obtained are similar to other international work. Strategies to improve quality of life of survivors are necessary, preferably focused on the creation of healthier environments.

Lifestyles of Survivors of Childhood Hematologic Neoplasms

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Background
The prevention of late effects caused by treatments and the promotion of healthy environment and lifestyle are the two pillars of the Long-Term Follow-Up Program for Childhood Cancer Survivors in the Region of Murcia (Spain) (PLASESCAP-MUR) to achieve the highest levels of environmental and quality of life in childhood cancer survivors. The objective of this project is to analyze the lifestyles of survivors of childhood hematologic neoplasms.

Methods
Descriptive cross-sectional study. A total of 55 survivors were analyzed within the PLASESCAP from August 2015 to May 2016.

Results
There were 39 leukemias and 16 lymphomas. Mean age = 16.8 (15.6; 17.9). Of these, 9.4% are smokers and 50% occasionally consume alcohol. About 52% of the survivors engaged in physical activity less than three times a week. Almost 56% and 60% of the survivors eat less than one portion of fruit and vegetables per day, respectively. Finally, 53% use electronic devices more than 2 hours a day and 44% of them never engage in activities in contact with nature or do so only in summer.

Conclusions
More than half of the survivors do not meet the dietary and physical activity recommendations. Up to 50% of them consume alcohol with a mean age under 17. Programs that encourage the promotion of healthy lifestyles with a diet rich in fruits and vegetables, exercise, and regular contact with nature as well as avoidance of toxic habits and drugs such as alcohol or tobacco are necessary to obtain the best environmental standard and quality of life.

Spatial Clustering of Childhood Leukemia in the Region of Murcia, Spain, 1998-2010

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Background

The objective of this study is to test the causal hypothesis that exposure to carcinogens in utero leads to the onset of early childhood leukemia by exploring the presence of spatial and spatial-temporal clusters within administrative divisions in the region of Murcia, Spain, while considering the residential addresses of cases during pregnancy, early childhood and diagnosis.

Methods

The Pediatric Environmental Health Specialty Unit is carrying out an ongoing research project on the environment and pediatric cancer, collecting a pediatric environmental history (PEH) to create regional maps and analyze the geographical distribution of incident cancer cases in the region of Murcia. Between 1998 and 2010, 117 children were diagnosed with leukemia. Pregnancy, early childhood and diagnosis addresses were collected. Spatial and spatial-temporal clusters were then evaluated using the statistical software SatScan®.

Results

Leukemia was most common in children under 5 years of age. The incidence rate was 40.1 per 1 million children during the study period. Among subtypes of leukemia, ALL (acute lymphoblastic leukemia) has a greater incidence in children, occurring in 31.5 per million children, in comparison to AML (acute myeloblastic leukemia), affecting 8.6 in every million children. The incidence rate of all leukemias and subtypes increased in the time frame between 1998-2004 and 2005-2010. Spatial clusters were observed for leukemia in general and ALL, considering the pregnancy addresses and census district; however, no clusters were identified for the residential addresses during diagnosis.

Conclusions

The detection of spatial clusters in a localized area when examining the distribution of pregnancy addresses and census district areas lends proof to the hypothesis that fetal environmental exposure is likely implicated in the etiology of childhood leukemia.

Secondhand Tobacco Smoke and Survival in Children With Acute Lymphoblastic Leukemias in the Region of Murcia (Spain)

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Background
Environmental tobacco smoke is associated with diseases and premature death in childhood. It has been associated with an increased risk of several pediatric tumors, including acute leukemias, with variable results. There are certain clinical and biological features that have prognostic influences in childhood acute lymphoblastic leukemia (ALL). However, the observed plateau in survival rates in recent years suggests that there must be other unknown factors affecting prognosis. In adults, there are some reports linking active smoking with decreased survival in patients with myeloblastic leukemia, but this relationship has not been studied in the pediatric population. Our objective is to study the relationship between environmental tobacco smoke and overall survival in children diagnosed with ALL.

Methods
Survival analysis in the MACAPEMUR (Environment and Pediatric Cancer in the Region of Murcia) cohort of patients between 0 and 15 years with ALL diagnosed from January 1998 to December 2013 in the Region of Murcia (Spain).

Results
Sixty percent of children with ALL live with at least one parent smoking at diagnosis and in 26% of households both parents are smokers. Environmental tobacco smoke from maternal smokers after diagnosis was significantly associated with lower overall survival (HR = 9.92; 95% CI 1.89 – 51.89).

Conclusions
Maternal smoking after diagnosis of ALL in children is an independent prognostic factor and easily adaptable in the overall survival of acute lymphoblastic leukemia. In order to increase survival and improve their environment and quality of life it is necessary to provide smoking cessation programs to parents of children with leukemia.

Changing Kindergarten Practices with Localized Real-Time Information on Outdoor Air: the Experience of the CITI-SENSE Project in Oslo, Norway

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Background

In Norway, children in kindergarten spend a lot of time outdoors in all weather, and there is a natural concern about the quality of outdoor air. It is well known that air pollution is associated with a wide variety of adverse health impacts in children, with greater impact on children with asthma. Kindergartens in Oslo that are situated close to streets with busy traffic, or in areas where wood burning is used for house heating, can experience many days with bad air quality, particularly during winter and spring. During these periods, updated information on air quality levels can help to plan outdoor activities and thus protect children's health.

Methods

We tested new low-cost air quality monitoring platforms to provide air quality information to kindergartens. These platforms are smaller, cheaper and less complex to use than reference equipment. Performance evaluation shows that while they are less accurate and suffer from higher uncertainty than European Committee for Standardization reference equipment, they still can provide reliable coarse information to the local pollution. We received approval from the Norwegian ethical committee.

Results

We installed the monitoring platforms in 17 kindergartens in Oslo to measure nitrogen dioxide, nitrogen dioxide, ozone, carbon monoxide and particulate matter. The data is displayed using the Air Pollution Indication in a 5-colour scale, indicating if the air pollution is very low, low, rather low, rather high and very high (http://oslo.citi-sense.eu).

Conclusions

We arranged a focus group with the participation of the local administration, kindergarten staff and parents to understand their opinion and needs related to the air quality information that was generated in Oslo kindergartens. They expressed concern about the data quality but agree that having updated information on the air quality in the surrounding kindergartens can help to reduce children's exposure to air pollution or to better plan medication to reduce asthma symptoms.

Engaging Schoolchildren in Understanding the Indoor Environment Using Citizen Science

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Background
Children spend a substantial part of their childhood in school buildings. The school staff might not have the time or knowledge to investigate the indoor environment, even though they acknowledge that it could be improved, nor do they have the capacity to have a dialogue with the students regarding a good indoor environment.

Methods
As part of a CITI-SENSE project, we used citizen science approaches to investigate how the situation can be improved. We engaged schools to study the indoor environment with the help of sensor technology and support from scientists. Some schools took this as an opportunity to conduct individual student-led research as part of the school curriculum, while others wanted to confirm the indoor environmental issues the school was known to have.

Results
We provided 13 schools in Belgrade, Edinburgh, Ljubljana, Oslo and Haifa with low-cost sensor units, which collect indoor environmental data in near real time, and gave them the resulting data as graphs or data tables. The students defined and conducted related research, e.g., studied how the carbon dioxide concentration changes depending on the amount of students in the classroom, or investigated the variability of indoor parameters across classrooms and workshops in the schools. Others investigated why particulate matter is high when students are present in the classroom. A school with a known Radon issue was happy to investigate further which rooms were the most problematic. Questionnaires conducted by the scientists assessed learning outcomes related to general knowledge on the indoor environment or ability to think critically about the environment.

Conclusions
These activities created awareness in the schools, increased the individual students' and teachers' knowledge about indoor air, and sometimes led to mitigation measures at schools such as changing cleaning practices.

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Indoor Air and Improving Children's Health, the School Indoor Pollution and Health-Observatory Network in Europe and the School Environment and Respiratory Health of Children Projects

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Background

The first of two projects presented here is the School Indoor Pollution and Health-Observatory Network in Europe project, (SINPHONIE), 2010-2014, which established a scientific/technical network to act at the EU level with the long-term perspective of improving air quality in schools and kindergartens and reducing the risk and burden of respiratory diseases among children and teachers due to outdoor and indoor air pollution. The project also supports future policy actions by formulating guidelines, recommendations and risk management options for better air quality and associated health effects in schools.

The second is the pan-European School Environment and Respiratory Health of Children (SEARCH II) project (2010-2013). It is the second phase of the SEARCH initiative and was developed in order to expand monitoring of children's health and air quality, and to assess energy use in selected schools in 10 countries. Four new countries (Belarus, Kazakhstan, Tajikistan and Ukraine) joined the six countries that participated in The School Environment and Respiratory Health of Children I (Albania, Bosnia and Herzegovina, Hungary, Italy, Serbia and Slovakia).

Methods

The School Indoor Pollution and Health-Observatory Network in Europe has produced guidelines for healthy school environments (www.sinphonie.eu). The guidelines are intended to be generally applicable in most school environments in Europe. However, as each school environment is unique (in terms of design, climatic conditions, operational modes, etc.), the guidance needs to be adapted at the national or local level. This network was initiated and funded by the European Parliament. The project coordination committee includes Éva Csobod, REC, Eduardo de Oliveira Fernandes, IDMEC-FEUP, Peter Rudnai, NIEH and Stylianos Kephalopoulos, JRC.

Results

The final reports of the SINPHONIE project summarise the work performed by a consortium of 38 partners from 25 countries that involved around 300 people of specialised scientific and/or technical backgrounds (www.sinphonie.eu).

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The extensive database of the SEARCH II project contains information on 7,860 children from 388 classrooms in 100 schools in 10 countries. It has created a unique opportunity to study a wide variety of school indoor and outdoor environments, to measure outdoor and indoor concentrations of several air pollutants, and to study the associations between the school environment and children's health (www.search.rec.org).

Conclusions

The implementation of both projects was coordinated by the Regional Environmental Center for Central and Eastern Europe (REC). The funders, EP/DG SANCO and the Italian Ministry of Land and Sea (IMELS), provided targeted contributions to research on air quality and children's health to improve the quality of life for children in the future.

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Lifelong Exposure to Green Space and Attentional Development: A Prospective Birth Cohort Study

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Background

Natural environments including green spaces are thought to exert beneficial impacts on brain development; however, the available evidence on such impacts is still very scarce. The aim of this study was to evaluate the association between lifelong exposure to residential surrounding greenness and cognitive development during preschool and early primary school years.

Methods

A longitudinal study based on data from a well-established multi-centre population-based birth cohort in Sabadell and Valencia (Spain) followed participants from pregnancy (2003-2006) till 7 years of age (2012-2013). A satellite-derived normalized difference vegetation index was used to quantify surrounding greenness (100 m, 300 m, and 500 m buffers) of participants' residential addresses at birth and at 4 and 7 years of age. Attentional function was assessed using Kiddie-Continuous Performance Test at age 4 (N=888) and Attention Network Task at age 7 (N=978). Mixed effects linear and negative binomial models with cohort random effect were developed to quantify the association between greenness exposure and attention, adjusted for relevant covariates. Ethical approval was granted by the ethical committee of each cohort.

Results

Higher average residential surrounding greenness between birth and age 4 was associated with lower omission errors and lower hit reaction time standard error, both indicators of inattentiveness in the Kiddie-Continuous Performance Test. Similarly, higher average residential surrounding greenness between birth and age 7 was associated with lower hit reaction time standard error in the Attention Network Task.

Conclusions

This is the first longitudinal study to report on the impact of lifelong green space exposure on cognitive development in general and attentional development in particular. It found this exposure was associated with enhanced attentiveness in preschool and primary school children. The associations for attentiveness were consistent using different tests (Kiddie-Continuous Performance Test and Attention Network Task) and different exposure windows (birth to 4 years and birth to 7 years).

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The PERSIAN Birth Cohort: A Work in Progress

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Background

The influence of various exposures during the pre- and postnatal period is not limited to reproductive and childhood outcomes and can extend over a lifetime, a corpus of knowledge embodied by the Developmental Origins of Health and Diseases (DOHaD) concept. The overarching aim of this project is to study DOHaD in the Iranian population. Towards this aim, we will evaluate the impact of socioenvironmental, psychological and genetic factors on pregnancy outcomes, child mental and physical health, growth, and development, and early- and late-onset chronic non-communicable diseases.

Methods

The Prospective Epidemiological Research Studies of the Iranian Adults, Adolescents and Newborns birth cohort is designed as a multi-centre network of population-based birth cohorts in areas representing cultural and contextual variations in Iran. Standardised protocols for data collection, maintenance, and analysis tailored for the Iranian population with the prospect of future international collaborations have been developed. The cohort will be conducted in 5 phases: periconception to birth, infancy, childhood, adolescence, and adulthood. Data collection will be based on computerized questionnaires, biological samples, physical examinations, clinical tests, hospital records, and surveys of living environment.

Results

The pilot phase will start in Shahreza (Isfahan) and Yazd in April 2016 and is expected to last 2 calendar

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years. In each study site, 2000 pregnant women will be recruited during their first pregnancy visit (at the end of the 1st trimester). We will utilize a combination of public and private healthcare providers in order to ensure that the participants represent the ethnic and socioeconomic distribution of the underlying population.

Conclusions

The Prospective Epidemiological Research Studies of the Iranian Adults, Adolescents and Newborns birth cohort will advance our knowledge of DOHaD in the Iranian population. Moreover, it will establish a platform in the Middle East for participating in international studies of DOHaD.

Spatial Pattern Analysis of Hepatitis A Cases in Children using Geostatistical Analysis of Geographical Information Systems in Turkey

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Background

Epidemiology is the scientific study of the spread and control of diseases as a function of time and location. Epidemiology follows the patterns of a disease on people in their healthy and unhealthy periods; and tracks their history of illness, especially to understand its nature and characteristics. In this context, spatial data is strongly required in order to understand the spatial pattern (distribution and expansion) of the illness. Epidemiologists have traditionally used maps to analyze the spatial characteristics of illnesses in terms of relations between location, surrounding environment, and cases. Developing information technologies introduced geographical information systems (GIS) as a strong tool to be used in spatial decision making applications such as surveillance and monitoring of diseases. Geographical information systems and geostatistical techniques are used to account for spatially varying population sizes and spatial patterns in the surveillance and monitoring of diseases. In environmental and public health, identification and quantification of the disease patterns provide the first steps towards increased understanding and possibly, control of a particular disease. Spatial statistical methods, of which geostatistics is a subset, offer a means for us to use such location information to detect and quantify patterns in public health data and to investigate the degree of association between potential risk factors and disease.

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Methods

This study presents a general overview of the geostatistical methods used in epidemiology, experimenting an innovative geographical information systems-based approach to the analysis of epidemiological data. The paper additionally aims to analyze the spatial pattern of Hepatitis A cases in children at ages under 15. In this context, province-based official data including the number of measles cases and deaths by gender and age were provided monthly from 2001 to 2011. The data were classified by age considering 3 main groups: 0-4, 5-9, and 10-14 years of age. Incidence rates and morbidity of Hepatitis A cases were considered as the main parameters for primary analysis of the cases by province. Time series maps were prepared and Natural Neighbor analysis was also applied to introduce the spatial pattern of case distribution in time. Additionally, Moran's I and Local Indicators of Spatial Association analysis were respectively applied to introduce the characteristics of the global and local spatial pattern of cases in time. Ethical approval was granted by the Human Research Ethics Committee of the Istanbul Technical University.

Results

Time series maps of Hepatitis A cases in children concluded that incidence rates of the cases children under the age of 5 were significantly lower than the other age groups, while incidence rates the highest for children in the 5-9 age group during the study period. Although the results outlined a timely decrease in the incidences of Hepatitis A in Turkey, high incidence rates occurred in 2001, 2005 and 2007 and were significant for children, especially between the ages of 5-9. Spatial pattern analysis of the cases showed that incidence rates were relatively higher in the Eastern Mediterranean and South-eastern Anatolian Regions covering Ceyhan, Asi and Southeast part of the Fırat-Dicle river basins in Turkey. Gaziantep, Kilis and Hatay provinces were the hotspots of these regions. Incidence rates of cases in children aged 5-9 were also higher in the Aegean and Central Anatolia regions, especially in Gediz and Kızılırmak river basins.

Conclusions

At the conclusion of this study, the spatial distribution of Hepatitis A cases in children from 2001 to 2011 in Turkey were mapped and analyzed using GIS technology. Since Hepatitis A is a waterborne communicable disease, spatial distribution was also examined considering the coverages of the river basins in Turkey. The study outlined the regions and specific provinces where intensive water treatment facilities were needed in Turkey during the study period.

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Persistent Organic Pollutants in Women's Breast Milk and Proximity to Municipal Waste Incinerators in the UK

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Background

EU legislation restricting landfilled waste has led to an increase in municipal waste incineration (MWI) within the UK. Persistent organic pollutants (POPs), including dioxins and heavy-metals, released from MWIs have been found in elevated levels in areas surrounding these sites. Due to public concern over health risks associated with MWIs, this project aims to quantify POPs in human breast-milk to examine relationships between individual level POP uptake in proximity to MWIs.

Methods

Recruitment was completed in three phases via postal invites. Primiparous women between 18-40 weeks gestation, aged >18 years and living within 20 km of three MWIs were invited. Women were asked to provide up to 120 ml of breast-milk and complete a questionnaire (including questions on lifestyle, diet, residential history). Breast-milk was analysed for selected POPs, depending on the amount of milk provided. Ethical approval was granted by the Research Ethics Committee under the Health Research Authority (for England).

Results

587 women were recruited (14% recruitment rate), 329 provided milk (56% completion rate). Modelled PM_{10} emissions from MWIs have been used as a proxy for incinerator exposure gradients for other pollutants, such as POPs, which cannot be directly modelled. Modelled exposure to PM_{10} from incinerators is very low (average of incinerator postcode level concentrations varied from 8.70x10-6 to 7.72x10-3 μg/m^3). A total 224 (38%) women live in areas in the top tertile of modelled incinerator PM10 exposures and 203 (35%) women in the bottom tertile. Initial chemical analysis results will inform whether there are significant differences in POP or dioxin concentrations in women by MWI, proximity to MWI, and if any relationships are modified by lifestyle factors.

Conclusions

This study is the first and largest in the UK to provide individual level POP exposure estimates in proximity to MWIs and improve understanding of the diverse routes of dioxin exposure. It will also aid the interpretation of findings from an ongoing national study of MWIs and risk of adverse birth outcomes.

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Lead in Soil: Reducing Exposure to Young Children

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Background

In young children, exposure to lead is associated with a reduced IQ (intelligence quotient) score even when exposure rates are low. On a population level, the loss of a few IQ points can have large consequences. For instance, the loss of one IQ point on a population level means an estimated 2% loss of productivity. It can also lead to an increase of people with (very) low IQ who need increased care and support. The European Food Safety Authority (EFSA) concluded that there is no evidence for a threshold for critical lead-induced effects. The main uptake pathways in young children are hand-mouth contact while playing in contaminated soil and the consumption of home-grown vegetables.

Methods

Using the integrated exposure uptake biokinetic (IEUBK) (a physiologically-based pharmacokinetic (PBPK)) model from the Environmental Protection Agency (EPA) and CSOIL from the National Institute for Public Health and Environment (RIVM), the maximum acceptable lead content in soil was calculated. For the calculations, the doses related to a loss of one and three IQ points were used. Calculations were made for different uses of the soil (i.e. vegetable garden, living with (vegetable) garden and places where children play).

Results

The calculated maximum lead content in soil for all soil uses was lower than the prevailing legislation. Recommendations are needed to lower the exposure of young children to a reasonably achievable level.

Conclusions

The Dutch public health services have set up recommendations for municipalities for managing health risks due to the exposure of soil lead. These recommendations include communication and education to residents about simple measures to reduce the exposure of soil lead and the removal of hot spots. Examples of recommendations to residents include having children play in specially prepared clean sand areas and growing vegetables in containers with clean soil separated from contaminated soil. In addition, it is advised to wash the hands of children frequently and to clean the in-home area by frequent vacuuming.

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Spatial Clustering of Childhood Leukemia in the Region of Murcia, Spain, 1998-2010

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Background

Occasionally, pediatricians and overall primary health care professionals become alert to the presence of little clusters of childhood cancer and frequently their expectations are frustrated when applying statistical methods. The study of little areas in spacial epidemiology has permitted the advance in the identification of clusters and the implicated environmental risk factors. The objective of this study is to test the causal hypothesis that exposure to carcinogens in utero leads to the onset of early childhood leukemia by exploring the presence of spatial and spatial-temporal clusters within administrative divisions in the region of Murcia, Spain, while considering the residential addresses of cases during pregnancy, early childhood and diagnosis.

Methods

The Pediatric Environmental Health Specialty Unit is carrying out an ongoing research project on the environment and pediatric cancer, collecting a pediatric environmental history (PEH) to create regional maps and analyze the geographical distribution of incident cancer cases in the region of Murcia. Between 1998 and 2010, 117 children were diagnosed with leukemia. Pregnancy, early childhood and diagnosis addresses were collected. Spatial and spatial-temporal clusters were then evaluated using the statistical software SatScan®.

Results

Leukemia was most common in children under 5 years of age. The incidence rate was 40.1 per 1 million children in the study period. Among subtypes of leukemia, ALL (acute lymphoblastic leukemia) has a greater incidence in children, occurring in 31.5 per million in comparison to LAM, affecting 8.6 in every million children. The incidence rate of all leukemias and its subtypes increased in the time frame between 1998-2004 and 2005-2010. Spatial clusters were observed for leukemia in general and ALL when considering the pregnancy addresses and the census district; however, no clusters were identified for residential addresses during diagnosis.

Conclusions

The detection of spatial clusters in a localized area when examining the distribution of pregnancy addresses and census district areas lends proof to the hypothesis that fetal environmental exposure is likely implicated in the etiology of childhood leukemia.

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Cotinine, Cadmium and Polycyclic Aromatic Hydrocarbon Levels in Children's Urine as a Result of Environmental Tobacco Smoke Exposure in Two Spanish Locations

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Background

Children are especially vulnerable to secondhand smoke (SHS) due to their reduced ability to metabolize and excrete toxic chemicals. Children exposed to SHS are at increased risk of developing asthma, sudden infant death syndrome, and ear and respiratory infections. In Spain, after 2011, a stricter anti-smoking legislation led to a reduction in the exposure in public places, however this reduction was not observed in private environments, and children are mostly exposed to SHS at home.

Methods

In the framework of the Demonstration of a Study to Coordinate and Perform Human Biomonitoring on a European Scale project (DEMOCOPHES), urinary levels of cotinine, cadmium and polycyclic aromatic hydrocarbon (PAH) metabolites (1-hydroxypyrene and hydroxyphenanthrene isomers) were studied in relation to SHS exposure. First morning urine samples corresponding to 120 children aged 6-11 years in urban (Madrid city) and rural (Añover de Tajo, Toledo) areas were collected from October 2011 to January 2012. Sociodemographic and environmental tobacco exposure data were collected by an epidemiological questionnaire. Cotinine levels were analyzed by high resolution liquid chromatography coupled to mass spectrometry in tandem mode and cadmium was determined by dynamic reaction cell inductively coupled plasma mass spectrometry. For PAH metabolites, high performance liquid chromatography-fluorimetric detection analyses were performed. Ethical approval was granted by the Ethical Committee of the Instituto de Salud Carlos III.

Results

The geometric mean for cotinine was 685.8 µg/g creatinine for smoker mothers and 0.6 µg/g creatinine for non-smoker mothers (max 3779.0 and 4.1 µg/g creatinine, respectively). In children, the geometric mean for cotinine was 4.62 µg/g (smoker mother) and 0.86 µg/g (non-smoker mother) with maximum values of 86.28 and 10.91 µg/g creatinine, respectively. For all children, the geometric mean (confidence interval 95%) for cadmium was 0.05 µg/g creatinine (0.04-0.05), for 1-hydroxypyrene 0.15 µg/g creatinine (0.10-0.24) and 0.22 µg/g creatinine (0.13-0.37) for hydroxyphenanthrene isomers. Significant differences were observed regarding residence area, age, number of smokers per household and their smoking habits.

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Conclusion

The home environment is a significant predictor of the cotinine levels in children and therefore efforts are required to protect children from SHS exposure in scenarios out of the scope of application of the current anti-smoking legislation.

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Preventing Exposure to Environmental Hazards — Role of Primordial Prevention

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Protecting children from environmental hazards requires individual clinicians to be alert to environmental causes of disease, but it also is important to adopt broad-based societal interventions; this is considered primordial prevention. Primordial prevention aspires to establish and maintain conditions to minimize hazards to health. It consists of actions and measures that inhibit the emergence and establishment of environmental, economic, social and behavioral conditions.

In the field of environmental health, population-level actions are needed to address, for example, the problem of global climate change. Clinicians can raise awareness and be effective advocates for action on the national and international level to promote energy efficiency and renewable energy production while decreasing incentives for continued production and consumption of carbon-intensive fuels. The American Academy of Pediatrics issued a policy statement and technical report on the health effects of climate change on children that encourage child health care professionals to engage in efforts to reduce national $C0_2$ emissions, and major medical journals and organizations have highlighted the importance of health professional involvement. In 2015, Pope Francis spoke out on the threats of global climate change to future generations in his encyclical Laudato Si, On the Urgent Need for Care of Our Common Home. When clinicians address these concerns and work to reduce the country's use of fossil fuels that result in $C0_2$ pollution, they are practicing primordial prevention.

The influential role child health professionals are playing in national and international efforts to reduce environmental threats to children is not new. In 1957, the American Academy of Pediatrics (AAP) launched this field when it formed a committee to educate providers about the importance of recognizing, treating and preventing exposure to radiation, the first environmental hazard to be noted

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by the AAP. In 1998, Pediatric Environmental Health Specialty Units were established by the Agency for Toxic Substances and Disease Registry and the US Environmental Protection Agency to provide resources about children's environmental health to clinicians and communities. In 1999, the American Academy of Pediatrics published the first Handbook of Pediatric Environmental Health; a 3rd edition was published in 2012. A Textbook of Children's Environmental Health was published in 2014. Many international bodies have endorsed the need for healthier environments for children and called for actions to reduce children's exposures to environmental hazards.

Primordial prevention is an integral part of the practice of pediatrics. It is foundational to addressing the major environmental health problems facing children today.

Radiation Imaging Communication (Cooperation) in Pediatric Healthcare: Awareness, Accountability, and Action

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Background

Professional responsibilities for safe and effective diagnostic imaging consist of three A's: radiation awareness, collective accountability for protection of our patients (both adult and pediatric), and actions to achieve this end. These have been fundamental responsibilities in diagnostic imaging since the discovery of x-rays over 120 years ago. Concurrently, there have been remarkable advancements in imaging procedures that use ionizing radiation, including x-rays (radiography), fluoroscopy, and computed tomography (CT). This imaging portfolio clearly improves management and saves lives minute by minute, day by day across the world. Rapidly evolving technology affords both opportunities for improved service, but also challenges with the fundamental responsibilities for radiation safety. The principle components of radiation protection in medicine consist of justification (the imaging procedure is indicated) and optimization (the procedure is done in an appropriate fashion to balance diagnostic quality with risk considerations, including radiation exposure).

Methods/Results

Both justification and optimization are embodied in the action aspect of our professional responsibilities. Justification is really a shared duty between all stakeholders, including healthcare providers who request imaging procedures and members of the imaging team. While the branding using "justification" seems relatively simple, it is actually quite complicated. There are a myriad of factors which come into play

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in determining which of any imaging modality is appropriate. Many of these are global, and some are regional, such as in the US with defensive medicine. The fundamental success for justification requires communication between healthcare providers (e.g. decision support) as well as the children we care for and their care providers.

Conclusions

Development on both fronts requires consensus efforts (cooperation); a partnership of shaking hands rather than pointing fingers and assigning blame. Success may be more effectively and efficiently realized through a fourth A: assurance. This is exemplified through the Image Gently Alliance and the Alliance's mission for radiation education awareness as an advocate in the care of children. Such efforts can serve as global models for improved imaging care of children.

Radiation Risk and Strategies for Informed Use of Medical Imaging in Children: What Care Providers Should Know

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Background

Diagnostic imaging is lauded as one of the most important advancements in medical care for both adults and children. The benefits are accompanied by risks, such as the potential cancer risk from the incumbent exposure to ionizing radiation. Radiation risk in diagnostic imaging can be approached through a review of patterns of use, radiation dose measurements and doses delivered, potential risk, and strategies to mitigate risk.

Methods/Results

The use of medical imaging, especially CT, has increased rapidly and globally over the past three decades for a variety of reasons. In the US, CT now accounts for 25% of the per capita exposure annually, included background (natural) sources. Exposures in medical imaging are considered low level radiation although CT is a relatively greater radiation exposure than x-rays, or fluoroscopy. Approximately 5-10% of CT examinations are performed in children. Based on data from several sources, especially atomic bomb survivors, a risk, at most small, has been attributed to medical exposures in the range of some of the higher dose procedures such as CT for children (in general a more vulnerable population). The principle components of radiation protection in medicine consist of justification (the imaging procedure is indicated) and optimization. That is, the procedure is done in an appropriate fashion to

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balance diagnostic quality with risk considerations including radiation exposure.

General considerations for appropriate performance consist of minimizing the exposure time or views (e.g. fluoroscopy); examining only the necessary area; and adjusting the radiation exposure to the region scanned, clinical question(s), and the size of the child. Specific measures for CT include adjustment of scan settings, restricting multiple series taken of the same area, and avoiding overlapping of scan regions. There are special considerations for children in performing CT examinations such as the use of IV contrast media that must be not be neglected. There are also new technologies to help optimize the balance between dose and quality. Recently, dose monitoring programs for all patients have become a responsibility for the medical community. Finally, informed strategies supplementing requisite regulatory, guidance and accreditation components must include education.

Conclusions

Understanding and implementing appropriate strategies when imaging children will help in optimizing the value in medical care.

Communicating Radiation Risks in Paediatric Imaging

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Background

The use of ionizing radiation diagnostic imaging procedures for children has rapidly increased globally during the past 20 years, including computed tomography as a valuable tool for assessing paediatric illness and injury, as well as paediatric image-guided procedures, which may replace more complex surgical options. While the clinical value of imaging involving the use of radiation for paediatric health-care is unquestionable, this is often juxtaposed with children's relative increased susceptibility to radiation, including the potential for cancer from low-level exposures. While individual radiation risks are at most quite small, radiation protection in paediatric imaging is a public health issue due to the large population exposed and public concern. This demands policies and actions that recognize, maximize, and promote the multiple health benefits that can be obtained, which at the same time minimize potential health risks of the radiation exposure with the ultimate purpose of ensuring that the benefit outweighs potential harm. Radiation risk communication has a key role to inform the appropriate risk-benefit dialogue in healthcare settings. Healthcare providers requesting and/or performing radiological

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imaging procedures in children have a shared responsibility to communicate radiation risks to patients, parents and other caregivers.

Methods/Results

WHO organizes this seminar to present the new document "Communicating radiation risks in paediatric imaging: information to support health care discussions about benefit and risk" available at http://www.who.int/ionizing_radiation/pub_meet/radiation-risks-paediatric-imaging/en/ . This document is intended to serve as a tool for healthcare providers to communicate risks associated with paediatric imaging procedures. The session will discuss the effective and balanced benefit-risk dialogue in paediatric imaging and how this can be achieved to improve health service.

Conclusions

This WHO communication tool will serve as a basis to further develop training packages to improve communication skills of health care providers, as well as advocacy and information materials targeting patients, parents, other caregivers and the public.

Birth and Growth Without OH: Detection and Follow-Up From Pregnancy Until the End of Adolescence of Children at Risk of Neurobehavioral Disorders Through Exposure of Alcohol and Illegal Drugs

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Introduction

This integrated study examines the prevention and detection/follow-up of children at risk of neurobehavioral disorders associated with prenatal and/or postnatal exposure to alcohol and illegal drugs. We utilized the Elijo Mas Sano (Choose Healthier) registry of children at environmental risk from drugs and alcohol.

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Methods

For this descriptive study of environmental clinical history we observed the first 39 patients of Elijo Mas Sano. We included clinical, social and neurodevelopmental evaluations. The Elijo Mas Sano criteria of inclusion was a) >20 g/day of alcohol and/or 3 incidents of binge drinking of ≥40 g/day during periconceptional, gestational, or lactation stages and/or b) fetal exposure to any illegal drug at least once a week. Ethical approval was granted by the Clinical Research Ethics Committee of the University Hospital Virgen de la Arrixaca.

Results

The study group was comprised 39 subjects, 19 girls and 20 boys. The gestation period was an average of 38.26 weeks (min. 30; max. 41). There were 5 premature newborns (<36 gestation week). The average birth weight (≥36 gestation week) was 3,055 g (min. 2,433.9; max. 3,676.1). The average consumption of alcohol at early pregnancy in mothers was 33.55 g (confidence interval 95% 23.7-43.2).

In the study group, 33% reported 3 or more incidents of binge drinking. Fetal exposure to illegal drugs occured in 18% of the study group. Four patients had neonatal anthropometry (≥36 gestation week) with an average head circumference of <p10, a birth weight of <p10: 9, and 3 patients had a height of <p10. There were 6 patients with major congenital malformations. Two patients had chromosomal comorbidities.

We evaluated 37 of the 39 patients' facial features: palpebral fissure (<-2 standar deviation): 2, philtrum (4-5): 2, upper lip (4-5): 4. The Battelle test neurodevelopmental evaluation was given to 30 of the 39 subjects to examine personal and social, adaptive, motor, and communication domains. Twenty-eight showed delays on one domain and 21 in 3 or more. A negative correlation existed between g/day of ethanol and months of cognitive delay (-0.37, $p<0.05$). In the study, 35% had an average cognitive delay of -8.5 months (confidence interval 95% -0.5;-16.5).

For some of the study group participants, growth curves and head circumference showed normalization by 2 years.

Conclusions

Half of the children from the Elijo Mas Sano registry had neurodevelopmental delays before the age of 2. The program of prevention and harm reduction of intrauterine exposure to alcohol and other drugs has been implemented with good preliminary results: decreased alcohol consumption during pregnancy and syndromes and alcohol-related birth defects. The next step is to follow-up to children who are at risk of fetal alcohol spectrum disorders through adolescence.

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BORN WITHOUT OH: an Innovating Model for Preventing and Managing the Neurodevelopmental Disorders Caused by Alcohol and Drug Prenatal Exposure In a Mediterranean Region

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Background

Born without OH is a comprehensive program of prevention, reduction of harm and management of neurobehavioral disorders associated with prenatal exposure to alcohol and other drugs through the pediatric environmental health from the beginning of pregnancy until the end of adolescence. Our objective is to prevent and reduce damage from exposure to alcohol and other drugs during critical periods of development (periconceptional until the end of adolescence).

Methods

Beginning in 2009, at the University Clinical Hospital Virgen de la Arrixaca (Murcia, Spain), the GREEN SHEET was implemented in hospital and primary care. It is a set of basic and concise questions for women in the 1st trimester of pregnancy to detect the environmental risk factors related to alcohol and other drugs in early pregnancy. Those with high-risk criteria of prenatal exposure to alcohol and other drugs pass to a follow-up program called ELIJO MAS SANO (CHOOSE HEALTHIER): early and comprehensive intervention for the management and monitoring of pregnant women and / or children at risk of fetal alcohol spectrum disorders (FASD).

Results

In the follow-up of 200 children in the program ELIJO MÁS SANO, there was a significant decrease ($p < 0.05$) in women who drank some alcohol in early pregnancy and the amount of alcohol drunk by the couple. There was a decrease in the number of newborns with congenital heart disease associated with intrauterine exposure to ethanol controlled by the number of births and abortions. There were 6 children diagnosed with fetal alcohol syndrome (FAS) (in 1500 pregnant couples), estimating a prevalence of 4 cases of FAS per 1,000 newborns in the region of Murcia.

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Conclusions

The Born without OH programme has been implemented with good preliminary results: reducing the consumption of alcohol during pregnancy, decreased congenital heart diseases related to intrauterine exposure to alcohol and registration of syndromes and alcohol-related birth defects.

Temporal Trends of Organochlorine Compounds and Polybrominated Diphenyls from Utero until 4 Years of Age in the Asturias INfancia y Medio Ambiente Cohort

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Background

Persistent organic pollutants (POPs) include a wide range of compounds typically produced for agricultural and industrial applications. These compounds have diverse deleterious health effects and are persistent in the environment. Moreover, due to their lipophilic nature, they bioaccumulate in humans in utero and during the breastfeeding period. Assessment of the significance of these early accumulation processes is important for understanding the main mechanisms leading to the human body burden of these pollutants and for identification of toxic stresses in the early life period.
Accordingly, in utero POP accumulation has been addressed in previous cases, but extension of these studies to longer life periods has been rarely considered. Nevertheless, evaluation of the body burden of these pollutants at different early life stages is important for obtaining comprehensive descriptions of the processes involved in their build-up and assessment of their potential health effects.

Methods

In the present study we described one of these cases. Organochlorine pesticides, polychlorobiphenyls and polybromodiphenyl ethers were measured in maternal serum, placental tissue, cord blood and the serum of 4 year-old children from a cohort in Asturias sampled within the INfancia y Medio Ambiente Project. Ethical approval was granted by the Ethics Committee of San Agustin hospital, and each participant provided informed consent.

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Results

Maternal and children serum burdens were determined. The influence of maternal breastfeeding and other socio-demographic determinants in the accumulation of these compounds through time was evaluated. At 4 years of age, formerly breast-fed children were found to have higher POP concentrations and total burdens than non-breastfed children.

Conclusions

The significance of these general trends for each individual pollutant was identified.

TiPP TAPP-First Steps into Life

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Background

In April 2008, a home visit activity was launched as part of the social area oriented work approach "TippTapp". This preventive program combines low-threshold health counselling for families with babies and screening on youth welfare topics.

Methods

The program is currently located in disadvantaged areas of Bremen, Germany. Pediatric nurses offer to visit families and their babies at the age of 6 weeks, 6 months and 12 months. Parents decide if they would like to take part. There is no obligation to take part in the program. Because of their regional work, our pediatric nurses provide specific knowledge about helpful offers in their particular region. During our visit in the families' homes, we get a chance to discover circumstances of different origins that might influence the health and development of children. A standardized documentation sheet is used. Important development and safety topics are discussed. A differentiation of subjects mentioned by parents is important to grasp the needs of the family and to initiate appropriate help.

Results

In 2014 there were visits in 46, 63% (n=2041) of 4345 invitations. Besides many helpful hints, 13 cases were reported to youth welfare. In 4 of them, help was given, although the parents did not agree.

Conclusions

The content of our work is transferable. The gained knowledge may be helpful in questions of urban development. Individual and general support of families can be positively influenced. In an upcoming cohort study in Bremen, TiPP TAPP is part of the set of interventions.

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Forests for Health with the Environmental Midwife

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Background
Forests for Health (FFH) is a project within the program "Nacer sin OH" (Births without OH), promoted by the Pediatric Environmental Health Speciality Unit of the Clinical University Hospital Virgen of Arrixaca (Murcia, Spain). This project intends that each child born and raised will be linked with a tree: incorporating a forest within each of the maternity hospitals of the Region of Murcia (Spain), creating healthy environments as protective factors during infancy, thus building health equity and promoting the enjoyment of natural heritage and regional biodiversity.

Objective
To foster the linkage of pregnant partners with nature and their future children from birth through adolescence, stimulating contact with nature as a preventive and therapeutic tool to achieve health, wellness and quality of life.

Methods
The environmental health midwife and various maternity healthcare professionals collaborate, giving the family a pine seedling, linked with the birth of a child, and an information package containing educational and prevention materials in line with the goals of the program. Subsequently they contact and invite parents to the replanting day, with the aim of creating forests for health.

Results
From 2015 to 2016, approximately 2000 pine seedlings were given to families. There have been 3,637

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newborns. Approximately 450 trees have been planted in the FFH, with 4,694 tons CO_2/year absorbed.

Conclusions

As health professionals, midwives are vital in accompanying pregnant couples and influencing the stages of preconception, pregnancy, childbirth, postpartum, throughout the cycle of sexual and reproductive health. The simplicity of the project allows it to be feasible and transferable for families, especially during such a receptive period.

Factors Influencing Breastfeeding Initiation

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Background

Breastfeeding is a unique and priority nutrition during the first year of life. However, its initiation and duration is determined by the interaction of multiple constitutional and environmental factors (physical, chemical, biological and psychosocial). Children are greatly vulnerable to environmental factors during the periods of pregnancy and lactation. Our aim is to study the protective and risk factors related to the initiation of breastfeeding in the Murcia Region.

Methods

A cross-sectional study of 99 women from the Region of Murcia, consisting of a personalized "face to face" interview with mothers at the time of hospital discharge, which were done by a nurse utilizing a carefully crafted questionnaire instrument called "the green page".

Results

About 90% of mothers had the intention of exclusively breastfeeding prior to giving birth, 5% partial breastfeeding, and 5% no breastfeeding. However, only 51% exclusively breastfed, 36% partially breastfed, 8% predominately breastfed, and 5% did not breastfeed. Especially during the immediate and early postpartum period, difficulties can arise such as the ones found during our study. About 27% of the mothers had problems breastfeeding, and of those mothers, 6% experienced pain in the nipple area, in 5% the newborn had issues latching on, 5% had cracks in the nipple, and 5% had irritated nipples.

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Conclusions

Addressing multiple factors that affect breastfeeding can positively influence the initiation and duration of breastfeeding. As health professionals, we are able to promote breastfeeding and thus improving the quality of life of our children.

Human Biomonitoring Data Analysis for Metals in an Italian Adolescents Cohort: an Exposome Approach

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Background

In the framework of the Cross-Mediterranean Environment and Health Network-Life (CROME-LIFE) project, a cohort of 453 adolescents aged 13-15 years living in urban (Rome) and rural (Viterbo) areas from the Italian Programme for Biomonitoring of Exposure (PROBE) was enrolled to examine metals exposure. Children are more vulnerable to environmental stressors than adults, and have less control over their environment. Although evidence indicating the impact on children's development is growing, there is still only a partial understanding of the environmental risks to children.

Methods

Non-fasting blood specimens obtained by the National Microcytemia Association during the annual screening for microcytemia in schools (2009-10) were analyzed for nineteen metals by sector field inductively coupled plasma mass spectrometry. Administered questionnaires included information such as sex, diet habits, lifestyle factors and parental occupational status. Socio economic status of the family was derived by merging the educational level and occupational status of the parents. The Ethics Committee of the National Public Health Institute of Italy (ISS) approved the project.

Metal concentrations in blood were statistically evaluated. Basic statistics were used to obtain reference values where the 95th percentile describes the upper value to be used in health care and environmental policy. Data on the study participants were geo-referenced on the basis of their residence address

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and the data were stored in a geo-database along with human biomonitoring data, dietary habits, environmental pollution and land cover data. In the frame of the Cross-Mediterranean Environment and Health Network LIFE+ project, an exposome-wide analysis was performed to identify the associations between metal concentration levels in blood and several exposure determinants including land cover, milk and fish consumption, both considering them individually and in combination to explore potential synergies between covariates. Ethical approval was granted by the Ethical Committee of Istituto Superiore di Sanità, Roma, Italy.

Results

Results show robust statistical associations of chromium with the dietary pathways analysed and land cover, showing that both out-of-region and local sources can be associated with the observed human biomonitoring levels of chromium in the population. Other robust associations were found between tungsten and co-exposure to contaminated milk and proximity to industrial activities and mercury, with a more complex interaction between co-exposure to different dietary pathways (milk and fish) coupled with proximity to industrial activities. No pathway alone was dominant, but the combined effect results in statistically significant associations with blood concentration levels of mercury. The associations of nickel with dietary pathways (co-exposure to milk and fish) and platinum with fish and industrial activities and enhanced traffic, even though statistically significant ($p < 0.05$), fail to meet the statistical robustness test. None of the other metals showed statistically significant associations with dietary patterns and/or land cover information.

Conclusions

All metals analyzed in this study are environmental pollutants posing high concerns with regard to their effects on human health. Their distribution in the environment is a result of natural processes and anthropogenic activities. However, in addition to environmental sources,other factors such as individual lifestyles, diet, and socio-economic factors need to be taken into account as they contribute to the levels of metals found in the human body.

The results obtained thus far support the utility of an exposome approach to get a more accurate and holistic perspective in order to determine the association between population exposure and its determinants using human biomonitoring studies

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Early Life Exposure to Multiple Environmental Contaminants and Birth Outcomes: Pooled Analysis In Four Flemish Birth Cohorts

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Background

Prenatal chemical exposure has frequently been associated with reduced fetal growth, although results have been inconsistent. Most studies associate single pollutant exposure to these health outcomes, even though this does not reflect real life situations, as humans are exposed to thousands of pollutants during their life time. The objective of this study is to investigate the association between prenatal exposure to a mixture of environmental chemicals and birth weight.

Methods

We used exposure biomarker data obtained from cord blood samples of 2033 women from three Flemish birth cohorts (FLEHS I, II & III) and a regional birth cohort (3xG). The common set of exposure measures in these cohorts are the organochlorine compounds (three polychlorinated biphenyl (PCB) congeners (138, 153 and 180), hexachlorobenzene (HCB), p,p'-dichlorodiphenyldichloroethylene (p,p'-DDE)) and the heavy metals cadmium and lead. Birth weight was assessed as a proxy for reduced fetal growth. Elastic net regression was used to assess the effect of multipollutant exposure on birth weight. Ethical approval was granted by the ethical committee of Antwerp University (Hospital) and of the local hospitals.

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Results

In the pooled database, birth weight ranged from 1245 to 5575 g with a median of 3430 g. The median contaminant levels in cord blood were: 26 ng/g lipid for PCB 153, 15 ng/g lipid for PCB 138, 18 ng/g lipid for PCB 180, 90 ng/g lipid for p,p'-DDE, 17 ng/g lipid for HCB, 0.045 µg/L for cadmium and 9 µg/L for lead. In single pollutant models, the three PCB congeners were significantly associated with reduced birth weight. The correlations between the different pollutants were low to moderate ($r = 0.11 - 0.59$), except for the three PCB congeners which were highly correlated with Pearson correlation coefficients ranging from 0.74-0.84. From all exposure measures, the two PCB congeners PCB 153 and PCB 180 were most consistently associated with birth weight based on elastic net regression.

Conclusions

Assessing the health risk of combinations of exposure biomarkers better reflects real world situations. The findings allow for more effective risk assessment as addressing the critical chemicals in a mixture of pollutants is pivotal for risk assessment.

Acknowledgements

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Brainy Approaches to Children's Environmental Health

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The foetus and the child are particularly vulnerable to pollution. The foetus shares the mother's exposure and accumulated body burden of pollutants, and many chemicals are transferred to the infant via human milk. In relation to body weight, a newborn or small child needs more water, energy and oxygen than an adult, and contaminant exposures can therefore be comparatively larger. In addition, during early life, cell differentiation and organ development must occur in a particular sequence and at certain times to create optimal functions of the mature organism. This vulnerability is critical in regard to the nervous system. Because there is only one chance to develop a brain, even doses that are safe for adults may, if occurring during early development, cause permanent losses of IQ. More than 200 industrial chemicals are already known to cause brain toxicity in adults. About half of these substances are produced in high volumes. All of them must be suspected to be capable of harming the developing brain. However, only

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a dozen industrial chemicals are recognised causes of developmental brain dysfunction. Methylmercury may serve as a paradigm, where exposures previously thought to be safe are now linked to adverse effects on brain development. However, documentation and recognition of such risks is cumbersome and takes decades, because the full impact of adverse effects may not be apparent before school age. Adding to the lack of insight, chemical substances are not systematically screened for neurotoxicity. Still, over one thousand chemicals have been reported to be neurotoxic in laboratory models, and such toxicity is therefore by no means rare. Because optimal brain function is crucial to each individual, as well as to society, new and precautionary approaches are required both for research and for decision-making on chemical testing and control.

Psychosocial Stress and Obesity in Kaunas Children

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Background

Recent research has found that family socioeconomic status, parenting stress and other environmental factors can have impacts on child development. The aim of this study was to assess the association between psychosocial stress in the family and risk for obesity among 4–6 year old children.

Methods

This nested case-control study included 1,489 Kaunas Cohort Birth Study children followed-up for 4–6 years. We used the Parent-Child Dysfunctional Interaction subscale of the Parenting Stress Index (short form) and questionnaires on child development to assess risk factors for children obesity. The body mass index status for age was calculated and the risk factors for being overweight/obese were estimated. Logistic regression models were fitted to examine the associations as odds ratios (OR) between the parent-child relationship and the risk of overweight, adjusted for relevant covariates. The Kaunas Pregnant Women Birth Cohort had 3 ethical approvals conducted by the Lithuanian Bioethics Committee.

Results

A total of 6.8% of the children were overweight and 5.4% were obese. Children from smoking families with lower education faced almost double the risk of obesity. The stratified multivariate model showed that, with reference to the group of high educated and normal parent-child relations, low educated and pathological parent-child relationships were statistically significant risk factors for overweight children of

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4–6 years old (OR 2.43; 95% confidence interval 1.31–4.51).

Conclusion

Maternal tobacco smoking and pathological parent-child relations may be predictors of overweight and obesity throughout the developmental trajectory of childhood. Measures to quit smoking and psychosocial stress management should be encouraged among pregnant women to decrease their children's obesity risk.

Influence of Gestational Weight Gain on the Transfer of Organochlorine Pollutants to Infants

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Background

Transplacental transfer and breastfeeding are the main transport routes of organic pollutants to children at the beginning of life. These transmission mechanisms primarily depend on the maternal pollution burden, but its impact may be modulated by physiological effects. We found that gestational weight gain (GWG) exerts a considerable influence on the content of hydrophilic and low volatile pollutants in cord blood and breast milk.

Methods

We measured levels of 14 organochlorine pesticides, 7 polychlorobiphenyls and 14 polybromodiphenyl ethers (PBDEs). Persistent organic pollutant neonatal concentrations were inversely associated with GWG after adjustment for age, pre-pregnancy body mass index, educational level, and fish consumption. On average, neonates of women with high or recommended GWG as defined by the Institute of Medicine had lower persistent organic pollutant concentrations than neonates of mothers with low GWG. This study was approved by the ethics committees of the Clinical Research Ethical Committee of the Municipal Institute of Health Care, the Ethics Committee of the Donostia Hospital and San Agustin Hospital, and informed consent was provided by every participant.

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Results

Colostrum from mothers with low GWG also had significantly higher concentrations of polychlorobiphenyls and 4,4'-dichlorodiphenyldichloroethylene than colostrum from mothers who gained weight within Institute of Medicine recommendations or in those who exceeded this threshold. Statistically significant differences were also found in the colostrum: maternal serum ratios of these compounds. Women with low GWG retained higher pollutant amounts in colostrum.

Conclusions

The higher mobilization of stored organic pollutants observed in pregnant women with low GWG plays a role for in utero pollutant exposure and during breastfeeding. The present findings suggest an association between infant exposure to persistent organic pollutants and inadequate GWG, encouraging pregnant women to meet the recommended Institute of Medicine guidelines to reduce the accumulation of these pollutants in newborns and during breastfeeding.

Environmental Health Issues for Spain

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Background

In general, children in Spain have the same environmental health conditions as other European children. However, they undergo some specific pollution stresses that must be considered for the implementation of adequate public health policies.

Methods

This presentation combines relevant information from the scientific literature and the results of the studies developed at the IDAEA.

Results

One of these stresses concerns mercury exposure. With the only exception of Portugal, the concentrations of this metal in hair from children living in Spain are considerably higher than in children from other European countries, and the differences are strong. In Spain, the high mercury content observed in children's hair, and also cord blood, is rather uniform independently of location. These high mercury concentrations are likely related with high fish and seafood consumption. Often, Mediterranean fish sold in Spanish market places, both oily and lean fish, contain mercury concentrations above the

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EU regulations for human consumption. Impaired intellectual development due to mercury exposure has been observed in children from Granada, but not in children from other Spanish cohorts. Another specific pollution stress of children living in Spain is exposure to hexachlorobenzene. Examination of cord blood serum concentrations of this compound shows higher levels than in European children. In this case, the differences are significant when comparing newborns from different Spanish locations. In utero exposure to hexachlorobenzene has been observed to be related with lower birth size. It has also been associated with higher incidence of overweight, alteration of thyroid hormones, attention deficit hyperactive syndrome and poorer social behavior in four-year-old children from Spanish cohorts.

Cotinine content, and therefore exposure to tobacco smoking, is also high among Spanish newborns, although when compared with other European cohorts, the difference is not as strong as in the previously mentioned pollutants. Exposure to polychlorobiphenyls, hexachlorocyclohexanes, dichlorodiphenyltrichloroethane/dichlorodiphenyldichloroethylene, perfluorohexane sulfonate, perfluorooctane sulfonate, perfluorooctanoate, perfluorononanoate, bisphenol A, polybromodiphenyl ethers or cadmium in children from Spanish cohorts is similar to that observed in other European countries.

In recent studies, lower development of working memory and higher inattentiveness has been observed in children from Barcelona exposed to high levels of traffic pollutants, namely nitrogen dioxide, fine aerosol particles and polycyclic aromatic hydrocarbons. These effects are probably common in all children living in urban areas under strong traffic pollution.

Conclusions

In the context of health conditions that are comparable to those of other EU children, the specific pollution stresses described in this review deserve specific attention from the health authorities.

Environmental Exposure and Neurodevelopment in the Mothers and Children's Environment and Health Study

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Background

The Mothers and Children's Environment and Health study is a prospective multicenter cohort study of pregnant women with follow-up of their offspring in Korea.

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Methods

During 2006 to 2010, 1,751 mother and child pairs were recruited. Various environmental factors including biomarkers in blood and urine and health outcomes including neurodevelopment and allergic diseases were checked throughout periods of childhood. The Korean Bayley Scale of Infant Development, 2nd edition was performed at 6, 12, 24, and 36 months of age, and intelligence quotient was measured using the Korean version of the Wechsler Preschool and Primary Scale of Intelligence, revised edition and Korean - Wechsler Intelligence Scale for Children IV at 62 months and after.

Results

We found significant effects on children's neurodevelopment in association with maternal exposure to lead, iron, manganese, cadmium, phthalates, secondhand smoke, air pollutants such as nitrogen dioxide and PM_{10}, as well as maternal stress and depressive symptoms, job strain during pregnancy, and postnatal breastfeeding duration.

Two preliminary studies suggested an association with prenatal lead, cadmium, and iron exposure with children's cognitive development at 5 years of age. Currently, children in the Mothers and Children's Environment and Health study are between 7 to 10 years old, and are being measured on their social responsiveness and behavior using the Social Responsiveness Scale, Attention Deficit Hyperactivity Rating Scale and Child Behavior Checklist. Future analyses should consider multiple exposure factors, times of exposure, and various dimensions of neuro- behavioral- cognitive- development.

Conclusions

A new nationally representative birth cohort study, the Korean Children's Environmental Health Study, was initiated in 2015. Follow-up will be conducted at every growth stage for the following 17 years based on the experiences of the Mothers and Children's Environment and Health study, which is expected to provide statistically powerful and generalizable evidences in environmental and children's health.

Children's Exposure to Endocrine Disrupting Chemicals. 'Women in Europe for a Common Future - WECF' is Working with Physicians, Scientists, NGOs and Media For Better Policy and More Protection

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Background

Studies show that Endocrine Disrupting Chemicals (EDCs) play a role in disrupting human brain

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development, deterioration of male and female reproductive health, increased incidence of male and female hormone related cancers, and the increase in cardiovascular disease, obesity and diabetes. The most vulnerable groups are pregnant women, fetuses and children. Better regulation is urgently needed. The EDC criteria to classify EDCs for being banned/regulated under the EU pesticides and biocides regulations proposed by the European Commission in June this year are negligible, not protective and ignore precautionary principles. Since the EDC criteria should function as a blueprint for other EU regulations and probably even in countries outside the EU, pressure from all public interest groups is urgently needed. The WHO calls the ubiquitous presence of EDCs in daily products and food a "global threat". Scientists and scientific associations like FIGO and the Endocrine Society are calling for political action for better protection as well as on action from doctors on awareness raising. The voice of scientists and doctors is needed more urgently than ever.

Methods

Women in Europe for a Common Future is active on a national and European policy level around EDCs and on an international level within the framework of the United Nations Environment Programme chemical policy process Strategic Approach on International Chemicals Management (SAICM) to achieve better protection of children from EDC exposure. Within several projects, WECF works on different target groups to raise awareness, improve the legal situation and give concrete information to consumers. Together with other NGOs (www.edc-free-europe.org, www.ipen.org/search/node/EDCs), WECF aims to increase the pressure for policy makers to take responsibility in protecting human health and the environment from EDCs.

Results

WECF informed thousands of people who work and live with children about hazardous chemicals in products and ways to reduce the exposure via its Nesting programme (www.projetnesting.fr). It delivers websites in several languages, a mobile phone app, workshops for parents and health and educational experts and information materials. On a policy level, WECF advocates for better regulations and for their enforcement.

Conclusions

The presentation aims to give an overview of recent EDC policy developments, EDC awareness raising and media activities, and scientific advances around EDCs, as well as political action taken so far. We will also show how strengthened cooperation between NGOs, physicians, media and policy makers is possible.

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Ambient Air Pollution and the Onset of Asthma, Hay Fever, and Allergic Sensitization in Birth Cohorts: A Systematic Review and Meta-Analysis

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Background

The causal role of ambient air pollution on the onset of asthma and allergic conditions continues to be debated. We provide a systematic review and meta-analysis of birth cohort studies with follow-ups from birth to adolescence.

Methods

In a previous systematic review by Bowatte et al. (2015), 19 birth cohort studies published from 1960 to March 2014 were identified. Using the same methodology, we extended this search up to January 2016, which allowed several key new studies to be considered. Random effects meta-analysis was used to obtain combined estimates.

Results

A total of 338 references published between April 2014 and January 2016 were identified. Of these, 88 were duplicates and 216 studies did not meet the inclusion criteria. Manual searches identified 4 additional papers. These new studies were added to those previously identified by Bowatte et al. (2015). Ultimately, 27 eligible papers were included in the systematic review, 15 of which could be used in meta-analyses.

Combined associations between asthma with particulate matter ($PM_{2.5}$ (1.11 (95% confidence interval 0.97, 1.26) per 2 μg/m^3 increment) and nitrogen dioxide (1.08 (95% confidence interval 0.96, 1.20) per 10 μg/m^3 increment) were not significant. Also for wheeze, the combined association was not significant neither for $PM_{2.5}$ (1.13 (95% confidence interval 1.00, 1.28) per 2 μg/m^3 increment) nor for nitrogen dioxide (1.08 (95% CI 0.98, 1.18) per 10 μg/m^3 increment). None of the combined associations with allergen sensitization or hayfever reached statistical significance. There were too few birth cohort studies on eczema to conduct a meta-analysis.

Conclusions

Despite the existence of a wealth of high quality, large, longitudinal birth cohort studies, the epidemiological evidence supporting an association between traffic-related air pollution with asthma and other allergic health outcomes remains insufficient to confirm a causal association.

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Personal Exposure to $PM_{2.5}$ and Benzo[a]pyrene in Ostrava, Czech Republic

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Background

Benzo[a]pyrene (B[a]P) is a proven human carcinogen. In the air, it is associated with particulate matter ≤ 2.5 µm ($PM_{2.5}$). High concentrations of both compounds found in the Ostrava region, CZ, have led to concern in the local population. To support the local needs for a communication platform, we started a case study of the CITI-SENSE project "Citizen Observatories for Quality of Life", with a special study on personal exposure and monitoring in schools.

Methods

Twenty non-smoking adult volunteers were recruited in the most polluted part of Ostrava to participate in three biomonitoring campaigns. All participants completed a personal questionnaire and time-location-acitivity diary. High precision personal monitors for $PM_{2.5}$ were used next to the new sensor technology for NOx assessment. Outdoor concentrations of $PM_{2.5}$ and B[a]P were measured using a high volume air sampler.

Results

The campaigns were held in winter 2013, summer 2015 and winter 2016. Average two-day personal exposures to $PM_{2.5}$ were 68.8, 45.3 and 37.4 µg/m^3, respectively. In 2013 and 2015, personal exposures to B[a]P were 5.5 and 1.3 ng/m^3. The outdoor concentrations for 2013 and 2015 were 35.4 and 17.6 µg/m^3 of $PM_{2.5}$ and 5.3 and 1.2 ng/m^3 for B[a]P in two weeks period during the campaigns. The highest concentration of B[a]P was found in kindergarten Ostrava Radvanice in February 2016 of 1.8 indoor and 5.9 ng/m^3 outdoor.

Conclusions

With use of low-cost sensors, we created a Citizens' Observatory to boost the cooperation between scientists, citizens and other stakeholders, to increase opportunities for environmental health governance. To improve relevance to the local population, we combined low-cost online measurements with high precision instumentation, and with measurements and information campaigns in schools, all in cooperation with city authorities. Such activities provide the context necessary for communicating the

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results of the biomonitoring study to citizens as well as authorities.

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Minamata Convention on Mercury and Vulnerable Populations

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Background
The United Nations Environment Programme's global mercury assessment in 2013 identified artisanal and small-scale gold mining (ASGM) as the largest single sector releasing mercury emissions from intentional use of mercury. The United Nations Industrial Development Organization identified artisanal and small-scale gold mining practices using mercury in more than 50 countries, many of them low- and middle-income countries. Very often, gold extraction processes using mercury occur within residential areas, polluting villages and exposing residents, including children, pregnant women and women of child bearing age. This mercury exposure leads to adverse health effects to the cognitive and neurological development of affected children. The long-term impact of mercury pollution could lead to high socio-economic costs, fewer jobs and economic opportunities, and increased family burden and need for health care.

Methods
Observations conducted during the inter-governmental negotiation (INC) meetings to prepare a global legally binding instrument on mercury and literature review.

Results
The Minamata Convention on Mercury is a global environmental health agreement, signed by 128 countries in October 2013 and currently under ratification. The treaty's objective is to protect human health and the environment from anthropogenic releases of mercury and mercury compounds.

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The mercury treaty specifically provides for and highlights the need to protect human health. Special attention to health aspects addressed in Article 16 aims to promote the development and implementation of strategies and programmes to protect populations at risk, particularly vulnerable populations. Among the most important requirements of the treaty is that information related to mercury and human health must not be kept confidential, thereby highlighting the public 'Right to Know' about mercury impacts on their health.

Conclusions

Article 16 of the Minamata Convention on Mercury does not contain mandatory provisions, but it encourages parties to the treaty to promote a range of health related measures. In addition to the present study, health issues also addressed in other articles related to ASGM, mercury in products, emissions and releases, contaminated sites, awareness and education as well as information exchanges are discussed. Countries with ASGM activities are recommended to develop a public health strategy with regard to the exposure of artisanal and small-scale gold miners and their communities to mercury. Such strategies should be included in the national action plan after the respective country ratifies the treaty.

Birth Weight In Relation to Cord Blood Levels of Selected Elements In Slovenian Mother-Child Pairs

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Background

The purpose of the present study was to evaluate the impact of cord blood and serum levels of selected toxic and potentially toxic elements (manganese, copper, zinc, arsenic, selenium, cadmium, lead, mercury, magnesium, calcium and iron (III)) on birth weight in Slovenia, taking into account maternal socio-demographic characteristics and dietary habits due to various associations obtained in literature.

Methods

Delivering women (18-45 years) were recruited primarily from the central part of Slovenia as part of the

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Public Health Impact of Long-Term, Low-Level Mixed Element Exposure in Susceptible Population Strata study (PHIME) (2007-2011). Cord blood (CB) samples were collected at delivery. Associations between birth weight and a) predictors obtained through the questionnaires and b) levels of the selected elements in CB samples were tested using univariate and multivariate analyses.

Results

In general, babies had normal birth weight (GM=3400 g) and levels of selected elements did not represent a health risk for the mother-child pairs. Linear regression analyses showed statistically significant positive correlations between birth weight and number of children in the family, maternal pregnancy problems, pregnancy body mass index of mothers, gestational age, level of maternal education; child's gender (boys were heavier) and negative correlations between birth weight and the number of bedrooms in the home. Among the elements tested, birth weight showed significant positive correlation with calcium in CB serum and negative association with iron (III) in CB serum.

Conclusions

The main predictors of the newborn's weight (length of baby, gender of the baby, gestational age, pregnancy and pre-pregnancy body mass, level of education) were expected, while the associations between birth weight and essential elements (calcium and iron (III)) in the Slovenian birth cohort should be further evaluated in future studies.

Reality of Children's New Environment and Future Policy Needs

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Background

As professionals, we are confronted with increasing challenges in the fields of environment and health. Attempting to find the best way to solve numerous problems, new disciplines have been established. How can we make efficient policy to reduce risks and prevent harmful scenarios in the future? Some of us will still be alive and children that are five years old today will have their own young children in 2050. Besides knowledge, do we have the courage and imagination for an effective holistic approach to produce successful policy to preserve the environment for our children?

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Methods

Based on the premise that students are the decision makers of the future, this research examines and analyzes (using a questionnaire) students' opinions about public health priorities in the field of environment and health.

Results

The results present the initial phases of data collection and consider priorities in public health, especially in connection to the environment. Preliminary results point to the necessity of giving priority to climate change, water safety, and other environmental challenges. The challenge of a fast changing environment due to climate changes is probably the most important. Children are growing up in different environments, full of risk as consequences of climate changes and different disasters, as well as human migration, homelessness, discontinuation of schooling, unsecure health protection, etc.

Conclusions

Future policy should be comprehensive, foster adaptation and mitigation activities and aim to include children all along their education. Policy should be established by multi-sector stakeholders, in collaboration between education and health, with the primary aim to decrease health consequences on children, protect children's health and the whole population, now and in the future. We need a new approach to prepare students, children, professors and families for climate changes, and provide them with knowledge to raise their awareness. We should increase capacity to overcome all these rapid changes in the environment now, and prepare children for the future.

Association Between Breastfeeding Duration and Cognitive Development, Autistic Traits and ADHD Symptoms: a Multicenter Study in Spain

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Background

Several studies have related longer breastfeeding durations to better intellectual performance in children. However, whether this relationship is entirely attributable to socio-environmental factors remains under debate. Few studies have investigated the potential protecting effects of breastfeeding against behavioral problems such attention deficit hyperactivity disorder (ADHD) symptoms, and even fewer on autism spectrum disorders (ASD) traits, and the extent to which these effects are mediated by cognitive function has never been explored.

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Methods

This study examines the association between breastfeeding duration and cognitive development, attention, ADHD symptoms, and autistic traits using data from the Infancia y Medio Ambiente – Environment and Childhood – Project, a Spanish multicenter birth-cohort study, taking into account the intensity of breastfeeding. Duration of overall, predominant, and exclusive breastfeeding was documented during infancy through maternal questionnaires. Children (N = 1,832; mean age = 4.8 years) were assessed for cognitive development (McCarthy Scales of Children's Abilities), attention (Conners' Kiddie Continuous Performance Test), ADHD symptoms (criteria of the DSM-IV form list), and autistic traits (Childhood Autism Spectrum Test). Ethical approval was granted by the Clinical Research Ethical Committee of the Parc de Salut Mar.

Results

Several potential confounding factors were documented through parental interviews. After adjustment for confounders, longer duration of breastfeeding was associated with better cognitive development, reduced ADHD symptoms, and lower autistic traits. The latter effects appeared independent from each other.

Conclusions

This study provides further confirmation of a positive association with cognitive function over socio-environmental factors, and also suggests a protecting role against ADHD symptoms and autistic traits. Results are in agreement with recommendations of prolonged breastfeeding durations to promote child development.

Occupational Noise Exposure During Pregnancy — New Aspects in Children's Language Acquisition

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Background

Occupational noise in pregnancy may affect the child´s central auditory processing and language acquisition. There are no investigations on this topic. At present, work safety focuses on protecting maternal hearing.

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Methods

We conducted a cohort study among women working in the food industry, and as kindergarten teachers, musicians, dental nurses or pharmacists. We contacted 855 women with new-born children, 578 (68%) of which responded to baseline and 423 (73%) when their children were 12 months old. The final analyses included 406 mother-child pairs.

The baseline questionnaires focused on maternal occupational exposure and family factors. Language acquisition was measured by a validated questionnaire, Esikko, evaluating social communication, speech production and language comprehension. The mother filled out the questionnaire when her child was 12 months old. An occupational hygienist assessed noise exposure on the basis of maternal profession, job tasks and noise measurements using the categories: no exposure (<70 dB, n=178), low exposure (>=70 dB<=80 dB, n=108), and moderate/high exposure (>80 dB, n=120). We used linear regression, adjusted for mother's age, employment, child's gender and father's education to evaluate the association between noise exposure and children's language acquisition. Ethical approval was granted by the Ethics Committee of The Hospital District of Helsinki and Uusimaa.

Results

The adjusted mean language acquisition scores (range 0–57) were 34.3 (95% confidence interval (CI) 32.5–36.0) for no exposure, 34.8 (32.6–36.9) for low noise exposure, and 34.9 (32.8–37.0) for moderate/high exposure. There were no statistically significant differences among the exposure groups. This was also true in analyses of social communication, speech production and language comprehension among food industry workers' children. Noise exposure was suggestively associated with lower language acquisition scores among kindergarten teachers' children. Reading to the child was strongly associated with high language acquisition scores in the entire data.

Conclusions

We found no clear association between noise exposure during pregnancy and language acquisition among one-year-old children. The study provides further results concerning two-year old toddlers.

Persistent Pollutants in Food Items from Menorca Island

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Background

Organochlorine compounds and mercury are persistent pollutants of concern for their potential health effects. Organochlorine compounds are synthetic products used in industrial and agricultural applications, whereas the environmental occurrence of mercury has been largely enhanced by human activities. Despite their different structure, these compounds share common properties such as high toxicity (several of them), persistence in the environment and are widely distributed on the planet. Furthermore, they bioconcentrate and biomagnify along the food chain. Dietary intake is therefore a major route of incorporation of these compounds in most human populations. However, it is important to ascertain what specific food items are the most relevant. This is particularly important for children since their organs and metabolism are still developing.

Body burden of dichlorodiphenyltrichloroethane and mercury in children from Menorca Island (western Mediterranean Sea) were considerably high when compared with cohorts from continental Europe (INfancia y Medio Ambiente and Cross-Mediterranean Environment and Health Network).

Methods

The present study aimed to determine the content of organochlorine compounds and mercury in representative food items from Menorca Island. Foodstuffs including seafood, meat, vegetables, fruits and dairy products were collected in 2014. Fish were captured by local fishermen and all other food stuffs were produced on the island.

Organochlorine compounds analysis for the determination of pentachlorobenzene, hexachlorobenzene, hexachlorocyclohexanes, dichlorodiphenyltrichloroethaneand metabolites (dichlorodiphenyldichloroethane and dichlorodiphenyldichloroethylene) and polychlorobiphenyls were performed by gas chromatography–electron capture detector and gas chromatography–mass spectrometry. Determination of mercury was performed by inductively coupled plasma mass spectrometry.

Results

Seafood was observed to be the foodstuff with highest organochlorine compounds and mercury levels. The most abundant organochlorine compounds were 4,4'-dichlorodiphenyldichloroethylene and polychlorinated biphenyl 153 with arithmetic means of 1.01 ng/g fresh weight and 0.69 ng/g fresh weight, respectively. Fruits and vegetables presented in lower concentrations. Concerning mercury, most fish samples exceeded the maximum level fixed by the European Commission (0.5 and 1.0 mg/kg fresh weight). Small-spotted catshark presented the highest concentration with 3.8 mg/kg fresh weight.

Conclusions

Low concentrations of many organochlorine compounds found in the present study suggest that the population has not been exposed to these compounds.

However, high mercury levels evidence that there is a risk for children living in the Mediterranean Basin if they are consumers of large amounts of local seafood.

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Study of Childhood Illness for the Period 2009—2011, Meeting the City: Sofia and Pleven with a View to Effective Health Promotion

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Background
Health status is an important aspect of children for their physical and mental development and their future career. It is determined by a number of factors, including family and school environment, the organization of school health and environmental factors. These determinants are reflected in the incidence of turnover registered by their personal physicians.

Methods
We collected official data from the Capital District Health Inspection, SRZI, and regional health inspection in the city of Pelven over a two-year period from 2009 -2011.

Results
Pleven, Bulgaria has a high degree of respiratory diseases, infectious diseases, eye diseases, diseases of the digestive system, diseases of the ear and injuries.

Conclusions
We believe that appropriate programming for targeted health promotion specifically identifying health problems in connection with leading environmental factors would be beneficial.

Potential Environmental Hazards to Child Health in a Prospective Mining Area in North Sumatra, Indonesia

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Background

Globally, Indonesia is well known for its natural environment and rich resources of potential mining areas. However, a number of environmental health issues have arisen due to mining activities. Human exposure could lead to various health impacts, such as kidney damage, cancer, child development, and other toxic effects. Children are most vulnerable to various heavy metal intoxications, especially in the first five years of life, since this is the critical period for brain and physical development. This study aimed to understand the potential environmental hazards in a prospective mining area in North Sumatra and to assess the heavy metals concentration on children's blood.

Methods

This is a cross-sectional study conducted in areas which may potentially be affected by future mining activities. The survey covered ten villages living in the 30 kilometer radius of the mining areas. Father-child pairs were recruited, with male adults aged 19-55 years and a young child 24-59 months old. Surveys were conducted to gather data on environment, food market, and diet patterns. Assessment of heavy metals concentration in blood was performed. Ethical approval was granted by the Committee of the Medical Research Ethics, Faculty of Medicine, University of Indonesia.

Results

The environmental survey showed the heavy metals concentration were within allowable range as sources for drinking water, while mercury and zinc level in soils were high. The mean capillary blood lead levels in children were 7.17 ± 0.23 µg/dL, whereas those of fathers were 6.01± 2.89 µg/dL. The blood concentrations of arsenic, copper, zinc, cadmium, and mercury were in the acceptable range for both children and fathers. The mean hemoglobin level of children and fathers were 11.72 ± 1.19 g/dL and 15.08 ± 1.50 g/dL, respectively. No correlation was found between lead and hemoglobin level.

Conclusions

This study showed that the heavy metals concentration in the environment and human body were within tolerable limits. However, further research should be done when mining activities take place in the area.

Minamata Convention on Mercury and Children's Environmental Health: Study on Mercury-Added Consumer Products Use in Pakistan

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Background

Children are at high risk of developing neurodevelopmental disorders that affect the brain and nervous system, including autism, attention deficit hyperactivity disorder, intellectual disabilities, and other learning and behavioral disabilities. Thousands of chemicals are used in material production processes (nearly 100,000 in the EU) that have not been adequately assessed for human and environmental impacts, and yet are used daily in consumer products. There is ample scientific evidence to support a link between children's risks for neurodevelopmental disorders and toxic chemicals, such as mercury, in consumer products, food, air and water.

Mercury ranked 3rd in the hazardous list of toxic substances, and it is a pollutant of increasing concern, as it is not only toxic to humans, but also to wildlife and the environment. In view of mercury and mercury-added products' toxicity and hazardousness, in 2013, under the United Nations Environment program, the Minamata Convention on Mercury was enacted by over 140 countries, already signed by 128 countries (including Spain & Pakistan) and ratified by 28 countries (including USA). The main objective of this convention is to protect human health and the environment from emissions and releases of mercury and mercury compounds. Articles 4 & 16 of the convention deal, respectively, with mercury added products (including dental amalgam & skin lightening/tanning creams) and health aspects (to protect population at risk, particularly vulnerable populations – children, pregnant women & others).

Methods

Over the past few years, the Sustainable Development Policy Institute has been actively involved in the negotiations process leading to the Minamata Convention on Mercury, as well as research on the health and environmental effects of the use of mercury-added products, such as mercury dental amalgam and skin lightening/tanning creams in Pakistan. Standard analytical methods were used for the measurement of mercury in air and semisolid skin lightening creams. For opinion sharing, interviews based on developed questionnaires were held with dental professionals and dermatologists/skin specialists.

Results

Measurements at 34 dental sites indicated mercury vapors levels in outdoor/indoor air in the range 109 – 26,000 ng/m^3 for air (against reference standard = 300 ng/m^3). Survey work/interviews at 38 dentistry teaching institutions in the country and over 90 private dental clinics in 3 main cities showed 90% of the respondents supported review and revision of the current curriculum and inclusion of additional contents on dental mercury amalgam related to health, waste issues and mercury free dentistry, using mercury free material for dental restoration. Of the interviewed dental professionals, 70% supported mercury free material use for dental restoration as the first choice for pregnant women and children (under 12 years age) and 67% supported a ban on mercury dental amalgam use. Chemical analyses of 20 samples (others in progress) of different skin lightening creams brands revealed alarmingly high total mercury content in some of the analyzed samples. On the basis of total mercury contents, the studied skin whitening creams have been categorized into 4 groups: most, (mercury > 10,000 ppm), highly (mercury > 5000), moderately (mercury < 5000) and least (mercury < 1 ppm) hazardous skin lightening creams.

Conclusions

Our research findings provide ample evidence of most likely mercury exposure to personnel (especially children) at dental sites and due to the use of skin lightening creams containing high levels of mercury content. We strongly recommend (i) mercury specific legislation for public/consumers daily use products,

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(ii) review and revision of dentistry & dermatology curriculum at medical institutions and (iii) ban on the production/use of skin lightening creams with total mercury content above one ppm (as per Minamata convention on mercury requirement) and in the first phase, use of mercury amalgam for dental health restoration of pregnant women and children below the age of 12 years. In this regard, our awareness & advocacy activities and discussion with the stakeholders (including government) are in progress.

Children and Artisanal and Small-Scale Gold Mining in West Sumbawa Regency, Indonesia

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Background

The high value of gold reserves in West Sumbawa Regency and West Nusa Tenggara Province, Indonesia has resulted in an increase in small-scale gold mining activity in this area. Artisanal and small-scale gold mining is an attractive alternative livelihood for rural workers because it has good potential to improve the wealth of a community. Women and children are often involved in mining activities as miners usually bring their family to live close to their place of employment, thus women and children (<13 years old) are potentially highly exposed to mercury. The current study was conducted to better understand the life style, extent of mercury exposure, and the health of people living in the Taliwang artisanal and small-scale gold mining area, West Sumbawa Regency, West Nusa Tenggara Province, Indonesia. The present study was designed as a purposive field sampling study conducted in the Taliwang artisanal and small-scale gold mining area, West Sumbawa Regency, West Nusa Tenggara Province, Indonesia.

Methods

The subjects were miners and families including their children from three different areas within the West Sumbawa Regency: individuals directly exposed to mercury, indirectly exposed individuals and non-exposed individuals. Hair samples and medical examination were obtained from the subjects and subjects were questioned about their mercury exposure over time. Hair samples were collected at the time of the study. Ethical approval was granted by the Ethical Committee from Medical Faculty of

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University of Mataram, Indonesia.

Results

A sub-analysis of data showed that children in individuals directly exposed subgroups had highest mercury in their hair (mean 4.7 mg/kg) than indirectly exposed individuals subgroups (mean 1.5 mg/kg) and non-exposed individuals subgroups (mean 0.4 mg/kg). Medical examination on children showed no symptom of mercury intoxication yet. The results indicated that artisanal and small-scale gold mining activities were shown to affect the health of miners and their family in a very short time, as evidenced from the high mercury residue in their bodies above the normal level permitted by World Health Organization.

Conclusions

The current scale of artisanal and small-scale gold mining activity in the West Sumbawa Regency is predicted to rise, raising the possibility of environmental and health disasters.

Environmental Pollution and Children's Health

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Background

Pollution-related disease (PRD) is a massive and growing global problem. Diseases caused by pollution are responsible for nearly 9 million premature deaths each year, almost three times as many deaths as result from AIDS, tuberculosis and malaria combined. PRD, poverty and inequity are intertwined, and PRD falls most heavily upon children, women, and the poor. More than 90% of deaths due to PRD occur in low- and middle-income countries (LMICs).

The nature of pollution is changing. In rapidly developing countries, levels of ambient air pollution, toxic chemical pollution and soil pollution are increasing sharply as a consequence of urbanization, increasing motor vehicle use and the proliferation of toxic chemicals, pesticides and polluting industries. Asthma, neurodevelopmental disorders and sudden infant death syndrome are the main health consequences for children. In adults, health effects include chronic obstructive pulmonary disease, atherosclerosis, ischemic heart disease, stroke, renal disease, lung cancer and accelerated neurological degeneration. PRD is responsible for staggering economic costs. These costs include direct medical expenses as well as the diminished productivity of people who die prematurely or are disabled by PRD. These costs are

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largely invisible, but they are so great that they can distort health system spending and undermine the growth of entire societies.

Pollution can be prevented. Pollution and PRD are not the unavoidable consequences of development. Cost-effective pollution control strategies have been developed and successfully deployed in countries at all levels of income. These strategies are data-driven and are based on combinations of law, policy, civil engagement, governmental institutions and technology. They provide practical tools of proven efficacy that are available today to governments and people around the world. Interventions against PRD can win economic benefits as great as those associated with other highly effective public health programs such as childhood immunization.

PRD and pollution have been neglected in the global health and international development agendas. The resources allocated to pollution control and PRD prevention have, apart from water pollution and sanitation, been meager. Pollution has continued to worsen, and PRD has quietly become the world's largest cause of avoidable premature death.

Methods

To address this great and growing global problem, we have launched the Global Commission on Pollution & Health (the Commission). The Commission is an initiative of The Lancet, the Global Alliance on Health and Pollution, and the Icahn School of Medicine at Mount Sinai. The Commission will present the first-ever analysis of the global burden of disease attributable to all types of pollution combined and the first analysis of PRD's global economic costs. It will present case studies of successful interventions against pollution.

Results

The goal is to provide world leaders and global policy-makers the data and the strategic blueprint that they need to justify decisive action against pollution. The Commission's report will be published in early 2017.

Conclusions

PRD is at a tipping point. While the problem is massive, it is now well mapped, and the tools for its control have been developed, tested and proven effective. With leadership and resources, pollution and PRD are problems than can be largely resolved within a generation.

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Children Exposure to Phthalates and Bisphenol A In the Phthalates and Bisphenol A Biomonitoring In Italian Mother-Child Pairs: Link Between Exposure and Juvenile Diseases Project: Preliminary Results on Biomonitoring and Case-Control Studies

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Background

DEHP and BPA are non-persistent environmental contaminants recognized as endocrine disruptors, potentially affecting human health, and children in particular, because of their susceptible phase of development. The Phthalates and Bisphenol A Biomonitoring in Italian Mother-Child Pairs: Link Between Exposure and Juvenile Diseases (LIFE PERSUADED) Project is focused on the evaluation of the children exposure to plasticizers, such as Diethylhexyl phthalate (DEHP) and Bisphenol A (BPA), through the biomonitoring study. Moreover, the potential association with idiopathic premature thelarche and precocious puberty and idiopathic obesity is evaluated through case-control studies.

Methods

This project has been approved by the Ethics Committees of Istituto Superiore di Sanità and Bambino Gesù Children's Hospital.

In HBM, 2160 mother-child pairs from urban and rural areas of the Italian geographical macro-areas (North, Centre, South) are recruited by trained family paediatricians. Data on lifestyles, food storage and consumption are collected through a structured questionnaire and a food diary. BPA and DEHP metabolites (mono-(2-ethylhexyl) phthalate (MEHP), 5OH-MEHP and 5oxo-MEHP) levels are determined in urine samples by electrospray ionization, liquid chromatography–mass spectrometry.

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30 girls for each group, aged 2-7 years (idiopathic premature thelarche and precocious puberty) and 30 boys and 30 girls, aged 6-10 years (idiopathic obesity) are recruited. BPA and DEHP metabolite levels are assessed in urine samples, and clinical and toxicological biomarkers related to puberty onset and obesity in serum samples.

Results

The project approach and descriptive preliminary results on DEHP metabolites and BPA internal levels will be presented.

Conclusions

LIFE PERSUADED fills the data gap on DEHP and BPA exposure in Italian children by setting background levels for susceptible groups of population and implementing the EU database. Data integration for endocrine disruptors risk assessment, the evaluation of determinants of exposure as well as the creation of a biobank for urine samples will represent relevant output of the project.

Acknowledgement

The study is supported by LIFE13 ENV/IT/000482.

Low Level Arsenic Exposure During Pregnancy in the 3xG Cohort In Flanders: Less Efficient Detoxification is Associated with Higher Oxidative Stress

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Background

Increasing epidemiologic evidence indicates that even low level arsenic exposure affects adverse pregnancy outcomes. On the other hand, it is known that arsenic metabolism changes during pregnancy

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by means of detoxification. The adverse outcome pathways from arsenic exposure during pregnancy need further clarification.

Methods

This study investigates whether urinary arsenic species and arsenic methylation efficiency are associated with oxidative stress in 151 pregnant women of the 3xG cohort in Flanders, Belgium (2012-2015). Urine samples were collected between 25 and 35 weeks of gestation and different arsenic species (inorganic arsenic (inorganic arsenic; arsenic (III), arsenic (V)), monomethyl arsenic acid (MMA) and dimethyl arsenic acid) were measured using liquid chromatography–mass spectrometry. Multiple linear regression analyses were performed to evaluate the associations between arsenic exposure and oxidative stress, measured by the amount of 8-hydroxy-2′-deoxyguanosine (8-OHdG, ln-transformed) in the same urine samples (enzyme-linked immunosorbent assay). The associations were adjusted for age and smoking before sample collection. Ethical approval was granted by the Ethical Committee of Antwerp University (Hospital) and of the local hospitals.

Results

Increased 8-OHdG levels values were associated with higher MMA levels: for each µg/l increase in MMA, 8-OHdG increased with 24% (µg/l) (95% confidence interval =0.5-51.7%). Furthermore, a decreasing trend between the secondary methylation index (=dimethyl arsenic acid/MMA) and 8-OHdG was found (β=0,998 (95% confidence interval =0.996-1.000)). No significant associations were observed for inorganic arsenic, dimethyl arsenic acid and the primary methylation index (=MMA/ inorganic arsenic) with 8-OHdG.

Conclusions

The information in this study indicates that in a region with a relatively low environmental arsenic burden, the toxic metabolite MMA is associated with increased oxidative stress in pregnant women. Furthermore, mothers with less efficient detoxification of arsenic had higher levels of 8-OHdG.

The 3xG study is part of the cAT project, funded by NIRAS and the local partnerships MONA and STORA.

Lead and Mercury Exposure Associated with Low Resting Heart Rate in Community Children

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Background

Few studies have examined the neurotoxic influence of heavy metals on the autonomic nervous system. Previously, one study showed that occupational chronic lead exposure decreased resting heart rate (RHR). The purpose of our study is to test whether environmental lead and mercury exposure is associated with decreased RHR in community children.

Methods

As part of the China Jintan Cohort Study, 564 children aged 12 years (standard deviation=0.6) were tested for blood levels of lead (BLL) and mercury (BML) and RHR. RHR was recorded using electrocardiography placed axially on the left and right ribs. Generalized linear models (GLMs) were conducted to test the relationship between BLL and BML and the RHR controlling for children's sex, age, and socioeconomic status. Analysis was clustered at the preschool level when the children were recruited to adjust for standard error. Ethical approval was granted by the University of Pennsylvania Institutional Review Board.

Results

The mean (standard deviation) BLL and BML was 3.1 (1.2) μg/dL, with a median value of 2.9 μg/dL and 0.1 (0.07) μg/dL and a median value of 0.1, respectively. GLMs results showed that after adjusting confounders, children with BLL (B=-1.23, p=0.010) or BML (B=-1.86, p=0.013) higher than the median level showed decreased RHR. Particularly, compared with girls, boys were more likely to have decreased RHR when their BML exceeded the median level (i.e. 0.1 ug/dL) (B=-3.33, p<0.001). No gender differences were observed for BLL and RHR. A further analysis showed that RHR was the lowest among children with both high BLL and BML (B= -3.30, p<0.001), and this combined effect was greater among boys (B=-4.09, p<0.001) than among girls (b=-2.64, p=0.147).

Conclusions

Low RHR is an indication of chronic under-arousal and has been implicated to psychopathology, particularly for externalizing behavior. We previously reported that lead exposure was associated with increased behavioral problems in community children. Our finding of the relationship between heavy metal exposure and low RHR provides the direction for our future study testing the possible mediating role of low RHR on the relationship between heavy metals and behavioral problems in children.

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Environmental Screening of Girls with Early Puberty Disorder

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Background

A decrease of the age of menarche and thelarche has been observed during the last decades. The cause of most cases of precocious puberty in girls remains unknown. Some environmental factors such as obesity and adoption have been related to early puberty. Our objective is to explore environmental factors within a sample of girls with early puberty disorders.

Methods

We performed a cross-sectional study with a sample of 30 randomly selected girls who consulted at a tertiary hospital in an agricultural area of southeastern Spain with a diagnosis of precocious puberty, isolated premature thelarche, early puberty, early menarche, early adrenarche or early pubarche. Environmental factors previously described in literature studies were explored through an interview performed by a single interviewer. Auxiological parameters were measured at the moment of the interview. The body mass index and z-scores for each parameter were calculated. Written informed consent was obtained from all participants.

Results

6.9% of girls in the sample were adopted. The age of thelarche was positively and significantly correlated with family income (r 0.738, CI95% 0.342-1.345; p0.001), with the poorest girls being the ones that began puberty earlier. Of the total sample, 12% of the girls were overweight and 11.1% obese. Body mass index at the age of diagnosis was correlated, but not significantly, with the age of thelarche (r 0.702, CI95% -0.019 -1.423; p0.056). At least 80% of the girls were exposed to pesticides in different degrees. Another 80% of the sample was exposed to lice treatments, especially tea tree oil.

Conclusions

Adoption and obesity were present in the sample. The correlation between income status and menarche has been previously reported, but this is the first study to correlate poverty with earlier thelarche. Pesticide exposure is extremely common in our sample, probably due to the fact that agriculture is one of the most important activities in the area of study. Tea tree oil exposure has been related with

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gynecomastia in boys. The effect on puberty among girls remains unknown. An environmental approach of patients with early puberty disorders may help to create a hypothesis about the etiology and develop specific treatments.

The Role of Perinatal Essential Fatty Acids In Attention Deficit and Hyperactivity Disorder Symptoms and Cognitive Functions

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Background

Essential fatty acids play a key role in brain development. The balance between omega-6 and omega-3 is important for an optimal nutrition pattern. We aim to assess the role of omega-6/omega-3 ratio on child attention deficit and hyperactivity disorder (ADHD) symptoms and cognitive functions.

Methods

This study was based on the population-based birth cohort INMA, including 4 different Spanish regions (Asturias, Gipuzkoa, Sabadell and Valencia). Fatty acids were collected from whole cord blood samples by using venipuncture of cord vessels before the placenta was delivered. The omega-6/omega-3 ratio was calculated by dividing arachidonic acid (AA) with the sum of docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA). The ADHD symptoms were reported by each child's teacher using the Diagnostic Manual of Mental Disorders, 4th ed. (ADHD DSM-IV) at age 4. The child cognitive functions of the children were assessed by a psychologist using McCarthy Scales of Children's Abilities (MSCA) at age 4. Pooled negative binomial regression models were used for ADHD symptoms (n=571). Pooled linear regression models were used for MSCA (mean=100, SD=15) (n=670). All models were adjusted for child gestational age, birth weight, gender, age during testing, maternal social class, smoking during pregnancy and cohort location. The study was approved by the ethics committees of participating hospitals in Valencia and Sabadell (Spain).

Results

Omega-6/omega-3 ratio was associated with ADHD symptoms (IRR=1.23; 95%CI=0.98, 1.53) at 4 years old. Adverse associations were observed between omega-6/omega-3 ratio and different cognitive domains assessed with MSCA; general cognition (coef.: -1.34; 95%CI=-2.60, -0.09), verbal (coef.: -1.31; 95%CI=-2.63, 0.002), memory (coef.: -1.67; 95%CI=-3.06, -0.29), and executive function (coef.: -1.32; 95%CI=-2.60, -0.05).

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Conclusions

Higher omega-6/omega-3 ratio on cord blood was related to more ADHD symptoms and worse cognitive functioning at 4 years of age. The identification of nutritional biomarkers that explain its effects on child cognitive development will enable the implementation of appropriate and effective nutritional recommendations as well as interventions during pregnancy.

Prenatal Exposure to Outdoor Airborne Trace Elements and Cognitive and Psychomotor Development During Childhood in Four European Birth Cohorts

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Background

Studies on the association between exposure to elemental composition of particulate matter in outdoor air and neuropsychological development are sparse. We aimed to investigate the association of prenatal exposure to trace elements of outdoor particulate matter with diameter of <2.5 µm ($PM_{2.5}$) with cognitive and psychomotor development during childhood.

Methods

We analyzed data from 4 European population-based birth cohorts – Generation R (The Netherlands), Duisburg (Germany), GASPII (Italy) and INMA-Sabadell (Spain) – with mother–infant pairs recruited between 2000 and 2006. Monitoring campaigns measuring $PM_{2.5}$ levels were performed between 2008 and 2011 in all corresponding regions and the elemental composition of the particles was determined. Individual exposures to 8 elements (copper, iron, potassium, nickel, sulfur, silicon, vanadium and zinc) that represent major anthropogenic sources of air pollution were estimated at birth addresses using land use regression models. Cognitive (general, verbal, and non-verbal) and psychomotor (global, fine, and gross) development was assessed between ages 1 and 9. Adjusted region-specific effect estimates were combined using random-effects meta-analysis. Ethical approval was granted by local authorized institutional review boards.

Results

There were 2904 children included in this analysis. Prenatal exposure to vanadium and nickel was associated with a reduced verbal development (-1.71 points [95% CI = -3.06 to -0.37] per increase of 2 µg/m^3 of vanadium and -1.96 points [95% CI = -3.46 to -0.46 per increase of 1 µg/m^3 of nickel]). A similar tendency, although statistically not significant, was found for exposures to sulfur and silicon with verbal development; for exposure to nickel, sulfur, and silicon with general cognitive development; and

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for exposure to all elements with fine psychomotor development. In a few cases, exposure to some elements showed a tendency towards improved non-verbal and gross psychomotor development, although these results were statistically non-significant as well.

Conclusions

Prenatal exposure to airborne trace elements vanadium and nickel of outdoor $PM_{2.5}$ was associated with an impaired verbal development during childhood.

Promoting Health: Recommendations of Food Consumption as a Tool to Minimize Exposure of Pollutants in Children

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Background

Health care workers (HCW) are opinion leaders in the field of food safety and their promotion in the population is very effective in public health. Food is an important exposure source for many environmental contaminants and children are the most vulnerable age group for most of them.

Methods

With the aim to improve the knowledge about food contaminants for HCW, 275 HCW in 16 of the main hospitals from the Balearic Islands attended 2 hours of lessons in 2015. A test before and after the lesson was given to assess the knowledge of HCW about how to prevent the exposure of children and pregnant women to food contaminants and to determine their opinion about the course. In addition, teaching materials for families was provided to the HCW.

Results

Of those workers, 60% answered the test correctly. The average percentage of correct responses prior the training was 10%. The most valued aspects were the high profit and the opportunity to share scientific knowledge about risks in food between HCW and public health workers. Their demands have been to extend the course contents and its duration.

Conclusions

The low percentage of tests performed was due to the difficulty of workers leaving their tasks to arrive on time at the sessions. This fact, added to their wish to receive more extended content and longer courses, requires another course format. Also, the low score of correct answers shows the necessity to

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provide more courses to HCW.

In 2016, a new online food safety course for HCW will be available in the Balearic Islands. The attendees will connect when they can and will have access to more extended content. To access the content they will have to take the introductory tests, and to obtain the certificate they will have to do the post test, and thus the entirety of the data will be collected. We will dtermine if better knowledge is achieved with online lessons in order to better prevent exposure of children to contaminants.

Mercury Concentrations in Commercial Seafood from the Western Mediterranean Sea

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Background

Mercury is a strong neurotoxic agent that can cause severe neurological damage to children because of their immature metabolism and organs. Mercury (Hg) emissions in the atmosphere due to mining and fossil fuel burning (Hg^0) are deposited into seawaters after oxidation to Hg^{2+}. There, Hg may undergo bioaccumulation and scavenging by organic-rich particles, be eventually transported from surface to deep waters and reduced back to Hg^0 and to CH^3Hg.

Fish and shellfish consumption is the known predominant input of this metal into human populations of Mediterranean regions. Attention has been focussed on oily fish as the main group of species responsible for the incorporation of Hg into the human diet. Conversely, few studies on the potential role of lean fish regularly consumed by humans have been reported so far in the scientific literature. The present study is therefore aimed to determine the Hg levels in commercial seafood from the Mediterranean Sea.

Methods

Samples were caught between February 2014 and December 2015 in the Balearic Islands. The sampling plan included the most consumed and fished species in the Balearic Islands, grouping them for their study in three trophic levels with the aim to identify the species which carry the most Hg. Samples were collected in local fish markets and auction halls with validated sampling and analysis methods.

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Information gathering included data for each specimen of variables related with the amount of mercury in fish, as size, weight and catch location.

Results

Eighty-two percent of the samples showed detectable Hg levels. The levels were generally higher than those reported in seafood from the Atlantic Ocean. A substantial number of samples exceeded the maximum level set forth by the European Union Maximum Limits of 0.5 and 1.0 mg/kg wet weight. Twenty-nine percent of the thirty-nine fish and shellfish species studied had average concentrations above these limits.

Conclusions

The present study shows that not only oily fish, but also lean and shellfish species from the Mediterranean Sea have mercury concentrations above the recommended European Union Maximum limits. A reassessment of the impact of fish consumption from this region on children and the general population is needed. This assessment should estimate how much mercury intake can be attributed to this source and along with its health effects.

Lung Function Growth Trajectories in Children in Relation to Prenatal Exposure to Particulate Matter — Cracow Cohort Study

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Background

Patterns of early life function development during childhood may be helpful in understanding the pathogenesis of respiratory diseases throughout life. The aim was to investigate the individual growth trajectories of children's lung functions as they get older by gender and prenatal personal level of exposure to airborne particulate matter 2.5 ($PM_{2.5}$), which was hypnotized to decline studied parameters. Both the shape of trajectories and the degree of variability in growth among children were of interest.

Methods

The study sample was comprised of 322 children from a Cracow birth cohort who annually underwent standard lung function testing (forced volume capacity, forced expiratory volume in 1 s and forced expiratory flow 25–75%) between 4 and 9 years of age. Personal measurements of $PM_{2.5}$ were performed over 48 hours in the second trimester of pregnancy among pregnant women recruited prenatally to the

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study. Data on child development and health status as well as exposure assessment were collected regularly based on standardized questionnaire. Growth trajectories of children's lung functions were adjusted by polynomial multilevel linear mixed models. The parents of all children involved in the study gave their informed consent and the Ethical Committee of the Jagiellonian University in Krakow and Columbia Presbyterian Medical Center approved the research.

Results

Lung function trajectories differed significantly for boys and girls for FVC and FEV1. Boys had a higher increase than girls (mean annual difference: 23.1ml (95% confidence interval: 8.8;37.1), p=0.002 and 22.6 ml (95% confidence interval: 10.0;35.2), p<0.001), respectively). In cases of FEF25-75%, trajectories had similar shape for boys and girls. Significant lung function impairment (decrease in FVC and FEV1) was observed from 4 through 9 years among subjects prenatally exposed to higher levels of $PM_{2.5}$, but not in the case of FEF25-75%.

Conclusions

High levels of prenatal exposure to $PM_{2.5}$ might be related to diminishing lung function growth in children.

Prenatal Exposure to Perfluoroalkyl Substances and Cardio-Metabolic Risk Components During Early Childhood

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Background

Prenatal exposure to perfluoralkyl substances (PFAS) might increase obesity and cardio-metabolic (CM) risk during childhood, but results are inconclusive. We evaluated the effect of PFAS on individual and combined CM risk components during childhood in a Spanish birth cohort.

Methods

We measured perfluorohexanesulfonic acid (PFHxS), perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), and perfluorononanoic acid (PFNA) in maternal plasma. We assessed rapid growth at 6 months of life (n=1109) and age-and sex-specific z-scores for body mass index, waist circumference and mean arterial pressure at 4 (n=1,230) and 7 (n=1094) years. Using non-fasting blood samples at 4 years we measured lipid concentrations (n=629): total cholesterol, triglycerides and, high-density and low-density lipoprotein cholesterol. We calculated a continuous CM risk score at 4 years; a higher score indicated a higher CM risk. All participating women signed written informed consent before

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beginning the study. The study was approved by the regional ethical committees of each cohort.

Results

Twenty-four percent of children were rapid growers at 6 months and 30% and 35% were overweight at ages 4 and 7, respectively. At 6 months, PFOA was associated with increased weight gain in boys [β=0.22 (95% confidence interval: 0.04, 0.40)] but not in girls [β=-0.06 (-0.21, 0.10)] (p-value for sex-interaction=0.08). We found no association between PFAS and body mass index z-scores, overweight or waist circumference at 4 and 7 years. PFAS tended to decrease mean arterial pressure z-scores at 4 years of age, but was not statistically significant. Higher PFAS concentrations increased total cholesterol and triglycerides at 4 years, especially PFHxS [β=6.32 (0.96, 11.68)]. Higher PFOA concentrations increased the CM risk score at age 4, especially in boys [β=1.37 (0.03, 2.71)].

Conclusions

This is one of the largest studies to comprehensively assess the effect of PFAS on individual and combined CM risk components during early childhood. Our results suggest that PFAS can affect some CM risk components during childhood, especially in boys. Further replication of our results is needed.

Mobile Phone and Other Digital Technology Use in UK Adolescents: The SCAMP Cohort

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Background

Scientists remain uncertain as to whether children's developing brains are vulnerable to radiofrequency (RF) waves emitted from mobile phones and other wireless devices. The Study of Cognition, Adolescents and Mobile Phones (SCAMP) is a three-year prospective cohort study of adolescents across London, UK, which aims to investigate whether children's use of mobile phones and other wireless devices influences their neurocognitive/behavioural development.

Methods

Data on cognitive function, wireless device use and lifestyle are collected at baseline and follow-up via school-based computerised assessments and optional parent/pupil home-based questionnaires. Parents are invited to consent to linkage of their child's assessment data with routine records (e.g. health and educational records, mobile traffic data), thus allowing for comparisons between self-reported and

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objective mobile phone use. Biological samples (e.g. urine, saliva) are collected to provide additional information about potential confounders, such as pubertal status. A RF personal monitoring study is also being conducted in a subset of the cohort to gain an in-depth understanding of children's personal RF exposure and the relative contribution of each RF source. Ethical approval was granted by the North West Haydock Research Ethics Committee.

Results

To date, 5,504 predominantly 11 to12-year-olds participate in SCAMP (53.2% female, mean age 12.0 (SD 0.4); 42.3% White, 20.3% South Asian, 15.9% Black, 11.5% Mixed, 9.9% Other). Preliminary analysis shows that over 80% of participants own a mobile phone. Device usage is comparable among boys and girls, apart from gaming. Black adolescents consistently report highest use across all devices. Validating self-reported information against traffic data in a subset revealed children had underestimated call frequency, but overestimated call duration and text messages.

Conclusions

SCAMP will improve our understanding of children's RF exposures, device use, and cognitive function and will provide an evidence base to inform public health policy in this area.

Current Findings on Maternal Gut Microbiome and Polychlorinated Biphenyls Concentration in Birth Cohort Study With Omics Analysis: Chiba Study of Mother and Children's Health

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Background

In previous studies, we have reported that environmental contaminants such as polychlorinated biphenyls (PCBs) were detected in maternal blood, umbilical cord and cord blood. On the other hand, in animal studies, it has been reported that intake of PCBs induced the alteration of the microbiome. Moreover, several studies have reported that the gut microbiome influences the balance between health and disease. A birth cohort study, the Chiba Study of Mother and Children's Health focuses on environmental health effects on foetuses, and involves multiomics analysis and has been conducted since 2014. Currently, the correlation between maternal blood PCB levels and microbiome status is being investigated. The associations between changes in the maternal gut microbiome and alteration of differentially methylated regions of diabetes-associated genes in umbilical cord samples are also examined.

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Methods

The Chiba Study of Mother and Children's Health consists of three hospital-based cohorts. Ethical approval was given by the Biomedical Research Ethics Committee of the Graduate School of Medicine, Chiba University. Consent to participate was obtained from 433 pregnant women. Among those, 376 women answered the questionnaires regarding their characteristics and life style during the early gestational period. The mean age was 32.5 (± 4.4) years old. Blood PCBs concentration level in 93 women was measured by gas chromatography–mass spectrometry. The microbiome of 10 participants was studied. The 16S rRNA metagenome analysis of maternal stool samples and deoxyribonucleic acid methylation assays of umbilical cord samples were performed.

Results

The mean concentration of blood total PCBs was 420 pg g−1 wet wt, in which chlorinated biphenyl (CB)153 (mean: 100 pg g−1 wet wt), CB138 (mean: 70 pg g−1 wet wt), and CB180 (mean: 58 pg g−1 wet wt), contributing the most of the total PCB. In our preliminary analysis, total PCB level and one genus of gut microbiome showed positive correlation. Additionally, the proportion of *Firmicutes* in the maternal gut were associated with deoxyribonucleic acid methylation levels of some diabetes-associated genes in umbilical cord samples.

Conclusions

These findings suggest that PCB exposure of mothers might affect the microbiota components of mothers and epigenetic change in fetuses. Further detailed studies are needed to reveal whether maternal exposure will affect maternal microbiota components or epigenetic statues in fetuses.

Poor Education – Poor Jobs – Poor Health

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Background

Lack of schooling during childhood leads to a vicious circle with access only to hazardous, insecure, and poorly paid jobs, with higher health risks and poorer access to health care, successively with more disease and injuries, again less income and consecutively poorer housing and even more risks. Not only does this lead to individual misfortune, but also affects the fate of offspring. The mechanisms are even more visible in developing countries without a well-established welfare-system with social securities and free access to public education.

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Methods

We investigated health in relation to occupational exposures in the cotton industry of Pakistan. A random sample of plants in the area of Faisalabad was selected, stratified by plant size. Most workers present at the plant at the day of visit received and answered a questionnaire about job history and health complaints. A random sample of workers in each plant was further examined by spirometry and buccal cell test. Dust measures were performed during each visit. Ethical approval was granted by the Ethical Review Committee of the Health Services Academy, Ministry of National Health Services, Regulation and Coordination in Islamabad, Pakistan.

Results

We found that small enterprises producing for the local market generally, but also on demand for big companies with long-standing contracts with European and American traders, not only displayed the highest dust exposures, poorest occupational safety measures and hygiene, but also had the longest shifts (typically 2 shifts of 12 hours each), and the least educated work-force, typicallywith a working history from the age of 15. These workers also fared poorest on several health parameters, from poorer lung function to a long list of reported symptoms not exclusively but also including respiratory symptoms, along with signs of cytotoxicity and genetic damage.

Conclusions

In this observational study it was not possible to disentangle the effects of longer years of exposure because of early initiation of work, longer occupational exposure per day, and higher exposures due to poorer occupational hygiene. Nevertheless we want to point out that all these factors were primarily caused by poor education and early termination or even lack of proper schooling.

An Unexpected Epidemic of Respiratory Distress

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Background

In 2011, a series of severe cases of respiratory distress came to the notice of Korean officials. The index case was a young female who developed deadly bronchiolitis obliterans a few weeks after an uncomplicated pregnancy. Consecutive examinations revealed that dozens of similar cases had appeared throughout the country, mostly in children and in females, the latter often either pregnant or shortly after pregnancy. The mortality rate was exceptionally high among cases and many more cases only survived after lung transplantation. We will summarize the findings of other authors reported in the

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literature. The aim is to draw attention to a highly instructive episode.

Methods

As infectious causes could not be established, further studies focused on toxic exposures. Because of the characteristics of the affected persons (no common occupational exposure), indoor pollutants were suspected.

Results

It turned out that cases had used humidifiers at home and had treated these with disinfectants as advertised by industry. Several case-control studies clearly indicated the causal role of these disinfectants. Animal studies demonstrated the same severe damage of lung tissue after inhalative exposure towards a disinfectant previously deemed "safe" and "not toxic". Further studies also revealed that similar epidemics had happened for the last couple of years, usually in the cold season, without anyone taking notice.

Conclusions

General implications for toxicity testing and for the application of the precautionary principle will be discussed.

Hazards and Risks in the Glyphosate Debate

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Background

The question of whether licensing of glyphosate, a widely used herbicide, should be continued or phased out has been subject to intense and sometimes very emotional controversy during the last two years. The media, non-governmental organizations (NGOs), farmers, scientists, and official and government agencies, e.g. the International Agency on Research of Cancer (IARC), the Joint Meeting of the FAO/WHO on Pesticide Residues (JMPR), the German Federal Institute for Risk Assessment (Bundesinstitut für Risikobewertung (BfR)), and the European Food Safety Agency (EFSA) have differed in their opinions, namely on the carcinogenicity of glyphosate. Despite its low acute toxicity and the fact that glyphosate is not persistent, the worldwide distribution of some 700,000 tons per year, resulting in the practically ubiquitous presence of this substance, doubtlessly warrant thorough evaluation.

Methods

The publications and arguments of different agencies and NGOs have been reviewed and evaluated,

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including, in some cases, the underlying primary studies and publications. Since the carcinogenicity of glyphosate has been the aspect most widely and intensely discussed, our analysis centered on this question, but we are aware that endocrine disruption and mutagenicity are further aspects of interest.

Results

Both BfR and EFSA see no risk for human health under the present conditions of application. However, during their deliberations, the IARC classified glyphosate as probably carcinogenic to humans (Group 2A), arguing that, although "there is limited evidence in humans for the carcinogenicity of glyphosate", there is an "observed positive association for non-Hodgkin lymphoma. There is sufficient evidence in experimental animals for carcinogenicity". The animal experiments cited by the IARC report marginal effects with borderline significances in some groups under chronic and very high glyphosate dosage. The JMPR declared that there was no risk for humans, considering real exposure rates.

Conclusions

The unresolved conflicts within these official agencies and with NGOs are caused by insufficient wording and lack of public awareness of the fact that hazard and risk denote different categories. Several years ago, the IARC defined these concepts: "A cancer 'hazard' is an agent that is capable of causing cancer under some circumstances, while a cancer 'risk' is an estimate of the carcinogenic effects expected from exposure to a cancer hazard", being "one part of the body of information on which public health decisions may be based". The European Commission prolonged the license for another 18 months on June 30, 2016, thus giving time for more deliberation and discussion.

Autism Spectrum Diseases, including Asperger Syndrome: Fairy Tales and Facts about Environment and Genetics

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Background

During the last two or three decades, awareness of the existence of autism and, more generally, autism spectrum disorders (ASD), also classified as pervasive developmental disorders (PDD), has increased. This has led to a wider recognition and more frequent diagnosis of ASD. It has been debated, but remains questionable, whether the incidence really has increased. Both genetic and environmental factors are important for the phenotypic manifestation of ASD.

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Methods

The more recent literature on the genetics of ASD and on precipitating environmental factors have been evaluated and reviewed.

Results

The prevalence of ASD is generally reported as 5 to 6 per thousand population, and in some studies and populations even more than 10 per thousand population. The male to female ratio is about 3:1. Homozygotic twins very frequently both manifest the ASD phenotype, more than 95% in boys, and around 80% in girls. The recurrence rate in families with more than one affected member is about 50% for boys and 20% for girls. Thus heritability apparently is one cause, and is probably necessary to make individuals susceptible to environmental factors. A list of substances and conditions for which positive associations with ASD have been seen or discussed is included in this paper. Five epidemiologic studies in the United States are cited which show statistically significant associations between air pollution or residence close to highways and ASD.

Conclusions

As the genesis of ASD is multifactorial, there remains much to be elucidated as to causes and mechanisms which can lead to its phenotypic manifestation. The need for the provision of good nutrition should already be obvious, and, if necessary, for adequate food supplementation during pregnancy. In addition, we recommend avoidance – if possible – of toxicants and environmental conditions associated with ASD, at least for families at high risk for recurrence, i.e. those families that already have two or more affected persons.

Autistic Symptoms Associated with Childhood Lead Poisoning

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Background

Autism is known as a complex developmental disability. Experts believe that autism presents itself during the first three years of a person's life. The condition is the result of a neurological disorder that has an effect on normal brain function, affecting development of the person's communication and social interaction skills. Lead is a neurotoxin to which the developing brain is particularly vulnerable. Moreover, lead poisoning in children is known to negatively affect brain systems implicated in cognitive, communication, and social functioning. One potential weakness of autistic children is that they are less

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able to remove heavy metals from the body so that the metal accumulates in the body and brain.

Methods

This observational study with a cross-sectional approach, examined 44 children diagnosed with autism n Grogol Jakarta and the Islamic Hospital Mental Klender Jakarta. Data were collected through interviews, and blood lead levels were checked by flame atomic emission absorption spectrophotometer. Ethical approval was granted by YARSI University.

Results

Hair examination of children with autism showed elevated levels of heavy metals. Examination of the 44 children with autism, ages 1-10 years old, 97% boys and 23% girls, showed that 16.7% had high levels of heavy metals. Patients were diagnosed since one-month-old.

Conclusions

If a child is showing symptoms of autism, then detoxification and other types of therapies, such as speech therapy, behavioral, occupational must be done. If there has been damage to the brain, detoxification cannot directly fix the symptoms. Detoxification is just to prevent further damage. Toxic metals are not the cause of autism, but can be a trigger, or aggravate the symptoms of autism.

Relationships Between the Exposure of Factory Air Pollution with Asthma Impacted in Children Who Live in Shelters in an Industrial Area in Jakarta, Indonesia

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Background

Exposure to hazardous environments can cause damage to the respiratory tract, particularly in individuals who have atopy who may suffer from continuous inflammation and can also cause asthma in children. A recent study describes the correlation between exposures to traffic air pollution with the respiratory tract exchanges. One evidence of this correlation is the increasing concentration of nitric oxide (eNO) expiration as a sign of inflammation of the respiratory tract in children. The analysis showed a strong correlation between asthma with the exposure to nitric oxide (NO) and other toxic air. Our

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objective is to verify the hypothesis which stated that children who live in shelters around industrial areas and are exposed to air pollution will experience more respiratory tract irritation than children who do not live in the surrounding district of the industrial area, confirmed by increased concentrations of eNO.

Methods

Case controls and data collection were held in Jakarta to investigate the effects of the environment around the plant with increased exposure of FeNO, and data from the area of East Nusa Tenggara, Lombok, Indonesia were used as a control.

Results

Children whom are often exposed to toxic air pollutants can undergo an inflammatory process and this may cause a decrease in vital lung function. This was supported by evidence found from the increasing eNO concentrations and derivation of expiratory peak flow rate (PEFR) in children who live around industrial areas under study.

Conclusions

There are strong correlations between asthma in children with the exposure of toxic factory air pollution. Others factors that may increase asthma include (1) the size and width of the house, (2) the humidity of the house, (3) the lighting of the house, (4) the ventilation of the house, and (5) mother's education and knowledge.

Children's Environmental Health and Opportunities for Action in the Sustainable Development Goals Era

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The Sustainable Development Goals (SDG) present an opportunity for the health sector to work with other fields in reducing environmental hazards to children. What children experience in the first five years of life is the foundation for their future health; SDG 3, which emphasizes the importance of well-being at all ages, depends on this critical period. Healthy lives must be nurtured in healthy environments, but environmental influences to children's health extend far beyond SDG 3. Of the 5.9 million deaths of children under five each year, 26% are attributable to the environment, deaths which can only be prevented with multilateral action.

Children need access to clean water and sanitation to be healthy; action to address water, sanitation

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and hygiene issues will not only work towards the goals of SDG 6, but also prevent child deaths from diarrhoea, malnutrition and vector borne disease. Children should breathe fresh air and live pneumonia-free with clean energy for home and industrial use, the focus of SDG 7. They must be at the center of urban planning, addressed in SDG 11, as safe roads, buildings and public spaces can prevent injury and encourage healthy activity among the young. It is crucial for children's development and well-being that early toxic exposures are prevented and that SDG12 on sustainable production and consumption is achieved. Children's special vulnerability is also a great motivator for SDG 13: take urgent action to combat climate change and its impacts, as these impacts, including extreme weather and increased levels of asthma-inducing pollen and mould, are most harmful to children.

Improving children's health and reducing environmental risks are at the heart of sustainable development. Every SDG relates to an element of children's environmental health, and multisectoral collaboration has the potential to improve the lives of so many. Children's futures are the strongest motivation for all SDGs, and should inspire the multisectoral efforts that will bring about a healthier world, free of environmental hazards.

Prenatal Exposure to Particulate Matter and the Occurrence of Wheezing in the Chest in Children

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Background

Several studies have found associations between air pollution levels and respiratory symptoms occurrence. We hypothesized that prenatal exposure to particulate matter ($PM_{2.5}$) may be associated with respiratory symptom (especially wheezing) occurrence in children.

Material and methods

The subjects come from the birth cohort study from Krakow, Poland. Air pollution was measured with personal samplers for $PM_{2.5}$ over a 48 hour period in the end of second trimester of pregnancy. The newborns and later children were examined regularly up to 9 years of age. Parents were concerned about their child's heath, especially about symptoms related to the respiratory tract. Overall, the data for full 9 years of follow-up were available for 272 children (135 boys). The impact of $PM_{2.5}$ on the number of days of wheezing symptoms was adjusted for other known factors of respiratory diseases, using a zero-inflated Poisson regression model.

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Ethical approval was granted by the Bioethical Committee of the Jagiellonian University.

Results

Wheezing symptoms were present for 18.8% of children during the first year of their life, and was decreased for the next years to 4.8% for nine year olds. The risk of wheezing episodes was significantly related to $PM_{2.5}$ level during the first four years of life: during the first year incidence rate ratio =1.010; 95% confidence interval: 1.007-1.013 for 1 ug/m^3 of $PM_{2.5}$; and this impact was decreased to an incidence rate ratio =1.0006 (95% confidence interval: 1.0003-1.0009). Later, this impact was no longer significant.

Conclusions

Prenatal exposure to $PM_{2.5}$ pollution can lead to higher occurrence of wheezing symptoms among children. However, this association was weaker with time.

Dietary Environment in Preventing Allergic Airway Diseases

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Background

Allergic airway disease is increasing in prevalence globally. Asthma is a global health epidemic and over 1 billion people currently suffer and this is anticipated to increase to about 4 billion in 2050. Air pollution causes 8 million deaths globally.

Methods

Over the years our objectives have been to control the symptoms of allergic disease and improve quality of life focusing on bronchoconstriction, airway hyper-responsiveness, inflammation and remodelling, the united airway concept, phenotypes and genetics. The current focus is on dietary habits to prevent airway allergies and reduce the morbidity, mortality and socioeconomic burden of these diseases.

Results

Diet plays a multifaceted role in shaping the observed world-wide trends of childhood allergies and in particular airway diseases. Sensitivity can occur by ingestion or inhalation of allergens. Both IgE and non IgE mediated immune responses and both early and late phase reactions are observed.

Dietary measures to prevent airway allergies are reviewed with regard to diet in pregnant mothers,

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breastfeeding of infants and diet. Diet in children with airway disease, dietary restrictions, and links between obesity and asthma are also addressed.

Maternal Dietary Intention: Maternal diet rich in antioxidants during pregnancy has the potential to influence postnatal susceptibility to allergic diseases by modulatory T cell response. However, strict elimination of essential foods like milk, egg etc. may have an adverse effect on maternal and fetal nutrition. Meta-analysis is not recommended at this stage.

Diet of infants and Breast feeding: It is recommended to continue breast feeds for 6 months and add solids after 6 months. Emerging data suggest that early introduction of allergic foods may reduce the risk of food allergy.

Diet for Allergic Children: Diet rich in antioxidants like fruits, vegetables, vitamins, curds, butter, fish and Omega 3 fatty acids and home-made food is recommended

Diet to be avoided in allergic children: Salty food snacks, take away food consumption, and soft drinks containing preservatives or colorants.

Obesity and Asthma: Obesity is increasing in India. Between, 2002-2011 it increased from 15-20% in boys and 13.7-18.1% in girls. Decreased lung function is proportionately related to obesity. Asthmatic children should reduce the intake of gas producing food items like asparagus, broccoli, cabbage, garlic, melons, peppers, radish, cauliflower, cucumbers, raw onions, beans etc.

Conclusions

Epidemiology and tradition strongly suggest the association of nutrition and airway allergy, but we lack robust scientific data to make national policy. Traditional local food habits should be encouraged along with disease guidelines to be followed to manage disease and costs can be cut by two thirds. For better compliance, links between patients, parents and other health providers is essential as well as science to progress the link between practitioners, academicians, researches and pharmaceutical companies.

Empowering Youth and Communities to Promote Health and the Environment — The Bangalore Experience

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Background

In the quest to promote health and protect the environment it has been our experience that the power of youth can impact communities and the results are far reaching and sustained. In the process of working with youth from underprivileged communities we are creating future generations who can ensure a responsible society who will protect the planet and leave behind a legacy for the children of tomorrow to inherit.

Methods

The primary objective of our efforts was to promote community responsibility and action for health promotion. The secondary objectives were to create self responsibility for health, focus on issues of livelihood, health and safety concerns, to promote need based social and health intervention and research, protect the environment, promote health and also to establish a network of health professionals, policy makers and the public. For the past few years we have constantly strived in this direction and have had several experiments that have yielded very positive results encouraging us to make our services widespread, accessible and affordable. The media has supported the propagation of health practices relevant for the time and needs of the specific population. All of our initiatives in communities have been followed up with impact studies and the results have been highly encouraging.

Results

Some of our activities included the setting up of twenty-one schools in three years in villages in and around Bangalore in communities where children did not have an option but to continue in the traditional sculpting profession of the elders as there were no schools in the nearby vicinity. Today an impact study reveals that 65% of the children of this village are being educated in the schools that we have built for them. We also had the local policy makers involved and today there is community responsibility for the cause of education.

The solar lighting project has been another significant step in lighting the dark homes of underprivileged sections of society. We have installed solar panels in schools, hostels and homes of agricultural workers to ensure the safety and security of the people along with additional subsidies for parents of girls to promote the education of girls in particular. An impact study revealed a 24% increase in the admission of girls to schools. In the State of Karnataka, 800 student hostels have been lit up and 15,000 students have benefited. Girls are now spared hard work in the fields and are getting educated. Low cost toilet blocks have been put up in schools with no proper toilet facilities and girls are again back to school. A low cost sanitary napkin making machine has been set up in the Bangalore Central Prisons for the benefit of women inmates and girls and follow-up studies have shown a reduction in genitourinary tract infections by 33% in less than one year. Another project, called Asha Kiran, is about getting one child back to school at a cost borne by a donor. These are children who are in bonded labor and destitute who now have their right to education and a happy childhood restored. Youth have been motivated to conduct blood donation camps and a record 3000 units of blood are regularly collected monthly from voluntary donors - college students and youth in particular to be given free for those who cannot afford the cost. We conduct these camps in association with the blood banks who provide the logistics free of cost. We have started a program called WASH in SCHOOLS which has reduced infections significantly in children going to school where they previously never had a hand washing facility. We have raised

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funds for supporting dialysis costs of poor renal failure patients. We also conduct free health camps for children in schools and ensure their timely immunisation. Free midday meals are provided to children in all our schools thereby catering to their nutritional needs. We also identify exceptional talent in children and youth and promote their training in areas of their interest.

There are several other initiatives that we have undertaken and these efforts are directed to the promotion of education and literacy, provision of a clean environment, health care, nutritional support of children and the welfare of underprivileged children in particular.

Conclusions

Interventions for promoting health and protecting the environment need to be issue and need based and tailored to suit particular communities. Involvement of communities in addressing the issue of health promotion and protection of environment is imperative and the results are far reaching and sustainable. The interplay of stake holders has also ensured effective services and promoted community responsibility. Involvement of youth in our community welfare programs have enabled the creation of responsible future citizens and leaders. The involvement of corporations have been an added incentive for the funding of these projects. Positive significant changes in lifestyle and health practices can develop a nation of healthy and productive individuals. Accessibility to health, good nutrition, safe environment and education is everyone's right. Igniting the passion among youth to serve the underprivileged in society ensures continuity and responsibility. We intend to widen our network to involve more stake holders, NGOs and governmental agencies and reach out to the remotest areas in communities.

Rapid Urbanization and Changing Prevalence of Chronic Cough

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Background

Cough is a reflex response to mechanical, inflammatory or chemical irritation of the respiratory tract predominantly and also a social signal as well. Depending on duration, cough may be considered to be chronic if it lasts at least 2 to 8 weeks. The present study condered cough to be chronic if it lasted more than two weeks.

Chronic cough has a tremendous socio-economic impact on children. It produces sleep disturbance, exhaustion, nausea, vomiting, urinary incontinence, rectal prolapse, fecal soiling, subconjunctival hemorrhage, hernia, cerebral hypoxic encephalopathy, and cough syncope. Parents often feel frustrated,

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upset, helpless and may experience sleepless nights and financial burden. In the present study, 80% of children had five consultations for cough.

Methods

The aim of our study is to determine the prevalence and spectrum of chronic cough and to correlate our findings with earlier data and city demographic changes.

We analysed 510 patients referred for pulmonary problems between Jan 2015 to March 2016. Among these patients, 106 patients came just for cough over 2 weeks duration. A detailed history including environmental history, clinical examination and laboratory testings, imaging, pulmonary function were performed as needed according to clinical judgement and patient capacity to perform pulmonary function testing.

Results

The prevalence of chronic cough was 105 out of 510 cases (20.78%). Wet cough and night/early morning cough were present in 80% and 84% of cases, respectively. The majority were due to allergic rhinosinusitis and asthma, and 3 cases each of bronchiectasis, pertussis, and psychogenic origin.

In 1999, the prevalence of chronic cough was 8%, and this has risen to 20.78%. In 2010, the prevalence of chronic cough was reported to be 10.5%. The population in Bangalore was 2.92 million in 1981, and had risen to 8.5 million in 2011. Traffic congestion has also increased. A total of 1,600 vehicles are added every day. A road length of 13,000 km would be needed to park all vehicles bumper to bumper. Vehicle now average 9.6 km per hour. Slow vehicles emit 5.5 times more emissions than vehicles moving at 70 km/hr. In summer there is greater production of ozone, slow wind velocity, and higher automobile emissions. Air pollution produces oxidative stress on airways, causing smooth muscle contraction, epithelial damage, altered release of inflammatory mediators and produces hyper-reactive airways and chronic cough.

Discussion

The prevalence of chronic cough in children was 8% in 1999 and has increased to 20.78%. A community survey by same group in the year 2010 on point prevalence of chronic cough was 10.5%. The Bangalore city population was 2.92 million in the year 1981 it was increased to 8.5 million in the year 2011.

Traffic congestion is increased. There were 5,875,237 vehicles in Oct 2015. Of these, 406,456 are two wheelers, 11,44,196 are cars, and 569,579 are buses. Now we add 1,600 new vehicles every single day. Previously, from 2009-2010, there were 600 vehicles per day. We would need 13,000 km length of roads to park our vehicles bumper to bumper. The speed of vehicles now is 9.6 km per hour.

Slow vehicles emit 5½ times more emissions to the atmosphere than vehicles at 70 Km/hr speed. In summer time there is greater production of ozone in bright sun, slow wind velocity and higher automobile emission. Air pollution produces oxidative stress on airways causing airway smooth muscle contraction, epithelial damage, excess mucus production, decreased ciliary movement, increased permeability of vessels, altered release of inflammatory mediators and airway hyper-reactivity and chronic cough.

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Conclusions

Rapid urbanization and demographic changes have increased the number of slow moving vehicles, with greater emissions producing oxidative stress and airway hyper-reactivity, leading to chronic cough. Chronic cough has increased from 8% to 20.78% over a period of 17 years. Along with proper medications, measures to mitigate air pollution should be taken with all stakeholders.

Descriptive Analysis from a Hospital-Based Childhood Cancer Survivors Cohort: Report From the Project Spain-CCSS

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Background

Therapeutic advances in paediatric oncology have led to an increase the number of childhood cancers survivors (CCSs). Emerging evidence shows that CCSs experience long-term morbidity due to their cancer therapy (and the cancer itself). The Spain-CCSS (Spanish Childhood Cancer Survivors Study) aims to set up a childhood cancer survivor's cohort in Spain in order to join international efforts for studying long term health effects among this population and optimise treatment and follow-up.

Methods

CCSs treated between 1980 and 2009 in the paediatric hemato-oncology department of Hospital Sant Joan de Deu in Barcelona (one of the largest in Spain) were invited, via mail services and by phone call, to participate in the study and to complete a health status questionnaire (HSQ). Recruitment, disease validation and retrospective record collection (treatment) are still ongoing. Ethical approval was granted by the ethical committees of Hospital Sant Joan de Dèu and Parc de Salut Mar.

Results

Of over 1568 individuals who survived more than 5 years, 536 (34%) consented to participate (509 returned a complete HSQ), 83 (5%) were not alive at the time of the questionnaire, 480 (30%) could not be traced, and 140 (6%) refused to participate. We are still waiting for a response from 340 (30%) participants.

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Among the total participants, 285 (53 %) are male. Participants' median age is 22 years (range 6-50) and the majority (N = 311; 58%) have been treated recently (from 2000-2009). The median follow up is 13 years (range 5-35). The median age at diagnosis is 5 years (range 0-19). Central nervous system tumour (N= 120, 22%) and leukaemia (N= 113, 21%) are the most prevalent primary neoplasm. Information collected through the HSQ includes socio-economic status and quality of life health related outcomes.

Conclusions

Though more effort is needed to increase the participation rate, this cohort is an important source of information on different health outcomes among CCSs.

Cognitive Effects After Low- to Moderate Dose Exposure: Study Plan in a Cohort of Childhood Cancer Survivors

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Background

Brain cancer survivors are at higher risk to develop a cognitive deficit and cranial radiotherapy (RT) is one of the well-known risk factors of this impairment.

However, the effect of low dose radiotherapy (such as the scatter radiation that is absorbed by the brain when radiotherapy is delivered in another anatomical region) still needs to be clarified and more research is warranted in this area.

Methods

We are planning to evaluate the neuro cognitive profile in a cohort of childhood cancer survivors who received a dose below 5 mGy to the brain. Brain tumor survivors will be excluded in order to avoid confounding due to the cancer itself. Function will be assessed in different cognitive domains (intelligence, executive function, processing speed, memory, attention and executive function among others) and the score of each test will be correlated with the dose absorbed in different anatomical brain structures (with matter, hippocampus, temporal lobe, frontal lobe and posterior fossa) as estimated from medical records. We haven't yet submitted the protocol to an ethics committee, as we are still designing the study.

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Results

Assuming that around 40% of survivors did not received radiotherapy, 35% received a dose below 1 Gy and 5% between 1 and 5 Gy (de Valthaire personal communication) and assuming a 4 point difference in the test score (average 100, standard deviation 15) between dose groups, we expect to have 80% power to find a trend among those three groups with around 100 participants. To reach 80% power to find a 4 point difference between the group who did not receive RT and the ones who received a dose below 1 Gy, we would need around 500 patients.

Conclusion

It appears to be feasible – and informative for radiation protection – to study cognitive effects due to low-to moderate doses of radiation in a cohort of childhood cancer survivors.

Determining the Impact of Smoking Point of Sale Legislation Among Youth (Display) Study: New Findings From Scotland

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Background

Point of sale displays are one of the most important forms of tobacco marketing still permitted in many countries. Point of sale displays have been shown to increase susceptibility to smoking, experimentation and initiation into smoking, particularly amongst adolescents. These displays may also influence perceived prevalence of smoking and the perception that tobacco products are easily obtained and are a 'normal' product.

Methods

This study examines the impact of the implementation of both a partial and comprehensive ban on point of sale tobacco advertising on attitudes to smoking, brand awareness, perceived ease of access to tobacco products and youth smoking prevalence. The study has a multi-modal before and after design and uses mixed methods to collect data, at baseline and then with longitudinal follow-up for 4 years, in four purposively selected communities. In each of the four communities (school catchment areas), at baseline and in follow-up years, data collection includes: mapping and spatial analyses of tobacco retail outlets; tobacco advertising and marketing audits of tobacco retail outlets most used by young people; cross-sectional school surveys of secondary school pupils; and focus group interviews with purposive samples of secondary school pupils. The tobacco audit is supplemented by interviews and observations conducted with a panel of tobacco retailers recruited from four matched communities.

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Results

The results to be presented from the initial phases of data collection consider: the changing levels of point of sale exposure over the study period; the degree of compliance with the new legislation post implementation; connections between point of sale displays and young people's brand awareness; the emergence of e-cigarette marketing; and the connections between e-cigarette/cigarette marketing and e-cigarette use amongst young people.

Conclusions

The results will be of considerable interest to policy makers both from the UK and other jurisdictions where they are considering the development and implementation of similar legislation.

The Role of Local Natural Space in Children's Social, Emotional and Behavioural Development in Scotland: a Longitudinal Study

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Background

Poor mental health in childhood has implications for health, wellbeing, and productivity in later life, as well as presenting a considerable burden for families and wider society. Independent play is a crucial part of 4–6 year olds' social, emotional and behavioural development. We investigate whether total natural space, public parks and access to a private gardens enhance children's social, emotional and behavioural development.

Methods

We analysed longitudinal data for 2,909 urban-dwelling children (aged 4 at 2008/9 baseline) from the Growing Up in Scotland survey. Social, emotional and behavioural difficulties were scored using the Strengths and Difficulties Questionnaire (divided into four domains), and area (%) of total natural space and parks within 500 m of the child's home was quantified using Scotland's Greenspace Map. Access to a private garden was captured at the household level. We ran repeated-measures multilevel models, then stratified by sex or household educational attainment.

Results

Prosocial behaviour scores were higher (i.e., better) throughout for children with more total natural space, but neighbourhood natural space was unrelated to change over time of any Strengths and Difficulties Questionnaire domain. Boys and girls in neighbourhoods with more total and park space, respectively,

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had fewer problems. Better social outcomes were found for all groups with more neighbourhood natural space. Having access to a garden was related to the largest benefits for all except those from high education households. Having access to a garden was related to mental health benefits on a par with the advantage apparent for girls over boys, children from degree-educated households over those from households without educational qualifications, or a £20,000 to £50,000 increase in equivalised household income.

Conclusions

Neighbourhood natural space may reduce social, emotional and behavioural difficulties for 4 to 6 year olds, but private garden access may be most beneficial.

Modifiable Factors Related to Low Water Intake In Mexican Children and Adolescents

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Background

Proper hydration is important for maintaining homeostasis in all physiological processes and to avoid some diseases. Some reports have suggested that 87.5% of males and 65.4% of females have water intake below the recommendations. In children, there is a lack of information about hydration habits. This study was aimed to assess modifiable factors related to low water intake in a Mexican sample of adolescents and children.

Methods

A cross sectional study was performed. Cardiovascular risk factors were determined (overweight, obesity, abdominal obesity). Physical activity (frequency and type) and dietetic habits such times of eating per day were assessed. Statistics were performed using SPSS Version 22.0. Ethical approval was granted by Ethics Committee and Research from Mexican School of Medicine, Univesity La Salle.

Results

247 children and adolescents were included; the average age was 12.5±1.9 years old and boys made up 54.91% of the sample.. The global prevalence of overweight and obesity was 49.2%. The daily intake of water, including foods, was 1317.5 ± 648.8 ml, with no differences between boys and girls or according to the presence of cardiovascular risk factors. Only 12.1% reach the recommendations of

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water intake according to Mexican recommendations. Also, water intake was not different between those who practice any physical activity more than 3 days per week compared with those physically actives (1163.3±571.3 vs 1339.6±697.9, respectively; p=0.181) and considering the type of activity (aerobic or anaerobic; p>0.05). According to times of eating, those who eat less than 3 times per day reported lower water intake (778.6±477.2 vs 1342.0±688.0; p=0.033) lunch and the afternoon snack being most important, and seem to risk of not accomplishing the recommendations (odds ratio=1.148 (1.093-1.206).

Conclusions

There is a high prevalence of cardiovascular risk factors among Mexican adolescents. Low water consumption was reported in this population and it seemed not to be related to anthropometric indicators, suggesting that environmental factors such number of meals could be more important than nutritional status or the practice of physical activity.

Pilot Phase of the Next Generation Study

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Background

The Next Generation Study is a new prospective birth cohort initiated as a collaborative project of Masaryk University and the University Hospital in Brno, Czech Republic. The study is designed to follow up 7000 children from their prenatal period to adolescence with the aim of assessing multiple factors potentially affecting children's health (exposome factors).

Methods

Special attention is being paid to prenatal and early postnatal developmental abnormities, postnatal psychomotor development, neurobehavioral disorders and immune system disorders. Information on complex exposures will be based on on-line versions of a combination of validated on-line questionnaires and biological tissue analyses will be used to estimate complex exposures. Information on health outcomes will be taken from the psychomotor developmental screening questionnaires, medical records, and health registers. Ethical approval was granted by The University Hospital Brno.

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Results

The Next Generation Study was initiated in April 2015 with a three-stage pilot. Feasibility of the cord blood sample collection and processing protocol was assessed at the first stage on 100 mother–child pairs. The aim of the second stage was to evaluate feasibility of the protocol for recruitment of women in the in 38th week of pregnancy. That allowed for estimation of future study response rates. Samples of venous blood, urine, and saliva were collected from 150 participating mothers, and stool and saliva were taken from newborns in addition to cord blood samples. On-line versions of the self-reported questionnaires will be tested at the third stage (scheduled to start in August 2016) together with robustness of the IT systems.

A majority of the approached mothers was willing to participate in the Next Generation pilot study (90% of mothers were willing to donate venous blood in 38th week of pregnancy, 70% agreed to donate cord blood, to fill the questionnaire and provide health data). The sample collection and processing protocol were proven to be feasible: all types of samples were processed and stored within 180 minutes regardless the day and time. Whole blood, plasma, serum, red cells, and buffy coat will be stored at -80°C, viable cell lines from cord blood will be stored in liquid nitrogen.

Conclusions

Based on the results of the pilot phase the full scale TNG study is scheduled to start in January 2017.

Maternal Lifestyle During Pregnancy and Child Neurodevelopment

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Background

Substantial attention has been paid in recent years to the impact of environmental factors on child development. The objective of this study was to evaluate the association between maternal lifestyle factors and child neurodevelopment.

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Methods

The current analysis included mother–child pairs from the Polish Mother and Child Cohort study (REPRO_PL). The following factors related to maternal lifestyle were considered: smoking (based on cotinine level), phthalate exposure based on their metabolite levels in urine, microelements levels in maternal and cord blood, alcohol consumption, leisure-time physical activity and stress in pregnancy, pre-pregnancy body mass index and folic acid supplementation based on questionnaire data. Psychomotor development was assessed in children at the ages of one and two by the Bayley Scales of Infant and Toddler Development. Ethical approval was granted by the Ethical Committee of the Nofer Institute of Occupational Medicine, Łódź, Poland and written consent was obtained from all subjects.

Results

A significant association was observed between prenatal exposure to tobacco constituents and decreased child motor development in assessments performed at both ages ($\beta=-0.8$, $p=0.01$; $\beta=-1.4$, $p=0.001$). Child motor development was also inversely associated with natural log concentrations of most of the phthalate metabolites ($p<0.05$). Maternal pre-pregnancy underweight was associated with decreased child language abilities ($\beta=-5.2$, $p=0.01$). Negative impact on child cognitive development at the age of two was observed for the Perceived Stress Scale ($\beta=-0.8$, $p=0.01$) and the Social Readjustment Rating Scale ($\beta=-0.4$, $p=0.03$). The recommended level of leisure-time physical activity during pregnancy was beneficial for child language development ($\beta=4.8$, $p=0.02$). Finally, a positive association between selenium levels in pregnancy and motor development ($\beta=0.2$, $p=0.002$) at one year of age and language development ($\beta=0.2$, $p=0.03$) at two years of age was observed. For alcohol and folic acid there were no significant associations with any of the analyzed domains of child neurodevelopment.

Conclusion

These results underscore the importance of policies and public health interventions promoting healthy lifestyle among women in reproductive age and during pregnancy.

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Prenatal Exposure Assessment Approaches Need to Consider Spatio-Temporal Variation of Air Pollution

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Background

Air pollution exposure during pregnancy may have consequences for for the unborn child's life and the future generation. The time-window of exposure (intermediate between short- and long-term effects) poses a methodological problem in the choice of the most suitable exposure assessment approach. The objective of the present study was to evaluate the effect of different prenatal exposure assessment approaches on reproductive outcomes.

Methods

In the Emilia-Romagna region (Northern Italy) two independent studies (Moniter and Sinatra projects) were conducted on air pollution and several reproductive outcomes. The first assessed the residential exposure to incinerator pollution of mothers living in areas next to plants; the latter considered different factors of environmental pressure in an urban-industrial city (Ravenna). Each newborn was georeferenced and characterized by a specific level of exposure emissions, and categorized in quartiles of PM_{10}. Modeling approaches were adopted for exposure assessment, namely an ADMS-Urban dispersion model for each type of environmental determinant, to account for both spatial (residential street number) and temporal (monthly simulations) variability of exposure. Both studies showed statistical associations only with preterm births. Analyses were repeated considering poorest indicators of exposure, to verify the influence of exposure assessment approach on final results.

Results

Considering the best method of exposure (spatio-temporal variability of air-pollution), both studies showed a significant association between preterm births (PTB) and exposure to incinerators and port activities. The exclusion or an inadequate assessment of the temporal variability of the exposure led to a reduction of the associations and loss of statistical significance in RRs (from 1.30: CI95% 1.08-1.57

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to 1.02: CI95% 0.88; 1.25 and from 1.52: CI95% 1.01-2.29 to 1.01: CI95% 0.66-1.55) respectively, considering the highest versus the lowest level of exposure.

Conclusions

Air pollution from industrial sources is associated with PTB. Our experience confirms the need of exposure models capable of capturing both the spatial and temporal variability of air pollution exposures, in order to be able to detect associations with birth outcomes.

Air Pollution and Children's Environmental Health Action in Brazil

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Background

Air pollution is estimated to cause around 800 deaths in children under 5 years of age in low- and middle-income countries of the Americas. Although it is not the worst scenario compared to regions like Africa or the Eastern Mediterranean region, this rate may be underestimated because environmental awareness and air pollution monitoring are extremely scarce, even in middle-income countries like Brazil.

Methods

A quick review of children's environmental health in Brazil is presented, highlighting some issues regarding risk awareness and current environmental threats.

Results

Around 19 million people use biomass for cooking or heating purposes in Brazil, and the country has one of the highest rates of pediatric asthma as evidenced in worldwide epidemiologic studies. The lack of awareness about children's environmental health in low- and middle-income countries is not exclusive to air pollution: children's access to unsafe water, the emergence of vector-borne diseases (like the triad Zika / Dengue / Chikungunya viruses), manmade disasters, and unsafe buildings in landslide areas are problems that occur frequently, mostly due to the lack of proper risk perception. Another example is the fact that Brazil has led the use of pesticides in the world since 2008 and yet concerns about children's ingestion of pesticides are rare. Efforts to increase awareness (not only about air pollution) are urgently needed, not only in Brazil, but probably in most low- and middle-income countries. On the other hand, children's exposure to indoor pollution due to second-hand tobacco smoke has been reduced consistently in Brazil over the last 2 decades, after a strong action of all stakeholders and a long-lasting governmental campaign. This successful case shows that it is indeed possible to increase awareness about other children's environmental health issues as long as all players work together.

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Conclusion

In an effort to collect data, help policy makers, increase research possibilities, and create training programs for health workers, the WHO has recently created a Collaborating Center for Children's Environmental Health in the South of Brazil with the goal of helping improve this scenario.

Children's Environmental Health Training in Brazil

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Background

Due to their unique characteristics, children are more vulnerable to environmental hazards than adults. The environment is responsible for one third of the global burden of disease in children, but there is a lack of proper awareness of such risks in many countries.

Methods

To highlight the current state of environmental pediatric training in Brazil, and describe ongoing strategies to address problems.

Results

The environmental burden of disease in children is not equally distributed throughout the world: the heaviest burden lies in low- and middle-income countries. To prevent, assess and treat environmental problems, it is essential to understand the hazards and physiologic characteristics particular to children. Unfortunately, many pediatricians still lack knowledge and awareness regarding environmental health issues in low- and middle-income countries. In Brazil, for example, 79% of pediatricians have never received any kind of training regarding children's environmental health. Only 17% declared they knew about the risks of lead intoxication in children, a concern included long ago in the routine pediatric care in developed countries.

In Brazil, the inclusion of children's environmental health in the pediatric curricula during residency is rare. Pediatric departments of universities lack specific divisions or even pediatricians able to share information and promote environmental health. The Brazilian Society of Pediatrics is the third largest in the world, with 22.000 affiliates. It has 33 different departments, but no one dedicated to children's environmental health (although some of them are in related areas, like toxicology).

Conclusions

The pediatric curricula in residency programs in Brazil have a giant gap that urgentlyneeds to be

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fixed. To help with this, the WHO and the Collaborating Center for children's environmental health in the south of Brazil are working to disseminate training programs in the country, based on 29 training modules developed by the WHO and translated into Portuguese by the Collaborating Center. In addition, partnerships with governmental administrators and pediatrics societies are being established. The subject was formally introduced in some post-graduate and residency programs in the south of Brazil.

Burden of Congenital Malformations Possibly Due to Infectious Disease: The Case of Zika Virus and Microcephalia in Brazil

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Background

It has long been known that a number of infective agents have the capacity to induce severe cerebral lesions in fetuses of women infected during the first months of pregnancy, but this was considered to be a rather rare event, under the influence of several environmental conditions. During the last few years, the Zika virus, known for decades as an agent of a very mild disease, has for the first time rapidly spread across Central and South America. Some months ago an international alarm ("Public Health Emergency of International Concern") was created under the hypothesis that this virus could be the cause of a large epidemic (thousands of cases) of cerebral malformations and microcephalia in Brazil. This WHO declaration has had enormous environmental and economic consequences worldwide.

Methods

We summarize the scientific literature (and the daily contributions of health authorities and of "experts" in the media reports) available on the issue of the Brazilian "epidemic" of microcephaly which could be caused by the Zika virus.

Results

According to available data, after one year from the beginning of the "epidemic", three things can be said:

1) in Brazil the number of cases of craniostenosis confirmed from September 2015 up to the present is not higher than the incidence expected on the basis of international global epidemiology.

2) in Brazil more than 80% of these cases of microcephalia were registered in a few states in the northeast of the country, where peaks of this malformation were also registered several years before the appearance of the Zika virus. At the same time, no cases were reported in the western or southern states of the country where Zika virus infection has the highest incidence.

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3) in none of the more than 60 other countries around the world in which the Zika virus is epidemiologically active has there been a reported increase in the incidence of microcephalia.

Conclusions

These data suggest that in Brazil there is no link between the Zika virus and an "epidemic" of microcephalia. If this is the case, then the "scientific medical community" should discuss why, at least sometimes, an unjustified "burden" can arise from causes outside of a scientific rationale.

Prenatal Early Exposure to the Environmental Endocrine Disruptors

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Background

Endocrine disruptors (EDs) are chemicals compounds that send confusing messages causing various dysfunctions by mimicking or altering the effect of hormones in the human body. Several EDs such as bisphenol A, phthalates, organotins, among others are involved in obesity and diabetes diseases in children. Recent studies have shown evidences that these chemicals can cross the placental barrier making fetal exposure closely related to maternal exposure. The aim of this research is to establish and detect early fetal exposure to different EDs.

Methods

To address this issue, recently, a human biomonitoring campaign in a cohort of pregnant women has begun, in order to predict the ED mothers' intake and also the dose of ED at which the child has been exposed in the early stage of the development. The data obtained from this cohort (biological levels of EDs and results from questionnaires regarding food frequency intake, habits, and lifestyles) will be implemented into the physiological based pharmacokinetic model. For the physiological based pharmacokinetic model development and parameterization, data from literature were used. Approval of the hospital ethical committee was received.

Results

Regarding the human biomonitoring campaign, complete data are expected to be analyzed by April

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2018. Development of PBPK models and parameterisation for selected EDs are in progress. Initial validation of these models is performed using literature data. Biomonitoring data obtained during this study will be cross validated and further analysed to understand early fetal exposure of selected EDs.

Conclusions

The integration of the data obtained from current on-going human biomonitoring campaign and the physiological based pharmacokinetic model, here developed, will predict the prenatal early exposure of the child/foetus to EDs. This work is included in the frame of HEALS project (FP7-603946).

Particulate Matter Characterisation in Schools Located around Petrochemical Industrial Complex: Infiltration of Particles From Outdoor to Indoor Air

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Background

Evidence of associations between exposure to ambient particulate matter (PM) and cardiovascular and respiratory diseases has being widely reported. In recent years, in addition to PM_{10} and $PM_{2.5}$ (particle having a diameter of less than 10 and 2.5 µm, respectively), other smaller fractions such as PM_1 and "ultrafine" particles ($PM_{0.1}$) become more relevant in the literature due to their capacity to deposit deeper in the respiratory tract. With a changing lifestyle, children, same as adults, spend more of their time in indoor environments (mainly in school and homes). However compared to adults, children are more susceptible to air pollutants. The aim of this study is to characterize the composition of indoor PM fractions at schools and validate with an indoor air quality model.

Methods

Indoor and outdoor samples of PM_{10}, $PM_{2.5}$, PM_1 and $PM_{0.25}$ were collected in different schools close to one of the largest industrial complexes of southern Europe located in Tarragona (Northeast Spain). Using AIRMOD, an air dispersion model, schools were selected from the most impacted by industrial (chemical and petrochemical) and harbor emissions. PM fraction levels were measured in both the indoor and outdoor environment of schools using two different samplers, high volume samplers and cascade impactors for outdoor and indoor air, respectively. Chemical characterization was carried out

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by analyzing elements and ions content. In addition, electron microscope analyses were done in order to assess the morphology of different particles fractions. In order to establish the amount of particles that come from outdoor air to inside the schools, an indoor air quality simulation model (IAQX 1.1) was applied. This model takes into account building parameters such as ventilation rates and room volumes in order to calculate the infiltration of outdoor particles to indoor compartments. Sensitivity analysis and calibration with real data were applied. This work is in the framework of the Ultrapar project (Spanish Ministry) and HEALS project (7FP European Union).

Results

Despite the absence of indoor PM sources, indoor PM levels were higher than outdoor. The gym was the environment where highest levels of PM were reached. These results are related with the phenomena of resuspension. For that reason, the lack of a module to introduce resuspension is the main limitation of indoor air quality simulation. As a result, modelled indoor PM levels were about 10% of measured levels. To correct this, resuspension was introduced into the model as an indoor source, having thus a higher similitude between modelled and measured PM levels. Chemical characterization of outdoor PM show a higher contribution from every component in $PM_{2.5}$ fraction, except for Secondary inorganic aerosols Regarding morphology, four main types of particles were found in our samples: fly ash, mineral, soot and undetermined.

Conclusions

Higher levels of PM were experienced in indoor environments, mainly by the effect of resuspension. IAQX model results are improved by taking into account the phenomena of resuspension as an indoor particle source. Characterization of outdoor PM shows that playgrounds could act as a source of fine mineral matter. Future research with more samples is needed to improve the present results.

School Children Exposure to Particulate Matter (Coarse, Fine, and Quasi-Ultrafine) around Petrochemical Complex: Respiratory Tract Dosimetry

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Background

With the changing lifestyle in developed countries, children are spending more than 80% of their

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time indoors. Pollutants levels, as well as emission sources, could be different between inside and outside buildings and change across heterogeneous indoor environments. Children are one of the most vulnerable population groups to environmental pollutants, including particulate matter (PM). In a previous study we measured several fractions of indoor PM ("coarse" (PM_{10}-$PM_{2.5}$), "fine" ($PM_{2.5}$-$PM_{0.25}$) and "quasi-ultrafine" ($PM_{0.25}$)) in several schools. These schools are in a highly impacted area of the largest petrochemical industrial complex in southern Europe, located in Tarragona (Northeast Spain). The aims of the present study is to provide an advanced risk assessment of PMs in a vulnerable population cohort by: 1) characterizing the PM exposure of children in schools impacted by industrial emission in Tarragona; and 2) assessment of primary toxicity characterization of these particle fractions through 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium Bromide assay with epithelial alveolar cell. Mechanistic exposure models can provide a valuable insight that considers human variability for risk assessment.

Methods

The exposure model applied was a respiratory tract dosimetry model that assesses the dose retained in the different parts of the human respiratory tract (Multiple-Path Particle Dosimetry Model). This exposure model takes into account the parameters that affect human exposure to particles such as PM concentration and size, and activity patterns of children in different environments (indoors and outdoors). The activity patterns of children were assessed using time spent surveys and physical activity questionnaires. The 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide assays with human pulmonary alveolar cells were conducted to evaluate the viability of exposed cells to PM collected in the schools. This work is in the framework of the Ultrapar project (Spanish Ministry) and HEALS project (7FP European Union).

Results

A total mass of 198 µg was retained daily by children in the respiratory tract as a whole. More than half of this mass was retained in the head region. Maximum deposition fractions for every PM fraction were reached in this region. Similar mass of PM was retained in tracheobronchial (41.1 µg) and pulmonary (37.5 µg) regions. However, most of the mass retained in the tracheobronchial region is composed of $PM_{10\text{-}2.5}$, while deposition in lungs is composed almost exclusively of $PM_{2.5\text{-}0.25}$ and $PM_{0.25}$. Since most of the particles reaching the alveolar region were the fractions $PM_{0.25}$ and $PM_{2.5\text{-}0.25}$, we performed the cytotoxicity assay for these two fractions. At low doses, $PM_{0.25}$ show greater toxicity, while doses equal or higher than 50 µg/mL show similar damage for both fractions.

Conclusions

The approach, here described, provides an assessment of the evaluation of PM exposure and toxicological assay. Principal advantages of this methodology when evaluating exposure are the ability of working with different microenvironments, activities, and population collectives, instead of using only PM levels in one environment (usually outdoor) and physiological parameters of one population group (usually adult males). This methodology also provides a powerful tool to join toxicological assays with real PM exposures.

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Impact of Prenatal Exposure to Environmental Pollutants on Autism Spectrum Disorder: A Case Report

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Background

Autism spectrum disorder has a high prevalence. This disease remains a complex issue and each patient is an etiological challenge. Hundreds of mutations in all chromosomes have been identified related to autism. In fetal life, brain development is exquisitely susceptible to exposure to toxic chemicals present in the environment. This report presents a case of a patient with a somatic mosaicism related to parental exposure to chemicals during early pregnancy.

Methods

We examined the case of an 8-year-old boy diagnosed with pervasive developmental and attention deficit and hyperactivity disorder. Microarray hybridization identified a duplication of a segment of chromosome 19 from band p12 to q13.12. He was the first child of healthy non consanguineous parents. The pregnancy was achieved naturally and there was no medication or drug intake. Both parents work as operators in a chemical plant. The mother stopped working at 4 weeks gestation. She had episodes of nausea and dizziness when purging fuel vapors.

Results

The affected segment includes over 160 genes that have possible associations with autism. Using the National Center for Biotechnology Information and Medical Data Institute database, we identified the chemicals associated with these genes, and volatile organic compounds, and volatile organic compounds and metals were some of the most common mutagenic chemicals identified.

Conclusions

A careful environmental history is needed to understand the etiology of Autism spectrum disorder. In this case we describe acute symptoms of intoxication with gases derived from fossil fuels around the time of gastrulation. These gases contain volatile organic compounds and metals that are classified as mutagenic and could be associated with the chromosomal duplication and the clinical picture present in the patient. Despite the limitations, there is evidence to support that environmental and genetic factors could converge in neurotoxicity.

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Neuropsychological Profile of an Adopted Patient with Fetal Alcohol Spectrum Disorder.

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Background

Prenatal exposure to alcohol causes a variety of clinical manifestations known as fetal alcohol spectrum disorder (FASD), with neurodevelopmental effects, among others. Alcoholism is common among mothers of children adopted from Spanish institutions, especially from Eastern Europe.

Methods

A 17-year old boy, born in Ukraine and adopted by a Spanish family at the age of two was referred to the Genetics Unit because of psychomotor delay and facial dysmorphia. He is the product of an unknown controlled pregnancy, and had a sister with psychomotor retardation. The presence of dysmorphic features was detected in infancy by the Medical Genetics Unit, as well as psychomotor and pondostatural growth retardation. At the age of 7 he developed inattention and hyperactivity, as well as anxiety and depressive symptoms. The child was evaluated by the Neuropediatrics and Psychiatry Unit. Subsequently, the child was evaluated at school and by the Environmental Pediatric Service.

Results

He presented with behavioral problems and poor school performance, limited IQ and verbal reasoning capacity below average, as well as significant curricular gaps in grammatics, mathematics and languages and difficulties in social relationships. He did not show an adequate level of autonomy, all in the context of FASD. The child was diagnosed with FASD.

Conclusions

Patients with FASD may have a normal or decreased IQ, from minimum to profound mental retardation. Executive functions are the most frequently affected. In addition, they usually have poor performance in behavioral inhibition and self-control, verbal and nonverbal fluency, organization and planning. Other manifestations include difficulties in the area of mathematics and social communication because of language disorders. Problems in socialization are influenced by understimulation, common in adopted children. Behavioral problems, substance use, sexual behavior and psychotic disorders are also

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common. Early diagnosis and intervention and psychopedagogical treatment seem to achieve an improvement in the neurodevelopment of these patients.

Exposure of Children to Polycyclic Aromatic Hydrocarbons and Potential Carcinogenic Risk Assessment From Biomass Burning Incorporating Internal Dosimetry Metrics

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Background

The current study deals with the assessment of the children's cancer risk attributable to exposure to polycyclic aromatic hydrocarbons (PAHs), under an increased use of biomass for space heating in Greece since the winter of 2012-2013.

Methods

The study incorporated ambient air particulate matter (PM) sampling in several sites, as well as chemical analysis of PAHs and levoglucosan, as the most specific tracer of biomass combustion. External exposure was estimated accounting for PAHs concentration variability among the various locations and the use of personal sensors providing information on location, temperature and intensity of activity. Internal exposure to PAHs was estimated taking into account the deposition of the respective PM fractions across the human respiratory tract and the respective PAHs concentration of the respective PM fractions. Deposition at different regions of the human respiratory tract was estimated using the Multiple-Path Particle Dosimetry model. Potential cancer risk due to exposure to the mixture of urban ambient air PAHs was calculated using the toxicity equivalence factor approach using as basis the benzo(a)pyrene cancer potency. Cancer risk was estimated from the integral of the toxic equivalent quotient of the different size of PM deposited daily across different human respiratory tract regions, by a slope-factor equal to $0.25 \cdot 10^{-6}$ ng/kg body weight/day) function, initially derived by the benzo(a)pyrene Inhalation Unit Risk (equal to $0.88 \cdot 10^{-6}$ $(ng/m^3)^{-1}$).

This refined exposure and risk characterization methodology allowed us to identify significant differences experienced by the different age group, as well as people living in different areas within an urban agglomeration.

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Results

The human respiratory tract deposition results indicated that the lower respiratory tract of infants and children (up to 14 years old) can retain up to 74% higher mass fraction of PM_1 particles than that of adults. The maximum difference in the thoracic deposition between adults and children (referring to children between 3 and 8 years old) is that of 68% and 230% for the $PM_{2.5-1}$ and $PM_{10-2.5}$ fractions respectively. Thus, the $PM_{2.5}$ and PM_1 fractions rather than PM_{10} contribute to a greater extent to the absorption of PAHs by the respiratory tract in younger individuals compared to adults. The estimated lung cancer risk was above 10-6 for the areas affected by biomass combustion. Age dependent differences in the estimated risk were mainly attributed to the respiratory physiology differences and the increased intensity of activity characterizing children, favoring the deposition of smaller (and more toxic particles) in children. In addition, biomass emitted particles were found to be more toxic (in terms of PAHs content) than the ones emitted from traffic sources.

Conclusions

Age dependent differences in human physiology, combined with the increased intensity of activity characterizing children, resulted in 2-3 times higher risk estimates from exposure to PAHs compared to adults.

Acknowledgements

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Internal Dosimetry Metrics for Risk Assessment of Endocrine Disruptors — The Case of Bisphenol A

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Background

Bisphenol A (BPA) remains one of the most controversial industrial chemicals with respect to early developmental stage exposure and effects.

Methods

The current study aims at a comprehensive exposure analysis of BPA, using an integrated exposure

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modelling framework that comprises far field and near field exposure modelling coupled to a dynamic lifetime physiologically based pharmacokinetic model. Exposure analysis was applied in European data, largely based on literature review of BPA food residues, as well as exposure reconstruction of human biomonitoring data. The latter were further assimilated through an advanced exposure reconstruction modelling framework. Special attention was paid to the assessment of BPA internal exposure through critical developmental stages such as gestation, by modelling the mother-fetus toxicokinetic interaction.

Results

The analysis indicated that current exposure levels in Europe are below the temporary tolerable daily intake of 4 µg/kg body weight/day proposed by the European Food Safety Authority. For chemicals with widespread consumer applications such as BPA, environmental pathways contribute insignificantly to BPA intake, while overall exposure is dominated by specific consumer behaviors. For BPA these pertain to consumption of canned food and beverages and the use of medical products found in neonatal intensive care units, such as bags containing intravenous fluids and total parenteral nutrition and tubing associated with their administration. Premature neonates hosted in intensive care units have also been also identified as the only population group that potentially faces some risk related to BPA exposure, especially when accounting for the immaturity of the detoxification pathway. In principle, health risks might be underestimated for specific population groups (e.g. neonates and infants) if the assessment does not take into account the variability in internal exposure due to genetic, physiological and developmental factors. In utero exposure was found to be highly associated to maternal exposure; actual fetal exposure was higher than maternal exposure by almost 20% due to the presence of β-glucuronidase in the placenta. Nevertheless, at the current levels of maternal exposure to BPA, in utero exposure is also very low, and significantly below the respective biologically effective dose derived from the European Food Safety Authority temporary tolerable daily intake.

Exposure reconstruction of literature available on human biomonitoring data resulted in very low intake estimates, similar to the ones estimated from the exposure models. Using biological pathway altering dose derived from in vitro BPA toxicity assessment as the internal exposure reference value, the maximum derived internal exposure values of the worst-case exposure scenarios (premature neonates) are 10 times lower to the lower 99th percentile of the Biological Pathway Activating dose, indicating that there is no reason for concern for individual or aggregate scenarios of BPA exposure.

Conclusions

In addition, the use of the internal dosimetry module allowed the translation of the European Food Safety Authority temporary tolerable daily intake into a biomonitoring equivalent urinary BPA-Glu concentration of320 µg/L. Comparison of this value to the collected biomonitoring data shows that the current existing levels of BPA in EU are 2 orders of magnitude below the European Food Safety Authority temporary tolerable daily intake; this margin of safety is in the same magnitude of order to the one estimated when daily intake is estimated from human biomonitoring data.

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Assessing the Impact of Hazardous Waste on Children's Health: The Exposome Paradigm

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Background

Assessment of the health impacts (e.g. cancer, neurodevelopmental disorders and congenital anomalies) related to hazardous waste is an emerging scientific challenge with multiple societal implications. Most studies on the links between hazardous waste and health are based on proxies of exposure to waste-related toxicants. They do not provide established mechanistic links between environmental exposure and disease burden prohibiting the exploration of cost-effective waste management options.

Methods

The exposome paradigm embraces dynamic interactions between environmental and endogenous exposures and genetic expression in humans, with a special focus on early developmental stages that have been proven determining for later life health status. Thus, it provides a novel tool for holistic hazardous waste management taking into account their adverse effects on children's health. Waste streams are associated with a broad range of contaminants, such as PCDDs and PCDFs, toxic metals (Cd, As, Cr(VI), Hg), VOCs, PAHs, H_2S, particulate matter, CH4, pesticides, phthalates, and PCBs. All of these compounds form a complex mixture of highly variable composition in space and time—accounting for differences in multimedia environmental transfer, persistence and bioaccumulation among the mixture components—to which children are exposed through multiple pathways and routes. Waste streams and the related contamination of environmental media are not viewed in isolation, but rather as components of the expotype, the vector of exposures an individual is exposed to over time.

An array of sensors including in situ systems for regulatory monitoring of environmental media, remote and personal sensors and human biomonitoring were used to provide the data necessary for determining the external exposome associated with hazardous waste contamination. Advanced data and model fusion algorithms were designed to integrate functionally integrate these different environmental datasets taking into account and adequately filling data gaps in space and time. External exposures were translated into internal dose through the use of physiology-based biokinetic models and they were assimilated with the biomonitoring data. Biological perturbations were identified through the use of multi-omics technologies. According to our paradigm, starting from untargeted transcriptomics and

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metabolomics we proceed with joint analysis of biological processes induced by exposure to waste-related xenobiotics at the molecular level and of metabolic processes induced in parallel. Dynamic flux balance analysis is used to jointly interpret gene expression data and metabolite profiles. Thus putative pathways of toxicity are identified; they need to be verified by targeted multi-omics and functional assays to confirm the causal association of waste components with adverse health outcomes. Advanced bioinformatics deep learning algorithms allow us to identify the functional links among the data derived from high throughput testing platforms and disease phenotypes providing phenotypic anchoring of the mechanistic hypotheses made earlier. Waste management practices are thus assessed with regard to their effects on children's health at the individual and community level, taking into account intra-subject variability.

Results

The health risk associated with exposure to potential contaminants from recycling waste streams and recycled waste processing under normal and accidental conditions was assessed. Experimental data were obtained for the case of a disastrous fire at the waste recycling facility in Aspropyrgos, Greece. Based on agnostic metabolome analysis, inhibition of de novo fatty acid biosynthesis was manifested by down-regulation of acetyl-CoA, malonyl-CoA, palmitoyl-CoA metabolites and related mRNA levels. Results strongly support the important role of the AhR in mediating the metabolic effects seen following PCDDs/PCDFs exposure. This additional evidence on the AhR perturbation, allowed the use of the well-established slope factor for TCDDs and to translate this into an internal exposure slope factor. The latter was used to estimate risk for the exposed and the non-exposed population. The risk of chronic exposure was estimated (mean value) equal to $2.57 \cdot 10^{-7}$, while the exposed population risk (mean value) was up to $2.91 \cdot 10^{-7}$. The respective risk is expected to be higher for neonates (almost 20%) and even higher for neonates that are also breast fed (up to 32%).

Conclusions

There is sufficient evidence that the various waste management options contribute to potential health effects; yet it is obvious that a more systematic approach is required. Exposome research proposes a paradigm shift that goes far beyond the proxy of exposure and macroscopic health effects association, enhancing our understanding of (a) the type of compounds released from the waste management sites, (b) the environmental fate of these compounds, (c) how population space-time lines cross with the space-time lines of these compounds and (d) the effects at the multiple biological organization levels as a result of this cross.

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School Environmental Health: the First Steps Towards Environmental Health

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Background
The educational stage (3-18 years) is a period of life in which environmental factors have a major impact on a child. Environmental factors shape current and future adulthood biological strengths and weaknesses. In addition, during the educational stage social and emotional interactions form personality.

Methods
Since 2006, the Pediatric Environmental Health Specialty Unit of the Hospital Clínico Universitario Virgen de la Arrixaca has worked along with Colegio San Jorge (Murcia) to promote school environmental health by developing knowledge and maintained goals/concerns that allow us to carry out and implement concrete activities in schools.

The first step was to have the approval and commitment of the school administration to free a professor for a couple hours a month to carry out these tasks. Subsequently, a complete environmental diagnosis of the school was completed in order to understand the strengths and weaknesses of the environment of the school. Once completed, the goals were developed, two of which were implemented and one which will be implemented next year.

Results
1st Goal – Tobacco: Identification of the prevalence of smoking at school, awareness activities, ephemeris celebrations (global day without tobacco), and group therapies of tobacco dishabituation for professors and parents of students.

2nd Goal – Ultraviolet Radiation: Including a hat for the school uniform, choosing a time during the year least hot for the most exhaustive physical activity, as well as organizing schedules so that the younger children have exposure to the sun earlier in the day.

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3rd Goal – Pesticides: Inform parents at school of fumigation days and the products that are used, production and use of organic pesticides, awareness activities.

Conclusions

These goals are integrated into the day-to-day activities of the school, which affects future habits and strengths of both students and the school community.

Smoking Cessation Consultation In Pediatrics

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Background

Exposure to tobacco smoke (active or passive) is one of the leading causes of pregnancy complications and a risk factor for developing multiple pediatric diseases. Smoking cessation consultation in pediatrics is aimed at pregnant couples. The consult has a group structure (although in exceptional cases is done individually) and is divided into 5 in-person and 5 telephone sessions. The main action developed in the consult is the control of nicotine dependence, and above all, behavioral and emotional dependence to tobacco.

Methods

During 2016, we developed 3 therapy groups with a mean of 5 patients per group. Individuals who did not attend all sessions and also did not respond to the telephone calls were excluded from the results. There were a total of 16 patients, 12 women and 4 men. The average consumption of cigarettes/day average was 9.78.

Results

For the Fagerström test there was an average of 4.4 (little dependence) and for the Richmond test there was an average of 7.5 (moderate motivation). The current cessation rate is 75%. Emotional and behavioral control is very important during pregnancy. The inclusion of the partner in the process

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ensures that the cessation is long-lasting, while also promoting a smoke free childhood environment.

Conclusions

The strengths of group therapy are that individuals with the same characteristics (feelings, fears, motivations, etc.), avoid feeling lonely during the process. The group can solve doubts and questions (fears, shyness, etc.) that otherwise would not be resolved. It helps us to establish pertinent emotional linkages among patients within the group. The results indicate a strong adherence to treatment.

Environmental Reproductive Nursing Consultation: Health from the Beginning

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Background

The Environmental Reproductive Nursing consultation involves a clinical consultation focused on detection, intervention and prevention of exposures to environmental hazards during the critical periods of fetus development (spermatogenesis and pregnancy) that pays special attention to legal and illegal drugs.

Methods

The consultation is supplemented with an ultrasound at 12 weeks of gestation. The goals of the consultation are to detect and reduce environmental exposures that can negatively affect the health of the fetus (or embryo) and to prevent recurrent diseases. In addition, to establish "environmental risk labels " in those pregnancies where the exposures have been severe enough to trigger diseases related to those exposures and allow us to make diagnoses prenatally or in the first months of life. The working tool is called the "hoja verde" and consists of a set of basic and concise questions that allow us to identify and manage/reduce environmental risk factors at critical periods of pregnancy (including spermatogenesis) and breastfeeding. We examine socioeconomic factors, reproductive history, ionizing radiation, drugs/herbalism/homeopathy, occupational exposures, smoking, illegal drugs, alcohol, pesticides and environmental perception of their community. Ethical approval was granted by La Hoja Verde's ethics committee.

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Results

Of the first 1,500 couples with risk during early pregnancy (2009/2012), we found a rate of 34.9% of maternal smoking, 45.4% of paternal smoking, 59.4% of maternal alcohol consumption during early pregnancy, 85% of paternal alcohol consumption during spermatogenesis, and 10.1% of fetuses exposed to illegal drugs during early pregnancy. In the successive years, the data presented showed a significant decrease in women who drink some alcohol in early pregnancy, a significant decrease in the amount of alcohol that the couples consume and a decrease in the number of newborns with congenital heart disease associated with intrauterine exposure to ethanol.

Conclusions

The Environmental Reproductive Nursing consultation is a clinical consultation/practice that allows us to identify, address and prevent environmental risk factors that would be otherwise go unnoticed. The training in this type of discipline/consultation is critical in order to increase the quality of pregnancy, health of the pregnant couple, as well as the health of the upcoming newborn.

Blood Lead Concentrations From Children Practicing Airgun Shooting

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Background

Elevated lead concentrations in blood samples from adult indoor shooters are well known. Children are shooting mainly with airguns, but data about blood lead concentrations is missing. Such data would be important to know because even lead concentrations from children below 100 µg/l are under suspect nowadays.

Methods

For this investigation, children between the ages of 12 and 16 years were recruited after agreement of the local ethical committee. Blood samples (1.2 ml ethylenediaminetetraacetic acid) were drawn from 54 shooters (67% boys) and 48 controls (79% boys) after written consent from children and parents. Lead was analyzed by graphite furnace atomic absorption spectroscopy (GF-AAS) under strict internal and external quality control. All 102 samples were above the detection limit of 5.0 µg/l. Ethical approval was granted by the Hospital of University Munich, Munich, Germany.

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Results

The shooters reported a mean training time of 4.8 (SD 2.7) hours per month with 215 shots (SD 115). The mean lead concentration of shooters was 32.4 µg/l (SD 15.1) and somewhat higher compared to controls (mean 25.4 µg/l, SD 13.2). The difference was borderline significant ($p = 0.048$). There was no difference between results from boys and girls and there was no correlation between shooting hours and blood lead levels.

Conclusions

The results underline that shooting with airguns maybe an additional source of lead in children. Due to the known health effects of lead for children, all sources of lead uptake need to be reduced. Further research is necessary to obtain more recent data of the body burden of children in Germany and to look to previously unknown sources.

Training Modules for Paediatricians: Health Effects of Climate Change

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Background

Health care systems will be increasingly faced with new challenges due to climate change-related health risks. There are several risks to be mentioned: heat-related health problems, allergies and respiratory diseases as well as a new onset of infectious diseases, increased risk of skin cancer due to strong ultraviolet radiation and accidents due to extreme weather events and as a result - mental stress. Children, due to their vulnerability, are seen as a special risk group for numerous pollution and exposure to climate change related factors. It is therefore important for the health sector to improve knowledge about the health effects of climate change.

Methods

As part of the German Strategy for Adaptation to Climate Change (DAS), the Institute of Occupational, Social and Environmental Medicine at the Ludwig Maximilian University of Munich receives funding for a project from the Federal Ministry for Environment, Nature Conservation, Building and Nuclear Safety (grant number 03DAS073) to develop training modules for paediatricians.

Results

The project funding was launched in April 2016 and will continue until March of 2019. With the support of a

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cooperation network of professional associations and stakeholders of the target group, a blended learning module is currently being developed for paediatricians. The e-learning phase will begin in spring 2017. The phase to phase teaching will take place during three paediatric annual meetings from summer to autumn 2017.

Conclusions

The project aims to provide scientific knowledge on climate change-related health risks for children and adolescents. Paediatricians will develop necessary skills for the new challenges in diagnosis, therapy and prevention. It is hoped that the project will enable adequate preventive and curative action for children.

Thinking of the Relationship Between Children's Health and the Environment as a Rights Issue — the UN Committee on the Rights of the Child Day: General Discussion on Children's Rights and the Environment on 23 September 2016

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Background

In recent years, it has become increasingly clear that environmental harm is one of the most pressing human rights challenges facing humanity in the twenty-first century. A vast range of human rights, including the rights to life, health, food, water, and housing, depend on a healthy environment. Children are particularly vulnerable to environmental harm. Nevertheless, the effect of environmental degradation on their lives is rarely addressed as a rights issue. The UN Convention on the Rights of the Child (CRC) is often overlooked in setting and implementing environmental policies and standards even though the convention specifically identifies "the dangers and risks of environmental pollution" as a threat to the right to health. States rarely address environmental issues in their periodic reports to the Committee on the Rights of the Child, which monitors the implementation of the CRC, and while many NGOs (and academics) have started working on human rights and the environment, only a few of them cover issues related to children in particular.

Methods

The Committee on the Rights of the Child (CRC) periodically devotes one day of general discussion (DGD) to a specific article of the UN Convention on the Rights of the Child (CRC) or to a child rights issue. The purpose of the DGD is to foster a deeper understanding of the contents and implications of the UN Convention. The 2016 Day of General Discussion (DGD) on 23 September will be on the topic of children's rights and the environment. Local and global experts from different fields will participate.

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Results

The presentation will provide an overview of the main objectives and scope of the UN conference and highlight key aspects of the current debate, including the potential added value of a rights—based approach to children's environmental health.

Conclusions

The day of general discussion is an important first step to promote understanding of the relationship between children's rights and the environment and identify what needs to be done for environment-related law, policy and practice to be rights-based.

Mismatch of Classroom Furniture and Student Body Dimensions in Schools in Delhi, India

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Background

Children (aged 10-19) in India represent about 20% adolescents as proportion of total population. The classroom is a formal environment for learning. A conducive and comfortable classroom environment motivates students to perform better and encourages the learning process. Furniture plays an important role in the maintenance of good sitting posture. Using furniture that promotes proper posture is more important as sitting habits acquired in childhood are very difficult to change later in adolescence or adulthood. Anthropometric measurements are an important factor that should be taken into account in classroom furniture design. The function of the furniture should be to facilitate learning through providing a comfortable and stress free workstation. Hence, the classroom furniture needs to be designed to allow children to move about in their seats, as it is unnatural to keep still for long periods.

Methods

To fulfill this objective, an observation based study was undertaken in public schools of New Delhi for devising suitable furniture measurements for a sample size of 450 school children in relation to their anthropometric measurements. In the study, the school furniture measurements were compared with the Bureau of Indian Standards given for children of 10-13 years and > 13 yrs age group, but no comparison was made for the anthropometric measurements for children. However, a correlation between the anthropometric measurements with age was found, along with comparing the findings between the boys and girls.

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Results

The results showed that none of the schools conformed to the standards given by the Bureau of Indian Standards for school furniture. Also, the majority of the students were getting injured because of certain defects in the classroom furniture. It was reported by 49.5% of school children that the classroom seat on which they were sitting for continuous durations was not comfortable to them. Also, 34.5% of school children from 10-11 years found the classroom seat to be uncomfortable to them, whereas 31.4% children from 12-13 years and 34.1% from the >13 years age group reported the same. Furthermore, the furniture dimensions are one of the main aspects and, amongst these, the seat height is typically the starting point for the design of this type of furniture. The study also indicated the potential relationship between anthropometric data of children and the furniture dimensions. Furthermore, we reported, based on the rules adopted from Parcells et al. (1999), the children's anthropometric measurements and furniture dimensions were mismatched.

Conclusions

This highlights the fact that students in the sample schools did not find the existing seats and desks to adequately fit their body dimensions, which indicates an urgent problem for school children in Delhi.

Assessment of Indoor Air Quality in Air -Conditioned and Naturally Ventilated Schools in Delhi, India

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Background

Understanding the impact of the indoor environment on children is important as they spend most of their time indoors (approximately 80-90%), either at school or the home. Within a school, students spend most of their time inside classrooms, engaging in various activities which require considerable amount of concentration and attention. Several research studies have indicated that the air quality inside classrooms is often poor and carbon dioxide (CO_2) concentration exceeds recommended levels prescribed by the American Society of Heating, Refrigerating and Air-Conditioning Engineers for indoor environments in majority of schools; which might be due to high student density or poor facilities at schools. If the air inside classrooms is deteriorated, it may cause several health effects that may directly impair concentration or memory of students – e.g., neurological effects – or cause other health effects that indirectly affect learning of children – e.g., absenteeism, poor concentration, restlessness or

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dizziness. Hence the present research was designed to assess the quality of air inside air-conditioned (AC) and naturally ventilated (NV) schools in Delhi, India.

Methods

The present research was exploratory in nature. The research was conducted in four private schools (two AC and two NV) located in Delhi, India. The design features of the selected classrooms were studied using a checklist and observation tool. The indoor-air quality parameters namely CO_2, temperature and relative humidity (rH) were monitored at continuous 5 minutes interval from 7:30 am to 2:00 pm for three working days and 8:00 am to 2:00 pm for one non-working day in each school using air quality monitor Testo 435-2.

Results

The results of the research study indicated that the measured CO_2 concentrations varied among school classrooms based on type of ventilation, windows, room occupancy and student movement. The average CO_2 concentration in naturally ventilated classrooms were within recommended limits (472.97 ppm to 718.02 ppm) on all the working day,s i.e less than 1000-ppm CO_2 limit prescribed by the American Society of Heating, Refrigerating and Air-Conditioning Engineers 62-2001 standards. However, the average CO_2 concentrations frequently exceeded the limits in the AC classrooms on all working days (1674.51 ppm to 3298.12 ppm). The CO_2 concentrations were within limits in all classrooms irrespective of ventilation type on all non-working days (minimum 386.08 ppm and maximum 478.37 ppm). The average temperature and rH ranged between 24.22°C to 26.29°C and 53.68% to 63.72%, respectively, in AC classrooms on working days providing adequate thermal comfort to occupants. The same was found to be ranging from 30.6°C to 33.01°C and 66.5% and 82.92% respectively in NV schools; exceeding the limits of comfortable temperature (approx. 20°C to 28°C) and rH (less than 65%) suggested by the American Society of Heating, Refrigerating and Air-Conditioning Engineers. The analysis of the data highlighted the degraded indoor air quality in the air-conditioned school on all the working days.

Conclusions

The elevated indoor carbon dioxide concentrations in AC schools may indicate inadequate ventilation per occupant, which may lead to sick building syndrome symptoms in students affecting their health and performance in schools. On the contrary, students in NV schools often experienced thermal discomfort due to higher temperature and relative humidity in class.

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Quantitative Profiling of Metabolic Markers to Assess Dietary and Microbiota Related Exposure Factors

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Background

Dietary and intestinal microbiota related exposure factors directly influence human metabolism, thus affecting health states. Quantitative metabolic profiling by mass spectrometry and specifically selected reaction monitoring (SRM) assays may be used to capture an individual's metabolic phenotype, revealing potential perturbations. Biomarker levels correspond to a specific exposure factor and perhaps are consistent with early indications of disease. This study focuses on biochemical intermediates of tryptophan metabolism to explore the influence of dietary and microbial exposure factors on this essential biochemical pathway.

Methods

A chemical library containing 234 standards of diverse biochemical intermediates was analyzed using ultra-high pressure liquid chromatography- mass spectrometry system (1290 Infinity II and 6495 QqQ, both from Agilent, CA, USA) to develop SRM assays for all detectable metabolites. Urine samples (n=51) from pregnant women collected in the 38th week of gestation were lyophilized, extracted with methanol, internally standardized and assayed for a panel of metabolites relevant to tryptophan metabolism by SRM technology. Ethical approval was granted by the Ethics Committee of Central European Longitudinal Study of Pregnancy and Childhood.

Results

The dietary intake of tryptophan is essential in humans to maintain protein biosynthesis and synthesis of neurotransmitters (serotonin and melatonin). At the same time, tryptophan is metabolized by microbiota residing in the human intestine. The collective dietary and microbiota exposure was explored using highly selective, sensitive and reproducible SRM assays for 20 key intermediates of tryptophan metabolism. The levels of these intermediates were determined in urine samples from pregnant women collected in the frames of Central European Longitudinal Study for Pregnancy and Childhood in the region of South Moravia, Czech Republic. Quantitative metabotypes were compared in urine samples based on abundance levels and mutual ratios between metabolic markers. This study contributes novel data in the area of health related dietary and microbial exposure factors, particularly to the emerging field of the exposome (i.e. non genetic factors affecting human health).

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Conclusions
Innovative study of health related dietary and microbial exposure factors in the emerging field of the exposome.

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Impact of Air Pollution to Oxidative Damage In Newborns and Mothers

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Background
The aim of our study was to investigate the impact of air pollution on oxidative DNA damage and lipid peroxidation in the urine and blood from mothers and newborns from two localities with different levels of air pollution: Ceske Budejovice (CB), a locality with a clean air, and Karvina, a locality with high air pollution.

Methods
The samples from normal deliveries (38-41 weeks+) of nonsmoking mothers and their newborns were collected in the summer and winter seasons. Levels of 8-oxo-7,8-dihydro-2'-deoxyguanosine (8-oxodG) in urine were analyzed with ELISA, levels of 15-F2t-isoprostane (15-F2t-IsoP) in blood plasma were analyzed with immunoassay kits. Ethical approval was granted by the Ethical Committee of the Institute of Experimental Medicine, Academy of Sciences of the Czech Republic, the Polyclinic Hospital Karvina-Raj, and by the Hospital Czech Budejovice.

Results
Higher $PM_{2.5}$ (particulate matter < 2.5 mm) concentrations were found in Karvina than in CB in the summer of 2013, and in the winter of 2014 ($P < 0.001$). We observed significant differences in 15-F2t-IsoP levels between the summer and winter seasons in Karvina for newborns (mean±SD: 64.24 ± 26.75 vs. 104.26 ± 38.18 pg/ml plasma, respectively ($P < 0.001$). Levels of 8-oxodG differed only in the winter season between localities; they were significantly higher ($P < 0.001$) in newborns from Karvina in

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comparison with CB (mean±SD: 5.70 ± 2.94 vs. 4.23 ± 1.51 nmol/mmol creatinine, respectively).

Conclusions

The results of multivariate regression analysis in newborns from Karvina showed $PM_{2.5}$ concentrations to be a significant predictor for 8-oxodG excretion, and $PM_{2.5}$ and benzo[a]pyrene concentrations to be a significant predictor for 15-F2t-IsoP levels. The results of multivariate regression analysis in mothers showed $PM_{2.5}$ concentrations to be a significant predictor of 8-oxodG levels.

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Children's Environmental Burden of Disease: Review of Key Findings and General Methodology

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Background

Children are vulnerable to environmental exposures resulting in disease burden. This can be quantified using the environmental burden of disease (EBD) method. EBD method and key findings of children's EBD are presented.

Methods

Quantifying the EBD in terms of disability-adjusted life years (DALYs) is explained. Recent global studies estimating DALYs caused by environmental risk factors (ERF) for children are summarized and discussed to understand DALYs. A focus is given to global estimates from the World Health Organization (WHO) and the Institute of Health Metrics and Evaluation (IHME).

Results

EBD is a method to quantify how many DALYs in a population are lost due to health restricted life time

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and premature death attributable to ERF. The WHO estimated that 25% of global DALYs for children (<5 years) are caused by modifiable ERF (e.g., air pollution, noise, unsafe water). In children, ERF contributes the most to the burden of infectious diseases, neonatal conditions, nutritional diseases, and injuries. E.g., 11% of 25 Mio DALYs due to neonatal conditions in children (<5 years) worldwide are assumed to be caused by ERF as in indoor/outdoor air pollution, tobacco smoke during pregnancy, unsafe water/ sanitation. In comparison, the environmental contribution to lower respiratory infections is with 60% of 52 Mio DALYs much higher. IHME quantified DALYs for a selection of ERF, including unsafe water/ sanitation/handwashing, air pollution, radon, and lead. These ERF explain less than 5% of the total DALYs for children <5 years but more than 10% for children aged 5-9 years.

Conclusions

The EBD studies differ regarding the definition of "environment" and inclusion of ERF. Moreover, data restrictions avoid the inclusion of all ERF of relevance. However, obvious is a high impact of the environment for children's health. This contains a high chance for prevention of the burden by reducing the exposure.

The Study on the Relationship Between Mercury Exposure and Child Birth Defects

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Background

Due to lack of knowledge of the negative health impacts of mercury, illegal gold miners still using mercury for gold extraction activities. Mercury causes not only environmental pollution, but also effects human health. According to children's health status statistics from 2006 to 2011 in South Gobi province, there have been 26 children born with birth defects. This number has a tendency to increase each year.

Methods

The Scientific Review Board of the Public Health Institute has reviewed the methodology of this study and the Ethical Review Board of Ministry of Health gave permission to conduct the study. In order to find a connection with the causes of these defects and the parents' work environments, we implemented a human bio monitoring survey of mercury exposures among children 0-5 years of age who were living

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in a mining area. A total of 56 children participated in this study, 22 boys and 34 girls. We performed pediatric clinical examinations for the all of the participants.

Results

We found that 52.9% were normal, 11.8% had rachitis, 7.8% were hypo oxygenated, and 6% had weight loss. We examined the mercury content in hair, urine and blood. The average mercury in participants' urine was 0.215 µg/l (confidence interval (CI) 95% 0.045-0.477), mercury in the root of the hair was 0.075 µg/g (CI 95% 0.042-0.108), mercury in the end of the hair was 0.111 µg/g (CI 95% 0.011 - 0.232), and mercury in the blood was 1.401 µg/l (CI 95% 1.179-1.623).

Conclusions

The results of mercury analysis were compared to the threshold of the Human Bio monitoring I limit. It concluded that no statistically significant differences were observed between mercury levels in biological samples of children and their parents' work related to gold mining with mercury. Parents working condition of the children involved in the study was not found to have an influence on children's health status (p=0.130, p=0.619).

Noise Prevention in Kindergarten

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Background

One of the most important and underestimated challenges is high noise exposure in kindergarten. More than 50 percent of teachers complain about unfavourable noise conditions in child development facilities. Constant noise exposure affects not only attention performance and the development of language; it may also cause psychosomatic complaints or higher stress perception. Furthermore, legislative authorities, architects and teachers see noise pollution as an inevitable fact and do not consider noise protection or current needs, like children's exercise, when building or renovating premises, for example. Our priority intention is to introduce, develop and evaluate noise reducing interventions, which are easily to apply and have immediate effects.

Methods

We carried out a 10-month long longitudinal case-study in a kindergarten of high noise exposure, which had been selected according to a set of criteria. Our selection criteria were poor structural technical conditions, at least two groups with similar floorplans, number and age of children. Two similar groups

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were considered, one intervention group (IG) and one control group (CG) without any interventions. In the presented project qualitative and also explorative – interpretative – methods were used (open-nonparticipating observation, interviews, survey tools, quantitative determination of individual sound levels (n=12) and also reverberation time of the rooms), because an authentic and natural setting was of great interest. In addition there were two observers in each group, observing and documenting near misses, conflict rate and also the daily routine respective of confounding variables, for example children shouting into their dosimeters. After the first measurement, all involved people developed a specific action plan for noise prevention. After the intervention implementation, a second measurement was taken.

Results

The evaluation was carried out by comparing inter- and intra-individual differences between noise exposure levels in both groups (IG and CG) before and after implementation of measures.
At the first survey IG showed an average sound level of 76,3 dB, and after the implementation the sound level reduced to 70.9 dB (compared to CG: 71.5-72.7). Hence, it can be concluded that the noise prevention measures were successful. If the analysis of the observed conflicts and near misses rate in both groups beyond the two times of measurements is considered, a reduction was also achieved. The difference between CG and IG suggests a correlation between conflicts (IG: 23-9/CG: 18-16) or near misses (IG: 14-0) and high noise exposure. As the baselines of both groups differed, we do not want to interpret without further research. Looking at the individual sound exposure levels of adults and children, it appears that children are more affected than teachers, which matches our observations.

Conclusions

On basis of these results it can be assumed that high noise exposure seems to have a negative impact on kindergartens. Construction, organisational or educational measures are able to reduce stressful sound volume and as a consequence the conflict and near misses rate as well. Noise measurements and consulting interventions in kindergartens should be put into practice. A Noise Prevention Checklist ("Which interventions are the most useful at a specific kindergarten?") and guidance about noise preventions for kindergarten management and policy makers is needed. Further research and evaluation of technical, organisational and pedagogical interventions should be developed in order to make policy makers and other stakeholders, like architects, aware of noise problems and its negative impacts.

Quantification of the Burden of Disease Due to Environmental Risk Factors in Children and Adolescents in Germany — the UKAGEP Project

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Background

Environmental Burden of Disease (EBD) estimates are increasingly used by scientists to inform decision-makers about environmental risk factors causing ill-health. Currently, no up-to-date national estimates of the EBD are available for Germany. Children and adolescents represent a group vulnerable to the effects of environmental risk factors. Therefore, the research project UKAGEP aims to estimate the EBD of 16 risk factors for children aged between 3 and 17 years of age in Germany.

Methods

The UKAGEP project uses the EBD methodology and its core measure, the disability-adjusted life year (DALY). Current exposure and human-biomonitoring data derived in the currently ongoing population-representative German Environmental Survey (GerES 2014-2017) are used to estimate the exposure of children in Germany. Combined with exposure-response functions (ERF) and data on the related health effects, DALYs will be estimated. The ERF will be derived from or updated by systematic literature reviews and meta-analyses. To take into account cumulative chronic effects, probabilistic modeling will be performed. Furthermore, it is also necessary to estimate the potential future burden, because many current exposures might affect health after a long lag-period.

Results

The concentration of most environmental hazards is expected to be rather low. However, some of the risk factors might still pose a considerable threat at population level, especially if both effects of mortality and morbidity are considered. Furthermore, the estimated future burden will show how current exposures will impact the health of children living with today's exposures in the upcoming years.

Conclusions

The UKAGEP study will present the EBD of a set of known hazards, but will also provide insights on newly emerging risk factors. It is also envisaged to strengthen the use of human-biomonitoring data and methods of probabilistic modelling in EBD assessments.

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What is the Environmental Burden of Disease? An Animated Video Gives an Answer

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Background
The Environmental Burden of Disease (EBD) method is used to quantify disability-adjusted life years (DALYs) which can be attributed to environmental risk factors. Thereby, risk factors of major concern for population health can be identified. DALYs are not easily understandable, which might prevent their use in risk communication to the general public as well as in political decision-making.

Methods
An animated video was produced to explain the EBD method and its possible application fields to the interested general population, scientists from other research fields and policy makers. A vivid example, outdoor air pollution, which affects everyone's health, was chosen to illustrate the quantification steps. Technical terms are used and explained in common language.

Results
The 8-minute video describes the DALY as a summary measure of population health which consists of years of life lost due to premature mortality and years lived with disability. Likewise, the attribution of DALYs to the risk factor outdoor air pollution is illustrated. The video is freely available on YouTube in German and English.

Conclusions
The video is designed to be understandable to a broad audience by using a balance between simplification and scientific correctness. It gives a short but comprehensive explanation of the complex EBD method and is therefore an attempt to break out of the scientific ivory tower.

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WHO's Work on Early Life Exposures and Future Health — Prevention for Future Generations

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In 2012, 38 million people lost their lives due to non-communicable diseases (NCDs), and three-quarters of these deaths occurred in low and middle income countries. NCDs include obesity/diabetes, cardiovascular diseases, respiratory diseases, cancers, allergies and mental illnesses. Recently, the number of children with NCDs has increased, and this is cause for serious concern.
In the United Nation's (UN) Sustainable Development Goals (SDGs), target 3.4 aims to reduce by one third premature mortality from NCDs through prevention and treatment and promote mental health and well-being by 2030; target 3.9 aims to reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination. Although according to the Organisation for Economic Co-operation and Development (OECD), chemical production is increasing rapidly in the world, many chemical exposures could potentially be reduced or removed through environmental management. These chemicals include pesticides, asbestos, various other household and occupational chemicals, ambient and household air pollution, second-hand tobacco smoke, lead and arsenic.
In June 2016, an international expert meeting on "Avoidable Early Environmental Exposure" was convened by the World Health Organization (WHO) in Geneva. Experts from various fields such as maternal/children's health, developmental origin of health and disease, epigenetic effects, cohort study, and communication participated. The meeting discussed the current situation of early life exposure to chemicals, possible interventions to reduce the risks to children, and effective advocacy among health care professionals, policy makers, and civil society. A roadmap of action for implementing interventions is now being developed. The outcomes of the meeting results will be submitted for publication in a scientific journal.

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Neurodevelopment, Low Level Mercury Exposure and Genetic Polymorphisms in a Birth Cohort From Slovenia and Croatia

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Background

The aim of the present study was to evaluate association between prenatal exposure to mercury and the neurodevelopment of children, taking into account relevant confounders and some relevant genetic polymorphisms. We examined apolipoprotein E (*Apoe*) and glutathione transferase (GSTM1 and GSTT1), the genes that are hypothetically involved in elimination of mercury from the body, and *Apoe* in neurodevelopment.

Methods

The study population was comprised of 601 mother-child pairs recruited from the central Slovenia region and 243 from Rijeka, on the Croatian coast of the northern Adriatic. Determination of total mercury in cord blood, neurodevelopment assessment using Bayley Scales of Infant and Toddler Development, Third Edition (Bayley III) at 18 months of age and genotyping was done in 361 children; 237 of them were from Slovenia and 124 from Croatia. The National Ethics Committees of Slovenia and Croatia approved this study.

Results

The results showed a negative association between low-to-moderate mercury exposure levels and cognitive outcomes and with fine motor scores at 18 months of age. The observed decrease in cognitive function was significant only in children carrying at least one *Apoe* ε4, while the decrease in fine motor score was independent of the *Apoe* genotype. Adjusting for selenium and lead revealed positive association between selenium and language and negative between lead and motor function, but only in the subgroup of children not carrying the ε4 allele. The GSTT1 genotype revealed positive association between cord blood selenium and cognition in children without gene deletion (β=11.8, p=0.008), but not in children with GSTT1 deletion (β=-15.1, p=0.128).

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Conclusions

The present study indicates that even low-to-moderate mercury exposure in children with normal neurodevelopmental outcome can be associated with lower cognitive and fine motor Bayley III scores and that stratifying for specific genotypes and accounting for beneficial and other potentially neurotoxic substances is crucial in assessing such associations.

Early Life Exposure to Organochlorine Pesticides and Behavioral Development in Children

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Background

Although organochlorine pesticides were banned in the West decades ago, bioaccumulation in younger generations still occurs. Exposure to organochlorine pesticides may be related to adverse effects on behavioral development. Exposure during early life may be particularly harmful, as rapid structural and functional changes take place. The aim of this study is to explore the association between early life exposure to organochlorine pesticides and behavioral development at 18 months.

Methods

Data from 59 mother-child pairs from LINC, a prospective birth cohort in the Netherlands, were used. The targeted compounds were the sum of polychlorinated biphenyls (ΣPCBs), hexachlorobenzene (HCB), the sum of hexachlorocyclohexane isomers (ΣHCH), heptachlor epoxide, and dieldrin; all determined in breast milk. The scales 'Attention Deficit Hyperactivity Disorder' (ADHD) and 'Externalizing Behavior' of the Child Behavior Checklist 1.5-5 were used for the behavioral assessment. Whole population and sex-stratified regression analyses were performed, in which exposure levels were classified in tertiles (T1, T2 and T3). A family history of ADHD, educational level, smoking, and alcohol or

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illicit drug use during pregnancy were included as confounders. Ethical approval was granted by the Vrije University Medical Center.

Results

Children exposed to the highest levels of ΣHCH presented higher scores on the ADHD-scale of the CBCL. After stratification for sex, significant associations were only found for girls. Positive associations were found between early life exposure to the highest levels of ΣPCBs, ΣHCH, dieldrin, and T2 levels of HCB; and ADHD symptoms. Higher scores were found on the Externalizing Behavior scale of the CBCL after exposure to dieldrin (T3) and ΣPCBs (T2 en T3).

Conclusion

Significant associations were found between early life exposure to organochlorine compounds and behavioral development at the age of 18 months. Associations were sex-specific (in girls only). Results should be seen as exploratory, as the sample size was small.

Prenatal Exposure to Environmental Chemicals: Associations with Neurotransmitter Levels in Cord Blood

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Background

Neurodevelopmental disorders such as attention deficit hyperactivity disorder and autism have been associated with exposure to environmental chemicals, including dioxins and organochlorine pesticides. Effects have been observed, particularly in relation to exposure in early life. Mechanistic pathways, such as relations between chemical exposure and neurotransmitter levels, have, however, been studied less frequently. Our objective was to study the effect of early life exposure to environmental chemicals on neurotransmitter levels in cord blood.

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Methods

Data were used from 63 mother-child pairs from the LINC study, a prospective birth cohort in the Netherlands. Cord plasma was collected at birth and was used to determine both levels of environmental chemicals and neurotransmitters. Exposure to various compounds was determined, including phthalates (metabolites of di-2-ethylhexyl phthalate [DEHP]), perfluorinated alkyl acids (perfluorooctanesulfonic acid [PFOS], and perfluorooctanoic acid [PFOA]), and brominated flame retardants. The neurotransmitters included dopamine, epinephrine, norepinephrine, acetylcholine, serotonin, gamma-amino butyric acid (GABA), and glutamate. Univariate regression models were composed for each compound in tertiles, and each neurotransmitter. Ethical approval was granted by the Vrije University Medical Center.

Results

An overall significant effect of PFOA exposure on GABA was observed ($p = 0.049$). It appeared to be that higher levels were observed in the second tertile compared to the first, and lower levels in the third tertile compared to the first. Furthermore significant overall effects were observed for MEHHP (acetylcholine, $p = 0.039$), and MEOHP (epinephrine, $p = 0.048$). For mono(2-ethyl-5-hydroxyhexyl) phthalate (MEHHP), lower levels of acetylcholine were observed in the highest exposure tertile, whereas for mono(2-ethyl-5-carboxypentyl) phthalate (MEOHP) higher levels of epinephrine were observed in the second exposure tertile.

Conclusions

Prenatal exposure to PFOA and DEHP was associated with levels of GABA, acetylcholine, and epinephrine. Dose-response effects were non-linear. Whether these changes in neurotransmitter levels in cord blood are related to abnormal behavioral development needs to be further explored.

Maternal Exposure to Particulate Matter and Birth Weight in Dutch Children

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Background

Maternal exposure to particulate matter (PM) may cause decreased transplacental oxygen and nutrient transport to the fetus, potentially resulting in a lower birth weight (BW). Results of observational studies have, however, been inconsistent and because of the potential health implications, further research is needed to confirm the relation between maternal exposure to PM and BW.

ED_001703B_00003475_145_9cd74649-ce16-6ddc-2556-71ddf03afd90

Objective

To investigate the association between maternal residential exposure to fine and coarse particulate matter ($PM_{2.5}$ and PM_{10}) and BW.

Methods

Data were used from the LINC study, a prospective birth cohort study in the Netherlands (n = 223). Individual exposure estimates to $PM_{2.5}$ and PM_{10} at each participant's home address were assessed using a geographical air quality map. Data on BW, gestational age and maternal anthropometry were obtained from the midwives, and data on parental health, lifestyle and socio-demographics characteristics were collected by means of questionnaires. To estimate the impact of PM on BW as a continuous measure, linear multivariable models were used. Because the sample size, PM was converted into a dichotomous variable with the concentration groups <12 µg $PM_{2.5}/m^3$ (reference group) and 12 – 13 µg $PM_{2.5}/m^3$ for $PM_{2.5}$ and the concentration groups <19 µg PM_{10}/m^3 (reference group) and 19 – 20 µg PM_{10}/m^3 for PM_{10}. Ethical approval was granted by the Vrije University Medical Center.

Results

For 191 of the 223 children (85.7%), exposures were successfully estimated. The highest exposure level for $PM_{2.5}$ was 12-13 µg/m^3, to which 65.4% of participants were exposed. For PM_{10}, the highest exposure level was 19-21 µg/m^3, which was observed for 52.4% of households. Only exposure to a higher concentration of $PM_{2.5}$ resulted in a statistically significant negative effect on BW (p=0.027). After adjusting for confounders, a decrease in mean BW was found for $PM_{2.5}$, with a change of -142.8 g (95% CI, -269.1 to -16.4).

Conclusions

Maternal exposure to higher levels of $PM_{2.5}$ was associated with a lower BW. The implications for public health in the Netherlands are important, as exposure levels in this study are common.

ED_001703B_00003475_146_797a0d8f-6a36-5a86-8bcd-03312fcf937c

Polycyclic Aromatic Hydrocarbons from Traffic Exhausts in Primary Schools and Cognitive Development of Children

Barend L. Van Drooge (1), Joan O. Grimalt (1), Mikel Esnaola, (2,3,4), Ioar Rivas (6), Mar Alvarez-Pedrerol (2,3,4), Joan Forns (2,3,4), Payam Dadvand (2,3,4), Xavier Basagana (2,3,4), Xavier Querol (1), Jordi Sunyer (2,3,4,5)

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(2) Barcelona Institute for Global Health, Centre for Research in Environmental Epidemiology, Barcelona, Spain
(3) Pompeu Fabra University, Barcelona, Spain
(4) Centro de Investigación Biomédica en Red de Epidemiología y Salud Pública, Madrid, Spain
(5) IInstitut Hospital del Mar d'Investigacions Mèdiques-Parc de Salut Mar, Barcelona, Spain
(6) Department of Civil and Environmental Engineering, University of Surrey, Surrey, United Kingdom

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Background

Traffic air pollution is associated with slower cognitive function growth in schoolchildren. Polycyclic aromatic hydrocarbons (PAHs) impair brain development in animal studies. Here, we assess the association between PAHs in urban schools (n=39) and the cognitive development in children (n=2,897) from 2nd to 4th grade (7-10 years).

Methods

Cognitive development was assessed through 12-month change in working memory and attention. All parents or guardians signed the informed consent form approved by the Clinical Research Ethical Committee of the IInstitut Hospital del Mar d'Investigacions Mèdiques-Parc de Salut MAR, Barcelona, Spain.

Schools were sampled on particulate matter 2.5 ($PM_{2.5}$) indoor (classroom) and outdoor (playground) twice in 2012 during one-week periods. One fourth of each $PM_{2.5}$ filter was used for PAH analysis by gas chromatography–mass spectrometry. Furthermore, organic carbon, elemental carbon, nitrogen dioxide and $PM_{2.5}$ from traffic origin were measured.

Results

Indoor PAH levels were similar to outdoor levels (ratio 0.9), except for the more volatile particulate bounded PAHs, such as benz[a]nthracene and chrysene with higher indoor levels (ratio 1.5).
Higher PAH concentrations were observed in schools from the urban centre. BaP, the only compound with an established annual limit concentration (1000 pg/m^3), ranged from 22 to 343 pg/m^3 indoors and from 17 to 301 pg/m^3 outdoors. Correlations between outdoor PAHs and EC were high ($0.66<r<0.79$) while indoor correlations had a wider range ($0.54<r<0.84$) and were lower for benz[a]anthracene ($r=0.62$)

ED_001703B_00003475_147_60597df8-200b-f3a5-6d48-e2b6bff3bc62

and chrysene (r=0.54). A similar pattern was seen for NO2 and traffic $PM_{2.5}$.

Outdoor PAHs were generated by traffic inputs, while indoor PAHs reflected older mixtures. The more volatile PAHs were under the influence of gas-particle partitioning in combination with high indoor organic carbon. Children attending schools with higher PAH levels had worse working memory and an increase in inattentiveness, which was statistically significant for the more volatile PAHs and benzo[ghi] perylene. The exact mechanism by which PAHs affect the developing brain remains unclear, however, it is likely to be mediated by inducing inflammation, oxidative stress, and vascular injury.

Conclusions

This study points towards the role of motorized vehicle exhausts in air pollution in schools on cognitive development in a modern urban area. Although stronger associations to effects were observed in the outdoor PAH distribution, and thus, fresh vehicle exhaust, the effects were also reflected in the indoor air, which receives outdoor contamination.

Acknowledgements

The research leading to these results has received funding from Fundació Obra Social "La Caixa" and the European Research Council under the ERC Grant Agreement number 268479 – the BREATHE project.

Considerations for Policies Design to Promote Drinking Water Consumption in Mexican Children and Adolescents: Santa Fe, CDMX

Arely Vergara-Castañeda, María de los Angeles Peña-Farfán, Donovan Raúl Ríos-Hernández, César Jesús Sandoval-García, Laura Martino-Roaro

Research Group "Food and Health". Faculty of Chemistry, La Salle University, D.F., Mexico

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Background

Water is the major constituent of the human body and drinking water is the most important source to fulfil its needs. There are several choices in water provision (e.g., bottled water consumption, home-based water treatment or installation of water storage facilities) which can be adapted to the existing water supply system in urban communities where we cannot ensure access to potable water. According to the World Health Organization, not only physical environmental, biological or chemical factors affect human health, but also environmental and psychosocial factors. In this sense, factors such as little or no availability of drinking water can contribute to low water consumption. The aim of this analysis is to emphasize the need for multicomponent strategies (access, social campaigns, social empowerment and

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psychosocial factors) to attain the recommended levels of water consumption in Mexican children and adolescents living in Santa Fe, CDMX.

Methods

This study examines the feasibility of implementing strategies aimed at increasing water consumption in children and adolescents as stated in the National Food Health Agreement (Acuerdo Nacional de Salud Alimentaria) in 2010 according to the socio-demographic conditions reported for a marginalized urban area in CDMX, Mexico. We also describe various other factors that could play a decisive role in the trend of tap water consumption in this specific population, putting them at risk for not accomplishing the recommendations and discuss a direction for developing specific child welfare policy for vulnerable groups.

Results

In Mexico, one sixth of the population has no access to drinking water (1100 million) and almost 40% lack basic sanitation. These figures are worse in marginalized vulnerable urban communities as Santa Fe in CDMX where only 18% of children and adolescents reach water consumption recommendations. As this population spends most of their time in schools and at home, these places should been considered key places to promote and ensure water consumption. Current polices to promote drinking water are focused only on the installation of water fountains in schools (some reports estimated that 55% of public elementary schools have this service) without considering availability at home and it has been recognized that confidence about the quality of water filters affects water consumption. Psychosocial factors such as intent, knowledge, beliefs, attitudes, subjective norms and self-efficacy, which are associated factors with low water consumption, have not been considered as part of environmental modifications.

Conclusion

Policies aimed to increase water consumption in children and adolescents should involve not only multicomponent environmental modifications aimed to ensure access to drinking water not only in schools, but also consider broader psychosocial factors.

ED_001703B_00003475_149_d4070c80-7695-17df-67e9-2f47d6d62591

Occupational Injuries Among Child Labourers: Results From a Cross-Sectional Study in Peru

Tobias Weinmann (1,2), Cornelia Schlick (2,3), Manuela Joachin (4), Leonardo Briceño (5), Daniel Moraga (6), Katja Radon (7)

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(2) German Centre for Lung Research, Munich, Germany
(3) Department of Neurology, Ludwig-Maximillian's-University of Munich, Munich, Germany
(4) Centro Medico Espinar Sociedad de Responsabilidad Limitada, Cuzco, Perú
(5) Department of Public Health, Universidad del Rosario, Bogota, Colombia
(6) Universidad Iberoamericana de Ciencias y Tecnologia, Santiago, Chile
(7) Department of Occupational Health and Environmental Medicine, Ludwig-Maximillian's-University of Munich, Munich, Germany

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Background

Although there is a considerable number of children involved in child labour worldwide, data on occupational hazards and injuries is limited. Thus, the objective of this study was to investigate the lifetime prevalence of and risk factors for occupational injuries in child labourers in Peru.

Methods

Between August and December 2010, a cross-sectional study was conducted at five public night schools in Cusco Province. 375 students (response 91.5%) aged 10 to 17 years completed an interview-based questionnaire on socio-demographic factors (age, sex, place of birth, education, residential status, minority status, health care coverage), work-related factors (income, working days per week, occupational sector) as well as lifetime prevalence of occupational injuries. Multiple logistic regression analyses were performed to estimate risk factors for different types of occupational injuries. Ethical approval was granted by the Medical Faculty of the University of Munich and the Ministerio de la Mujer y Desarrollo Social (Ministry of Women und Social Development) in Peru.

Results

We found falls (11%), car accidents (9%) and physical violence (3%) were common causes of injuries in this population. Severe injuries (fractures, luxation or amputations) were reported by three percent of the study sample. Participants with high daily income (≥20 PEN, ~15 USD) showed increased odds for falls (odds ratio 2.8; 95% confidence interval 1.2-6.5) and physical violence at work (odds ratio 12.1; 95% confidence interval 1.3-116.0). Children working in the service sector were at higher risk of injuries caused by car accidents (odds ratio 4.2; 95% confidence interval 1.2-15.3).

ED_001703B_00003475_150_86bc554f-eac3-6e6d-c1de-97021bab62b0

Conclusions

Occupational accidents among child workers attending public night schools are common in Cusco with a lifetime prevalence of three percent for severe injuries. High income seems to convince child labourers to accept poor working conditions.

Air Pollutants Exposure and Functional Repair Activity in Placenta

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(2) Maternal and Fetal Health Research Centre, St. Mary's Hospital, Manchester, England

Corresponding author:
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Background

Maternal exposure to air pollutants can affect fetal development and cause adverse birth outcomes. Nitrogen oxides (NOx) can react with amines to generate toxic alkylating agents (AAs), and their biological effects are mediated, in part, by the formation of DNA damage including the promutagenic and toxic, O6-methylguanine. O6-methylguanine methyl transferase (MGMT) removes O6-alkylguanine adducts by transferring the alkyl group from the O6 position to the cysteine residue within its active site. The aim of this study is to quantify MGMT functional repair activity in placentas and to determine its association with air pollutant exposure over various time windows during pregnancy.

Methods

Tissue samples from the middle, cord and peripheral areas of the normal placentas were collected from 10 mothers, who lived in Greater Manchester, and stored at -80°C until processed. MGMT repair activity was quantified in cell-free sonicates of 100-120 mg tissue using a standard radioistotopic methyl transfer assay and protein levels were quantified by a Bradford assay. Postcodes of the mothers were geocoded by ArcGIS and air pollutant data obtained from the Department for Environment, Food and Rural Affairs. Ethical approval was granted by the Central Manchester University Hospitals NHS Foundation Trust.

Results

Placental MGMT activity (mean ± standard deviation) was 0.140 ± 0.022, 0.134 ± 0.014 and 0.124 ± 0.007 fmoles/µg for middle, cord and peripheral samples respectively and varied 4, 5 and 1.5 fold respectively. Level of pollutant exposure varied with mean nitrogen dioxide exposure was 16.2 µg/m^3, NOx 23.3 µg/m^3, PM_{10} and $PM_{2.5}$ were 13.1µg/m^3 and 9.4µg/m^3 respectively. None of the pollutants were significantly associated with any time windows during the pregnancy ($p>0.05$).

ED_001703B_00003475_151_a214a0be-3b94-506b-1ded-b6530fc22790

Conclusions

This initial study indicates that the placenta contains functional MGMT activity that may affect susceptibility to alkylating agent exposure. The biological significance of variable placental MGMT activity remains to be characterized. An association between placental MGMT activity with pregnancy outcomes need to be further studied.

Acquired Immune Deficiency syndrome Orphans in Sub-Saharan Africa: A systematic Review on Differences Between Rural and Urban Environments

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(2) Shepherd's Village, Narok, Kenya

Corresponding author:
Zolnikov, Tara Rava
San Diego, California
tarazolnikov@gmail.com

Background

Currently, there are more than 11 million acquired immune deficiency syndrome (AIDS)-affected orphans that suffer from various adverse effects, most of whom reside in sub-Saharan Africa. The difference between whether a child resides in a rural or urban environment can have a significant role in a child's education, health status and access to healthcare, and social or family relationships.

Methods

A systematic review was conducted in order to understand these environment-based differences on orphans directly affected by human immunodeficiency virus infection (HIV)/AIDS in sub-Saharan Africa. There were 233 sources used for this review; however, 164 manuscripts focused more on a general review of orphans within a rural or urban environment. Thus, after eliminating for various factors, 69 manuscripts were used, which focused primarily on the social aspect of orphans due to HIV/AIDS.

Results

Rural environments provided more family support, while urban environments generally had more resources available to orphans (e.g. school fees). Unfortunately, both rural and urban environments were found to be fairly non-supportive of orphans and their development. This systematic review found, in general, that orphans in both urban and rural environments continue to suffer from the iatrogenic effects of low parental support due to AIDS mortality.

Conclusions

These conclusions continue to support an increase in developmental support through school and social relationships specific to orphans throughout sub-Saharan Africa.

ED_001703B_00003475_152_0b8d0d59-6bfb-6510-a668-c7f083f4c9dc

Improved Relationships in Eastern Kenya from Water Interventions and Access to Water

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(2) Shepherd's Village, Narok, Kenya
(3) Human Development and Family Science, North Dakota State University, North Dakota, USA

Corresponding author:
Zolnikov, Tara Rava
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tarazolnikov@gmail.com

Background

Global health interventions focus on providing solutions to unaddressed public health issues in low- and middle-income countries. Providing nearby access to safe drinking water is a primary public health concern and a frequent public health intervention throughout sub-Saharan Africa; access to water eliminates long gathering and transport time and provides an individual with more personal time. Previous research has not reviewed the aspect of time and relationship changes after implemented water interventions.

Method

A qualitative phenomenological approach used 52 semistructured interviews to examine relationship experiences among primary water gatherers and their families after receiving nearby access to water. The study group consisted of men and women from approximately 7 years old to 75 years old. This study took place throughout the historically semiarid eastern region in Kitui, Kenya, where community members have been beneficiaries of various water interventions. Ethical approval was granted by both North Dakota State University and Moi University.

Results

Before the water intervention, family members experienced difficulties with irregular meal times and food availability, infrequent family conversations, irritation with lack of bathing and cleanliness, and general discontent without the availability of 1 able-bodied family member. Participants' experiences after implemented water interventions revealed enhanced relationships within household family units; additional personal time was gained and used to rebuild relationships. The newly established relationships included constructive discussions and conversations built around understanding and developing solutions to address economic or individual challenges encountered by the family.

Conclusions

This study's findings suggest that relationships significantly improved after households receive access to nearby water. Furthermore, this research provides evidence of an increased need for access to quality water for communities throughout the world to positively contribute to constructive family relationships.

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A Review on Managing and Treating Mercury Emissions in Small Artisanal Gold Mining

Tara Rava Zolnikov (1,2), Gavin Hilson (3)

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(2) Shepherd's Village, Narok, Kenya
(3) Sustainability in Business, University of Surrey, Surrey, United Kingdom

Corresponding author:
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tarazolnikov@gmail.com

Background

Small artisanal gold mining (SAGM) continues to be a pervasive public health issue worldwide, affecting miners as well as both children and women. While there are various problems associated with SAGM, mercury exposure is the primary hazard contributing to adverse health effects in exposed human populations.

Methods

A literature review was conducted in order to specifically assess the impact of current mercury interventions within the entire SAGM industry. To aid in this review, a resource pool of information on SAGM and mercury emissions, treatment and management of emissions, and interventions was assembled through a search conducted via multiple search engines.

Results

Mercury usage continues to be largely embedded in the handling, processing, and extraction techniques of SAGM; however, current interventions have been implemented worldwide to focus specifically on reducing or eliminating mercury emissions through education, processing centers, or mercury alternative techniques. Education focused on environment or health awareness or more specifically on alternative techniques. Processing centers offered areas of large-scale technology centers for small-scale miners. Alternative techniques included retorts, vat-leaching, magnets, direct smelting of gold, and borax. Results determined positive and negative outcomes associated with every intervention, thereby confirming the fact that a single solution managing and treating mercury currently does not exist.

Conclusions

Ultimately, the need for novel techniques addressing mercury emissions in SAGM needs to be pushed to the forefront of critical issues in public health in order to aid in developing positive change in the industry.

ED_001703B_00003475_154_f00b2521-2f0a-6eb0-59c7-17eb1b3353a6

Message

From: Hackel, Angela [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=B2E0A52DBEBC4D8C84961F50C117334D-HACKEL, ANGELA]
Sent: 3/12/2018 8:55:55 PM
To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]
Subject: Draft March CEH Bulletin for Review
Attachments: Mar. 2018 Bulletin Draft2.docx

Hi Ruth,

Attached is the March bulletin for your review. Please note, that Brenda and I reviewed and provided input on this version.

If I could get your edits by mid-day Weds. that would be great.

Thank you and have a nice day,

Angela

Angela Hackel, M.A.
Director, Program Implementation and Coordination Division
Office of Children's Health Protection | Office of the Administrator
U.S. Environmental Protection Agency
Room 1131 EPA West Building
Washington, DC 20460
Office: 202.566.2977

Message

From: Schroeder, Kathleen [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=0DB676B2FADE4B54BEBCC7B6E664FC94-SCHROEDER,]
Sent: 6/15/2016 12:26:36 PM
To: AO-OCHP-Everyone [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=222d03d48d634481af638d4892296469-AO-OCHP-Everyone]
Subject: Glyphosate/CARC

House Panel Investigating Possible EPA Staff Split On Glyphosate Risk

June 14, 2016

The House panel investigating EPA's oversight of glyphosate is seeking to determine whether agency scientists are split over whether the nation's most commonly-used herbicide is likely to cause human cancers, potentially complicating the agency's ongoing cancer analysis of the substance, according to a source with the panel.

There may be two "groups within EPA that have different feelings on the impacts of glyphosate," a committee aide tells *Inside EPA*, explaining a motivation behind the panel's recent inquiry into EPA's ongoing cancer analysis of the herbicide. "Our concern is ensuring that they are going to make that decision based on sound science, and that there isn't any political motivation involved."

House science panel Chairman Lamar Smith (R-TX), in May and June letters to EPA Administrator Gina McCarthy, has questioned EPA's handling of the glyphosate review, and requested documents and staff interviews to support the panel's oversight.

The congressional inquiry began after EPA April 29 posted its "Cancer Assessment Document: Evaluation of the Carcinogenic Potential of Glyphosate" finding the substance is unlikely to cause cancer and then subsequently withdrew that document along with a dozen others May 2.

The report by EPA's pesticides office's Cancer Assessment Review Committee (CARC) faults the World Health Organization International Agency for Research on Cancer's (IARC) March 2015 report that concluded glyphosate probably causes cancer.

The IARC finding broadened advocates' calls for greater restrictions on glyphosate, which had largely focused on ecological concerns, to focus more on risks to human health. Glyphosate is commonly used on genetically-modified crops, but advocates are urging EPA to ban the substance due to concerns about its health impacts.

EPA's withdrawn report faults the IARC review, in which some EPA scientists participated, saying IARC overlooked negative findings, which could have influenced the group's conclusions.

In a May 4 letter, Smith faulted EPA's release and subsequent withdrawal of its glyphosate cancer review, and requested all documents and communications informing that analysis, dating back to Jan. 1, 2015. Smith said the move raised questions about EPA's motivation to provide a fair review of glyphosate and suggested broader problems with agency chemical risk reviews.

Smith's Concerns

In a June 7 letter, Smith reiterated his concerns and requested transcribed interviews with four EPA pesticides and research office officials, including some that participated in the IARC review.

A House science committee aide tells *Inside EPA* that the panel has a lot of questions about why EPA published and then withdrew its CARC review, which was marked "final," and found glyphosate is unlikely to cause cancer. An agency spokeswoman told *Inside EPA* in May that the documents were "preliminary" and were "taken down because EPA's assessment is not final."

The purpose of the House inquiry, the committee source says, is to ensure that EPA's analysis of glyphosate is based on scientific findings, rather than political motivations. The source also says that the panel could address its concerns through legislation, though lawmakers have not yet begun to consider that prospect.

"I think there is probably a legislative option, but we haven't explored that yet until we get more information from the agency," the source says.

Additionally, EPA has told the House panel that staff is currently searching for documents in response to the May request, though the agency has not been clear on what documents staff will provide or when.

The House oversight committee is interested to learn "whether there is some sort of struggle or some argument between what may be competing groups about how they feel about the potential impacts of glyphosate," the source says.

Smith's inquiry into EPA's review of glyphosate is at least the second time this year the House panel has questioned agency processes for reviewing chemicals' risks.

This spring, Smith raised questioned EPA's management of and motivation to improve its controversial Integrated Risk Information System (IRIS) chemical review program. In May, Smith requested numerous documents on the IRIS program, and then, in a June 2 follow-up letter, threatened to subpoena the documents after EPA had missed his deadline for providing the records. -- *Dave Reynolds* (dreynolds@iwpnews.com)

)

Kathleen Schroeder, MD, MSI
Senior Environmental Employee
US EPA
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202-566-2279

Message

From: stilp.mark@epa.gov [stilp.mark@epa.gov]
Sent: 3/2/2017 10:19:52 PM
To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]
Subject: Litigation Hold, EELI v. EPA, FOIA re Ramazzini, glyphosate, risk assessments
Attachments: Complaint_Docket_US_DIS_DCD_1.16cv1928_09.29.2016.pdf

Ex. 5 - Attorney Work Product

Message

From: Reed, Khesha [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=C62327CEE1FD4DA29A1CC485EFE546F7-REED, KHESHA]
Sent: 10/14/2016 4:46:56 PM
To: Dzubow, Rebecca [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=403ca1721f3d43d38de9189a93a95b76-Dzubow, Rebecca]; Berger, Martha [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=58f5ef445e4d4dc694a2d4fb35951b9a-Mberger]
CC: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]
Subject: FW: Next steps - Papers for OCHP review
Attachments: Issue Paper_Chlorpyrifos_4 October 2016.docx; Issue Paper_Glyphosate_ 4 October 2016_clean.docx; Issue Paper_Zika_4 October 2016.docx; Lead Transition Paper_4 October 2016_HK-dan.docx; PCBs Schools Transition Paper_4 October 2016 -dan.docx; TSCA Issue Paper_4 October 2016 -dan.docx; Draft Emerging Contams Issue Paper 10-13-16.docx

See email below and attachments. We have a lot to get done by Monday. There are a total of 7 transition papers to be reviewed. Since Rebecca is a one woman shop in RSSPD today, here are my thoughts on how we attack this task.

Ex. 5 - Deliberative Process

Sound like a plan?

Khesha

From: Wiggins, Lanelle
Sent: Friday, October 14, 2016 12:04 PM
To: Reed, Khesha <Reed.Khesha@epa.gov>; Etzel, Ruth <Etzel.Ruth@epa.gov>
Cc: Allen, Reginald <Allen.Reginald@epa.gov>
Subject: Fw: Next steps - Papers for OCHP review

Hi,

Attached are the Transition Issue papers that OCHP requested to review (for which I am the POC). You have, or will soon, receive the others from the other respective POCs. Please forward your comments on these to me no later than **mid day Monday (10/17).**

Thanks,
Lanelle Wiggins
202-566-2372

From: "Reed, Khesha" <Reed.Khesha@epa.gov>
Date: October 13, 2016 at 5:25:26 PM EDT
To: "Gentile, Laura" <Gentile.Laura@epa.gov>
Subject: FW: DAA/DRA -- Call for Transition Issue Papers by Oct 4

Laura,

Apologies if you already received this email from me. Below is the list of Transition Papers that OCHP would like to review.

Thanks for your help.

Khesha Ex. 6 cell

On Oct 5, 2016, at 7:14 AM, Allen, Reginald <Allen.Reginald@epa.gov> wrote:

Here is the excel sheet with all the papers – sorry to say that most were due in yesterday.

I am checking the OP Transition POCs to determine the best wayahead to allow OCHP input.

In the mean time you or Khesha can reach out to the POC and check and maybe work it that but in any case it would have to a quick turn.

Sorry for getting this to you late.

Reggie

Reginald E. Allen

Director, Administrative and Executive Services

Office of the Administrator

U.S. Environmental Protection Agency

Office 202-564-0444

Direct 202-564-1029

Cell Ex. 6

AO SharePoint Site

From: Etzel, Ruth
Sent: Thursday, September 29, 2016 4:38 PM
To: Allen, Reginald <Allen.Reginald@epa.gov>
Cc: Reed, Khesha <Reed.Khesha@epa.gov>
Subject: FW: DAA/DRA -- Call for Transition Issue Papers by Oct 4

Hi Reggie,

Khesha and I appreciated the opportunity to review the list of transition issue papers. We would like you to ask that OCHP be added as a collaborator on the following issue papers:

Chlorpyrifos & Glyphosate

Lead

New TSCA

PCBs in schools

Zika

Climate Resilience

Tire Crumb

Emerging Drinking Water Contaminants

East Chicago

Flint

Would you happen to have a list of the point person for each issue paper? Given the short time frame, I'd like to call them directly, if possible.

Many thanks!

Ruth

From: "Allen, Reginald" <Allen.Reginald@epa.gov>
Date: September 29, 2016 at 9:56:19 AM EDT
To: "Reed, Khesha" <Reed.Khesha@epa.gov>
Subject: FW: DAA/DRA -- Call for Transition Issue Papers by Oct 4

As discussed

Reginald E. Allen

Director, Administrative and Executive Services

Office of the Administrator

U.S. Environmental Protection Agency

Office 202-564-0444

Direct 202-564-1029

Cell Ex. 6

AO SharePoint Site

From: Kenny, Shannon
Sent: Friday, September 16, 2016 12:11 PM
To: DAA-Career <DAACareer@epa.gov>; DRA <DRA@epa.gov>; Hull, George <Hull.George@epa.gov>; Richardson, RobinH <Richardson.RobinH@epa.gov>; Caraballo, Mario <Caraballo.Mario@epa.gov>
Cc: Transition Coordinators <Transition_Coordinators@epa.gov>; 2016OPTransitionTeam <2016OPTransitionTeam@epa.gov>; Grantham, Nancy <Grantham.Nancy@epa.gov>; Siciliano, CarolAnn <Siciliano.CarolAnn@epa.gov>
Subject: DAA/DRA -- Call for Transition Issue Papers by Oct 4

All,

Thank you again for all of your thoughtful input on the transition effort to date.

Our next step is to begin drafting short **issue papers** on key topics. Attached please find the list of 30 papers we ask that you develop - along with a lead office or region, and a suggested list of collaborating offices/regions, for each paper - by **October 4**. We have also included a **2-page template** we ask that you follow.

The list was developed based upon your input, input from your transition coordinators, OPA, OCIR, and OP, as well as information about the campaigns and our learning from previous landing teams.

My team will work through your Transition Coordinators to provide clear instructions for putting these draft papers into Sharepoint for review no later than October 4.

Ex. 5 - Deliberative Process

Please note that this is not a complete inventory of the briefing materials to be provided to the landing team. I will be in touch with many of you soon to discuss what additional materials we want to work on.

Please give me a call anytime if you would like to discuss.

Shannon

<Issue Papers_All_Issues_Final.xlsx>

Message

From: Dzubow, Rebecca [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=403CA1721F3D43D38DE9189A93A95B76-DZUBOW, REBECCA]
Sent: 2/5/2016 8:26:25 PM
To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]
CC: Schroeder, Kathleen [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=0db676b2fade4b54bebcc7b6e664fc94-Schroeder,]
Subject: RE: Zika communications
Attachments: 2015 Briefing Milk Study_OCHP_Sept_8_2015_BS (4).pdf

Ruth,

Kathy reminded me that OPP briefed us in September on a breast milk study. I'm attaching the slides here. Of relevance, malathion and permethrin were detected in this study.

Just to reiterate something you know well, and I'm sure OPP would want me to say, is that the presence in breast milk does not necessarily signify risk.

Also, Kathy found the following additional citations:

Pyrethroids: http://www.ncbi.nlm.nih.gov/pubmed/25027720
http://www.ncbi.nlm.nih.gov/pubmed/23850662
http://www.ncbi.nlm.nih.gov/pubmed/19557612
http://www.ncbi.nlm.nih.gov/pubmed/16564119 [in context of anti-malarial use]

Multiple pesticides: http://www.ncbi.nlm.nih.gov/pubmed/25011502
http://www.ncbi.nlm.nih.gov/pubmed/23850662 [same group as above citation]
http://www.ncbi.nlm.nih.gov/pubmed/22009134

Malaria control pesticides and breast milk: http://www.ncbi.nlm.nih.gov/pubmed/20019894

~~~~~~

Rebecca C. Dzubow, MPH, MEM
Health Scientist
U.S. EPA Office of Children's Health Protection | Regulatory Support and Science Policy Division
1200 Pennsylvania Avenue, NW (1107T) | Washington, DC 20460
(202) 564-0967

From: Dzubow, Rebecca
Sent: Friday, February 05, 2016 2:52 PM
To: Etzel, Ruth <Etzel.Ruth@epa.gov>
Cc: Schroeder, Kathleen <Schroeder.Kathleen@epa.gov>
Subject: RE: Zika communications

I didn't find much about these in breast milk. Maybe Kathy can use her library skills to find more information?

Malathion: http://www.ncbi.nlm.nih.gov/pubmed/12693830

Pyrethroids: http://www.ncbi.nlm.nih.gov/pubmed/22717642 ; http://www.ncbi.nlm.nih.gov/pubmed/25261753
~~~~~~

~~~~~~

Rebecca C. Dzubow, MPH, MEM
Health Scientist
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1200 Pennsylvania Avenue, NW (1107T) | Washington, DC 20460
(202) 564-0967

From: Etzel, Ruth
Sent: Friday, February 05, 2016 1:50 PM
To: Dzubow, Rebecca <Dzubow.Rebecca@epa.gov>
Cc: Schroeder, Kathleen <Schroeder.Kathleen@epa.gov>
Subject: Re: Zika communications

This is helpful, thanks! I guess what I was worried about was whether we know if these substances get in to breast milk and how much gets in? Is there data?

Sent from my iPhone

On Feb 5, 2016, at 1:08 PM, Dzubow, Rebecca <Dzubow.Rebecca@epa.gov> wrote:

> Ruth,
>
> In general, if a pesticide is registered for use, it should be protective of all populations including pregnant women, infants, and children (when used according to the label).
>
> Organophosphates (Temephos, Malathion, Naled) are generally of concern based on the epi studies for chlorpyrifos showing neurodevelopmental risk. Newer risk assessments are currently under public review, and if finalized will require uses some or all uses to be cancelled. (I cannot speak to the safety of the mosquito use alone).
>
> Pyrethroids (Permethrin, Resmethrin, Sumithrin, Prallethrin, Etofenprox) – there is ongoing research, and a FIFRA SAP meeting was held last May: "Research to Evaluate the Potential for Juvenile Sensitivity to Pyrethroids. Pyrethroids and Pyrethrins have been considered under a cumulative risk assessment, and has the cumulative exposure has been determined to be safe.
>
> Just to be sure, I checked to see if there are any outstanding concerns, as currently registered by EPA, and there are none for the remaining active ingredients listed below.
>
> Rebecca
>
> ~~~~~~
>
> Rebecca C. Dzubow, MPH, MEM
> *Health Scientist*
> U.S. EPA Office of Children's Health Protection | Regulatory Support and Science Policy Division
> 1200 Pennsylvania Avenue, NW (1107T) | Washington, DC 20460
> (202) 564-0967
>
> ---
>
> **From:** Etzel, Ruth
> **Sent:** Friday, February 05, 2016 10:07 AM
> **To:** Dzubow, Rebecca <Dzubow.Rebecca@epa.gov>
> **Cc:** Schroeder, Kathleen <Schroeder.Kathleen@epa.gov>
> **Subject:** Re: Zika communications
~~~~~~

Hi Rebecca,

This is super! I would like to share with children's health people in regions. But first, can you assess which of these should not be used during pregnancy and breastfeeding?

Thank you!

Ruth

Sent from my iPhone

On Feb 3, 2016, at 2:05 PM, Dzubow, Rebecca <Dzubow.Rebecca@epa.gov> wrote:

> Ruth,
>
> Below is the messaging sent to the regions on Zika. Also, I looked through these websites and there is no mention of DDT use.
>
> Active ingredients in EPA-registered skin-applied insect repellents:
> - Catnip oil
> - Oil of citronella
> - DEET
> - IR 3535
> - Picaridin
> - p-Menthane-3,8-diol (Oil of Lemon Eucalyptus)
> - 2-undecanone
>
> EPA-registered mosquito larvicides
> - Bacterial insecticides: Bacillus thuringiensis israelensis, Bacillus sphaericus
> - Insect growth inhibitors: S-Hydroprene, S-Kinoprene, Methoprene, S-Methoprene
> - Organophosphates: Temephos
> - Other: Mineral Oils, Monomolecular films
>
> EPA-registered mosquito adulticides
> - Organophosphates: Malathion, Naled
> - Synthetic Pyrethroids: Permethrin, Resmethrin, Sumithrin, Prallethrin, Etofenprox
>
> Misting Systems:
> - Permethrin
> - Pyrethrins
> - Piperonyl butoxide
>
> ~~~~~~
>
> Rebecca C. Dzubow, MPH, MEM
> *Health Scientist*
> U.S. EPA Office of Children's Health Protection | Regulatory Support and Science Policy Division
> 1200 Pennsylvania Avenue, NW (1107T) | Washington, DC 20460
> (202) 564-0967

From: Strauss, Linda
Sent: Wednesday, February 03, 2016 1:43 PM
To: Dzubow, Rebecca <Dzubow.Rebecca@epa.gov>
Subject: RE: Zika communications

Absolutely – here's what I sent to them. Let me know if you need more.

Note to Regional PADs and Pesticide DD/BCs

List of EPA and CDC Resources on Preventing Mosquito-Borne Illnesses

With outbreaks of mosquito-borne illnesses such as Dengue in Hawaii and Zika in Puerto Rico, we want to make sure the EPA Regions have the information they need to communicate about mosquito-borne illnesses. Below are some basic resources (additional sites are included within those links).

Insect repellents registered by the EPA can be expected to repel mosquitoes carrying these diseases, provided the EPA-approved labeling says the product is for use to protect against mosquitoes in general or against *Aedes* mosquitoes in particular. EPA must have reviewed and accepted data to support these claims. Insect repellents are one part of a more comprehensive program to control mosquitoes and prevent bites. We recommend integrated pest management as well. This includes excluding mosquitoes from the home by using window and door screens, dressing in light-colored clothing, long pants, and long sleeves, avoiding areas where mosquitoes are present, and removing sources of standing water to prevent breeding.

EPA Resources

Insect Repellents: www.epa.gov/insect-repellents
Mosquito Control: www.epa.gov/mosquitocontrol
Disease-Specific Links: www.epa.gov/insect-repellents/using-repellent-products-protect-against-mosquito-borne-illnesses ***(new)***

CDC Resources

www.cdc.gov/features/stopmosquitoes/
www.cdc.gov/zika/
www.cdc.gov/chikungunya/

We are working closely the Centers for Disease Control and Prevention (CDC) and with other federal, state, and local agencies to protect the public from mosquito-borne diseases. For information about our roles, visit www.epa.gov/mosquitocontrol/joint-statement-mosquito-control-united-states.

For all media inquiries, please contact: Cathy Milbourn and copy Monica Lee and Nick Conger

For all technical inquiries, please contact: Jackie Mosby and copy Anne Overstreet

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From: Dzubow, Rebecca
Sent: Wednesday, February 03, 2016 1:00 PM
To: Strauss, Linda <Strauss.Linda@epa.gov>
Subject: Zika communications

Hi Linda,

The Office of Children's Health Protection (OCHP) is interested in keeping engaged on EPA's response and communications on the Zika virus. OCHP's director, Ruth Etzel, recently spoke with Louise Wise and learned of a communications package sent to the Regions. Would you be willing to share that with us? It would be great if you could keep OCHP in mind when developing and distributing any messaging on this topic.

Thanks so much,
Rebecca

~~~~~~

Rebecca C. Dzubow, MPH, MEM
Health Scientist
U.S. EPA Office of Children's Health Protection | Regulatory Support and Science Policy Division
1200 Pennsylvania Avenue, NW (1107T) | Washington, DC 20460
(202) 564-0967
~~~~~~

Message

From: Spire, Paul [PSpire@aap.org]
Sent: 1/28/2016 11:30:12 PM
To: robertsj@musc.edu [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=5cacdc65e9a1449ab33f72777542647d-robertsj@musc.edu]
CC: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Lowry, Jennifer [jlowry@cmh.edu]
Subject: FW: carbon monoxide, cold and heat, & pesticides
Attachments: 26 Carbon Monoxide.docx; 27 Cold and Heat.docx; 39 Pesticides.docx

Hi Jimmy.

I am writing to follow-up on the discussion below, as I don't believe we ever came to a conclusion regarding your possible revision of the Pesticides chapter. If you would be willing and able to take this on, we would very sincerely appreciate it. We realize you've already got two others, so we could be very flexible on the timeline. 3 - 4 months would be fine, possibly a little longer if it would help sway you. Thanks much for considering.

Best,

Paul

From: Spire, Paul
Sent: Monday, October 26, 2015 4:34 PM
To: Roberts, James <robertsj@musc.edu>
Cc: Etzel, Ruth <etzel.ruth@epa.gov>; Lowry, Jennifer <jlowry@cmh.edu>
Subject: carbon monoxide, cold and heat, & pesticides

Hi Jimmy.

Thanks much for your reply and for your support.

We've got you down for the "Carbon Monoxide" and "Cold and Heat" chapters. I have attached Word versions of these from the previous edition green book to use as a starting point for revision. Track Changes has been enabled, and if you are comfortable doing so, it would be helpful if you could update the document using this feature.

Regarding "Pesticides," you are correct that Mark Miller had led this chapter in the past, but the editorial team had conferred and wanted to ask if you would lead the revision this time around. It was recalled that there were some issues with the previous version, and our recollection was that you and the editors ended-up doing the reworking. Also, although we can reach-out to non-AAP-members to contribute to the green book, it was noted that Mark dropped his Academy membership about 5 years ago. If you're willing and able, it seemed like a better fit to ask you as a current member and the lead-author on the AAP's pesticides statement. This chapter is attached as well for your consideration. Please let us know what you think. Since this would be a third chapter for you, if you'd need a bit more time on this one, we could definitely have some flexibility on the deadline.

Thanks again for considering.

Paul

From: Roberts, James R. [mailto:robertsj@musc.edu]
Sent: Friday, October 23, 2015 4:08 PM

To: Spire, Paul <PSpire@aap.org>
Cc: Etzel, Ruth <etzel.ruth@epa.gov>; Lowry, Jennifer <jlowry@cmh.edu>
Subject: Re: Invitation to contribute to the AAP's Pediatric Environmental Health, 4th Ed manual (Green Book)

Hey Paul
Sorry about that, this wS on my list of things to come back to and in fact I was checking email with this in mind when I saw your other one.

In terms of chapters:
Yes on carbon monoxide and yes on cold and heat.

For pesticides I wanted to check again in case there was a mistake. Mark Miller authored the chapter. I was the primary reviewer. So I didn't know if you wanted a fresh stab at it or if you meant to ask Mark.
Thanks
Jimmy

Sent from my iPhone

On Oct 23, 2015, at 4:43 PM, Spire, Paul <PSpire@aap.org> wrote:

> Hi Jimmy.
>
> It appears that we have not heard back from you yet regarding the email below. We sure would appreciate your support as we try to move the Green Book forward!
>
> Many thanks for considering,
>
> Paul

> **From:** Spire, Paul
> **Sent:** Thursday, October 01, 2015 5:22 PM
> **To:** Roberts, James <robertsj@musc.edu>
> **Cc:** Etzel, Ruth <etzel.ruth@epa.gov>; Lowry, Jennifer <jlowry@cmh.edu>
> **Subject:** Invitation to contribute to the AAP's Pediatric Environmental Health, 4th Ed manual (Green Book)
>
> Dear Dr. Roberts,
>
> I am writing on behalf of Editor Dr. Ruth Etzel and AAP Council on Environmental Health Chairperson Dr. Jennifer Lowry to invite your participation in the development of the 4th Edition of the AAP's landmark *Pediatric Environmental Health* manual.
>
> *Pediatric Environmental Health*, often referred to as "The Green Book," is the comprehensive AAP guide to the identification, prevention, and treatment of pediatric environmental health problems. Authored under the leadership of the AAP's Council on Environmental Health, the manual will be fully updated and substantially expanded for the forthcoming 4th edition, including new chapters on personal care products, alternative nicotine products, obesity, and fracking. The book will be published in both hard-copy and e-book formats. Development of a companion mobile app is also being actively explored.
>
> We would like to invite your participation in revising or developing the following chapters:

- **Carbon Monoxide** (revision)
- **Cold and Heat** (revision)
- **Pesticides** (revision)

In considering this opportunity, please note the following:

- Drafts chapters should be developed in Microsoft Word. For chapters that existed in the 3rd edition, the previous version will be provided in Word format to serve as a starting point for revision.
- Draft chapters are requested by January 29, 2016.
- A model chapter outline is attached.
- Draft chapters will be edited by the Green Book editorial team and by the Council on Environmental Health Executive Committee. Additionally, chapters will be subject to the Academy's internal stakeholder and policy development review, and you may be requested to help address issues identified through these processes. The AAP Board of Directors retains the final determination and approval of all manual content.
- Your contribution will be acknowledged in the compiled list of contributors that appears at the beginning of the book, but individual chapters will not be attributed to specific authors per Academy policy. All chapters and overall manual authorship will be attributed to the AAP Council on Environmental Health.

The Pediatric Environmental Health manual plays an important role in protecting children from environmental health hazards by providing a recognized, authoritative, and well-regarded resource for education and policy on these critically important issues. We hope you will support and contribute to the effort to update and expand this essential resource.

Your response to this invitation is requested by Friday, October 16. If you have any questions regarding the manual or the development process, please do not hesitate to contact Drs. Etzel or Lowry through my attention at pspire@aap.org.

Sincerely,

Paul

Paul Spire
Manager, Division of Technical & Medical Services
American Academy of Pediatrics
phone: Ex. 6
email: pspire@aap.org

<model chapter 4th edition green book.docx>

Message

From: Schroeder, Kathleen [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=0DB676B2FADE4B54BEBCC7B6E664FC94-SCHROEDER,]
Sent: 7/5/2016 1:26:51 PM
To: Curtis, Mellasonda [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=acf49921e9ad4fa9a95819e18d9e69a4-Curtis, Mel]
CC: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]
Subject: FW: WHO PowerPoint module
Attachments: PESTICIDES.ppt

Hi, Sonda;

Please schedule a meeting for Ruth and me(see Ruth's message below). I am not free Wednesday 10 – 11 AM, but otherwise am open.

Thank you!

Kathy

Kathleen Schroeder, MD, MSI
Senior Environmental Employee
US EPA
Office of Children's Health Protection

schroeder.kathleen@epa.gov
202-566-2279

From: Etzel, Ruth
Sent: Tuesday, July 05, 2016 9:06 AM
To: Schroeder, Kathleen <Schroeder.Kathleen@epa.gov>
Subject: WHO PowerPoint module

Hi Kathy,

I would like you to develop a short case study on pesticide poisoning, using the example of the family poisoned by methyl bromide in the Virgin Islands. It will be for us to use at the Pre Congress Workshop in Vancouver.

I hope that the attached WHO slides will be helpful to you. The last 4-5 slides show an example of a case study. I hope that you have enough clinical details about the family's poisoning to add those to the case study. If not, make the best of what you have.

Would you please set up a time with Sonda so that we can meet to discuss this?

Best,

Ruth

Ruth A. Etzel, MD, PhD
Director
Office of Children's Health Protection
U.S. Environmental Protection Agency
Room 1144 EPA West Building

Washington, DC 20460
Office: 202-564-2188

TRAINING FOR THE HEALTH SECTOR

[Date …Place …Event…Sponsor…Organizer]

PESTICIDES

Children's Health and the Environment

WHO Training Package for the Health Sector

World Health Organization

www.who.int/ceh

1

<<NOTE TO USER: Please add details of the date, time, place and sponsorship of the meeting for which you are using this presentation in the space indicated.>>

<<NOTE TO USER: This is a large set of slides from which the presenter should select the most relevant ones to use in a specific presentation. These slides cover many facets of the problem. Present only those slides that apply most directly to the local situation in the region.>>

LEARNING OBJECTIVES

- Learn about pesticides – what they are and what are the risks they may pose?
- Identify the scenarios – where and when are children exposed?
- Recognize signs, symptoms and diseases that may be related to pesticide exposure in children
- Know how to prevent and treat children's pesticide exposure

<<READ SLIDE.>>

OVERVIEW

- What are pesticides?
- Origin, environmental transport and fate of pesticides
- Routes and circumstances of exposure
- Exposure levels
- Toxicokinetics and toxicodynamics
- Target organs and systems
- Diagnosis and treatment of poisoning
- Prevention of pesticide exposure and poisoning

<<READ SLIDE.>>

ED_001703B_00003880_02_287748f6-aa79-b1e0-f323-2ee0de30ba7a

PESTICIDES – RISKS AND BENEFITS

BENEFITS

- Crop protection
- Food preservation
- Material preservation
- Disease control

RISKS

- Toxic to humans
- Impact on environment and ecosystems

Pesticides have numerous beneficial effects. These include crop protection, preservation of food and materials and prevention of vector-borne diseases.
For example pesticides may be used in the prevention of malaria, which kills up to 1 million children per year, and for preventing other vector-borne diseases such as dengue, leishmaniasis and Japanese encephalitis.
Pesticides are toxic by design – they are BIOCIDES, designed to kill, reduce or repel insects, weeds, rodents, fungi or other organisms that can threaten public health and the economy.
Their mode of action is by targeting systems or enzymes in the pests which may be identical or very similar to systems or enzymes in human beings and therefore, they pose risks to human health and the environment.
Pesticides are ubiquitous in the environment and most are synthetic.
There is growing concern about children's exposure to pesticides and their special susceptibility. Children are not little adults, and may have higher exposures and greater vulnerability at both high and low levels of exposure.

Ref:
National Resource Council. Pesticides in the diets of infants and children. National Academy Press, Washington, DC, 1993.

USE OF PESTICIDES

- First use of synthetic pesticides: 1940
- Consumption increasing worldwide
  - 2.26 million tons of active ingredients used in 2001
  - 25% of the world production used in developing countries... where 99% of deaths due to pesticides occur!

<<READ SLIDE.>>

a) First use of synthetic pesticides: 1940

b) Consumption increased substantially over time, for example, in the USA, the use of pesticides doubled from 1960 to 1980, but total use has since remained stable or fallen. Most pesticides are used in agriculture, but in 1999 about 74% of households in USA were reported to use at least one pesticide in the home.

c) Use has risen in developing countries and the fastest growing markets in Africa, Asia, South and Central America, Eastern Mediterranean. There is a high pesticide use on crops grown for export (Dr. N. Besbelli, WHO, personal communication).

d) Although developing countries use only 25% of the pesticides produced worldwide, they experience 99% of the deaths. This is because use of pesticides tends to be more intense and unsafe, and regulatory, health and education systems are weaker in developing countries.

Refs:

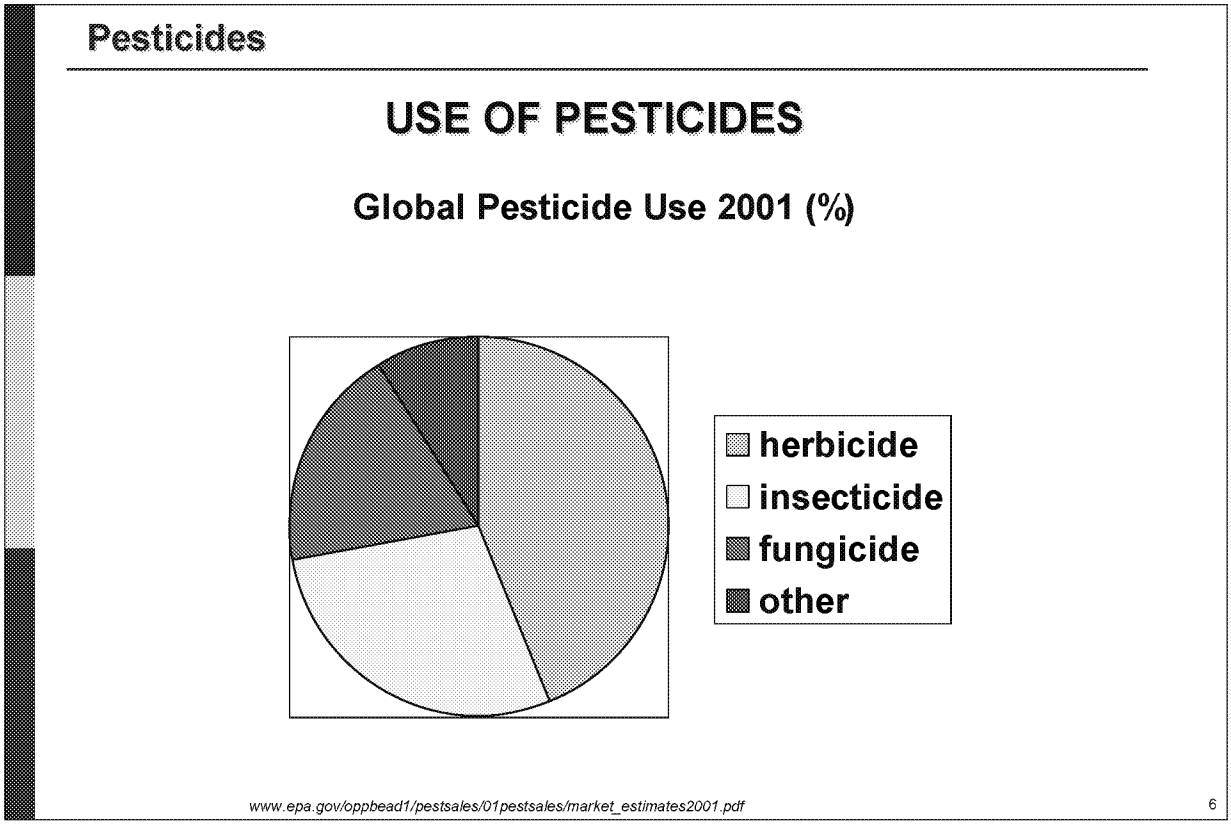
American Academy of Pediatrics Committee on Environmental Health. Pesticides. In: Etzel RA ed. Pediatric Environmental health. 2nd ed. Elk Grove Village, American Academy of Pediatrics, 2003.

Jeyaratnam J. Acute pesticide poisoning: a major global health problem. World Health Stat Quarterly, 1990.

UNEP United Nations Children´s Fund and WHO. Children in the new millennium: environmental impact on health. UNEP, UNICEF, WHO, 2002.

US EPA Pesticides industry sales and usage: 2000 & 2001 market estimates: (www.epa.gov/oppbead1/pestsales/01pestsales/market_estimates2001.pdf).

Vaagt G. New code of conduct on pesticide adopted. FAO Newsroom (www.fao.org/english/newsroom/news/2002/10525-en.html).



The pie chart shows the global use of pesticides and the different types.
Insecticides are mostly used in developing countries and fungicides/herbicides in developed countries.

<<READ SLIDE.>>

Refs:

American Academy of Pediatrics Committee on Environmental Health. Pesticides. In: Etzel RA ed. Pediatric Environmental health. 2nd ed. Elk Grove Village, American Academy of Pediatrics, 2003.

Jeyaratnam. Acute pesticide poisoning: a major global health problem. World Health Stat Quarterly, 1990.

UNEP United Nations Children´s Fund and WHO. Children in the new millennium: environmental impact on health. UNEP, UNICEF, WHO, 2002.

US EPA Pesticides industry sales and usage: 2000 & 2001 market estimates: (www.epa.gov/oppbead1/pestsales/01pestsales/market_estimates2001.pdf).

Vaagt. New code of conduct on pesticide adopted. FAO Newsroom (www.fao.org/english/newsroom/news/2002/10525-en.html).

USE OF PESTICIDES – TYPES OF PRODUCT

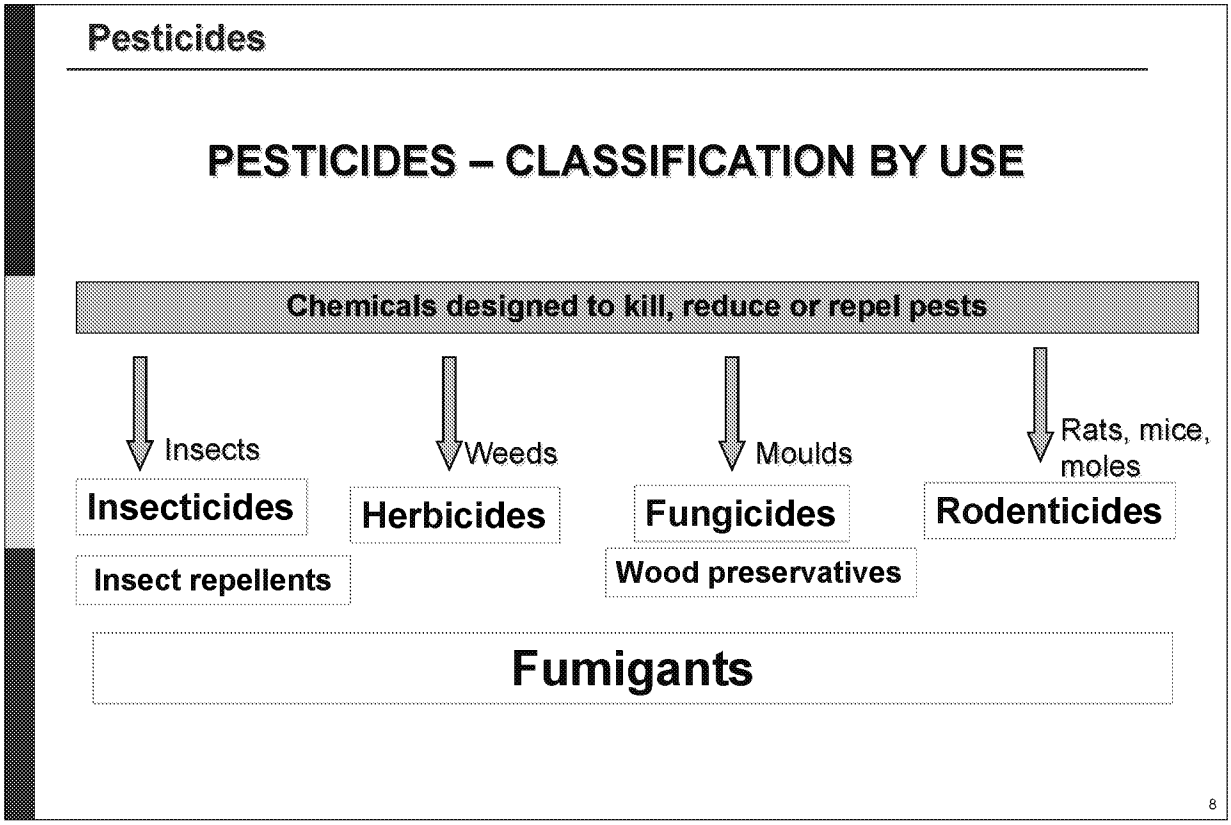
- **Pesticides used in different settings:** - Agricultural
  - Veterinary
  - Domestic
  - Institutional
- **Formulations:** liquid, gel, paste, chalk, powder, granules, pellets, baits...
- **Concentrations:** from 2% to 80% of active ingredient
- **Containers:** glass, plastic or metal flasks, bottles, drums, traps, plastic bags or paper bags....

Pesticides are used in different settings.

<<READ SLIDE.>>

It is important to consider the presentation, concentration and formulation of the products, as the toxic effects depend on the physical state of the product and also on the characteristics of the solvent or other substances contained in the formulation. "Chalk" pesticide has been sold illegally in the USA, it may contain pyrethroids. (See US EPA website.)
The rate of absorption depends upon the presentation of the product: volatile pesticides and fine powders are more easily inhaled than dense products and coarse granulated materials.
Concentrated solutions are much more dangerous than diluted ones; solid baits may be colourful, attractive and sweet, and may be easily ingested by toddlers.
In some cases, if the concentration of the active compound is less than 2% (as is generally the case for pesticides for household use), the toxicity in cases of human exposure may be due to the solvent (e.g. kerosene or paraffin) and not to the active ingredient.

Refs:
IPCS. The WHO Recommended Classification of pesticides by hazard, Guidelines to Classification 2000–2002 (www.inchem.org/documents/pds/pdsother/class.pdf)
Tomlin C. The pesticide manual, 11th ed. British Crop Protection Council Publications, 1997.
"Chalk" pesticides information at www.epa.gov/opp00001/health/illegalproducts/chalk.htm



There is a large variety of pesticides designed to kill specific pests – those most widely used are listed below.
Insecticides (for killing insects) such as organochlorines, organophosphates and carbamates. This category also includes insect repellents such as diethyltoluamide (DEET) and citronella (of natural origin).
Herbicides or weedkillers (e.g. paraquat, glyphosate and propanil).
Fungicides (to kill mould or fungi): when applied to wood, they are called wood preservatives.
Rodenticides (to kill mice, rats, moles and other rodents).
Fumigants are pesticides that exist as a gas or a vapour at room temperature and may be used as insecticides, fungicides or rodenticides, especially in closed storage places – as they kill every living organism. They are extremely toxic, due to their physical properties, rapid environmental dissemination and human or animal absorption (examples include cyanide, aluminium phosphate and methyl bromide).
Other pesticides include algaecides (to kill algae), miticides (to kill moths) and acaricides (to kill ticks).

PESTICIDES – CLASSIFICATION BY USE AND CHEMICAL STRUCTURE

Different chemicals used for different purposes

INSECTICIDES
- Pyrethroids
- Organophosphorus
- Carbamates
- Organochlorine
- Manganese compounds

HERBICIDES
- Bipyridyls
- Chlorophenoxy
- Glyphosate
- Acetanilides
- Triazines

FUNGICIDES
- Thiocarbamates
- Dithiocarbamates
- Cupric salts
- Tiabendazoles
- Triazoles
- Dicarboximides
- Dinitrophenoles
- Organotin compounds
- Miscellaneous

RODENTICIDES
- Warfarines
- Indanodiones

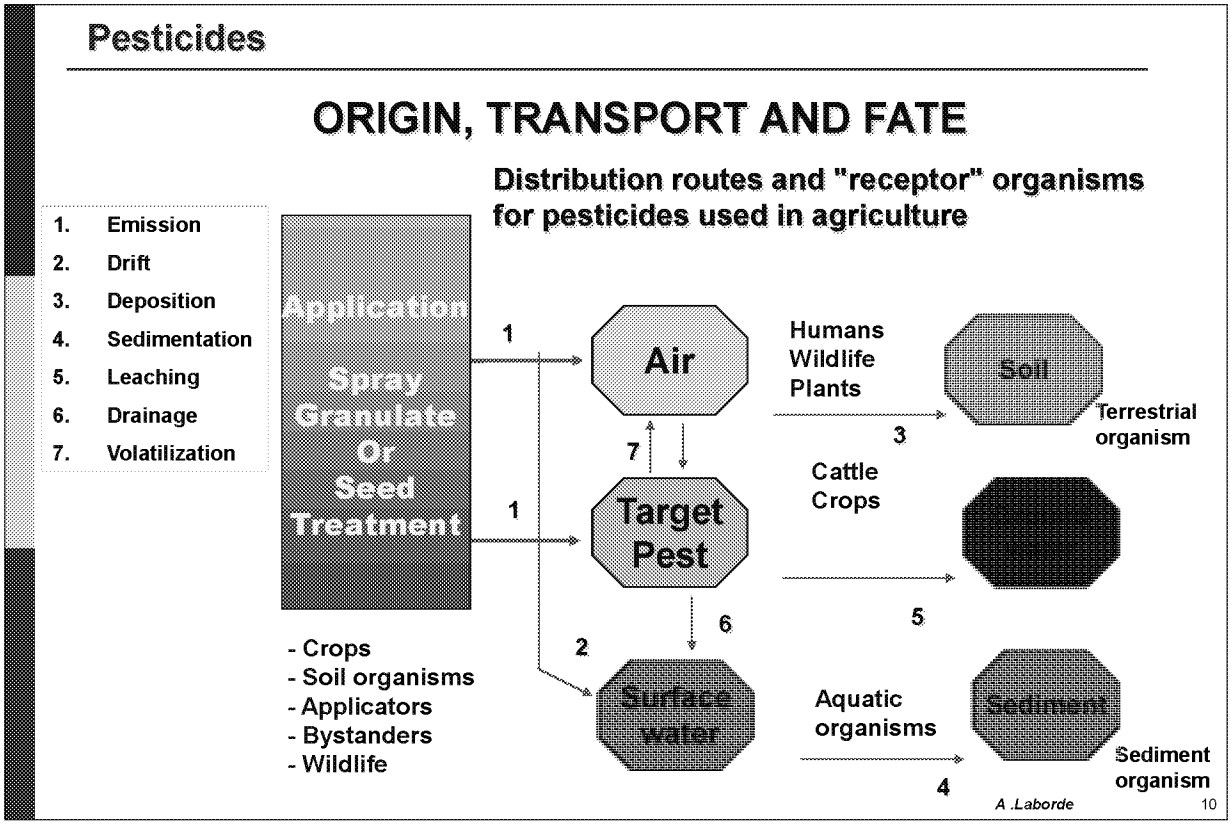
FUMIGANTS
- Aluminium and zinc phosphide
- Methyl bromide
- Ethylene dibromide

INSECT REPELLENTS
- Diethyltoluamide

There are many groups of chemicals used as pesticides. There are hundreds of different active principles or main ingredients of pesticide groups (e.g. approximately 300 in Uruguay and 900 in the USA).
<<NOTE TO READER: insert the number in your country/region.>>

Some domestic, agricultural or veterinary products may contain more than one chemical belonging to the same or a different chemical group.
Exposure or emission into the environment can occur from on-site exposure through spraying or application of solid formulations to different targets. For example exposure can occur in children during:
- agricultural use (spraying fields) or seed treatment;
- use in cattle dips and in animal husbandry;
- use as household insecticide (indoor), or in gardens;
- sanitary indoor use in schools, offices, hospitals and other institutions;
- public health use (outdoor or indoor): in parks and urban areas and for vector control (e.g. malaria, Chagas disease, dengue and onchocercasis);
- medical human use: to treat head lice or scabies; and
- veterinary products for pets (e.g. to treat infestations with fleas or ticks).

Refs:
IPCS. The WHO recommended classification of pesticides by hazard. Guidelines to Classification 2000-2002 (www.inchem.org/documents/pds/pdsother/class.pdf).
Tomlin C. The pesticide Manual, 12th ed. British Crop Protection Council Publications, 2000.



Pesticides have different distribution and persistence patterns in the environment, even if all of them are distributed in some way through air, soil and water. This should be addressed to gain an understanding of how acute and chronic exposure may occur because air, water and soil are the media of exposure.

This scheme illustrates the routes followed by an agricultural chemical (spray, granulate or seed treatment) that is applied to a given site, representing a risk to applicators, bystanders and wildlife.

When a pesticide is applied directly to a target pest (plant or animal) the whole site is affected including crop plants, soil organisms and, potentially, humans and wildlife in the immediate area. In addition, part of it goes to the air or to surface waters, due to emission (1) or drift (2). Once on the target site, the pesticide may "drain" (6) into surface waters or volatilize (7) into the air. From the air it may deposit (3) on humans, wildlife or plants or on the soil. From the animals or plants where it was applied the pesticide may leak (5) into groundwater.

Pesticides in surface water may go into aquatic organisms, and by sedimentation (4) into other organisms that remain in the sediment.

The persistence of the pesticide depends on its physical and chemical properties (partition coefficients, degradation rates, deposition rates) and the characteristics of the environment.

Climate characteristics also play a role in persistence. Studies in the Arctic have shown that insecticides and herbicides persist 3 to 8 times longer in cold climates than in temperate ones.

The most persistent pesticides are termed “persistent organic pollutants” (POPs) and are addressed in a separate module.

Refs:

Children: a CICH profile, 3rd ed. Canadian Institute of Child Health, 2000.

Health Canada. Health and the environment: handbook for health professionals. Ottawa, Ministry of Public Work and Government Services,1998.

Pesticides

SOME PESTICIDES PERSIST AND BIOCONCENTRATE

- **PERSISTENT ORGANIC POLLUTANTS (POPs)**
  - Low water solubility
  - Persist in the environment
  - Accumulate in the food-chain
  - Lypophilic
  - Travel long distances
  - Concentrate in marine animals
  - May produce toxic effects

PESTICIDES

Aldrin
Dieldrin
Chlordane
DDT
Endrin
Heptachlor
Mirex
Toxaphene

11

Some pesticides are characterized by being very persistent in the environment. They may represent long-term dangers as they biomagnify up the food-chain. Humans, and particularly breastfed babies, are at the top of the food-chain.
Most POPs (persistent organic pollutants) (these will soon be considered as persistent toxic substances or PTS) are organochlorine pesticides, namely, aldrin, endrin, clordane, DDT, heptachlor, mirex, toxaphene and hexachlorobenzene.
They have been banned for agricultural or domestic uses in Europe, North America and many countries of South America in accordance with the Stockholm Convention (ratified in 2004). However, some organochlorine pesticides are still used – e.g. DDT is used to control malaria in some developing countries.
Other POPs (and PTSs) include industrial chemicals (PCBs, HCB) and unintended byproducts (dibenzodioxins, dibenzofurans), and other chemicals.
These persistent chemicals are controlled under the Stockholm Convention.
POPs and PTSs are typically lypophilic compounds, with low water solubility, that are resistant to environmental breakdown and accumulate in adipose tissue.
They bio-concentrate in fish, wildlife and human tissues.
The highest levels are found in marine mammals.
There is concern about potential endocrine and developmental effects of the POPs and PTSs, especially in children.
Ref:
Kutz FW et al. Organochlorine pesticides and polychlorinated biphenyls in human adipose tissue. Rev Environ Contam Toxicol , 1991, 120:1.

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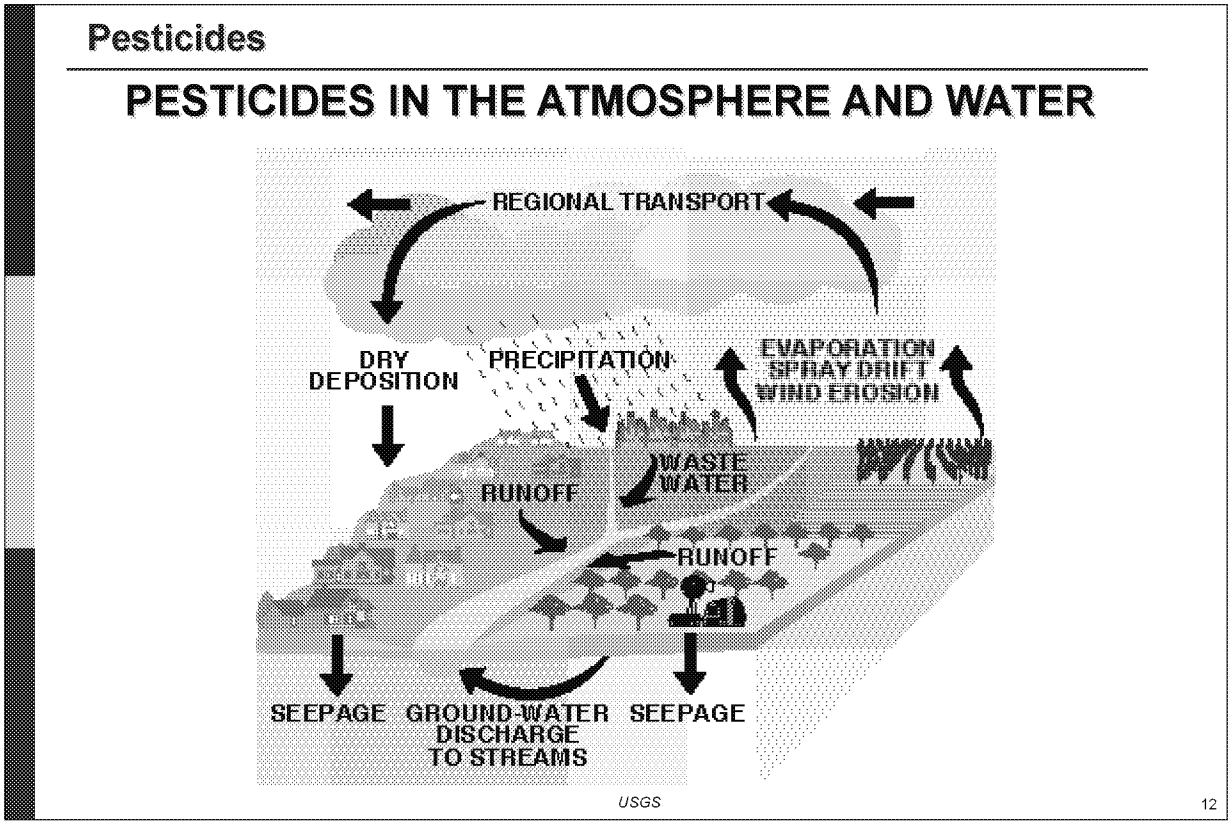


The US Geological Survey (USGS) monitors ground and surface water for 76 pesticides and seven pesticide breakdown products. A recent survey found that 90% of streams and 50% of wells tested were positive for at least one pesticide.
Ref:
USGS: ca.water.usgs.gov/pnsp/index.html
A great potential for adverse effects of pesticides is through contamination of the hydrological system, which supports human life, aquatic life and related food-chains.
Ref:
USGS: ca.water.usgs.gov/pnsp/atmos/atmos_1.html

EXAMPLE OF SEASONAL PESTICIDE USE

APPLE ORCHARD CALENDAR

NPS

AUTUMN

- **Herbicides: simazine, paraquat, 2-4D**

WINTER

- **Fungicides: dinitroorthocresol (DNOC)**
- **Insecticides: organophosphate compounds (OPs)**

SPRING

- **Fungicides: Cu salts, dithiocarbamates**
- **Insecticides: endosulfan, OPs**

SUMMER

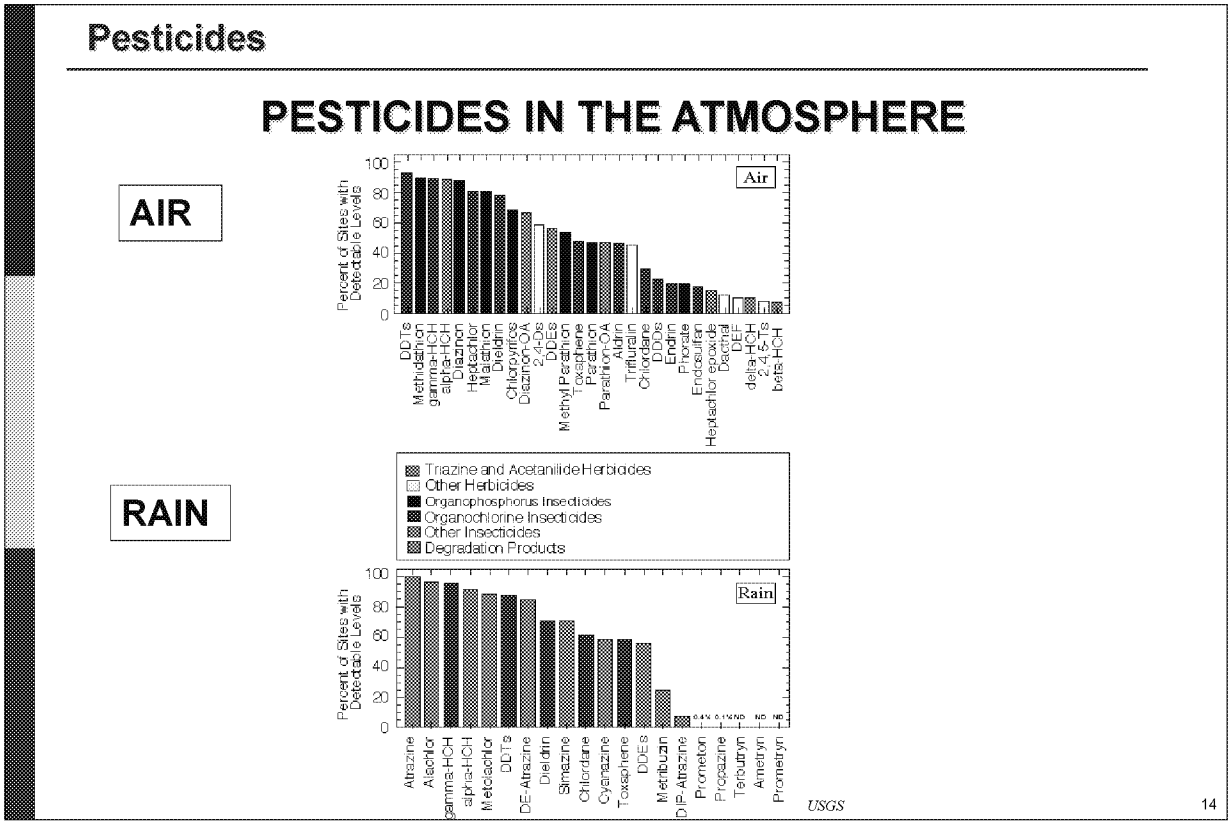
- **Insecticides: OPs**

Ref: Dr A. Laborde, Uruguay

<<NOTE TO USER: Include your local calendar for pesticide treatment of APPLES or any other agricultural tasks.>>
<<NOTE TO USER: How many pesticides may be found in an apple? Will "Snow-White" be offered a poisoned apple?>>

More than 10 different chemicals may be sprayed on apple trees or other vegetable crops before harvest.
The example of a calendar of pesticide application in apple trees in Uruguay was provided by Dr A. Laborde.

Ref:
Achard. Fruit growing calendar. Banco de Seguros del Estado Yearbook. Uruguay, 1996.
Picture: www.nps.gov/whmi/gallery/grounds016.htm – NPS – Us Department of the Interior. Apple orchard



Detection frequencies for those pesticides that have been analysed in air and rain at 10 or more sites in the United States.

Ref:

USGS. Pesticides in the atmosphere: ca.water.usgs.gov/pnsp/atmos/atmos_4.html

CHILDREN'S EXPOSURE

A cause of concern

- Multiple chemicals
- Multiple sources of exposure
- Multiple routes of exposure
- Multiple effects

WHO

Pesticides are considered an important environmental threat to children's health in rural areas. This is because:
A large variety of chemicals and mixtures are used as pesticides.
Many pesticides are used at the same time in the same place (agricultural regions).
They are ubiquitous in the environment – and in individual environments (micro-environments) of children – there may be several sources of exposure to the same or a different chemical.
Multiple exposures may occur from the preconception period throughout the child's growth into adolescence and adulthood.

Pesticides may also be heavily used indoors in urban areas, so this is not solely a rural issue.

CHILDREN'S ENVIRONMENTAL EXPOSURE

- **Pesticides in:** homes and schools, playgrounds, parks fields, hospitals and other public places
- **Children in:** work places, farms, agricultural areas (rural setting)
- **Pesticides present in:** air, soil, food, water, parents' clothing and shoes, other objects…

Different scenarios:

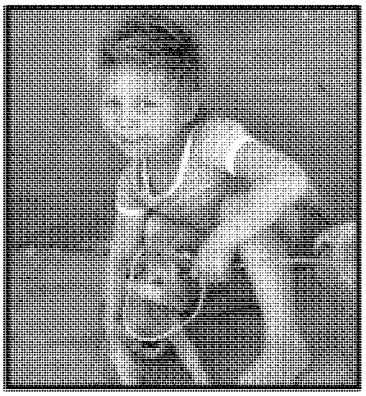
- ACUTE high-level exposure, overt poisoning
- CHRONIC low-level, chronic exposure, various effects

Children are exposed in different settings and by a variety of routes.
Pesticides may be unsafely used in the home, by parents who want to protect their children from mosquitoes, cockroaches or rodents. Different pesticides may be stored within the reach of children. They are used in schools and playgrounds (in treated wood) and in green areas (parks and playing fields) to destroy weeds. Hospitals are intended to be places of healing, yet many are using hazardous pesticides).
Living on farms or in agricultural areas, where pesticides are frequently and heavily used, is a high-risk scenario for exposure. Children may also undertake work in the agricultural industry, where they may participate in directly applying pesticides to crops or working in the field immediately after pesticide application.
Potential for "take home" of pesticides on parents'/childs clothing or shoes.
Pesticides may be present in food and water, either as residues from treatment of crops or at higher levels, as a result of contamination.
In some areas, there is a potential for release into the environment during production and formulation of pesticides (in factories).
These are the circumstances under which children may receive acute and high-level exposure leading to poisoning or chronic, low-level exposures linked to more subtle, developmental and other effects. (See next slide)

Pesticides

SOURCES AND SETTINGS OF EXPOSURE...

HOME, SCHOOL, DAY-CARE, INSTITUTIONS, ...



WHO

Indoor and outdoor application

- **Mosquito control**
- **Professional/domestic application**

Health uses

- **Lice or scabies**
- **Fleas or ticks on pets**

Pesticide residues

- **Dust, soil, furniture, carpets, toys, food…**
- **Playgrounds, playing fields, lawns, gardens**
- **Wood preservatives in play structures (e.g. PCP: pentachlorophenol)**
- **Long range transport of POPs (e.g. DDT)**

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A survey by the U.S. Environmental Protection Agency regarding pesticides used in and around the home revealed some significant findings:

Almost half (47%) of all households with children under the age of five had at least one pesticide stored in an unlocked cabinet, less than 4 feet off the ground (i.e., within the reach of children).

Approximately 75% of households without children under the age of five also stored pesticides in an unlocked cabinet, less than 4 feet off the ground (i.e., within the reach of children). This number is especially significant because 13% of all pesticide poisoning incidents occur in homes other than the child's home.

Pesticide application

Professional application of pesticides both indoors and outdoors is used increasingly commonly for the control of rodents, cockroaches, ants, termites, earwigs and other pests. Signs and symptoms of pesticide-related-illnesses have been described after indoor and outdoor spraying.

Domestic use of insecticides is also a source of exposure. Insecticides formulated as sprays, strips and baits are widely available.

Certain topical pharmaceuticals for direct application on children's skin or scalp contain insecticides to control lice or scabies. Their use carries a risk of acute (chronic if repeated) overexposure. High doses or applications lasting a long time have caused acute poisoning. There are many pharmaceuticals described in the International pharmacopoeia that contain organophosphorus (malathion) and organochlorine (lindane) pesticides still being used to treat head lice. Such products may contains up to 2% of pesticide.

Dogs and cats are often treated with insecticides to control fleas or ticks. Veterinary products can be as concentrated as agricultural ones. Pet dips for treatment of flea infestations usually contain organophosphate and pyrethroid pesticides. Children are often involved in pet care.

Pesticide residues

Insecticides may persist in house dust, in soil tracked in from outdoors, in carpets, toys, food and furniture.

High levels of insecticides have been measured for weeks after professional application.

Residues of organophosphorus insecticides sprayed in indoor environments have been reported to occur on floors,

carpets, children's toys, furniture, bed covers and in dust.
Poor hygiene habits or houses that are difficult to clean increase the risk of exposure.
Playgrounds, playing fields, lawns and gardens may be routinely sprayed in order to keep insects away.
Pesticides are found in recreational waters (lakes, rivers and in pools (algaecides)).
Persistent wood preservatives such as arsenic/ copper/chromium mixtures have been used on play structures.
The persistent organic pollutants (POPs) include nine pesticides.

Refs:
www.epa.gov/pesticides/factsheets/childsaf.htm
Bass JK et al. What is been used at home: a household pesticide survey. Rev Panam Salud Publica, 2001, 9:138.
CDC Surveillance for acute insecticide related illness associated with mosquito control efforts Nine States 1999–2002 (www.cdc.gov/mmwr/preview/mmwrhtml/mm5227a1.htm).
Fields S. Caution – children at play: How dangerous is CCA? EHP, 2001, 109 A262 (ehp.niehs.nih.gov/docs/2001/109-6/focus.html)
Forrester MB et al. Epidemiology of lindane exposures for pediculosis reported to poison centers in Texas, 1998–2002. J Toxicol - Clin Toxicol, 2004, 42:55.
Lemus R et al. Chlorpyrifos: an unwelcome pesticide in our homes. Rev Environ Health, 2000, 15:421.
WHO. The physical school environment, information series on school health, Document 2. Geneva, World Health Organization, 2003.
Picture: WHO

Pesticides

Historical use of DDT...

Norsk Barnemuseum

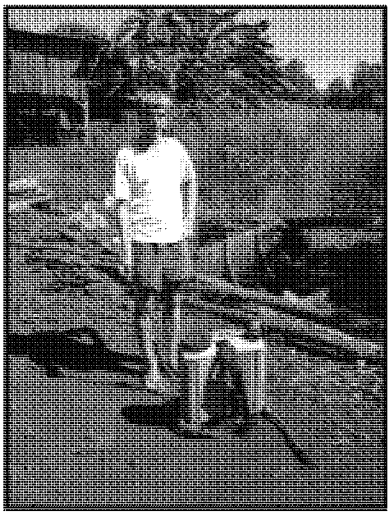
18

Fig: Norsk Barnemuseum. www.norskbarne.museum.no/html/barn100.htm Used with copyright permission.

SOURCES AND SETTINGS OF EXPOSURE

Children living on farms or in agricultural areas are exposed to:

- pesticide drift from sprayed fields
- contaminated dust & soil
- contaminated equipment and clothes
- treated fields
- parents spraying
- animal dips
- child labour



Corra

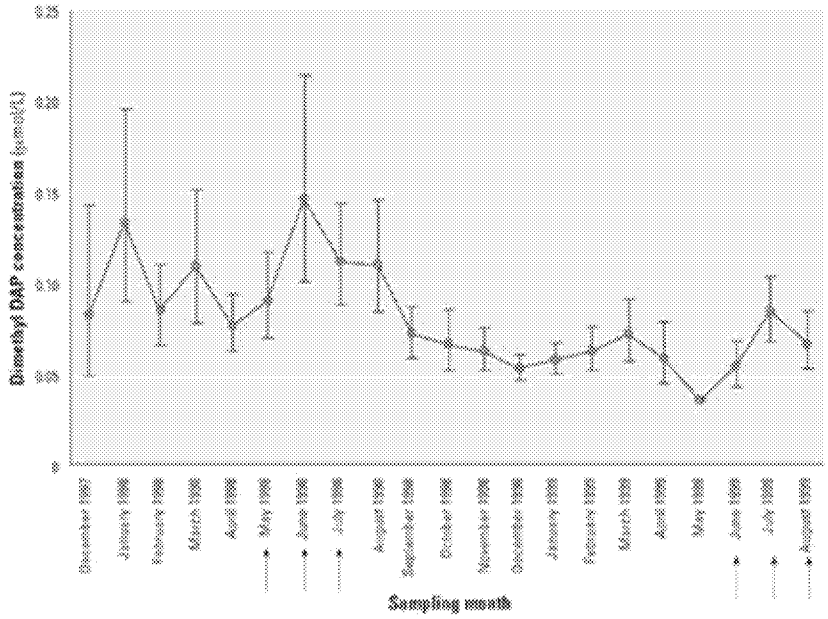
The rural setting is of particular importance for children and young adults.
Children may be exposed to pesticide drift from fields that are being sprayed.
Acute “unintentional" poisoning, is possible when small children play with pesticide bottles and colourful containers that have been discarded in their playing areas.
Highly concentrated pesticides may be stored in rural homes.
Parents who are farm-workers or applicators may bring pesticides into the home through contaminated clothes, shoes or equipment.
Children may accompany their parents to the fields and help them with their tasks.
Infants who are still being breastfed are often carried by their mothers in the fields.
Children may help with agricultural tasks or may be allowed to play around the sprayed field.
Re-entry intervals (the time required before it is safe to return to a treated area) are not always respected or may be established on the basis of criteria that ensure adult safety only.
Concern is increasing about child labour and young workers.
Although few data are available, it is generally assumed that children make up a substantial part of the agricultural workforce in developing countries. They could be at a higher risk because they are less experienced and assertive than adults; they may lack protective equipment and receive less training or none at all.

Refs:
Calvert GM et al. Acute pesticide-related illnesses among working youths, 1988-1999. Am J. Public Health 2003, 93: 605.
Quandt SA et al. Agricultural and residential pesticides in wipe samples from farmworker family residences in North Carolina and Virginia. Environ Health Perspect, 2004, 112:382.
Picture: L. Corra. Child working with pesticides, Argentina. Used with permission.

Pesticides

CHILDREN'S EXPOSURE IN RURAL SETTINGS

Increase in the levels of organo-phosphorus (OP) metabolites (DAP) paralleling pesticide spraying in a rural area



Koch *EHP*, 2002, 110 (8): 829

20

Numerous studies on children's exposure have demonstrated the absorption of pesticides.
Pesticide metabolites are used as biomarkers of exposure, and children often have higher levels than adults.
Younger children may have higher levels than older ones.
Levels of pesticides were associated with residence in rural areas AND with domestic use of pesticides.
The figure shows levels of dialkylphosphates (DAP) in children living in agricultural areas. Levels were measured in many samples taken over 1 year and were found to increase in parallel with periods of pesticide application.
Refs:
Aprea C et al. Biologic monitoring of exposure to organophosphorus pesticides in 195 Italian children. Env Health Perspect , 2000, 108:521.
Koch D et al. Temporal association of children's pesticide exposure and agricultural spraying: report of a longitudinal biological monitoring study. Env Health Perspect, 2002, 110:829.
We measured organophosphorus (OP) pesticide exposures of young children living in an agricultural community over an entire year and evaluated the impact of agricultural spraying on exposure. We also examined the roles of age, sex, parental occupation, and residential proximity to fields. We recruited 44 children (2–5 years old) through a Women, Infants, and Children clinic. We collected urine samples on a biweekly basis over a 21-month period. Each child provided at least 16 urine samples, and most provided 26. We analysed samples for the dialkylphosphate (DAP) metabolites common to the OP pesticides. DAP concentrations were elevated in months when OP pesticides were sprayed in the region's orchards. The geometric means of dimethyl and diethyl DAPs during spray months were higher than those during nonspray months ($p = 0.009$ for dimethyl; $p = 0.018$ for diethyl). Dimethyl DAP geometric means were 0.1 and 0.07 micro mol/L for spray months and nonspray months, respectively (57% difference); diethyl DAP geometric means were 0.49 and 0.35, respectively (40% difference). We also observed differences for sex of the child, with male levels higher than female levels ($p = 0.005$ for dimethyl; $p = 0.046$ for diethyl). We observed no differences due to age, parental occupation, or residential proximity to fields. This study reports for the first time the temporal pattern of pesticide exposures over the course of a full year and indicates that pesticide spraying in an agricultural region can increase children's exposure in the absence of parental work contact with pesticides or residential proximity to pesticide-treated farmland.

Loewenherz C et al. Biological monitoring of organophosphorus pesticide exposure among children of agricultural workers in Central Washington State. Environ Health Persp 1997, 105:1344.
Figure: ehp.niehs.nih.gov/members/2002/110p829-833koch/koch-full.html
Reproduced with permission from Environmental Health Perspectives

PESTICIDES IN DIFFERENT MEDIA

Air

- Respirable particles contaminated with pesticides
- Respirable aerosols during spraying
- Vapour from volatile residues of pesticides

Soil

- Hand-to-mouth behaviour
- Crawling on the ground
- Dermal contact

Some pesticides are volatile and can be inhaled over a period of hours or days because of the volatilization from contaminated surfaces.
Particulate material under 10 micrometres is breathable, and the smaller particles are more dangerous because they can reach the alveoli. Children can be exposed when they are around the spraying area.
The persistence of pesticides in the soil depends on their chemical characteristics and many pesticides used in homes have been found, many days to weeks after the application, in house dust.
The behaviour of children (e.g. crawling and hand-to-mouth activities) facilitates exposure.

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PESTICIDES IN DIFFERENT MEDIA

Water

- Pesticides in drinking water: tap, well

Food

- Crops routinely sprayed:
  - fruits, vegetables, grains
- Bioaccumulation in animals and products
  - fish, meat, eggs, dairy

WHO

Once used or spilled, pesticides may contaminate the water used for drinking or bathing.
Pesticides can contaminate nearby groundwater and surface water.
There is increasing concern about dietary ingestion of pesticide residues by children, in both plant and animal products.
Please note that the benefits to children of a diet rich in fruits and vegetables should be emphasized. There are preventive and regulatory measures on this issue. (See additional slides)
Picture: WHO, C. Gaggero. Nutrition child, Peru.

<<READ SLIDE.>>

PESTICIDES IN DIFFERENT MEDIA

Food residues

- Many food products have detectable levels of pesticides
- Guideline levels of pesticides in food (MRL)
- Guidelines to limit the population exposure: acceptable daily intake (ADI)

WHO 23

All industrialized countries have food monitoring programmes that measure pesticide residues.
Levels exceeding the maximum established limits have been reported occasionally in monitored food.
Maximum limits for residues have been established only for certain pesticides.
Although a single pesticide may be considered safe at a particular level, foods may contain residues of several pesticides at the same time (see the next slide for an example of the pesticide application scheme in apple trees) and to understand the effect of multiple exposures.
Locally grown food may not be properly monitored or controlled for residues of pesticides.
Families who eat food directly brought in from fields may have higher pesticide exposure.
A study of cumulative dietary pesticide intake in children from an agricultural community showed that up to 56% of the children exceeded the acceptable chronic dietary doses (Fenske, 2000).

Refs:

American Academy of Pediatrics Committee on Environmental Health. Pesticides. Chapter 24. In: Etzel RA. ed. Pediatric Environmental Health 2nd Ed. Elk Grove Village IL, American Academy of Pediatrics, 2003.
Fenske R et al. Biologically based pesticide dose estimates for children in an agricultural community. Environ Health Perspect 2000, 108:515.
Jensen AF et al. Cumulative Risk assessment of the intake of organophosphorus and carbamate pesticides in the Danish diet. Food Addit.Contam, 2003, 20:776.
Rhorer. Transfer efficiencies of pesticides from household flooring surfaces to food. J Exp Anal Environ Epidem 2003, 13:454.
Sanborn MD et al. Identifying and managing adverse environmental health effects: 4 Pesticides. CMAJ, 2002, 166:1431.
www.who.int/ipcs/food/jmpr/en/
www.codexalimentarius.net/
www.who.int/water_sanitation_health/dwq/guidelines/en/

Picture: WHO (L. Taylor), Nutrition, 1994

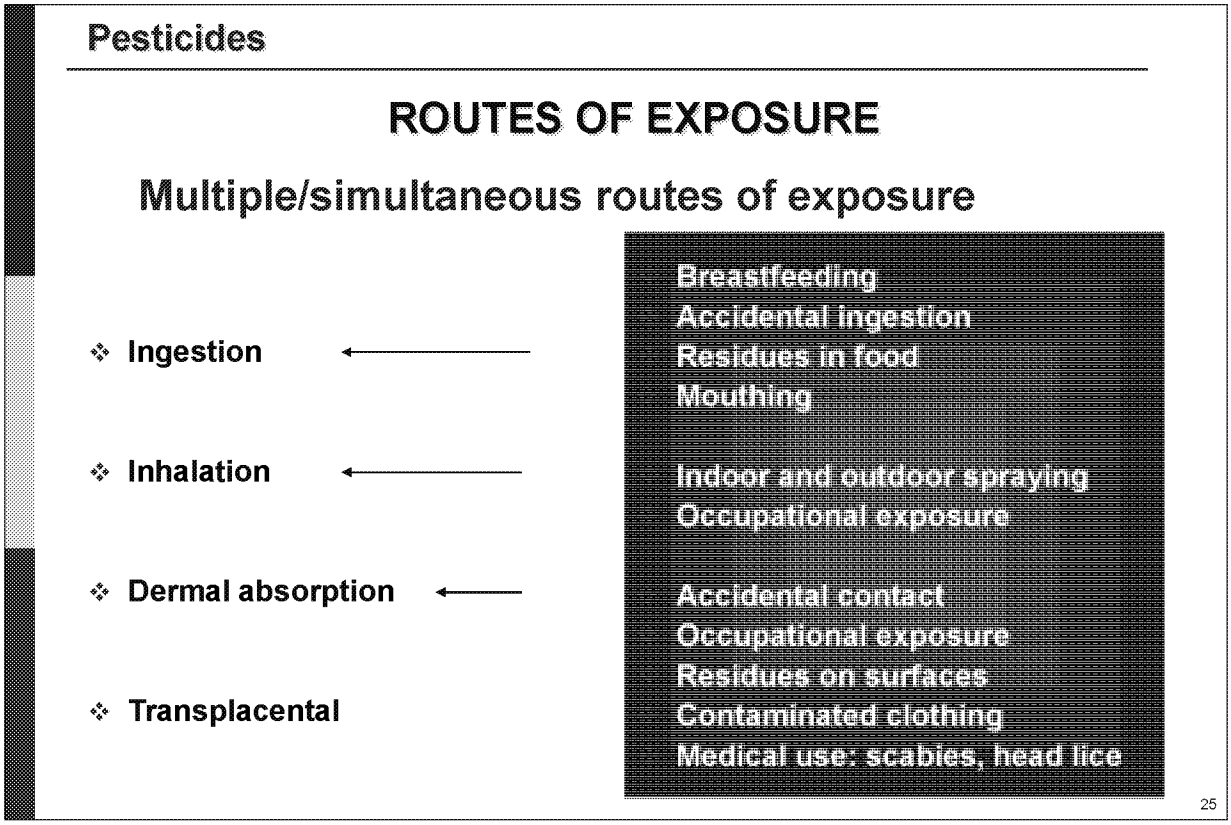
TOXICOKINETICS VARIES FOR DIFFERENT TYPES OF PESTICIDE

Important to consider:

- Routes of Absorption
  - Dermal, ocular, ingestion, inhalation, injection, Transplacental (prenatal)
- Biotransformation
  - Into inactive or more active metabolites
- Distribution and storage
  - Fat soluble pesticides are stored in adipose tissue
  - Other
- Elimination
  - Urinary excretion
  - Biliary / faecal excretion
  - Excretion in milk

Toxicokinetics depend on the specific pesticide, its chemical characteristics and formulation.
Routes of absorption are explained in the following slides.
The biotransformation of most pesticides involves a combination of several chemical reactions including oxidation, reduction, hydrolysis and/or conjugation, producing different metabolites that may be more or less active (toxic).
Biotransformation of some organophosphate pesticides involves oxidative activation (e.g. parathion = paraoxon).
Pesticides may reach different organs and tissues. Many pesticides accumulate in the adipose tissues.
Elimination is urinary, biliary and faecal.
Excretion in milk has been experimentally found to be proportional to blood dosage for DDT, dieldrin, aldrin, heptachlor and other organochlorine pesticides.

Ref:
Hodgson. Metabolism. In: Hayes, Handbook of pesticide toxicology. San Diego California, Academic Press Inc. 1991.

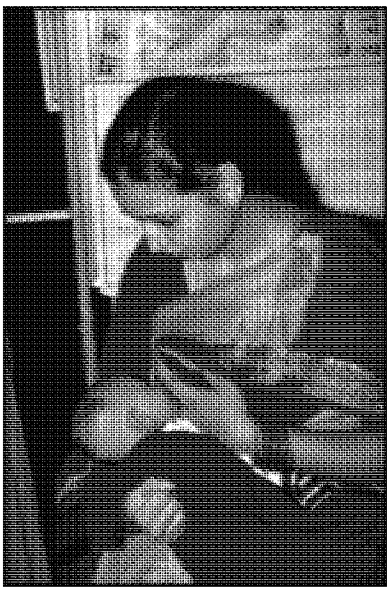


Almost all pesticides are absorbed by these routes.
<<READ SLIDE.>>
Different routes are associated with different settings and media of exposure. However, there are settings in which more than one route of exposure can occur (e.g. in an occupational setting).
Pesticides can cross the epithelium of the skin and mucous membranes that exchange gases (alveoli) or nutrients (gastrointestinal mucosa).
The rate of absorption depends on the chemical properties, amount of the chemical, length of exposure and the physical state of the molecule. There are also other factors that may contribute to increased absorption. Skin absorption is higher when there is vasodilatation (e.g. in summer, or with heating). Respiratory absorption is many times higher when respiration is more rapid (e.g. when playing or running).
(Transplacental exposure is considered in the next slide.)
In relation to their body weight, children have a larger skin area than adults, breathe in more air and drink and eat more. These aspects and certain childhood behaviours such as putting fingers and objects in their mouths allow exposure to larger amounts of pesticide per kilogram of body weight. Modifying diets and assuming their variety could be a way of reducing exposures...

Ref:
Health Council of the Netherlands. Pesticides in food: assessing the risk to children. The Hague: Health Council of the Netherlands, 2004.

ROUTES OF PERINATAL EXPOSURE

- **Mother's intake and body burden is transferred across the placenta**
- **Breast milk may be contaminated**
  "The very top of the food chain"



WHO 26

Pesticides can cross the placenta:
They have been detected in cord blood samples, amniotic fluid and body tissues of human foetuses even during early stages of prenatal life.
Pesticides have also been found in the meconium.
Measuring organophosphate compounds (OP) metabolites in meconium is considered a good biomarker of prenatal exposure because meconium starts to accumulate in the 16th week of pregnancy and is eliminated following delivery.

Breast milk may be contaminated and represents the very top of the food-chain:
Residues of organochlorine pesticides and POPs have been detected in breast milk (including DDT, HCB and HCH isomers) in contaminated areas.
There is currently no developed method to measure OPs in breast milk.
(Please see the module on Children and Chemicals.)

Refs:
Pronczuk J et al. Global perspectives in breast milk contamination infectious and toxic hazards. Environ Health Perspect, 2002, 110:A349.
Whyatt RM et al. Measurement of organophosphate metabolites in postpartum meconium as a potential biomarker of prenatal exposure. A validation study. Env Health Perspect, 2001, 109:417.

Picture: WHO, P. Virot. Portrait of a young baby breastfeeding, Delhi, India, Asia, November 2002.

Pesticides

METABOLIC PATHWAYS

- **Organophosphates metabolize into:**
  - **Oxones**
  - **Specific inactive metabolites (ME)**
  - **Non-specific metabolites: dialkylphosphates (DAPs)**

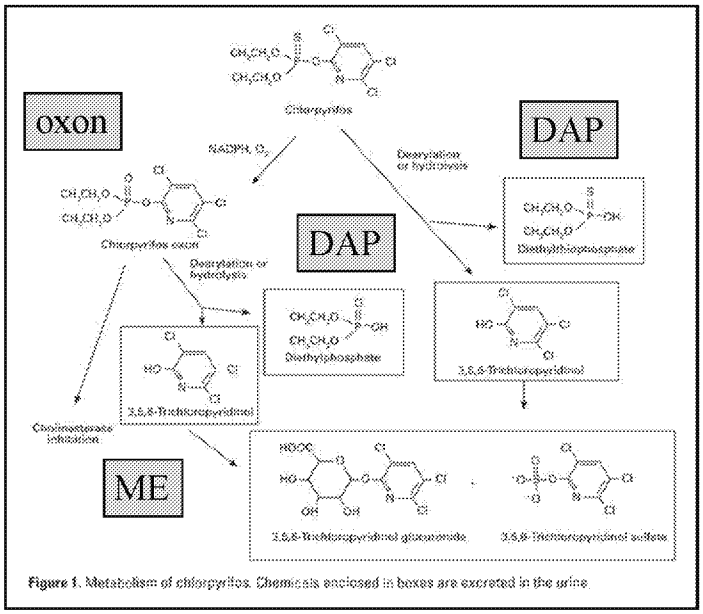


Figure 1. Metabolism of chlorpyrifos. Chemicals enclosed in boxes are excreted in the urine.

Wessels, EHP (2003) 111 (16): 1939

27

Metabolism may either activate or inactivate the chemical.
Therefore, immature metabolic pathways may be protective or increase the danger from specific chemicals.
As an example, organophosphates are metabolized to oxones (active metabolite), but also to other specific inactive metabolites (ME) and to non-specific metabolites (the dialkylphosphates (DAPs)) (shown in the figure).
DAPs are used as biomarkers of environmental exposure to all kinds of organophosphate pesticides because DAPs are metabolites of all these pesticides.

Ref:
Wessels D et al. Use of biomarkers to indicate exposure of children to organophosphate pesticides: implications for a longitudinal study of children's environmental health. Environmental Health Perspectives, 2003, 111:1939.
Figure: Reproduced with permission from Environmental Health Perspectives

MECHANISMS OF ACUTE TOXICITY

- Irritation (most of the pesticides)
- Allergic sensitization (e.g. fungicides)
- Enzyme inhibition (e.g. cholinesterases and OPs & carbamates)
- Oxidative damage (e.g. paraquat)
- Inhibition of neurotransmission (e.g. organochlorines)
  - Calcium (Ca^{2+}) homeostasis alteration
  - GABA inhibition
- Uncoupling of oxidative phosphorylation (e.g. glyphosate)

Several mechanisms of toxicity have been described and these differ according to the specific properties of the pesticide. They are summarized below.
Irritation is a local effect due to contact of the pesticide with the skin, eyes or other mucosa.
- The effects are usually redness and pain.
- Respiratory irritation can produce nasal, laryngeal or pulmonary effects.
- Most herbicides and fungicides are strong irritants.

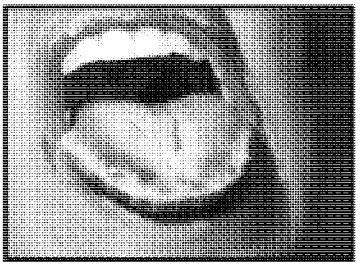
Allergic sensitization is a common effect of pesticides, especially fungicides.
Enzyme inhibition (e.g. cholinesterase activity is decreased by exposure to organophosphorus compounds and carbamates).
Oxidative damage (e.g. paraquat is a promoter of superoxide radicals).
Inhibition of neurotransmission (organochlorines inhibit the GABA system and cause alteration of calcium homeostasis.
Uncoupling of oxidative phosphorylation (e.g. glyphosate).

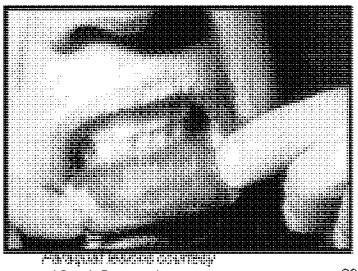
OP: organophosphorus compounds

Pesticides

ACUTE PESTICIDE-RELATED ILLNESS

- Dermal and ocular irritation (or allergic response)
- Upper and lower respiratory tract irritation
- Allergic responses / asthma (fungicides)
- Gastrointestinal symptoms
- Neurological symptoms
- Specific syndromes
  - Cholinergic crisis (organophosphorus pesticides)
  - Bleeding (warfarin-based rodenticides)
  - Caustic lesions and pulmonary fibrosis (herbicide, paraquat)





Photos courtesy of Dr. J Pronczuk

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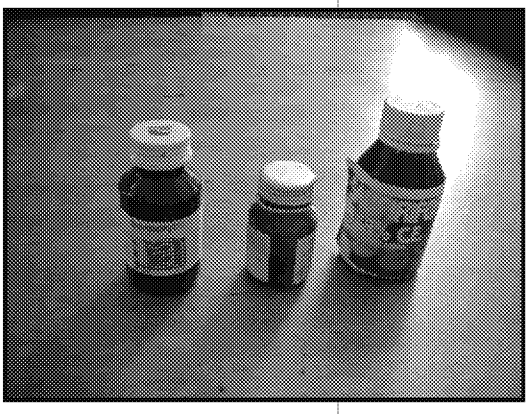
The signs and symptoms of pesticide poisoning depend upon the pesticide involved and the type and magnitude of exposure.
In general the signs and symptoms are:
dermal and ocular irritation (or allergic response)
upper and lower respiratory tract irritation
allergic responses and asthma
gastrointestinal symptoms: usually vomiting, diarrhoea and abdominal pain
neurological symptoms: excitatory signs in the case of exposure to organochlorines, lethargy and coma; also polyneuritis
specific syndromes:
- cholinergic crisis (organophosphorus pesticides)
- bleeding (warfarin-based rodenticides)
- caustic lesions and pulmonary fibrosis (paraquat)

<<NOTE TO USER: Refer to those pesticides commonly used in the country/area.>>
<<NOTE TO USER: insert local photo.>>
<<READ SLIDE.>>

Refs:
American Academy of Pediatrics Committee on Environmental Health. Pesticides. Chapter 24. In: Etzel RA. ed. Pediatric Environmental Health, 2nd Ed. Elk Grove Village Il. American Academy of Pediatrics, 2003.
CDC. Surveillance for acute insecticide-related illness associated with mosquito-control efforts--nine states, 1999–2002. MMWR Morb Mortal Wkly Rep, 2003, 52:629.
Salameh PR et al. Respiratory symptoms in children and exposure to pesticides. Eur Respir J , 2003, 22:507.
Sanborn MD et al. Identifying and managing adverse effects: 4 Pesticides. CMAJ, 2002, 166:1431.
Pictures: Courtesy of Dr. J. Pronczuk. Lesion caused by paraquat.

ACUTE POISONING BY "ACCIDENTAL" INGESTION

- Storage of leftover pesticide in a medicine or soft drink bottle
- Confusion with pharmaceutical
- Pesticide container reused for storing drinks or food
- Pesticide container present in the child's environment



Bottles containing pharmaceuticals and the pesticide chlorpyriphos
Laborde, CIAT, Montevideo

Acute poisoning results from "accidental" (non-intentional) exposure in toddlers and small children. Ingestion occurs, for example, when:

Pesticides have been stored in a medicine or soft drink bottle.

The pesticide bottle is similar to a bottle used for pharmaceuticals.

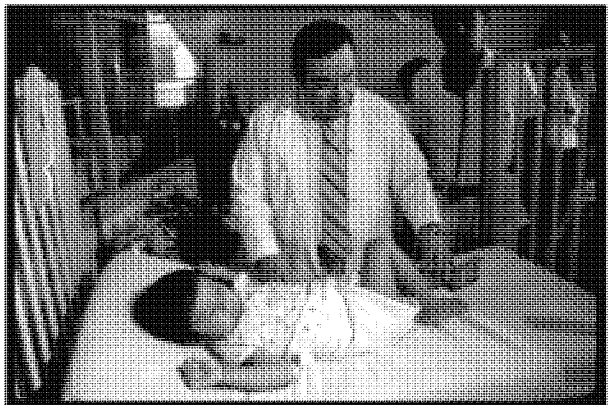
Pesticide containers are reused for storing drinks or food.

Pesticide containers are easily accessible in the child's environment.

Photo: Bottles containing pharmaceuticals and the pesticide chlorpyriphos
Courtesy of Laborde, CIAT, Montevideo

DIAGNOSIS OF EXPOSURE

- History of exposure
  - Availability of pesticides
  - Recent application
- Signs and symptoms
  - May be misdiagnosed!
- Laboratory tests



WHO

<<READ SLIDE.>>
The diagnosis is based upon the history of exposure (e.g. pesticides are available in the home, recently applied, or child was found playing with containers), signs and symptoms of exposure (see next slides) and laboratory measurements. Diagnosis also requires a high index of suspicion. Even after acute exposures, pesticide poisoning may be misdiagnosed as a viral illness (e.g. infectious diarrhoea rather than organophosphate poisoning) resulting in inadequate treatment and potentially returning children to a setting where exposure will be ongoing or recur.
Pesticides and/or their metabolites can be measured in samples of blood, urine, breast milk, amniotic fluid or meconium. This can confirm the diagnosis.
Laboratory tests are available to assess exposure to organophosphates, organochlorine, dicarboximide fungicides, carbamates, dipyridyl herbicides (e.g. paraquat) and pyrethroids.

Ref:
American Academy of Pediatrics Committee on Environmental Health. Pesticides. Chapter 24. In: Etzel RA. ed. Pediatric Environmental Health, 2nd Ed. Elk Grove Village Il. American Academy of Paediatrics, 2003.
Picture: WHO, C. Gaggero. Health child examination, Peru.

ACUTE TOXINDROMES

PESTICIDE	ACUTE SYMPTOMS	DIAGNOSIS	TREATMENT
Organo phosphorous E.g. Clorpyriphos Diazinon Azinphos Parathion	**"Irreversible" cholinesterase inhibition** Cholinergic crisis: - nausea, vomiting - hypersecretion - miosis - fasciculations - coma	**Low cholinesterase levels in red blood cells (RBC)**	- Supportive care - Atropine i/v - Oximes - Decontamination
Carbamates E.g. Carbaryl Aldicarb	**Reversible cholinesterase inhibition**	**Low cholinesterase levels (in RBC)**	- Supportive care - Atropine i/v - Decontamination

<<READ SLIDE.>>

Modified from Table of American Academy of Pediatrics, Committee on Environmental Health. In: Etzel, R. ed. Paediatric Environmental Health 2nd Ed. Elk Grove Village Il, 2003.

Pesticides

ACUTE TOXINDROMES

PESTICIDE	ACUTE SYMPTOMS	DIAGNOSIS	TREATMENT
Pyrethroids			
Type I E.g. Allethrin Permethrin Tetramethrin	- Tremor - Ataxia - Irritability	- Urinary 3-phenoxybenzoic acid (in research studies)	- Supportive care - Symptomatic - Decontamination
Type II E.g. Deltamethrin Cypermethrin Fenvalerate	- Salivation - Temporary paraesthesias - Seizures	- Urinary 3-phenoxybenzoic acid (in research studies)	- Supportive care - Symptomatic - Decontamination
Organo-chlorines E.g. Lindane Endosulfan	GABA blockade: - Tremors - Dizziness - Seizures	- Detectable in blood	- Supportive care - Symptomatic - Decontamination

33

<<READ SLIDE.>>

Modified from Table of American Academy of Pediatrics. Committee on Environmental Health. In: Etzel ed. Pediatric Environmental Health, 2nd Ed. Elk Grove Village Il, 2003.

Ref:

Aprea C et al. Analytical method for the determination of urinary 3-phenoxybenzoic acid in subjects occupationally exposed to pyrethroid insecticides, J Chromatogr B Biomed Sci Appl, 1997, 695:227.

ACUTE PESTICIDE TOXINDROMES

PESTICIDE	ACUTE SYMPTOMS	DIAGNOSIS	TREATMENT
Chlorophenoxy compounds (e.g. 2,4-D)	Nausea, vomiting, acidosis, myalgia fever, myopathy, neuropathy	Detectable in urine and blood	Decontamination and Urine alkalinization
Bipyridyl compounds paraquat	Vomiting Corrosive lesions Hepatotoxicity Acute tubular necrosis Pulmonary fibrosis	Dithionite test in urine	Decontamination Avoid O_2 haemoperfusion Possibly: corticosteroids and cyclophosphamide
Anticoagulant rodenticide Warfarin Brodifacoum Diphacinone	Haemorrhage (from vit. K antagonism)	Elevated prothrombin time (PT)	Vitamin K1 (Fitomenadione)

<<READ SLIDE.>>

Modified from Table of American Academy of Pediatrics. Committee on Environmental Health. In: Etzel R. ed. Pediatric Environmental Health, 2nd Ed. Elk Grove Village Il, 2003.

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Pesticides

LOW-LEVEL CHRONIC EXPOSURE

Growing body of epidemiologic and animal data and research studies suggests a link between long-term exposure and:

- **Abnormal growth and development**
- **Impaired neurobehavioral development / functions**
- **Cancer**
- **Increased susceptibility to infections**

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The mechanisms of action thought to produce chronic toxic effects include genotoxicity, endocrine disruption and immunotoxicity.
Effects may be seen when exposure occurs during critical windows of development, particularly the prenatal period. See additional slides.

Ref:
Children in the New Millennium: Environmental Impact on Health. UNEP, UNICEF, WHO, 2002.
Eskenazi B et al, Exposures of children to organophosphate pesticides and their potential adverse health effects. Environ Health Perspect, 1999, 107(3):409–419.

Pesticides

PRECONCEPTIONAL PRENATAL EXPOSURE

Pesticide exposure before or during pregnancy has been associated with increased risk of:

- Infertility
- Perinatal death
- Spontaneous abortion
- Premature birth
- Fetal growth retardation
- Congenital malformations
- Early childhood cancer

WHO

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Exposure of either mother or father to pesticide before conception, or exposure of the mother during pregnancy, has been associated with an increased risk of fetal death, spontaneous abortion and early childhood cancer.
There is increasing evidence that in utero exposure increases the risk of growth retardation: a small-for-gestational age baby, low birth weight, reduced length and small head circumference (see photo).
Significant increases in the risk of congenital anomalies have also been reported. These include: eye defects, limb reduction, urogenital defects, hypospadias, cryptorchidism, orofacial clefts, central nervous system defects and heart defects.

Refs:

Bell EM et al. A case-control study of pesticides and fetal death due to congenital anomalies. Epidemiology, 2001, 12:148.
Berkowitz GS et al. In utero pesticide exposure, maternal paraoxonase activity, and head circumference. Environ Health Perspect, 2004, 112:388.
Eskenazi B et al. Association of in utero organophosphate pesticide exposure and fetal growth and length of gestation in an agricultural population, Environ Health Perspectives, 2004, 112 (10): 1116-1124.
Garcia AM et al. Parental agricultural work and selected congenital malformations. Am J Epidemiol 1999, 149:64.
Heeren GA et al. Agricultural chemical exposures and birth defects in the Eastern Cape Province, South Africa. A case - control study. Environ Health, 2003, 2:11.
Nurminen T. Maternal pesticide exposure and pregnancy outcome. J Occup Environ Med, 1995, 37:935.
Rojas A et al. Malformaciones Congenitas y exposicion a pesticidas. Rev Med Chilena, 2000, 128:399.
Schreinemachers DM. Birth malformations and other adverse perinatal outcomes in four U.S. Wheat-producing states. Environ Health Perspect , 2003, 111 :1259.
Weidner IS et al. Cryptorchidism and hypospadias in sons of gardeners and farmers. Environ Health Perspect, 1998, 106:793.
Whyatt RM et al. Prenatal insecticide exposures birth weight and length among an urban minority cohort. Environ Health Perspect , 2004, 112:1125.

PRENATAL EXPOSURE AND NEURODEVELOPMENTAL EFFECTS

- Exposure during brain growth has subtle and permanent effects on:
  - Brain structure and function
  - Neuronal and axonal differentiation
  - Serotoninergic system
  - Synaptogenesis
  - Programming of synaptic function

Exposure during brain growth may exert subtle, permanent effects on the structure and function of the brain. These include:
neuronal and axonal differentiation;
alteration of serotoninergic system; and
altered synaptogenesis and programming of synaptic function.

Ref:
Slotkin TA. Guidelines for developmental neurotoxicity and their impact on organophosphate pesticides: a personal view from an academic perspective, Neurotoxicology, 2004, 25:631.
The appropriate regulation of drugs, chemicals and environmental contaminants requires the establishment of clear and accepted guidelines for developmental neurotoxicity. Ideally, these guidelines should encompass the ability to assess widely disparate classes of compounds through routine tests, with high throughput and low cost. Increasingly, however, the progress in primary research from academic laboratories deviates from this goal, focusing instead on categorizing novel effects of toxicants, development of new testing paradigms, and extension of techniques into molecular biology. The differing objectives of academic science as opposed to those of regulatory agencies or industry, are driven in part, by the priorities of the agencies that fund primary research. Recent work on organophosphate pesticides (OPs) such as chlorpyrifos (CPF) illustrate this dichotomy. Originally, OPs were thought to affect brain development through their ability to elicit cholinesterase inhibition and consequent cholinergic hyperstimulation. This common mechanism allowed for parallels to be drawn between standard measures of systemic toxicity, gross morphological examinations, and exposure testing utilizing an easily-assessed surrogate end-point, plasma cholinesterase activity. In the past decade, however, it has become increasingly evident that CPF, and probably other OPs, have direct effects on cellular processes that are unique to brain development, and that these effects are mechanistically unrelated to inhibition of cholinesterase. The identification and pursuit of these mechanisms and their consequences for brain development represent new and exciting scientific findings, while at the same obscuring the ability to sustain a uniform approach to neurotoxicity guidelines or biomarkers of exposure. In the future, a new set of test paradigms, relying on primary work in cell culture, invertebrates, or

non-mammalian models, followed by more targeted examinations of specific processes in mammalian models, may unite cutting-edge academic research with the need for establishing flexible guidelines for developmental neurotoxicity.

PRENATAL EXPOSURE AND NEURODEVELOPMENTAL EFFECTS

Mechanisms of developmental toxicity may be <u>different</u> from those of acute toxicity

Acetylcholinesterases are enzymes that play a direct role in axonal outgrowth and neuronal differentiation. Exposure to organophosphorus pesticides inhibits the enzymes and may therefore interfere with this function. The pesticides chlorpyrifos and diazinon alter axonogenesis, synaptogenesis and programming of synaptic functions. The mechanisms of action postulated are: serotonergic system alteration and inhibition of RNA synthesis in neurones and glial cells. Data suggest that some of the toxicity is from the parent compound rather than the active metabolite and occurs independently of the cholinergic systems that are responsible for acute toxicity.
And, these neurodevelopmental toxicities occur at exposure levels too low to cause overt symptoms of cholinesterase inhibition in the pregnant animals.

Refs:
Aldridge JE et al. Serotonergic systems targeted by developmental exposure to chlorpyrifos: effects during critical periods. Environ Health Perspect, 2003, 111:1736.
Colosio C et al. Neurobehavioral effects of pesticides. State of the art. Neurotoxicology, 2003, 24:577.

CHRONIC NEUROLOGICAL EFFECTS

- Neurological sequelae of acute poisoning
- Neurological symptoms due to high indoor levels of pesticides
- Subtle changes in memory and attention

It may be difficult to differentiate the effects of prenatal exposure from exposure in early childhood, or sequelae of non-fatal acute poisonings.
Chronic neurobehavioural and neurological effects after acute poisoning with organophosphorus pesticides have been reported in adults.
Memory and concentration problems, unusual fatigue, irritability and depression, visual difficulties and delayed polyneuropathy have been described.
In a well-documented case of chronic organophosphorus pesticide poisoning, the house of an infant with hypertonia, first diagnosed as cerebral palsy, was found to have high levels of chlorpyrifos weeks after a professional application (Wagner, 1994).
Few studies have examined the neurobehavioural effects of postnatal exposure to pesticides.
Subtle changes in short-term memory and attention may be associated with application of organophosphorus pesticides in the home.
There is increasing evidence, particularly from animal models, about neurobehavioural effects of long-term exposure to low levels of pesticides.

Refs:
American Academy of Pediatrics Committee on Environmental Health. Pesticides. Chapter 24. In: Etzel R. ed. Pediatric Environmental Health 2nd Ed Elk Grove Village Il, American Academy of Pediatrics, 2003.
Eskenazi B et al, Exposures of children to organophosphate pesticides and their potential adverse health effects. Environ Health Perspect, 1999, 107(3):409–419.
Keifer M et al. Symptoms and cholinesterase activity among rural residents living near cotton fields in Nicaragua. Occup Environ Med, 1996, 53:726.
Ruckart PZ et al. Long-term neurobehavioral health effects of methyl parathion exposure in children in Mississippi and Ohio. Environ Health Perspect, 2004, 112:46.
Wagner SL et al. Chronic organophosphate exposure associated with transient hypertonia in an infant. Pediatrics, 1994,

94:94.

PESTICIDES AND CHILDHOOD CANCER

Some studies have found an association between postnatal pesticide exposure and an increased risk of paediatric cancer

- **Brain tumours**
- **Acute lymphocytic leukaemia**
- **Non-Hodgkin lymphoma**

A number of epidemiologic studies have found a significant association between cancer and domestic exposure to pesticides.
Evidence is increasing, but still limited because of the methodological weaknesses of the research.
Investigations in children living in the rural areas of developed countries have also produced limited evidence.

Refs:
Borkhardt A et al. Congenital leukaemia after heavy abuse of permethrin during pregnancy. Arch Dis Child Fetal Neonatal Ed. 2003, 88:F436.
Daniels JL et al. Residential pesticide exposure and neuroblastoma. Epidemiology, 2001. 12:20.
Leiss JK et al. Home pesticide use and childhood cancer: a case-control study. Am J Public Health, 1995, 85:249.
Ma X et al. Critical windows of exposure to household pesticides and risk of childhood leukaemia. Environ Health Perspect, 2002, 110:955.
Pogoda JM et al. Household pesticides and risk of pediatric brain tumors. Environ Health Perspect, 1997, 105:1214.

PRENATAL EXPOSURE AND CHILDHOOD CANCER

- Maternal exposure to pesticide has been associated with paediatric cancer – acute lymphocytic leukaemia
- Association with parental occupational exposure
  - **Leukaemia**
  - **Brain cancer**
  - **Hodgkin and non-Hodgkin lymphomas**
  - **Kidney cancer**

Prenatal exposure has been associated with leukaemia in a newborn after intensive use of permethrin at home by the pregnant mother. Children with certain metabolic enzyme polymorphisms have an increased risk of acute lymphocytic leukaemia when exposed to pesticides in utero or during pregnancy (particularly 2,4-D herbicide). Brain cancer appears to be associated to maternal exposure during agricultural activities. There are some controversial studies that suggest an increased risk of cancer in children whose parents had occupational exposure to pesticides.

Refs:

Efird JT et al. Farm-related exposures and childhood brain tumours in seven countries: results from the SEARCH International Brain Tumour Study. Paediatr Perinat Epidemiol, 2003, 17:201.

Flower KB et al. Cancer risk and parental pesticide application in children of agricultural health study participants. Environ Health Perspect, 2004, 112:631.

Infante-Rivard C et al. Risk of childhood leukemia associated with exposure to pesticides and with gene polymorphisms. Epidemiology, 1999, 10:481.

Rodvall Y et al. Cancer risk in offspring of male pesticide applicators in agriculture in Sweden. Occup Environ Med, 2003, 60:798.

Zahm SH et al. Pesticides and childhood cancer. Environ Health Perspect, 1998, 106:893.

ENDOCRINE DISRUPTION

- Low doses of certain pesticides may mimic or block hormones or trigger inappropriate hormone activity
- Endocrine disruption may alter development and reproduction and induce birth defects
- Endocrine disruption has been linked to:
  - Infertility
  - Low sperm count
  - Early puberty
  - Hormone-dependent cancers (testicular, breast, prostate)
  - Altered sex ratio

Endocrine disruption is not an effect, but a mechanism of toxicity that may have different effects.
Evidence of the effect related to this mode of toxicity in children is still limited.
There is experimental evidence of endocrine disruption. Pesticides may have:
estrogenic effects (DDT, dieldrin, endosulfan, methoxychlor)
anti-androgenic effects (DDT, vinclozilin, procymidone)
anti-thyroid effects (ethylenethiourea (ETU), maneb, zineb metabolites)
anti-progestin effects (DDT).
Synthetic pesticides may interfere with the natural process of development.

Refs:

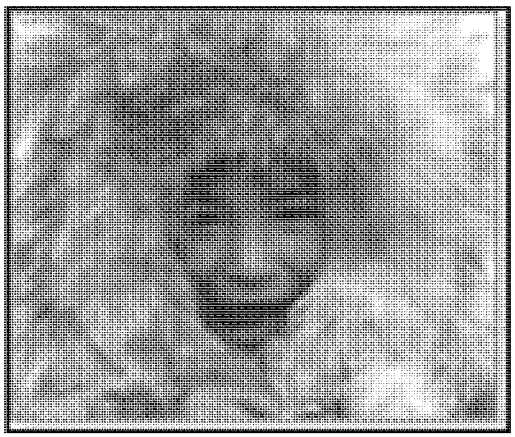
Baskin LS et al. Hypospadias and endocrine disruption, is there a connection? Environ Health Perspect, 2001, 109:1175.
Damstra T et al. Global assessment on the state of the science of endocrine disrupters. IPCS. UNEP/ILO/WHO, 2002.
Gray LE et al. Effects of environmental antiandrogens on reproductive development in experimental animals. Hum Reprod Update, 2001, 7:248.
Landrigan P et al. Assessing the effects of endocrine disruptors in the National Children´s Study. Environ Health Perspect, 2003, 111:1678.

IMMUNOTOXICITY

- Immunotoxicity is suspected, but evidence is limited

Studies in Arctic zone:

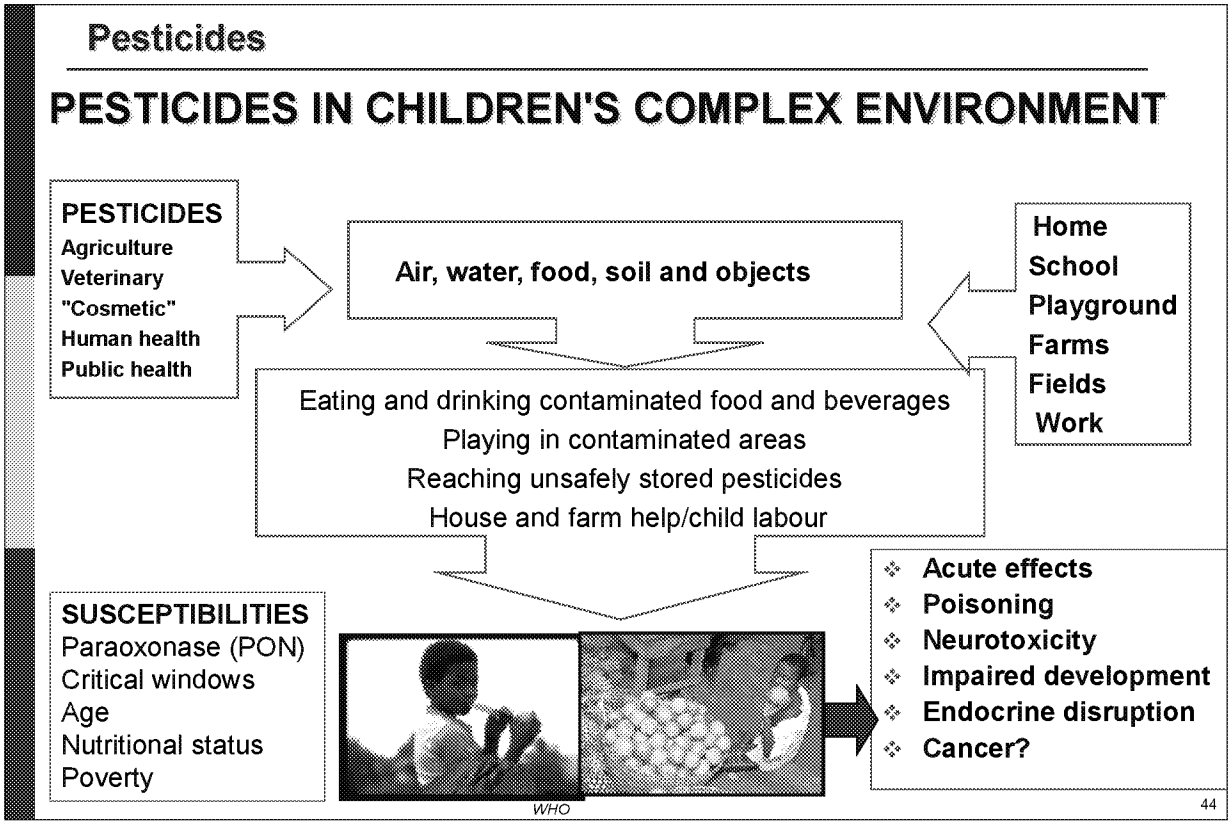
- Higher incidence of ear infections
- Cytokine panel abnormalities



www.smithsonianmag.si.edu/smithsonian/issues04/jan04/images/topdogs_mush_jpg.html

Evidence on the immunotoxic mode of action and effects is limited. Studies from the Arctic zone and Europe are beginning to provide some evidence. Children contaminated with chlordane and heptachlor had cytokine panel abnormalities.
Inuit infants from the Artic exposed in utero and to breast milk contaminated with p,p´-DDE, hexachlorobenzene and dieldrin had an elevated risk of otitis media.

Refs:
Dewailly E et al. Susceptibility to infections and immune status in Inuit infants exposed to organochlorines. Environ Health Perspect, 2000, 108:205.
Duramad P et al, Expression of Th1/Th2 cytokines in human blood after in vitro treatment with chlorpyrifos, and its metabolites, in combination with endotoxin LPS and allergen Der p1, J Appl Toxicol, 2006, 26(5): 458-65.
Phillips TM. Assessing environmental exposure in children: immunotoxicology screening. J Exp Anal Environ Epidemiol, 2000, 10:769.
Picture: www.smithsonianmag.si.edu/smithsonian/issues04/jan04/images/topdogs_mush_jpg.html - Copyright © Smithsonian Institution, 2002. All rights reserved.



This summary slide shows the complexity of the issues related to children's environmental exposure to pesticides and the effects on their health.
Pesticides used in agriculture, treatment of animals, on lawns ("cosmetic"), and for protection of human and public health may enter the air, food, water and soil in the places where children spend most of their time (e.g. at home, at school, in playgrounds, on farms and in fields) and may also contaminate their toys, floors, carpets and materials in their playgrounds.
Children become exposed by:
eating and drinking contaminated food and beverages
playing in contaminated areas
gaining acces to unsafely stored pesticides, or pesticides stored in attractive, colourful containers
helping in the house and on the farm or as child labour
Contact with clothing or shoes of working parents

Children have special susceptibilities related to:
paraoxonase (PON) - it catalyzes the hydrolysis of toxic metabolites and can protect against pesticide toxicity, which then depends on the PON genotypes
critical windows of susceptibility
age
nutritional status
poverty

Exposure may lead to:
acute effects including irritation of the skin or eyes, coughing, lacrimation
poisoning, with systemic effects
neurotoxicity

impaired development
endocrine disruption
cancer
<<NOTE TO USER: You may wish to replace this photo with an appropriate image of a child/children from your region.>>
Picture on the right: WHO, P. Virot. Fruits and vegetables, Ghana, 2003
Picture on the left: WHO, C. Gaggero. Jamaica, Nutrition and child

OBSOLETE PESTICIDES

Obsolete pesticides are pesticides that can no longer be used for their intended purpose or any other purpose.

They may include:

- Pesticides in liquid, powder or dust, granule, emulsion form.
- Empty and contaminated pesticide containers
- Heavily contaminated soil
- Buried pesticides

Causes of obsolete pesticides:

- Use prohibited for health/environmental reasons
- Product deteriorated as result of improper or prolonged storage
- Product not suitable for intended use and cannot be used for other purposes, nor can it easily be modified to become usable.

Obsolete, unwanted and banned pesticides are serious environmental hazards. Leaking and corroding metal drums filled with obsolete and dangerous pesticides dot urban and rural landscapes of developing countries around the world. These chemical leftovers have become villains in the agricultural world they were designed to help, affecting not only a nation's agriculture and its environment, but also fundamentally the health of its people and consequently development in general be it in rural areas or under urban conditions.

This global environmental tragedy is a direct result of several decades of mishandling and misuse, but is most dramatic in the developing world where there is no awareness of the inherent danger of pesticides. The unaware therefore draw water from contaminated site for own survival and that of their animals.

Obsolete pesticides may include: <<READ SLIDE>>

Most of the affected countries are under tropical conditions where agricultural and vector pests flourish both in diversity and numbers. Migratory pests such as locusts, grasshoppers, grain eating birds, storage pests, rodents, etc. inflict untold damage to agriculture and bring about hunger or misery when they are at their peak.

Poor nations have been led to believe that the only alternative to combat pests agricultural or otherwise effectively is only by using pesticides. The poor or the unaware never think for a moment that pesticides are poisonous and that they are dangerous to life. Most believe that pesticides are like medicines. They consider that they kill pests selectively and are therefore less harmful to humans, animals and plants. Governments save budgets to purchase pesticides on regular basis. Also constantly plead to donors and organizations for assistance either for direct supply of pesticides or for contributions of financial support for purchasing them. In response, donors and organizations supply pesticides. Recipient countries anxious to minimize pest damages to the minimum or, being less aware of the negative consequences, usually receive pesticides from every possible source and direction. This leads to uncoordinated influx of pesticide donations and trading, subsequently giving rise to excessive supply. While some of the donations are genuine, others take the opportunity to dump unwanted and illegal pesticides on the poor and unsuspecting countries. Pesticides reach individual farmers or household dwellers that value pesticides dearly. They keep them in their houses, with their food and animals. Pesticide vendors take the opportunity to promote pesticides aggressively. It is not uncommon to find pesticides being stored in the open or in heavily populated zones and usually in substandard stores and sold along with

food and drinks, etc. Children are used in advertising sales of pesticides and often get easy access to pesticides. They play with empty pesticide cans and use them for drinking water or milk. Most pesticide cans litter streets or are simply dumped in open municipality dumps for subsequent open burning leading to serious emissions of dioxins affecting child waste pickers (scavengers) working in the informal recycling sector. Obsolete pesticides found in open waste sites may also be used/sold by waste pickers and re-introduce them into the agricultural sector.

Common causes of obsolete pesticides include the following:

Use of the product has been prohibited or severely restricted for health or environmental reasons (e.g. through banning; withdrawal of registration, or policy decision by relevant government agencies)

The product has deteriorated as a result of improper or prolonged storage and can no longer be used according to its label specifications and instructions for use, nor can it easily be reformulated to become usable again.

The product is not suitable for its intended use and cannot be used for other purposes, nor can it easily be modified to become usable.

Other possible reasons for why we have obsolete pesticide include:

Banning of pesticides that are still kept in store.

Aggressive pesticide sales, promotions and distributions by the Chemical Industry.

Difficulties in forecasting outbreaks of pest.

Inappropriate assessment of pesticide requirements.

Insufficient application capacity.

Inappropriate formulations or substandard containers.

Excessive donations: these are usually inappropriate because they are not received when needed most (i.e. late arrival of donations or out of season delivery), or are uncoordinated with similar donations from various sources. Such are tantamount to dumping.

Inadequate storage facilities and lack of staff trained in storage management (i.e. poor stock taking and lack of records).

Ineffective distribution or poor marketing systems for pesticides (government or private sector or both).

Lack of awareness of the inherent dangers of pesticides.

Misuse of pesticide containers (e.g. for a variety of domestic uses, water containers, food storage, use for pot plants, etc.).

Notes from FAO: www.fao.org/WAICENT/FAOINFO/AGRICULT/AGP/AGPP/Pesticid/Disposal/index_en.htm

OBSOLETE PESTICIDES

Disposal of obsolete pesticides:

- United Nations Food and Agriculture Organization has developed a set of guidelines for disposal.
- Contact your local authorities for advice on disposal.

FAO

Disposal of obsolete pesticides:
In many countries, obsolete pesticides are a problem. The United Nations Food and Agriculture Organization have developed a set of guidelines for disposal, available at:
www.fao.org/WAICENT/FAOINFO/AGRICULT/AGP/AGPP/Pesticid/Disposal/index_en.htm.
Contact your local authorities for advice on disposal.

WHO Recommended Classification by Hazard contains a table of active ingredients (available at: www.inchem.org/documents/pds/pdsother/class.pdf) believed to be obsolete or discontinued for use as pesticides.

<< NOTE TO USER: Do you have stockpiles of obsolete pesticides in this country? If so, what is the reason for it?>>

Notes from FAO: www.fao.org/WAICENT/FAOINFO/AGRICULT/AGP/AGPP/Pesticid/Disposal/index_en.htm
Picture: FAO, I. Balderi. Obsolete pesticides that have heavily leaked into the environment polluted and contaminated ground water and containers left from domestic use have disappeared into the soil.

PREVENTION OF EXPOSURE

What can be done to prevent pesticide exposure and poisoning ?

- Take action at
  - Local level
  - National level
  - International

WHO

<<READ SLIDE.>>

Because of the potential for long-term damage to critical structures such as the nervous system, immune system and endocrine system, prevention of all acute poisoning events as well as of exposure to low doses during development is a high priority for ensuring children's environmental health. There are many steps that can be taken at the local/practice level, national/government level and international treaty/trade levels to decrease exposure to pesticides and related illnesses.

Picture: WHO, L. De Toledo. Ethiopia

Pesticides

PREVENTION – LOCAL LEVEL

Use pesticides ONLY when the benefits outweigh the risks

- Avoid cosmetic or scheduled use of pesticides in the home
- Use integrated pest management (IPM), non-chemical pest controls

If pesticides are necessary:

- Store in original containers with child-proof seals, out of reach, in a locked cabinet
- Educate on the safe use of pesticides
  - Follow manufacturer's instructions
  - Use protective equipment
  - Respect re-entry times
  - Pregnant women should not apply pesticides
- Use least hazardous chemicals, least dangerous mode of application

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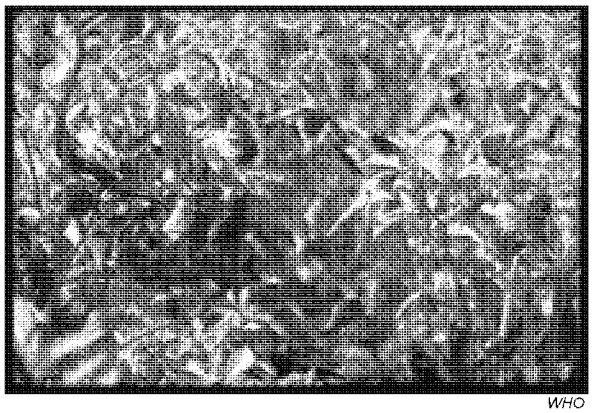
Pesticides should be used only when the benefits outweigh the risks, and non-chemical pest control procedures have failed.
Cosmetic use of pesticides, that is their use to control aesthetically unpleasant plants or non-dangerous insects such as crickets or house millipedes, should be completely avoided.
Integrated pest management (IPM) procedures which include hygiene, sealing of cracks and crevices, screening of doors and windows, and other measures should be the first line of defence for pest management.
If pesticides must be used, they should be stored only in their original containers with manufacturer's labels intact, preferably with child-proof seals, out of the reach of children and in locked cabinets or cupboards.
Users should always follow the safety precautions specified by the manufacturer and observe all safety recommendations including use of gloves, masks, protective clothing and observation of re-entry times (the time when it is safe to return to a treated area).
Pregnant women should not apply pesticides and particular care should be taken to determine appropriate re-entry times for pregnant women, infants and small children. These times may be considerably longer than for less vulnerable individuals.
If chemicals are required, the least hazardous chemical (when there is scientific evidence of less toxicity) should be used with the most contained mode of distribution considered effective. For example, fogs and bombs should not be used. Bait stations are preferable to baseboard sprays or crack and crevice treatment. Granules and bait stations should be used only if they are inaccessible to babies, toddlers and small children (and pets).

Refs:
UNEP Chemicals. Childhood Pesticides Poisoning. Information for Advocacy and Action. May 2004 (www.who.int/ceh/publications/en/pestpoisoning.pdf).
US EPA Webpage for Integrated Pest Management (www.epa.gov/pesticides/food/ipm.htm).

PREVENTION – COMMUNITY LEVEL

- **Integrated pest management (IPM)**
  - **Homes**
  - **Schools**
  - **Public buildings**
  - **Health centres**
  - **Public parks**
- **Community activities**
  - **Community campaigns**
  - **School activities**
  - **Local awards or contests**
  - **Pesticide-free "zones"**
  - **Support organic farming**



WHO

Many organizations (especially FAO and WHO) promote alternative non-chemical forms of pest-control and there is increasing engagement in non-pesticide dependent agriculture and integrated pest management (IPM).
A variety of local initiatives involving the community can help to create an environment that promotes decreased dependence on pesticides in homes, schools, public areas, health facilities and parks.

Examples of community activities include:
community campaigns and school activities
local awards or contests
pesticide-free "zones“
support for organic farming

FAO: Food and Agriculture Organization

<<READ SLIDE.>>
Picture: WHO, P. Virot. Plants at the Biofarm, Ethiopia, June 2002.

PREVENTION – NATIONAL LEVEL

- Education campaigns aimed at pesticide users, general population and children
- Restrict availability or limit use
- Establish and monitor maximum residue limits
- Surveillance and epidemiological vigilance for acute and chronic related illness
- Treatment capacities
  - Emergency services
  - Poison control centres
  - Education of health care providers

Education is a key component of safe pesticide use and prevention of toxic exposures. Farmers, pesticide applicators and their families need to be informed and educated on how to recognize and prevent pesticide poisonings. Trained or licensed pesticide applicators can maximize preventive measures. Educating mothers on home prevention strategies is particularly important.

Bans and restrictions on use of pesticides found to be highly toxic or persistent in the environment have been successful; severe poisonings are seen less frequently than in the past. For example, organochlorine poisoning no longer occurs in countries that restrict their uses to a specific agricultural application and have banned domestic use.

A major change in regulatory approaches to pesticides occurred when the US Congress passed the Food Quality Protection Act in 1996. This law requires the US Environmental Protection Agency to set residue levels for foods to protect the most vulnerable populations, specifically infants, children and fetuses (pregnant mothers) from harm due to cumulative exposure taking into account all routes of exposure. This law has led to the restrictions on use and voluntary withdrawal from the market by manufacturers of several previously widely used pesticides (e.g. chlorpyrifos and diazinon).

Pesticide manufacturers and governments should follow the voluntary FAO International Code of Conduct on the Distribution and Use of Pesticides.

Refs:

UNEP Chemicals. Childhood Pesticides Poisoning. Information for Advocacy and Action. May 2004 (www.who.int/ceh/publications/en/pestpoisoning.pdf).

US EPA Website Food Quality Protection Act, 1996 (www.epa.gov/oppfead1/fqpa/backgrnd.htm).

PREVENTION – INTERNATIONAL LEVEL

- **Persistent organic pollutants (POPs)**
  Stockholm Convention
- **Hazardous chemicals and pesticides**
  Rotterdam Convention (PIC)
- **International organizations:**
  WHO, IFCS, FAO, ILO

Pronczuk 51

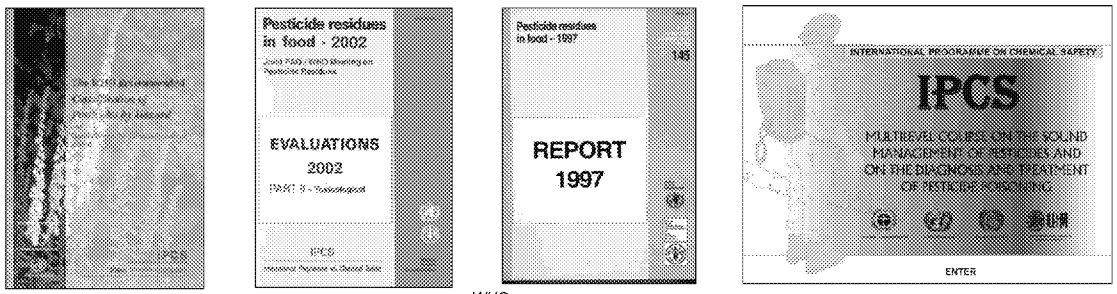
Nine of the 12 persistent organic pollutants (POPs) included in the Stockholm Convention, are pesticides (aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, mirex, toxaphene and hexachlorobenzene). This convention, under the auspices of United Nations Environmental Programme became effective in May 2004, after it was signed by 50 countries. The Rotterdam Convention on the Prior Informed Consent (PIC) procedure for certain hazardous chemicals and pesticides was adopted in September 1998, and has been signed by 73 countries. The convention establishes a first line of defence against toxic chemicals, giving importing countries the power to receive information and decide which potentially hazardous chemicals they want to receive. It also covers labelling requirements. The convention includes 22 pesticides.
Other international organizations such as the Intergovernmental Forum for Chemical Safety (IFCS), the International Labour Organization (ILO) and others are working towards safer use and monitoring of pesticides at the global level.

IFCS: Intergovernmental Forum for Chemical Safety
FAO: Food and Agriculture Organization
ILO: International Labour Organization

Refs:
UNEP Chemicals. Childhood Pesticides Poisoning. Information for Advocacy and Action. May 2004 (www.who.int/ceh/publications/en/pestpoisoning.pdf).
www.pic.int

PESTICIDES AND CHILDREN: ACTIVITIES IN WHO

1. Guidelines for the classification of pesticides by hazard
2. Joint FAO/WHO Meeting on Pesticide Residues
3. International pesticide limits in water
4. Training manual on pesticides
5. Poison centres and pesticide exposures



WHO

1. WHO guidelines for the classification of pesticides by hazard. The WHO Recommended Classification of Pesticides by Hazard was approved by the 28th World Health assembly in 1975 and has since gained worldwide acceptance. Guidelines were first issued in 1978, and have since been revised and reissued at 2-yearly intervals. Ref: IPCS. The WHO Recommended Classification of Pesticides by Hazard and Guidelines to Classification 2000-2002. Geneva, World Health Organization, 2002.
2. The Joint FAO/WHO Meeting on Pesticide Residues (JMPR) is an international expert scientific group that is administered jointly by the Food and Agriculture Organization of the United Nations (FAO) and the World Health Organization (WHO). JMPR, which consists of the FAO Panel of Experts on Pesticide Residues in Food and the Environment and the WHO Core Assessment Group, has been meeting regularly since 1963. During the meetings, the FAO Panel of Experts is responsible for reviewing information on residues and analytical aspects of the pesticides under consideration, including data on their metabolism, fate in the environment, and use patterns, and for estimating the maximum levels of residues that might occur as a result of the use of the pesticides according to good agricultural practices. The WHO Core Assessment Group is responsible for reviewing toxicological and related data and for estimating, where possible, acceptable daily intakes (ADIs) for humans of the pesticides under consideration.
Ref: www.who.int/ipcs/food/jmpr/en
The Codex Alimentarius Commission was created in 1963 by FAO and WHO to develop food standards, guidelines and related texts such as codes of practice under the Joint FAO/WHO Food Standards Programme. The main purposes of this Programme are protecting the health of the consumers and ensuring fair trade practices in the food trade, and promoting coordination of all work on food standards undertaken by international governmental and nongovernmental organizations.
Ref: www.codexalimentarius.net/web/index_en.jsp
3. International pesticide limits in water. WHO produces international norms on water and health in the form of guidelines.
Ref: www.who.int/water_sanitation_health/dwq/guidelines/en/
4. Training manual on pesticides. Available at IPCS (WHO).
5. Poison centres play a key role in providing information, advice and management of case of pesticide exposure in the countries where they are available. For more information, see: www.who.int/ipcs/poisons/centre/directory/en/

IPCS: Intergovernmental Programme on Chemical Safety
FAO: Food and Agriculture Organization
Pictures: WHO

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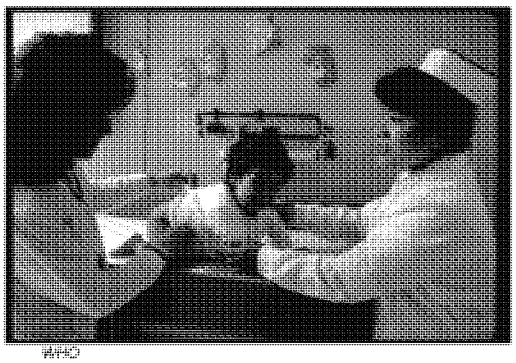
CRITICAL ROLE OF HEALTH AND ENVIRONMENT PROFESSIONALS



- Diagnose and treat
- Publish, research
  - Sentinel cases
  - Community-based interventions
- Educate
  - Patients and families
  - Colleagues and students
- Advocate
- Provide role model

Health and environment professionals have a critical role to play in maintaining and stimulating changes that will restore and protect children's environmental health, and protect them from pesticide exposure.
Health care providers can do something. At the one-to-one level with the patient, they can include pesticide poisoning in the differential diagnoses and in preventive advice.
They can be dissatisfied with the diagnosis of "idiopathic" in cases of paediatric disease and look harder for evidence pointing to pesticides as a potential cause of disease and disability.
They can ask specific questions about the use of pesticides within the home, in the garden or farming areas, or about potential pesticide residues in fruit and vegetables. Which pesticides are being used? When? Where? How? What safety and hygiene measures are being taken? Are the instructions being read and followed?
They can publish sentinel cases and develop and write about community-based interventions in relation to pesticides.
They can educate patients, families, colleagues and students didactically to diagnose, treat and prevent pesticide poisonings and exposures.
They can discourage chemical pesticide use and encourage integrated pest management.
They can also provide information about the local Poisons Centre or other sources of information on pesticides.
As professionals with an understanding of both health and the environment, health care providers are powerful role models who can practice integrated pest management, be advocates for strict pesticide laws and regulations, proper labeling of pesticide products and child-proof containers for all pesticide products.

POINTS FOR DISCUSSION

<<NOTE TO USER: Add points for discussion according to the needs of your audience.>>

CASE STUDY

- A family with two children ages 8 months and 6 years are referred to the clinic with concerns of pesticide exposure.
- They are worried because their apartment was sprayed with pesticides for termites 3 times when the mother was pregnant with her 6 year old son. She remembers feeling dizzy and fatigued during that period but attributed it to the pregnancy.

<<READ SLIDE>>

The setting is present day New York City, United States. This family is poor and lives in low income housing that was likely sprayed multiple times for termites. The most commonly used pesticide at that time was chlorpyrifos.

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CASE STUDY

- Her six year old was born at low birth weight for gestational age and has been behind in meeting developmental milestones. He now has behavioural problems and is behind in reading in school.
- She recently read in the newspaper that chlorpyrifos is not being used in residential settings in the US because it stays on surfaces for long periods of time and may have harmful health effects.

Read the Slide

The mother was told by someone at work that there was a newspaper article on a pesticide (chlorpyrifos) that was widely used in their part of New York. It stated that the the US Environmental Protection Agency phased out its use because of adverse health effects. The article pointed out that mothers who were exposed to chlorpyrifos prenatally may have delivered low birth weight babies.

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Pesticides

CASE STUDY

- She is wondering if her son's low birth weight and difficulties in school could be due to chlorpyrifos exposure.
- She asks if she should be worried about her 8 month old being exposed given that chlorpyrifos can stay on surfaces for long periods of time.

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As we know, pediatricians treat the entire family not just individual children. This case brings up a number of interesting points regarding each family member.

Pre-Test

What are the problems lists for the 6 year old and 8 month old?
What differential diagnoses would you consider for the 6 year old?
What further history do you want?
How would you further evaluate and manage these patients?
What is the likelihood that prenatal chlorpyrifos exposure is related to the 6 year old's health problems?

Pesticides

BACKGROUND

- **Chlorpyrifos (Dursban/Lorsban) is an organophosphate chemical. It acts as a pesticide by interfering with the acetylcholinesterase enzyme necessary for normal neurological functioning.**

- **It was used for the following purposes:**
  - agriculture
  - pet collars
  - cattle ear tag
  - mosquitocide
  - indoor crack/crevice sealant
  - treatment for lawns/turf
  - indoor termiticide

- **An estimated 20-24 million pounds of chlorpyrifos were applied annually in the late 1990s. 50% for agricultural use and 50% non-agricultural purposes.**

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Chlorpyrifos is in the organophosphate family of chemicals. It is a known human toxin that persists in the environment for decades. Chlorpyrifos is released into the environment and can travel through waterways and sediments to enter the food supply by way of farming or the fish/animal supply. It is ubiquitous in all parts of the world.

It has been used in farming extensively as a pesticide thereby exposing numerous food crops to its residues.
It has been used as an insecticide for termites and mosquitoes. It has been used as an indoor crack/crevice sealant, for pet collars, and as treatment on lawns, turf or pastures.

US EPA estimates that 20-24 million pounds of chlorpyrifos were applied annually in the late 1990s. Mitigation measures were put into place in the US in 2000 to phase out uses near or in schools, homes, parks, and daycare centers and to restrict uses in agricultural settings.

Ref:
US EPA Website Organophosphate Pesticide Information

Pesticides

CASE STUDY

- Apartment was sprayed with chlorpyrifos 3 times during pregnancy with 6 yr old son. She was dizzy and fatigued surrounding the times of spraying.
- She is wondering if her six year old son's low birth weight and difficulties in school could be due to the chlorpyrifos exposure.
- She asks if she should be worried about her 8 month old being exposed given that chlorpyrifos can stay on surfaces for long periods of time.

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Now, let's go back to the original case.

What does this information tell you and what more do you want to know?

1. First, this mother was exposed when she was pregnant. We would like to know the exact chemicals used and have documentation of the exposure. Also, we need to take a thorough environmental history:
Exposures to other environmental toxicants (there may be other substances in the household contributing to her health effects during pregnancy)
What are the occupations of the parents? Are there potential environmental exposures at work?
When is/was the exposure? Is it continuing currently?
What are the main effects? We would like to know more about the mother's symptoms during pregnancy (although there does not need to be overt clinical symptoms for low level toxicity).

In terms of the six year old son – we would like to know his birth weight, length, and head circumference
How has his growth has been?
What is his developmental history?
What are his activities and what he might be exposed to in the environment?

In terms of the 8 month old, we would like to know if he is crawling currently (exposure to floor, carpets, furniture).
Is he still breastfeeding?
How has his development been?

ANSWERS
Overall, there are not clear cut answers in low dose exposure toxicology as compared to acute exposures. All answers must weigh the scientific evidence of the toxicant against the clinical history and physical exam findings of the patients.

1. Chlorpyrifos exposure in high doses is associated with dizziness and fatigue. The differental diagnosis for her symptoms is long and, it is difficult say whether the mother's symptoms were due to this exposure given that most residential chlorpyrifos sprayings were not associated with overt toxicity.
2. Her son's low birth weight and difficulties in school may be due to a number of factors. Chlorpyrifos has been associated with low birth weight and decreased birth length in inner city newborns whose mothers were exposed during pregnancy. Long term neurodevelopmental outcomes have not been studied to date.
3. The 8 month old is crawling and being exposed to many surfaces in the home. The data has shown that higher levels of chlorpyrifos are inversely correlated with time from application to testing. Most of this data shows that residues persist for 1-2 wks after spraying but with multiple exposures, residues may persist longer.

CASE STUDY

What recommendations would you give to this family?

- **Primary prevention!**
- **Encourage home dust/furniture testing if they think exposure is ongoing**
- **Encourage blood testing for acetylcholinesterase if they are worried about ongoing exposures**
- **Encourage alternatives to pesticides for the future**

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Pesticides

ACKNOWLEDGEMENTS

WHO is grateful to German donors and to the US EPA Office of Children's Health Protection for the financial support that made this project possible and for some of the data, graphics and text used in preparing these materials.

First draft prepared by Amalia Laborde MD (Uruguay)

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Reviewers: Nida Besbelli PhD (WHO), Brenda Eskenazi PhD (USA), Ruth A. Etzel, MD, PhD (USA),

Update: August 2008
Project Coordination: Jenny Pronczuk MD
Medical Consultant: Katherine M. Shea MD MPH
Technical Assistance: Marie-Noel Bruné MSc

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Message

From: Allen, Reginald [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=799C3B0558E14130B17C66B2533548BA-ALLEN, REGI]
Sent: 10/5/2016 3:14:39 PM
To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]
CC: Reed, Khesha [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=c62327cee1fd4da29a1cc485efe546f7-Reed, Khesha]
Subject: RE: DAA/DRA -- Call for Transition Issue Papers by Oct 4
Attachments: Issue Papers_All_Issues_Final.xlsx

Here is the excel sheet with all the papers – sorry to say that most were due in yesterday.

I am checking the OP Transition POCs to determine the best wayahead to allow OCHP input.

In the mean time you or Khesha can reach out to the POC and check and maybe work it that but in any case it would have to a quick turn.

Sorry for getting this to you late.

Reggie

Reginald E. Allen
Director, Administrative and Executive Services
Office of the Administrator
U.S. Environmental Protection Agency
Office 202-564-0444
Direct 202-564-1029
Cell Ex. 6
AO SharePoint Site

From: Etzel, Ruth
Sent: Thursday, September 29, 2016 4:38 PM
To: Allen, Reginald <Allen.Reginald@epa.gov>
Cc: Reed, Khesha <Reed.Khesha@epa.gov>
Subject: FW: DAA/DRA -- Call for Transition Issue Papers by Oct 4

Hi Reggie,

Khesha and I appreciated the opportunity to review the list of transition issue papers. We would like you to ask that OCHP be added as a collaborator on the following issue papers:

Chlorpyrifos & Glyphosate

Lead

New TSCA

PCBs in schools

Zika

Climate Resilience

Tire Crumb

Emerging Drinking Water Contaminants

East Chicago

Flint

Would you happen to have a list of the point person for each issue paper? Given the short time frame, I'd like to call them directly, if possible.

Many thanks!

Ruth

From: "Allen, Reginald" <Allen.Reginald@epa.gov>
Date: September 29, 2016 at 9:56:19 AM EDT
To: "Reed, Khesha" <Reed.Khesha@epa.gov>
Subject: FW: DAA/DRA -- Call for Transition Issue Papers by Oct 4

As discussed

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From: Kenny, Shannon
Sent: Friday, September 16, 2016 12:11 PM
To: DAA-Career <DAACareer@epa.gov>; DRA <DRA@epa.gov>; Hull, George <Hull.George@epa.gov>; Richardson, RobinH <Richardson.RobinH@epa.gov>; Caraballo, Mario <Caraballo.Mario@epa.gov>
Cc: Transition Coordinators <Transition_Coordinators@epa.gov>; 2016OPTransitionTeam <2016OPTransitionTeam@epa.gov>; Grantham, Nancy <Grantham.Nancy@epa.gov>; Siciliano, CarolAnn <Siciliano.CarolAnn@epa.gov>
Subject: DAA/DRA -- Call for Transition Issue Papers by Oct 4

All,

Thank you again for all of your thoughtful input on the transition effort to date.

Our next step is to begin drafting short **issue papers** on key topics. Attached please find the list of 30 papers we ask that you develop - along with a lead office or region, and a suggested list of collaborating offices/regions, for each paper - by **October 4**. We have also included a **2-page template** we ask that you follow.

The list was developed based upon your input, input from your transition coordinators, OPA, OCIR, and OP, as well as information about the campaigns and our learning from previous landing teams.

My team will work through your Transition Coordinators to provide clear instructions for putting these draft papers into Sharepoint for review no later than October 4.

Ex. 5 - Deliberative Process

Please note that this is not a complete inventory of the briefing materials to be provided to the landing team. I will be in touch with many of you soon to discuss what additional materials we want to work on.

Please give me a call anytime if you would like to discuss.

Shannon

Transition Issue Papers -- Policy							
Topic	Lead Author	Lead Program or Region POC	Collaborators	Collaborator POCs	Date Assigned	Due Date	Description
Title VI							
Clean Power Plan & Associated Actions							
Transportation and Climate							
Climate Change: Beyond the CPP							
Paris Climate Agreement							
GHG Emission Trends							
Biomass							
Transportation and GHGs							
Volkswagen							
Zika							
New TSCA							
Pollinator Protection							
Lead							
PCBs in Schools							
Trade & Environment							
Abandoned Mines							
High Profile Clean-up Sites							
Climate Resilience							
Social Cost of Carbon & Other GHGs							
Food Waste							
Oil & Gas sector							

Ex. 5 - Deliberative Process

Hydraulic Fracturing
Financial Assurance
Sustainable Acquisition
Behavioral Sciences
Environmental Economics

EJ & Communities

Tire Crumb

IRIS

Emerging Drinking Water Contaminants

Water/Wastewater Infrastructure

Nutrients (including Harmful Algal Blooms)

Drinking Water Action Plan
Eastern Long Island Sound

Transporting Fuels
East Chicago

Flint

Earthquakes
Westlake Landfill

Puerto Rico

Dakota Pipeline

Ex. 5 - Deliberative Process

Transition Issue Papers -- Management							
Topic	Lead Author	Lead Program or Region POC	Collaborators	Collaborator POCs	Date Assigned	Due Date	Description
Enterprise Risk- Information Technology							
Enterprise Risk- Human Resources							
Enterprise Risk- Contracts							
Space Consolidation (HQ and Labs)							
Employee Misconduct							
E-enterprise							
Strategic Plan							
NPM Guidance							
State Oversight							
Cybersecurity							
Increasing Litigation							
Homeland Security							
Tribal Issues							
Lean							
Public Opinion							
EPA & Data							
Puerto Rico							

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Transition Issue Papers -- Regulatory							
Topic	Lead Author	Lead Program or Region POC	Collaborators	Collaborator POCs	Date Assigne	Due Date	Description
NAAQS							
Renewable Fuel Standards							
Chlorpyrifos & Glyphosate							
TCE use in Dry Cleaning and Aerosol Degreasing							
TCE use in Vapor Degreasing							
NMP and Methylene Chloride							
PCBs in light ballasts in schools and daycares							
Lead RRP Public and Commercial Buildings							
CERCLA 108(b) rule and additional classes notice							
Risk Management Modernization							
Drinking Water PAG							
Lead and Copper Rule							
Fees for Water Infrastructure							
Project Applications under							
Water Quality Standards for Indian Country and in individual States							

Ex. 5 - Deliberative Process

Message

From: Spire, Paul [PSpire@aap.org]
Sent: 3/8/2018 12:15:23 AM
To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Sophie Balk (sbalk@montefiore.org) [sbalk@montefiore.org]
CC: Jennifer Lowry [jlowry@cmh.edu]
Subject: Green Book - "Drinking Water" chapter - stakeholder feedback for editor review
Attachments: 17 - Drinking Water.docx; 17 - comments.docx

Dear Ruth and Sophie,

I am writing to provide the attached stakeholder feedback for the "Drinking Water" chapter. Also attached is a copy of the chapter as it was distributed for stakeholder review, which should serve as the starting point for any further revision.

The reviewer comments, unless specifically labeled "significant concerns," are to be considered advisory suggestions or requests, not mandates. Nonetheless, it is expected that all comments will be given serious consideration and accommodated where possible. We are also asked to provide a brief response under each comment, indicating whether the suggestion was incorporated, what was done, or a brief justification for not including. (The reviewer comments and COEH responses will travel forward with the book through the review and approval process.)

For each chapter, a decision will need to be made whether the editorial team may be able to address the comments, or if there will be a need to reach-out to the original author or perhaps the COEH executive committee for assistance.

Thanks again for all of your work on the book!

Best,

Paul

Message

From: Spire, Paul [PSpire@aap.org]
Sent: 5/2/2016 11:22:25 PM
To: Ahdoot, Samantha [atkinssam@yahoo.com]; John.Balbus@nih.gov [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=2c555339753d4bedb1a7a321779b25f6-John.Balbus@nih.gov]; Baum, Carl [carl.baum@yale.edu]; Bernstein, Aaron [Aaron.Bernstein@childrens.harvard.edu]; Bole, Aparna [Aparna.Bole@UHhospitals.org]; Brubaker, Todd [brutoddskier@gmail.com]; Brumberg, Heather [Heather_Brumberg@NYMC.edu]; Campbell, Carla C [ccampbell3@utep.edu]; DeNicola, Nate [ndenicola@gmail.com]; Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Foos, Brenda [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=18b24f2f79414190852a748bf650d2b9-Bperkovi]; Gadhia, Ami [agadhia@aap.org]; Lanphear, Bruce [blanphear@sfu.ca]; Laris, Zachary [zlaris@aap.org]; Lowry, Jennifer [jlowry@cmh.edu]; Mortensen, Mary [zeo4@CDC.GOV]; Pacheco, Susan [Susan.E.Pacheco@uth.tmc.edu]; Spanier, Adam [aspanier@peds.umaryland.edu]; Trasande, Leo [leonardo.trasande@nyumc.org]; Ward, Mary [wardm@mail.nih.gov]
CC: Balk, Sophie [sbalk@montefiore.org]
Subject: COEH Meeting - Green Book - draft chapters and review assignments
Attachments: 06 - Laboratory Testing - COEH review.docx; 13 - Workplaces - COEH review.docx; 19 - Herbs, Dietary Supps - COEH review.docx; 34 - Nitrates and Nitrites - COEH review.docx; 42 - Tobacco - COEH review.docx; 44 - Arts and Crafts - COEH review.docx; 45 - Asthma - COEH review.docx; 48 - Chelation - COEH review.docx; 52 - Emerging Technologies - COEH review.docx; 53 - Disasters - COEH review.docx; 56 - Global Climate Change - COEH review.docx; 57 - Green Offices - COEH review.docx; 58 - Idiopathic Env Intolerance - COEH review.docx; 63 - Advocacy - COEH review.docx
Importance: High

Dear COEH,

I am writing to convey the attached 14 draft Green Book chapters for discussion during the upcoming COEH meeting, as well as instructions for how we are going to approach these reviews. Our traditional meeting agenda pdf will be forthcoming within the next week, but we wanted to send these materials out in advance so you could begin the review process.

We will be spending a significant portion of the meeting on Friday, May 13 reviewing these chapters. All 11 executive committee members are scheduled to be in attendance on Friday and all are being assigned to serve as a "Primary Reviewer" on one or more chapters. (Although no liaisons have been assigned as primary reviewers, liaisons are very much encouraged to participate in the review and discussion process.)

All meeting attendees are encouraged to review all chapters. Primary reviewers are asked to lead discussion of their assigned chapter(s) during the meeting, record and collate all input offered by others, and convey all comments/edits to me within 1 week after the meeting. Our goal is to spend approximately 15 minutes per chapter. The input collected/submitted by the primary reviewers will be conveyed to the original chapter authors as guidance to adjust their chapter.

The list of chapters and primary reviewer assignments are as follows:

Chapter #	Chapter Title	Primary Reviewer	Chapter Lead Author
06	Laboratory Testing of Body Fluids and Tissues	Carl Baum	Mortensen, Mary
13	Work Places	Heather Brumberg	Runyan, Carol
19	Herbs, Dietary Supplements and Other Remedies	Aparna Bole	Woolf, Alan

Chapter #	Chapter Title	Primary Reviewer	Chapter Lead Author
34	Nitrates and Nitrites in Water	Aaron Bernstein	Fuortes, Laurence and Rippentrop, Steven
42	Tobacco Use and Tobacco Smoke Exposure	Carla Campbell	Wilson, Karen and Walley, Susan
44	Arts and Crafts	Aparna Bole	Zajak, Lauren
45	Asthma	Leo Trasande	Spanier, Adam
48	Chelation for Environmental Toxins	Susan Pacheco	Woolf, Alan and Hauptman, Marissa
52	Emerging Technologies and Materials	Samantha Ahdoot	Landrigan, Philip
53	Environmental Disasters	Adam Spanier	Adirim, Terry
56	Global Climate Change	Jennifer Lowry	Ahdoot, Samantha
57	Green Offices and Practice Sustainability	Bruce Lanphear	Bole, Aparna
58	Idiopathic Environmental Intolerance	Leo Trasande	Woolf, Alan
63	Environmental Health Advocacy	Adam Spanier	Ami/Zach (COFGA) and Ian (COSGA)

Many thanks for your support. Please let me know if you have any questions or need anything more.

Best,

Paul

Message

From: Schroeder, Kathleen [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=0DB676B2FADE4B54BEBCC7B6E664FC94-SCHROEDER,]
Sent: 10/26/2016 12:56:39 PM
To: AO-OCHP-Everyone [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=222d03d48d634481af638d4892296469-AO-OCHP-Everyone]
Subject: Testimony On EPA Herbicide Registration

Rep. Smith Faults McCarthy Over Testimony On EPA Herbicide Registration

October 25, 2016

Rep. Lamar Smith (R-TX), chairman of the science panel, is faulting EPA Administrator Gina McCarthy's testimony at an oversight hearing into the agency's controversial registration review of the world's most commonly-used herbicide glyphosate, saying a new committee analysis suggests there are contradictions in McCarthy's statements.

The concerns, outlined in an Oct. 25 letter to McCarthy, highlight Smith's ongoing oversight of EPA's Federal Insecticide, Fungicide, Rodenticide Act (FIFRA) registration review of glyphosate. His committee ramped up its tracking of the process after the agency in April posted to a public website an internal review finding that glyphosate is unlikely to cause cancer, and then withdrew it days later, saying it was released inadvertently.

Environmentalists have long sought stricter EPA oversight of glyphosate, arguing its heavy use with genetically-modified crops poses significant ecological risks, including increasing weed resistance.

The substance's potential human health risks then became a driving concern after a World Health Organization's (WHO) International Agency for Research on Cancer (IARC) March 2015 review that found glyphosate probably causes cancer -- though Smith now suggests flaws in McCarthy's testimony on this issue.

In the letter, Smith argues that McCarthy made incorrect statements during a June 22 oversight hearing on the role that a pair of agency scientists played in the IARC review completed last year. “The Committee has determined that EPA officials participated in the IARC study and contributed to the carcinogenicity finding, contravening statements made to the committee by the administrator and EPA staff,” Smith says in the letter.

“The Committee implores you to take control of this matter and determine why your staff failed you and failed to correct matters as necessary to ensure that the agency’s decisions are based solely on sound science,” the lawmakers said in an Oct. 25 press release to announce the letter.

Glyphosate Review

Additionally, Smith asks that EPA provide for transcribed interviews two agency scientists that participated in the IARC review, as well as agency toxics chief Jim Jones.

Smith also faults EPA's Oct. 14 decision to postpone its scheduled Oct. 18-21 FIFRA Scientific Advisory Panel (SAP) review of glyphosate's potential cancer risk, suggesting the delay raises questions about whether the agency's oversight of the substance is being driven by sound science. Smith also backs recent pesticide industry claims that certain selected panelists may be biased toward advocacy groups.

In the letter Smith asks that EPA provide for transcribed interviews Matthew T. Martin and Peter P. Egeghy, of the agency's Office of Research and Development, as well as Jones. He asks that EPA contact the committee to schedule the interviews by Nov. 1.

Industry has argued that the IARC review erroneously contradicts overwhelming evidence that glyphosate does not cause cancer, and has sought data on the review.

According to a Reuters exclusive Oct. 25, IARC has cautioned scientists who participated in the controversial 2015 review not to release information on that review under the Freedom of Information Act.

In a letter to scientists, IARC said it “is the sole owner of such materials,” according to a Reuters report. "IARC requests you and your institute not to release any (such) documents”. -- *Dave Reynolds* (dreynolds@iwpnews.com)

http://insideepa.com/daily-news/rep-smith-faults-mccarthy-over-testimony-epa-herbicide-registration

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Message

From: US EPA Children's Health [kargbo.marcia@epa.gov]
Sent: 3/19/2018 4:05:23 PM
To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]
Subject: Welcome to the latest edition of the EPA's Children's Environmental Health Bulletin!

Office of Children's Health Protection

Children's Environmental Health Bulletin

Interested in Creating a Community Garden or Expanding Urban Agriculture?

Communities throughout the country are turning to urban agriculture and gardening as a reasonable option to increase access to healthy, nutritious, and low-cost produce. However, creating a garden to serve the community requires a number of considerations including soil quality. Exposure to soils containing contaminants can pose health risks, particularly for children. For example, children playing in the garden may directly eat soil through hand-to-mouth play, or may eat from the garden without first washing produce to remove soil and dust. Knowledge of soil health and potential contamination are keys to helping communities identify and correct problems so that community gardens are safe and productive.

For steps to create a community garden or expand urban agriculture, click here.

Dear Ruth,

We want to hear from you! EPA's Office of Children's Health Protection is in the process of making changes to the Children's Environmental Health Bulletin to ensure we continue to provide relevant, current, and clear public health information to the general public. If you have any comments on the layout, content or structure of the bulletin, please email them to Marcia Kargbo at Kargbo.Marcia@epa.gov.

In This Month's Bulletin

Announcements & Updates

- **EPA Settles with Amazon for Distributions of Illegal Pesticides**
- **Pesticide Final Interim Decisions and Case Closures**

- **EPA Administrator Scott Pruitt's Meeting to Discuss Federal Efforts to Reduce Childhood Lead Exposure**
- **Upcoming Children's Health Protection Advisory Plenary Meeting Scheduled for April 19-20, 2018**

Public Comment & Peer Review Opportunities

- **Draft Human Health Risk Assessments for Pesticide Registration Reviews for Public Comment by April 30, 2018**
- **Proposed Interim Registration Review Decisions for Public Comment by April 30, 2018**

Announcements & Updates

EPA Settles with Amazon for Distributions of Illegal Pesticides

In February 2018, EPA announced an agreement with Amazon to protect the public from the hazards posed by unregistered and misbranded pesticide products. In August 2015 and January 2016, EPA issued FIFRA Stop Sale, Use, or Removal Orders against Amazon Services LLC to prohibit the sale of illegal pesticide products that can easily be mistaken for black-board or side-walk chalk, especially by children. After receiving the stop sale orders, Amazon immediately removed the products from the marketplace, prohibited foreign sellers from selling pesticides, and cooperated with EPA during its subsequent investigation. The orders, as well as EPA's subsequent engagement with the company, prompted Amazon to more aggressively monitor its website for illegal pesticides. As a result, Amazon has created a robust compliance program comprised of a sophisticated computer-based screening system backed-up by numerous, trained staff. In October 2016, Amazon notified all customers who purchased the illegal pesticides between 2013 and 2016 to communicate safety concerns with these products and urge disposal. Amazon also refunded those customers the cost of the products, approximately $130,000. Under the terms of this recent agreement, Amazon will pay an administrative penalty of $1,215,700 and will develop an online training course on pesticide regulations and policies that will be mandatory for all entities planning to sell pesticides on Amazon.com. This settlement is intended to prevent children from being inadvertently exposed to illegal pesticides, particularly those mimicking chalk.

For more information on this settlement or to read a copy of the consent agreement and final order, go to: https://www.epa.gov/enforcement/amazon-services-llc-fifra-settlement.

Pesticide Final Interim Decisions and Case Closures

A registration review decision is the Agency's final determination whether a pesticide meets the standard for registering pesticides. An interim decision based on the human health assessment can be issued before completing all required findings related to ecological impacts. Please note that only children's health concerns are highlighted here; there may be other human health or ecological concerns described in the relevant documents.

- **Aldicarb** is an insecticide registered for use to control soil borne pests and in agricultural areas, and on certain crops, as well as on imported commodities. There are drinking water risks of concern for children from domestic agricultural use; EPA is implementing the mitigation measures proposed by the registrant during the public comment period for the draft risk assessments (DRAs) are expected to reduce the acute drinking water exposure estimates from surface water contributions. Longer well setbacks in the southeast United States, in states where monitoring data suggested the need, are expected to reduce drinking water exposure from groundwater contributions. For The Aldicarb Interim Registration Review Decision, see: https://www.regulations.gov/document?D=EPA-HQ-OPP-2012-0161-0101.
- **Ethephon** is a plant growth regulator used on food, feed, and nonfood crops, for greenhouse nonfood crops, and outdoor plants. There are post-application risks of concern for children ages

1-2 years old hand-to-mouth exposure from playing on treated turf; EPA is terminating the use of ethephon on turf, with the exception of golf courses. For the Ethephon Interim Registration Review Decision, see: https://www.regulations.gov/document?D=EPA-HQ-OPP-2010-0098-0034.

EPA has also announced the availability of final interim registration review decision for the following pesticides. There are no children's health concerns for these pesticides that would require mitigation. Aliphatic esters (EPA-HQ-OPP-2016-0084); Atonik plant growth regulators (Sodium 5-Nitroguaiacolate, Sodium o-Nitrophenolate, Sodium p-Nitrophenolate; EPA-HQ-OPP-2008-0832); Bromuconazole (EPA-HQ-OPP-2015-0535); Carfentrazone-ethyl (EPA-HQ-OPP-2010-0815); Cyclanilide (EPA-HQ-OPP-2011-0153); Flumiclorac-pentyl (EPA-HQ-OPP-2009-0084); Hexazinone (EPA-HQ-OPP-2009-0755) Hymexazol (EPA-HQ-OPP-2010-0127); Menthol (EPA-HQ-OPP-2009-0900); Mepiquat chloride/mepiquat pentaborate (EPA-HQ-OPP-2012-0083); Metaflumizone (EPA-HQ-OPP-2016-0417); Propylene glycol/dipropylene glycol/triethylene glycol (EPA-HQ-OPP-2013-0218; EPA-HQ-OPP-2013-0219).

EPA has also announced case closure for Oxazolidine-E (EPA-HQ-OPP-2008-0404) and Bromohydroxyacetophenone (BHAP; EPA-HQ-OPP-2009-0726) because all of the U.S. registrations for this pesticide have been canceled.

For additional interim decisions and case closures, see: https://www.gpo.gov/fdsys/pkg/FR-2018-02-27/pdf/2018-03982.pdf.

EPA Administrator Scott Pruitt's Meeting to Discuss Federal Efforts to Reduce Childhood Lead Exposure

On February 16, 2018, U.S. Environmental Protection Agency (EPA) Administrator Scott Pruitt hosted fellow Cabinet members and other key senior leaders to outline a federal strategy to reduce childhood lead exposure and associated health risks.
Administrator Pruitt was joined by members or their designees of the *President's Task Force on Environmental Health Risks and Safety Risks to Children* (Task Force), and other principals to collaborate on a clear direction in the development and implementation of a new *Federal Strategy to Reduce Childhood Lead Exposures and Eliminate Associated Health Impacts.* The Task Force is co-chaired by Administrator Pruitt and Health and Human Services (HHS) Secretary Alex Azar. Notable attendees included: Secretary of Housing and Urban Development (HUD) Ben Carson, Secretary of Labor Alexander Acosta, and HHS Deputy Secretary Eric Hargan.
At the meeting, attendees agreed to:

- Make addressing childhood lead exposure a priority for Task Force departments and agencies;
- Five goals that frame the new *Federal Strategy to Reduce Childhood Lead Exposures and Eliminate Associated Health Impacts;*
- Set an aggressive, near-term timeline for the Task Force to complete its work to draft the strategy; and,
- Schedule a follow-up principals meeting or event to issue the federal strategy and discuss next steps.

Representatives from the following agencies or offices attended:

- U.S. Department of Health and Human Services
- U.S. Department of Housing and Urban Development
- U.S. Department of Labor
- U.S. Department of Agriculture
- U.S. Department of Education
- U.S. Department of Justice
- U.S. Department of Homeland Security
- U.S. Consumer Product Safety Commission
- Office of Management and Budget
- Office of Science and Technology Policy

- Council on Economic Advisers
- Council for Environmental Quality

Upcoming Children's Health Protection Advisory Plenary Meeting Scheduled for April 19-20, 2018

The next Children's Health Protection Advisory Plenary Meeting will be held on April 19-20 at the Holiday Inn Washington-Capitol 550 C Street, SW Washington, DC 20024. For more information on the upcoming meeting please visit https://www.epa.gov/children/childrens-health-protection-advisory-committee-chpac or contact Angela Hackel at hackel.angela@epa.gov or at 202.566.2977.

Public Comment Opportunities

Draft Human Health Risk Assessments for Pesticide Registration Reviews for Public Comment by April 30, 2018

Registration review is EPA's periodic review of pesticide registrations to ensure that each pesticide continues to satisfy the statutory standard for registration, that is, the pesticide can perform its intended function without unreasonable adverse effects on human health or the environment. As part of the registration review process, the Agency has completed comprehensive draft human health and/or ecological risk assessments for a number of pesticides. Please note that only children's health concerns are highlighted here.

- **Acetamiprid** is a neonicotinoid insecticide registered for use on fruit and vegetable crops and in a number of residential sites, including indoor application as a crack/crevice/bedbug treatment, applications to gardens, and pet (i.e., dogs) spot-on treatment. The acute dietary analysis is just below the level of concern for children 1<2 years old, as is the aggregate risk assessment. Using developmental toxicological endpoints, certain occupational uses result in estimated risks of concern. For the Draft Human Health Risk Assessment for Acetamiprid, see: https://www.regulations.gov/document?D=EPA-HQ-OPP-2012-0329-0025
- **Butralin** is an herbicide used as a plant growth regulator on tobacco. There are no dietary or spray drift risks of concern for children. The Agency has considered the exposure to humans from residues in tobacco smoke by assessing the short-term inhalation exposure and risks for adults only. For the Draft Human Health Risk Assessment for Bifenthrin, see: https://www.regulations.gov/document?D=EPA-HQ-OPP-2010-0384-0247.
- **Cypermethrins** are pyrethroid insecticides registered for use on a wide variety of agricultural food/feed crops, livestock, and sod farms; at recreational sites (i.e., golf courses, athletic fields); at indoor residential sites, on residential lawns; on gardens and trees; on mosquitoes and termites, and on pets. There are estimated risks of concern for children from certain uses on lawns, indoors, and pet collars. For the Draft Human Health Risk Assessment for the Cypermethrins, see: https://www.regulations.gov/document?D=EPA-HQ-OPP-2011-0720-0020.
- **Glyphosate** is an herbicide used on fruit, vegetable, and field crops, turf, and aquatic application scenarios. There are no dietary, residential or spray drift risks of concern for children. In response to concern from segments of the general public related to the presence of glyphosate in human milk, the EPA analyzed human milk samples collected by the National Children's Study for residues of glyphosate and its metabolites; there were no detection in the 39 samples from 39 mothers. EPA has determined glyphosate to be "Not likely to be carcinogenic to humans." For the Draft Human Health Risk Assessment for Glyphosate, see: https://www.regulations.gov/document?D=EPA-HQ-OPP-2009-0361-0068. For the Analysis of Human Milk for Incurred Residues of Glyphosate and its Metabolites, see https://www.regulations.gov/document?D=EPA-HQ-OPP-2009-0361-0085.
- **Prometon** is an herbicide used in non-agricultural and non-residential locations, including parking lots, roadsides, and under pavement. When using modeling data, drinking water estimates are of concern for children; however, when using monitoring data there is no concern. Spray drift estimates require a 10 foot buffer from the field edge. For the Draft Human Health

Risk Assessment for Prometon, see: https://www.regulations.gov/document?D=EPA-HQ-OPP-2013-0068-0019.

- **Pymetrozine** is an insecticide used in agricultural field and orchard/vineyard crops, on Christmas trees and ornamentals, and interior plantscapes. Acute and chronic dietary risk estimates, mainly from drinking water, are of concern for children. EPA has classified Pymetrozine as a "likely human carcinogen". For the Draft Human Health Risk Assessment for Pymetrozine, see: https://www.regulations.gov/document?D=EPA-HQ-OPP-2013-0368-0017.

EPA has also announced the availability of draft human health risk assessments for the following pesticides: Acibenzolar (EPA-HQ-OPP-2013-0755), Ametryn (EPA-HQ-OPP-2013-0249), Ammonia/ammonium sulfate (EPA-HQ-OPP-2012-0684), Naphthenate salts (EPA–HQ–OPP–2010-0455), and Pyrithiobac-sodium (EPA-HQ-OPP-2011-0661). There are no children's health concerns for these pesticides.

For more information, see: https://www.gpo.gov/fdsys/pkg/FR-2018-02-27/pdf/2018-03986.pdf.

Proposed Interim Registration Review Decisions for Public Comment by April 30, 2018

The proposed interim registration review and supporting documents describe the risk findings and consideration of possible risk mitigation measures for a pesticide undergoing registration review. Following a 60-day public comment period, the Agency will issue interim or final registration review decisions. EPA has announced the availability of the proposed interim registration review decisions for the pesticides Quinoxyfen (EPA-HQ-OPP-2013-0771) and Sucrose (EPA-HQ-OPP-2013-0751). There are no children's health concerns for these pesticides.

For additional information, see: https://www.gpo.gov/fdsys/pkg/FR-2018-02-27/pdf/2018-03983.pdf.

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Message

From: Schroeder, Kathleen [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=0DB676B2FADE4B54BEBCC7B6E664FC94-SCHROEDER,]
Sent: 12/14/2015 1:41:49 PM
To: AO-OCHP-Everyone [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=222d03d48d634481af638d4892296469-AO-OCHP-Everyone]
Subject: EPA Enforcement Division May Look Into Dow Pesticide Snafu

EPA Enforcement Division May Look Into Dow Pesticide Snafu
Posted December 10, 2015, 12:45 P.M. ET
By David Schultz
Jim Jones, head of the EPA's chemical regulatory office, told Bloomberg BNA that he has asked the agency's enforcement division to look into whether Dow Chemical Co. violated part of a law that requires pesticide makers to notify the EPA if they become aware of any new environmental effects of their products.
Jones is responding to recent developments involving Dow's Enlist Duo weed killer, a mixture of the herbicidal chemicals glyphosate and 2,4-D. Almost a year after granting final approval to Enlist Duo, the EPA learned that Dow claimed in a patent application that these two chemicals can amplify each other's effects, creating a synergism that the EPA worries would make the product more toxic than it had initially thought.
After it learned of the information in the patent application, the EPA took the unusual step last month of asking a court to nullify its own approval of Enlist Duo. Dow is strongly opposing this nullification request in court, but said it will voluntarily agree to stop selling Enlist Duo until this issue is resolved.

Kathy

Kathleen Schroeder, MD, MSI
Senior Environmental Employee
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202-566-2279

Message

From: Schroeder, Kathleen [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=0DB676B2FADE4B54BEBCC7B6E664FC94-SCHROEDER,]
Sent: 12/28/2015 1:57:02 PM
To: AO-OCHP-Everyone [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=222d03d48d634481af638d4892296469-AO-OCHP-Everyone]
Subject: Ag groups urge McCarthy to let farmers use Enlist Duo

Ag groups urge McCarthy to let farmers use Enlist Duo

Sam Pearson, E&E reporter

Published: Wednesday, December 23, 2015

U.S. EPA should withdraw its request to block registration of a controversial herbicide so that farmers can use it by next year's growing season, a coalition of agriculture groups argued in a letter yesterday to Administrator Gina McCarthy.

The letter, which was signed by the American Farm Bureau Federation, American Soybean Association, National Corn Growers Association, National Cotton Council and National Farmers Union, objects to EPA's recent request for a federal court to vacate and remand the registration of Enlist Duo.

EPA told the 9th U.S. Circuit Court of Appeals last month that it had obtained new information that the herbicide, which is made from a choline salt of the chemical 2,4-D and glyphosate, could result in greater toxicity to plant life surrounding the treated crops than previously thought.

The decision came after the receipt of new data from manufacturer Dow AgroSciences LLC, EPA said (*Greenwire*, Nov. 25).

The appeals court has yet to rule on EPA's motion.

Farming groups argued in their letter to McCarthy that EPA has already conducted a "lengthy review" of Enlist Duo. Continuing to delay farmers' use of the pesticide threatens their ability to control weeds, the groups said.

They argued that EPA lacks legal authority to withdraw a previously approved pesticide unless there is an "imminent hazard," such as an "unreasonable hazard to the survival" of a threatened or endangered species.

"No one has suggested that the information EPA now is considering with Enlist Duo comes close to meeting that threshold," the groups said.

EPA spokeswoman Monica Lee said in a statement that the agency remains concerned about Enlist Duo's impacts on surrounding plants.

"If EPA's review of data indicates that is the case, the agency may determine that additional restrictions on the use of Enlist Duo would be needed to meet the statutory standards for registration," Lee said.

More than 450,000 people submitted public comments to the agency ahead of its decision to approve Enlist Duo last year (*Greenwire*, July 23, 2014).

Kathleen Schroeder, MD, MSI
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Message

From: Schroeder, Kathleen [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=0DB676B2FADE4B54BEBCC7B6E664FC94-SCHROEDER,]
Sent: 9/27/2016 12:26:43 PM
To: AO-OCHP-Everyone [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=222d03d48d634481af638d4892296469-AO-OCHP-Everyone]
Subject: Pesticide Reviews

House, Senate Republicans Ramp Up Scrutiny Of EPA's Pesticide Reviews

September 26, 2016

House and Senate Republicans are ramping up their scrutiny of EPA's risk reviews for commonly used herbicides, seeking documents from the agency's registration reviews of atrazine and glyphosate, and questioning the National Institutes Of Health's (NIH) support of an international panel that deemed glyphosate a possible carcinogen.

In a Sept. 23 letter to EPA Administrator Gina McCarthy, Senate Homeland Security and Governmental Affairs Committee Chairman Ron Johnson (R-WI) seeks EPA documents supporting the agency's draft ecological review of atrazine, noting farmers are concerned that the review is spurring calls for a ban.

Meanwhile, House Committee on Oversight and Government Reform Chairman Jason Chaffetz (R-UT) sent a Sept. 26 letter to NIH Director Francis Collins seeking a briefing on the institute's funding of IARC. Chaffetz notes IARC's finding that glyphosate poses a risk of human cancer, and argues that the committee has a record of controversial findings, inconsistencies, and retractions.

The two letters underscore increasing concerns among GOP lawmakers and the pesticide sector about the merits of EPA's risk reviews that inform its registrations of pesticides.

EPA is currently taking comment through Oct. 4 on its June 6 draft review that found the nation's second-most commonly-used herbicide poses risks to species, including aquatic plants and some mammals, and suggested possible restrictions. The agency is also convening an Oct. 18-21 FIFRA Scientific Advisory Panel (SAP) review of the potential health risks of glyphosate.

In the letter to McCarthy, Johnson reiterates industry and House Republicans' concerns about EPA's handling of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) registration review of glyphosate. He notes that EPA in April posted an internal report finding glyphosate is unlikely to cause cancer, and then subsequently withdrew that document days later saying it had been released inadvertently.

“The EPA must conduct transparent and objective scientific studies when reviewing herbicides and pesticides,” Johnson says. “Farmers in Wisconsin and across the country deserve to know what factors the EPA considers when deciding whether to restrict farmers access to vital agricultural tools.”

Lawmakers' Questions

In the letter, Johnson asks whether EPA considered the social and economic benefits of atrazine in the review, as FIFRA requires, and argues that restrictions on the substance would spur increased use of less effective herbicides.

Johnson also presses EPA on its ongoing glyphosate review, asking when the agency will reach a decision on the substance, and questioning how the agency's retracted cancer study will factor into its decision of whether to renew glyphosate's registration. Johnson gives EPA an Oct. 7 deadline for answering his questions.

House science panel Chairman Lamar Smith (R-TX), began an investigation this spring into EPA's handling of the glyphosate review after the agency posted and withdrew its "Cancer Assessment Document: Evaluation of the Carcinogenic Potential of Glyphosate.”

Whether glyphosate poses a risk of human cancer has been a driving concern since the World Health Organization's (WHO) International Agency for Research on Cancer (IARC), in a March 2015 report found the substance probably causes cancer. The finding contradicted other reviews from international regulatory bodies, including one also within the WHO.

EPA Sept. 16 issued a new issue paper supporting next month's SAP review. The agency noted that its withdrawn Oct. 1, 2015 CARC review classified glyphosate as “Not Likely to be Carcinogenic to Humans.”

Meanwhile, Chaffetz uses his letter to Collins to ask for an NIH briefing and raises concerns that, “IARC's determinations influence American policymaking, even though IARC avoids having to meet the strict scientific standards and government scrutiny afforded to science committees in America,” the letter says. -- *Dave Reynolds* (dreynolds@iwpnews.com)

Kathleen Schroeder, MD, MSI
Senior Environmental Employment Program
SEE Enrollee
US EPA
Office of Children's Health Protection

schroeder.kathleen@epa.gov
202-566-2279

Message

From: Spire, Paul [PSpire@aap.org]
Sent: 1/3/2017 9:12:06 PM
To: Newman, Nicholas (Nick) [Nicholas.Newman@cchmc.org]
CC: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Jennifer Lowry [jlowry@cmh.edu]
Subject: "Pesticides" Green Book chapter
Attachments: 39 Pesticides.docx

Dear Dr. Newman,

With apologies for the delay in responding, we very much appreciate your willingness to contribute to the next edition of "Pediatric Environmental Health" manual. I am writing on behalf of Drs. Etzel and Lowry to request your assistance by leading the revision of the "Pesticides" chapter.

A copy of the previous, 3rd edition version of the chapter is attached in Word format to serve as a starting point for revision. The "track changes" feature has been enabled, and if you are comfortable doing so, it would be preferred that you update the document using this feature.

Do you think a 2-month timeframe would be do-able (ie, returned by March 3)? Please let us know what you think.

Thank you again for your support. If you have any questions or need anything more, please do not hesitate to let us know.

Best regards,

Paul

Paul Spire
Manager, Division of Technical & Medical Services
American Academy of Pediatrics
phone: Ex. 6
email: pspire@aap.org

From: Newman, Nicholas (Nick) [mailto:Nicholas.Newman@cchmc.org]
Sent: Friday, October 21, 2016 5:25 PM
To: Spire, Paul <PSpire@aap.org>
Subject: Re: COEH ListServ - seeking member volunteers to assist in revision of 4 Green Book chapters - response by Nov 2

Paul,

I'm interested in working on this project. I could work on any of the chapters, but I'm best suited to "Children's Unique Vulnerabilities to Environmental Hazards" and "Pesticides"

Thanks,
Nick

Nicholas Newman, DO, MS, FAAP
Assistant Professor of Pediatrics and Environmental Health
University of Cincinnati College of Medicine
Director, Environmental Health and Lead Clinic
Site Director, Pediatric Environmental Health Specialty Unit
Cincinnati Children's Hospital Medical Center
Cincinnati, OH 45229

From: COEH <COEH@LISTSERV.AAP.ORG> on behalf of Paul Spire <PSpire@AAP.ORG>
Date: Wednesday, October 19, 2016 at 5:20 PM
To: "COEH@LISTSERV.AAP.ORG" <COEH@LISTSERV.AAP.ORG>
Subject: COEH ListServ - seeking member volunteers to assist in revision of 4 Green Book chapters - response by Nov 2

Dear COEH Member,

The COEH Executive Committee, working in collaboration with Editor Dr. Ruth Etzel and Associate Editor Dr. Sophie Balk, are in the process of developing the next edition of the AAP's landmark ***Pediatric Environmental Health*** manual (commonly referred to as "The Green Book"). Hopefully you are familiar with the Green Book, but for those who are not, it is the AAP policy manual on the identification, prevention, and treatment of pediatric environmental health problems. Additional information here: http://shop.aap.org/Pediatric-Environmental-Health-3rd-Edition-Paperback

Revision of most of the previous, 3rd edition chapters are underway. At this time, however, we are seeking COEH member volunteers to lead revision of the following 4 chapters:

- Children's Unique Vulnerabilities to Environmental Hazards
- Food Safety
- Pesticides
- Birth Defects and Other Adverse Developmental Outcomes

Please note that these 4 chapters exist in the current 3rd edition, so this is a revision process, not a matter of creating something new from scratch. The key objectives of the revision are to ensure that the information, guidance, references, and resources are up-to-date. Authors will be provided the previous edition text in Word format as a starting point; the updated chapter would be requested by the end of January 2017.

If you might be interested and able to help support the revision of this important publication, please respond within 2 weeks, by Wednesday, Nov 2. Please indicate which chapter you are interested in revising and provide a short statement of your interest and background in this topic area.

If you have any questions or need any additional information, please do not hesitate to let me know.

Many thanks for
considering,

Paul

Paul Spire
Manager, Division of Technical & Medical Services
American Academy of Pediatrics

phone: Ex. 6
email: pspire@aap.org

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To unsubscribe, please forward this list message to listmaster at aap dot org.

Message

From: Spire, Paul [PSpire@aap.org]
Sent: 2/16/2018 3:48:00 PM
To: Newman, Nicholas (Nick) [Nicholas.Newman@cchmc.org]
CC: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Sophie Balk [sbalk@montefiore.org]; Jennifer Lowry [jlowry@cmh.edu]
Subject: Green Book - "Pesticides" chapter - addressing stakeholder review comments
Attachments: 40 - Pesticides.docx; 40 - COID comments.docx; 40 - comments.docx

Dear Nick,

I am writing on behalf of the Green Book editorial team to follow-up on the development of the "Pesticides" chapter.

The chapter was recently reviewed by a number of AAP internal stakeholder groups, which resulted in the attached comments. I am writing to ask if you would be able to help respond to these issues. The reviewer comments can be considered advisory suggestions or requests, not mandates. Nonetheless, it is hoped that all comments will be given serious consideration and accommodated when possible. We are also asked to provide a brief response under each comment, indicating whether the suggestion was incorporated, what was done, or a brief justification for not including. The current draft chapter is attached to serve as the starting point for any possible further revision.

The updated chapter would be requested by Friday, March 2.

Thanks much for considering and for your ongoing support.

Best,

Paul

Message

From: Schroeder, Kathleen [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=0DB676B2FADE4B54BEBCC7B6E664FC94-SCHROEDER,]
Sent: 12/1/2015 1:36:43 PM
To: AO-OCHP-Everyone [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=222d03d48d634481af638d4892296469-AO-OCHP-Everyone]
Subject: Lawsuit re: Glyphosate and cancer

http://news.bna.com/deln/DELNWB/split_display.adp?fedfid=79849573&vname=dennotallissues&jd=a0h5z6p4d9&split=0

Kathy

Kathleen Schroeder, MD, MSI
Senior Environmental Employee
US EPA
Office of Children's Health Protection

schroeder.kathleen@epa.gov
202-566-2279

Message

From: Schroeder, Kathleen [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=0DB676B2FADE4B54BEBCC7B6E664FC94-SCHROEDER,]
Sent: 7/26/2016 12:42:30 PM
To: AO-OCHP-Everyone [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=222d03d48d634481af638d4892296469-AO-OCHP-Everyone]
Subject: Glyphosate Carcinogenicity SAP OCT 18-21

EPA Convening FIFRA SAP To Review Glyphosate's Potential Cancer Risk

July 25, 2016

EPA is convening a meeting of its Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) Scientific Advisory Panel (SAP) this fall to review its recent analysis of whether glyphosate, the nation's most commonly-used herbicide, causes human cancers, as recent reviews by other regulatory bodies have drawn conflicting conclusions.

In a notice scheduled for publication in the *Federal Register* July 26, EPA seeks both nominations of scientists to participate in the Oct. 18-21 review in Arlington, VA, and public comment to inform the SAP's analysis. EPA will seek nominations for 30 days, and has set a preferred deadline for written comments by Oct. 4, though comments will be accepted until the meeting starts.

EPA says it will seek SAP advice on the agency's recent analysis of the potential carcinogenicity of glyphosate. Staff recently reviewed “a substantial amount of data,” the notice says, using its draft “Framework for Incorporating Human Epidemiological & Incident Data in Health Risk Assessment” to guide the review.

The plan to seek outside input comes as EPA is facing criticism for its handling of the FIFRA-required registration review of glyphosate and of its efforts to incorporate epidemiological, or human data, into pesticide risk reviews, assessments that in years past have generally relied on animal toxicology studies.

House science panel Chairman Lamar Smith (R-TX), began an investigation this spring into EPA's handling of glyphosate after the agency in April posted its "Cancer Assessment Document: Evaluation of the Carcinogenic Potential of Glyphosate" finding the substance is unlikely to cause cancer and then subsequently withdrew that document May 2.

Smith requested agency documents supporting the withdrawn review, and a source with the committee has said the panel's review is considering the possibility that EPA scientists are split on whether glyphosate causes cancer, and how such a split might affect the agency's registration review of the substance.

In a July 25 statement, Smith faulted EPA for withdrawing its completed review of glyphosate, and argued the agency is putting political considerations ahead of its own science.

“EPA has failed to provide the Committee with a single document responsive to its oversight request on this subject,” the statement says. “The Committee will continue to pursue its oversight efforts on this matter to ensure that EPA is using sound science.”

Environmental groups have long sought stricter EPA oversight of glyphosate, arguing heavy use of the substance, particularly since the advent of genetically-modified crops

designed to withstand the substance in the 1990s, poses significant ecological risks, including increasingly resistant weeds.
But focus on the potential human health risks of glyphosate picked up last year after a World Health Organization (WHO) International Agency for Research on Cancer (IARC) March 2015 report found glyphosate probably causes cancer.

Epidemiological Data

EPA cites the IARC review in the notice as well as other recent reviews including a May 2016 conclusion of the Joint Food and Agriculture Organization's Meeting on Pesticide Residues, another branch of the WHO, that glyphosate is unlikely to pose a risk of human cancers through diet. Also, the European Food Safety Authority (EFSA) in November deemed glyphosate unlikely to pose a cancer risk to humans, the notice says.
EPA's notice also describes its own recent analysis of "a substantial amount of data informing the carcinogenic potential of glyphosate," which relied on the agency's draft framework for incorporating epidemiological and incident data in risk assessment.
EPA says the draft guide provides a foundation for assessing multiple lines of evidence and includes a problem formulation component as well as mode of action and adverse outcome pathway frameworks.
Additionally, EPA says, "A comprehensive analysis of data on glyphosate from submitted guideline studies and the open literature was performed." The literature review considered epidemiological, animal carcinogenicity, genotoxicity, metabolism, and mechanistic studies.
EPA's use of epidemiological data in pesticide risk assessments has been controversial, with some agency science advisors at an April meeting on EPA's potential ban on the insecticide chlorpyrifos arguing the agency is improperly relying on a single Columbia University epidemiological study that was not designed for regulatory purposes.
For glyphosate, the agency conducted a systematic review to obtain relevant and appropriate open literature studies to inform its review of the pesticide's potential cancer risk, and compared the studies obtained with recent reviews conducted internally and by other international review bodies, including IARC and EFSA.
EPA also conducted a weight of evidence analysis of its multiple lines of evidence, evaluating the strength, consistency, and biological plausibility of the evidence, among other factors.
"The agency will solicit advice from the SAP on the evaluation and interpretation of the available data for each line of evidence and the weight-of-evidence analysis, as well as how the available data inform cancer classification descriptors according to the agency's 2005 Guidelines for Carcinogen Risk Assessment," the notice says. -- *Dave Reynolds* (dreynolds@iwpnews.com)

Kathleen Schroeder, MD, MSI
Senior Environmental Employee
US EPA
Office of Children's Health Protection

schroeder.kathleen@epa.gov

202-566-2279

Message

From: Reed, Khesha [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=C62327CEE1FD4DA29A1CC485EFE546F7-REED, KHESHA]
Sent: 10/11/2016 7:50:50 PM
To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]
Subject: RE: DAA/DRA -- Call for Transition Issue Papers by Oct 4

I have a call in to OP. Hopefully I'll hear back tomorrow.

From: Etzel, Ruth
Sent: Tuesday, October 11, 2016 12:39 PM
To: Reed, Khesha <Reed.Khesha@epa.gov>
Subject: RE: DAA/DRA -- Call for Transition Issue Papers by Oct 4

Hi Khesha,

Would you please give me an update on the lead transition paper?

Thanks!

Ruth

From: Allen, Reginald
Sent: Wednesday, October 05, 2016 11:15 AM
To: Etzel, Ruth <Etzel.Ruth@epa.gov>
Cc: Reed, Khesha <Reed.Khesha@epa.gov>
Subject: RE: DAA/DRA -- Call for Transition Issue Papers by Oct 4

Here is the excel sheet with all the papers – sorry to say that most were due in yesterday.

I am checking the OP Transition POCs to determine the best wayahead to allow OCHP input.

In the mean time you or Khesha can reach out to the POC and check and maybe work it that but in any case it would have to a quick turn.

Sorry for getting this to you late.

Reggie

Reginald E. Allen
Director, Administrative and Executive Services
Office of the Administrator
U.S. Environmental Protection Agency
Office 202-564-0444
Direct 202-564-1029
Cell Ex. 6
AO SharePoint Site

From: Etzel, Ruth
Sent: Thursday, September 29, 2016 4:38 PM
To: Allen, Reginald <Allen.Reginald@epa.gov>

Cc: Reed, Khesha <Reed.Khesha@epa.gov>
Subject: FW: DAA/DRA -- Call for Transition Issue Papers by Oct 4

Hi Reggie,

Khesha and I appreciated the opportunity to review the list of transition issue papers. We would like you to ask that OCHP be added as a collaborator on the following issue papers:

Chlorpyrifos & Glyphosate

Lead

New TSCA

PCBs in schools

Zika

Climate Resilience

Tire Crumb

Emerging Drinking Water Contaminants

East Chicago

Flint

Would you happen to have a list of the point person for each issue paper? Given the short time frame, I'd like to call them directly, if possible.

Many thanks!

Ruth

From: "Allen, Reginald" <Allen.Reginald@epa.gov>
Date: September 29, 2016 at 9:56:19 AM EDT
To: "Reed, Khesha" <Reed.Khesha@epa.gov>
Subject: FW: DAA/DRA -- Call for Transition Issue Papers by Oct 4

As discussed

Reginald E. Allen
Director, Administrative and Executive Services
Office of the Administrator
U.S. Environmental Protection Agency
Office 202-564-0444
Direct 202-564-1029
Cell Ex. 6
AO SharePoint Site

From: Kenny, Shannon
Sent: Friday, September 16, 2016 12:11 PM
To: DAA-Career <DAACareer@epa.gov>; DRA <DRA@epa.gov>; Hull, George <Hull.George@epa.gov>; Richardson, RobinH <Richardson.RobinH@epa.gov>; Caraballo, Mario <Caraballo.Mario@epa.gov>
Cc: Transition Coordinators <Transition_Coordinators@epa.gov>; 2016OPTransitionTeam <2016OPTransitionTeam@epa.gov>; Grantham, Nancy <Grantham.Nancy@epa.gov>; Siciliano, CarolAnn <Siciliano.CarolAnn@epa.gov>
Subject: DAA/DRA -- Call for Transition Issue Papers by Oct 4

All,

Thank you again for all of your thoughtful input on the transition effort to date.

Our next step is to begin drafting short **issue papers** on key topics. Attached please find the list of 30 papers we ask that you develop - along with a lead office or region, and a suggested list of collaborating offices/regions, for each paper - by **October 4**. We have also included a **2-page template** we ask that you follow.

The list was developed based upon your input, input from your transition coordinators, OPA, OCIR, and OP, as well as information about the campaigns and our learning from previous landing teams.

My team will work through your Transition Coordinators to provide clear instructions for putting these draft papers into Sharepoint for review no later than October 4.

Ex. 5 - Deliberative Process

Please note that this is not a complete inventory of the briefing materials to be provided to the landing team. I will be in touch with many of you soon to discuss what additional materials we want to work on.

Please give me a call anytime if you would like to discuss.

Shannon

Message

From: Landrigan, Philip [philip.landrigan@mssm.edu]
Sent: 12/10/2015 2:40:13 PM
To: 'Spire, Paul' [PSpire@aap.org]
CC: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; 'Lowry, Jennifer' [jlowry@cmh.edu]
Subject: RE: Emerging Technologies and Materials chapter for revision
Attachments: 52 Emerging Technologies.v2. December 10.docx

Paul, Ruth and Jennifer,

After having submitted my chapter to you yesterday evening, I picked up several typos. Also I decided to drop table 52.1, the table that presents information on chemical production volumes, because this information is not very reliable and I do not feel comfortable standing behind the numbers.

Therefore I ask you to please use the attached revision titled **52 Emerging Technologies.v2. December 10** in place of the version that I sent you yesterday

Phil

Philip J. Landrigan, MD, MSc, FAAP
Dean for Global Health
Arnhold Institute for Global Health
Professor of Preventive Medicine and Pediatrics
Icahn School of Medicine at Mount Sinai
12 16 Fifth Avenue, Room 556
New York, NY 10029

Tel: Ex. 6

phil.landrigan@mssm.edu

WHO Collaborating Centre in Children's Environmental Health

From: Landrigan, Philip
Sent: Wednesday, December 09, 2015 6:23 PM
To: 'Spire, Paul'
Cc: Etzel, Ruth; Lowry, Jennifer
Subject: RE: Emerging Technologies and Materials chapter for revision

Dear Paul

Here is my revised, slightly expanded and updated chapter.

My thanks again to you, Ruth and Jennifer for having invited me to do this

Phil Landrigan

Philip J. Landrigan, MD, MSc, FAAP
Dean for Global Health
Arnhold Institute for Global Health
Professor of Preventive Medicine and Pediatrics
Icahn School of Medicine at Mount Sinai
12 16 Fifth Avenue, Room 556
New York, NY 10029

Tel: Ex. 6

phil.landrigan@mssm.edu

WHO Collaborating Centre in Children's Environmental Health

From: Spire, Paul [mailto:PSpire@aap.org]
Sent: Wednesday, October 07, 2015 11:25 AM
To: Landrigan, Philip
Cc: Etzel, Ruth; Lowry, Jennifer
Subject: Emerging Technologies and Materials chapter for revision

Hi Dr. Landrigan.

Thanks much for your support and for your quick reply.

Attached please find a Word versions of the "Emerging Technologies and Materials" chapter from the previous edition green book to use as a starting point for revision. Track Changes has been enabled, and if you are comfortable doing so, it would be helpful if you could update the document using this feature.

The revised draft chapters are requested by January 29, 2016.

Thanks again for your help. If you have any questions or need anything more, please do not hesitate to let me know.

Many thanks,

Paul

From: Landrigan, Philip [mailto:phil.landrigan@mssm.edu]
Sent: Friday, October 02, 2015 2:09 PM
To: Spire, Paul <PSpire@aap.org>
Cc: Etzel, Ruth <etzel.ruth@epa.gov>; Lowry, Jennifer <jlowry@cmh.edu>
Subject: RE: Invitation to contribute to the AAP's Pediatric Environmental Health, 4th Ed manual (Green Book)

Paul, Ruth and Jennifer,

I am honored and delighted to accept this assignment

Phil

Philip J. Landrigan, MD, MSc, FAAP
Dean for Global Health
Arnhold Institute for Global Health
Professor of Preventive Medicine and Pediatrics
Icahn School of Medicine at Mount Sinai
12 16 Fifth Avenue, Room 556
New York, NY 10029

Tel: Ex. 6

phil.landrigan@mssm.edu

WHO Collaborating Centre in Children's Environmental Health

From: Spire, Paul [mailto:PSpire@aap.org]
Sent: Thursday, October 01, 2015 6:21 PM
To: Landrigan, Philip
Cc: Etzel, Ruth; Lowry, Jennifer
Subject: Invitation to contribute to the AAP's Pediatric Environmental Health, 4th Ed manual (Green Book)

Dear Dr. Landrigan,

I am writing on behalf of Editor Dr. Ruth Etzel and AAP Council on Environmental Health Chairperson Dr. Jennifer Lowry to invite your participation in the development of the 4th Edition of the AAP's landmark *Pediatric Environmental Health* manual.

Pediatric Environmental Health, often referred to as "The Green Book," is the comprehensive AAP guide to the identification, prevention, and treatment of pediatric environmental health problems. Authored under the leadership of the AAP's Council on Environmental Health, the manual will be fully updated and substantially expanded for the forthcoming 4th edition, including new chapters on personal care products, alternative nicotine products, obesity, and fracking. The book will be published in both hard-copy and e-book formats. Development of a companion mobile app is also being actively explored.

We would like to invite your participation in revising or developing the following chapter:

- **Emerging Technologies and Materials** (revision)

In considering this opportunity, please note the following:

- Drafts chapters should be developed in Microsoft Word. For chapters that existed in the 3rd edition, the previous version will be provided in Word format to serve as a starting point for revision.
- Draft chapters are requested by January 29, 2016.
- A model chapter outline is attached.

- Draft chapters will be edited by the Green Book editorial team and by the Council on Environmental Health Executive Committee. Additionally, chapters will be subject to the Academy's internal stakeholder and policy development review, and you may be requested to help address issues identified through these processes. The AAP Board of Directors retains the final determination and approval of all manual content.
- Your contribution will be acknowledged in the compiled list of contributors that appears at the beginning of the book, but individual chapters will not be attributed to specific authors per Academy policy. All chapters and overall manual authorship will be attributed to the AAP Council on Environmental Health.

The Pediatric Environmental Health manual plays an important role in protecting children from environmental health hazards by providing a recognized, authoritative, and well-regarded resource for education and policy on these critically important issues. We hope you will support and contribute to the effort to update and expand this essential resource.

Your response to this invitation is requested by Friday, October 16. If you have any questions regarding the manual or the development process, please do not hesitate to contact Drs. Etzel or Lowry through my attention at pspire@aap.org.

Sincerely,

Paul

Paul Spire
Manager, Division of Technical & Medical Services
American Academy of Pediatrics
phone: Ex. 6
email: pspire@aap.org

Message

From: Burke, Thomas [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=39FFC3DD34EA495B9A31E61B778FBBEC-BURKE, THOM]
Sent: 8/26/2016 9:30:40 PM
To: Perron, Monique [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=cc557abe34854b1aa08f00ab01474ff8-Perron, Monique]
CC: Jones, Jim [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=c32c4b9347004778b0a93a4cbd83fc8a-JJONES1]; Wise, Louise [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=cf7be035da4b45a3a7d45c84c9f4b4a3-LWise]; Mojica, Andrea [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=f47e2a2bfbc4434aa9cc1e8c2a385da3-Andrea Mojica]; Housenger, Jack [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=e5840e7ccea94f6b89471abd355dceb7-Jack E. Housenger]; Keigwin, Richard [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=151baabb6a2246a3a312f12a706c0a05-Richard P Keigwin Jr]; Lowit, Anna [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=1d3428a2c0b84d5099124a0460babd53-Anna B. Lowit]; Guilaran, Yu-Ting [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a698774e93e34a2b9181d4b3032b8a32-ytguilar]; Vogel, Dana [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=8fa57c9380b2438895809b525dd668ea-Dana Vogel]; Smith, Charles [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=74d894a08f0b4d079b1632049bc5ebf4-Charles William Smith]; Lowe, Kelly [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=0ed25a8b48b1425a803ec6bbbe1e2590-Kelly M Lowe]; Dawson, Jeffrey [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=b7281288675c408d9667266072f0ae21-Jeffrey Dawson]; McQueen, Jacqueline [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=3a023f4d48ee4e1f8b758fa87310f703-McQueen, Jackie]; Flowers, Lynn [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=1a4411c874d041b9a8badfc32b91bd70-Flowers, Lynn]; Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Dzubow, Rebecca [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=403ca1721f3d43d38de9189a93a95b76-Dzubow, Rebecca]; Dinkins, Darlene [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=5e8ce07dbbcc49ce86097f4a1f207bd6-Darlene R. Dinkins]
Subject: Re: Glyphosate

Thanks Monique, looking forward to the discussion.

Tom

Sent from my iPhone

On Aug 26, 2016, at 3:43 PM, Perron, Monique <Perron.Monique@epa.gov> wrote:

> Attached please find slides to guide our discussion on Monday.
>
> Thank you,
> Monique
>
> -----Original Appointment-----
> **From:** Jones, Jim
> **Sent:** Thursday, August 18, 2016 10:51 AM

To: Jones, Jim; Wise, Louise; Mojica, Andrea; Housenger, Jack; Keigwin, Richard; Lowit, Anna; Guilaran, Yu-Ting; Vogel, Dana; Perron, Monique; Smith, Charles; Lowe, Kelly; Dawson, Jeffrey; Burke, Thomas; McQueen, Jacqueline; Flowers, Lynn; Etzel, Ruth; Dzubow, Rebecca
Cc: Dinkins, Darlene
Subject: Glyphosate
When: Monday, August 29, 2016 2:00 PM-3:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: RM3156 EPA East

Call in number Ex. 6 access code Ex. 6

<Glyphosate draft SAP whitepaper_8.29.16 Meeting.pptx>

Message

From: McPhee, John, DOH [John.McPhee@state.nm.us]
Sent: 2/2/2016 3:47:22 PM
To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]
Subject: FW: John: This Pervasive Chemical Is Linked to Runaway Inflammation
Attachments: removed.txt

Ruth,

So this is two e-mails in two days that bring you and your mission to mind. This article "This Pervasive Chemical....." regarding the hazards of glyphosate, reminds me of our discussion in El Paso about the recent pro-industry change in regulation regarding allowable pesticide residues on fruits and vegetables, from, I think, 20 ppm to 40 ppm, despite the evidence of harm at 5 ppm. Anyway, the article herein probably is limited to what you already know about the hazards of glyphosate, but I was unaware that this chemical actually had a binding and encapsulating effect on micro-minerals that apparently prevent both the plant and the human consumer from benefitting from these minerals, even if they are present in the soil.

John

From: Dr. Mercola [mailto:jm@mercola.com]
Sent: Tuesday, February 02, 2016 12:16 AM
To: McPhee, John, DOH <John.McPhee@state.nm.us>
Subject: John: This Pervasive Chemical Is Linked to Runaway Inflammation

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*These statements have not been evaluated by the Food and Drug Administration.
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Message

From: Spire, Paul [PSpire@aap.org]
Sent: 12/9/2015 11:25:08 PM
To: Ahdoot, Samantha [Ex. 6]; John.Balbus@nih.gov [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=2c555339753d4bedb1a7a321779b25f6-John.Balbus@nih.gov]; Baum, Carl [carl.baum@yale.edu]; Bernstein, Aaron [Aaron.Bernstein@childrens.harvard.edu]; Bole, Aparna [Aparna.Bole@UHhospitals.org]; Brubaker, Todd [Ex. 6] Brumberg, Heather [Heather_Brumberg@NYMC.edu]; Campbell, Carla C [ccampbell3@utep.edu]; DeNicola, Nate [Ex. 6] Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Gadhia, Ami [agadhia@aap.org]; Lanphear, Bruce [blanphear@sfu.ca]; Laris, Zachary [zlaris@aap.org]; Lowry, Jennifer [jlowry@cmh.edu]; Mortensen, Mary [zeo4@CDC.GOV]; Pacheco, Susan [Susan.E.Pacheco@uth.tmc.edu]; Spanier, Adam [aspanier@peds.umaryland.edu]; Trasande, Leo [leonardo.trasande@nyumc.org]; Ward, Mary [wardm@mail.nih.gov]
Subject: Chicago Tribune article re pesticides for GMO's
Attachments: EPA tosses aside safety data, says Dow pesticide for GMOs won't harm people - Chicago Tribune2.pdf

Perhaps this is old news to you, but given the discussions during the COEH meeting, I thought the timing of this article in today's Chicago Tribune was interesting. Dr. Landrigan is quoted.
For what it's worth,
Paul

EPA tosses aside safety data, says Dow pesticide for GMOs won't harm people

By **Patricia Callahan** · **Contact Reporter**
Chicago Tribune

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How the EPA cleared the way for Dow to revive a worrisome old pesticide for new GMO crops.

DECEMBER 8, 2015, 10:13 PM

When Monsanto genetically engineered corn and soybeans to make them immune to its best-selling weedkiller, the company pitched the technology as a way to reduce overall use of herbicides and usher in an environmentally friendly era of farming.

Instead of relying on older, more harmful chemicals, farmers could douse their fields with Roundup, a product that Monsanto once advertised as less toxic than table salt.

Two decades later, overuse of Roundup has spawned weeds that can survive spraying to grow 8 feet tall with stems as thick as baseball bats. To kill those so-called superweeds, chemical giants are giving the next wave of genetically modified crops immunity to the weedkillers of generations past.

The technology that was supposed to make those older herbicides obsolete soon could make it possible for farmers to use a lot more.

Article continues below

For use on its new genetically engineered corn and soybeans, Dow Chemical Co. is reviving 2,4-D, a World War II-era chemical linked to cancer and other health problems.

If these crops are widely adopted, the government's maximum-exposure projections show that U.S. children ages 1 to 12 could consume levels of 2,4-D that the World Health Organization, Russia, Australia, South Korea, Canada, Brazil and China consider unsafe.

The U.S. Environmental Protection Agency had considered that exposure dangerous for decades as well. But the Obama administration's EPA now says it is safe to allow 41 times more 2,4-D into the American diet than before he took office.

To reach that conclusion, the Tribune found, the agency's scientists changed their analysis of a

pivotal rat study by Dow, tossing aside signs of kidney trouble that Dow researchers said were caused by 2,4-D.

The EPA scientists who revised that crucial document were persuaded by a Canadian government toxicologist who decided that Dow — a company that has a $1 billion product at stake — had been overly cautious in flagging kidney abnormalities that she deemed insignificant.

When Dow later published this study, the company's scientists likewise dismissed their earlier concerns and changed the most important measure of the chemical's toxicity so it agreed with the EPA's less stringent view.

These decisions paved the way for the EPA to approve Dow's weedkiller Enlist Duo last year and reassure the public that a surge in 2,4-D use wouldn't hurt anyone.

Girding that reassurance are two calculations: How much of the herbicide is safe for human health, and how much will Americans wind up consuming? There are ways to tweak each of those risk calculations. With 2,4-D, the Tribune found, the EPA's math favored a dramatic increase in the weedkiller.

Article continues below

Federal law has required the EPA to protect children from pesticides — chemicals that kill weeds, insects or other harmful organisms — since a National Research Council panel warned lawmakers in the 1990s that exposing fetuses and young kids to these compounds can cause lifelong damage at doses that wouldn't hurt their parents.

Dr. Philip Landrigan, the pediatrician who chaired that panel, is so alarmed by the potential spike in children's exposure to 2,4-D that for the last year he has urged EPA Administrator Gina McCarthy to reject the "notoriously toxic herbicide." He is calling for the federal National Toxicology Program to assess the safety of the mix of weedkillers that would be used on new genetically modified crops.

When Landrigan learned from the Tribune that EPA and Dow scientists had changed their minds about kidney anomalies found in exposed rats, he was shocked.

"If the tables were turned, and a group of scientists published a paper showing some adverse effect from 2,4-D, I have no doubt that Dow would say a second and third study were needed," said Landrigan, whose research on childhood lead exposure helped prompt the removal of lead from gasoline and paint. "And yet, Dow is saying we need to trust this one study where results were reinterpreted midstream. There's reason to raise doubt here."

Dow said 2,4-D is safe and is one of the most extensively studied pesticides in history. James Bus, a

former Dow toxicologist who worked on the company's recent rat study, said the EPA's evaluation of 2,4-D relies on state-of-the-art science and "stands as an example of how it should be done."

"We know from 70 years of exposure that 2,4-D has not presented health problems," Bus said. Studies that suggest such a link are flawed, and increased use will not put anyone at risk, he added.

For its part, the EPA said its scientific vetting ensures that any pesticide residues left in food and water won't cause harm. The Dow rat study reveals that 2,4-D is less toxic to people than once thought, agency officials say.

"It is EPA's understanding that other governments do agree with our interpretation of the new study, but have not yet incorporated the results into their 2,4-D reviews," EPA spokeswoman Cathy Milbourn said in a written statement.

In a surprise move last week, the EPA asked the 9th U.S. Circuit Court of Appeals to vacate the agency's approval so its scientists could review new data. But EPA officials made it clear they don't intend to bar the product permanently.

The holdup has nothing to do with human health. Enlist Duo combines 2,4-D and glyphosate, the main ingredient in Roundup, and the agency said it wanted to iron out concerns that the two chemicals combined are more toxic to endangered plants than either of the chemicals separately.

As far as people's health is concerned, though, the agency maintains that Enlist Duo is perfectly safe. Even if American farmers spray 2,4-D on every acre of corn and soybeans — crops that serve as the building blocks of processed foods and fatten farm animals — it still won't harm consumers, the EPA said.

So confident is Dow that the agency's concerns about endangered plants can be resolved quickly that the title of its news release last week read: "Dow Expects Enlist Duo to be Available for the 2016 U.S. Crop Season."

With so many farmers in America planting genetically modified crops, the potential market for Dow's product is huge. Today 94 percent of soybeans and 89 percent of corn planted in the U.S. are genetically engineered to survive herbicides, primarily the glyphosate in Roundup.

No one is comparing glyphosate to table salt anymore, though, with the WHO's cancer research agency now labeling it a probable carcinogen. And no one is hailing it as an agricultural savior.

More than 60 million acres of U.S. cropland are being choked by weeds that glyphosate can't kill. In response, chemical companies and federal regulators are advising farmers not to substitute one weedkiller for another but to add more.

Even some scientists who have spent their professional lives eradicating weeds oppose the new genetically modified crops and the chemical future they foreshadow.

"Those herbicide increases are not OK," said David Mortensen, a professor of weed and applied plant ecology at Pennsylvania State University. "To me, that is unconscionable that we can be OK with that, and I'm not an anti-chemical radical."

How much is too much?

Many people complain that eating genetically modified food could endanger their health. But it's the weedkillers used on genetically modified crops, not the corn and soy, that scientists have repeatedly found to cause harm.

Herbicides linger in the water Americans drink, in the air they breathe and on the foods they eat. Children are especially vulnerable because they take in more food, water and air, relative to their weight, than adults.

That's why scientists study weedkillers so closely and why regulators scrutinize them more heavily than other industrial chemicals.

Article continues below

The fact that 2,4-D was a main component of the Vietnam War-era defoliant Agent Orange made the chemical infamous, even though it was dioxin contamination of a different ingredient that brought harm to troops and villagers.

Over the years, federal and university researchers showed 2,4-D was worrisome on its own. Studies found increased odds of developing non-Hodgkin lymphoma, hypothyroidism and Parkinson's disease among people who used the chemical as part of their jobs. In June, the WHO's cancer research agency ruled that 2,4-D is a possible carcinogen.

But EPA scientists aren't convinced that 2,4-D causes any of those diseases because other studies reached different conclusions.

Though it wasn't widely used on corn and soybeans, 2,4-D has been a go-to chemical for wheat growers, ranchers and golf course groundskeepers. When the EPA in the early 2000s revisited the safety of 2,4-D as part of a wider review of pesticides long on the market, the goal was to determine from animal testing how much 2,4-D people could safely consume.

Such tests are carried out or commissioned by chemical-makers, even though they have a vested interest in the results.

The EPA relied on a 1995 Dow study that found rats dosed daily with 75 milligrams of pure 2,4-D

per kilogram of body weight (or mg/kg) over a two-year period gained less weight and experienced changes in kidney, thyroid, liver, lung, reproductive organ and blood chemistry measures compared with untreated rats.

Rats that consumed the next lowest dose — 5 mg/kg — showed no ill effects. This is called the "no observed adverse effect level," and it's the most important measure in a pesticide toxicity study.

Next came a series of math exercises. As they always do, EPA officials divided that dose by a factor of 100 to account for the fact that rats and humans are different and some people have heightened sensitivity to chemicals.

Since the mid-1990s, the EPA has been required to divide again — this time by a factor of 10 — because Landrigan's panel found children are more vulnerable than adults. This protection may be removed only if "such margin will be safe for infants and children."

In the case of 2,4-D, the EPA kept it in place because its scientists couldn't tell whether 2,4-D disrupts hormones, immunity and neurological development.

When the dividing was done, the EPA under President George W. Bush set the acceptable daily intake of 2,4-D at 0.005 mg/kg. Separate calculations showed that nobody was consuming too much, the EPA said at the time.

That same year, 2005, the EPA ordered the manufacturers to conduct two new studies that could answer the remaining questions about safety — research that ultimately would lead to the weakening of consumer protections.

One study was to expose adult rats and two generations of offspring to 2,4-D while looking for immune system problems, thyroid effects and toxicity in other organs. Another would scrutinize neurological development in offspring.

But with the EPA's permission, Dow rolled the studies into one and halted what would become the most important evaluation of 2,4-D after breeding just one generation of rats.

Article continues below

Dow's study design, which called for breeding a second generation only if certain problems were evident in the first, was crafted by a committee of the ILSI Health and Environmental Sciences Institute, a nonprofit that receives much of its funding from chemical, food and pharmaceutical companies.

The committee included scientists from pesticide giants Dow, Syngenta, Bayer and DuPont, as well as one from Exponent, a scientific consulting firm. In addition to providing regulatory help to pesticide-makers and other companies, Exponent is "the go-to firm at the top of the pyramid" for

companies that face a lawsuit, a product recall or a government crackdown, Exponent's financial chief told Wall Street analysts this year.

One of the few EPA members on the committee later went to work for Exponent. Bus, who helped lead the Dow study, joined Exponent after he retired; he still consults for Dow on 2,4-D.

Officials from the EPA and Dow say the committee's study design rigorously assesses many potential toxic effects from conception to adulthood while sacrificing fewer animals. The Organization for Economic Cooperation and Development, consisting of 34 countries, agrees and uses it as an international testing guideline.

But Paul Foster, a top toxicologist at the National Toxicology Program, said the study design has such "serious scientific weaknesses" that his arm of the federal government won't use it in its research. For example, the Dow study exposed rats to 2,4-D for four weeks before they mated. Foster said dosing should last 10 weeks to cover the entire time it takes rats to make sperm.

Moreover, though a 2011 analysis of 498 studies concluded the second generation "will very rarely provide critical information," Foster said it's important to find those rare instances of harm.

"Everyone wants to use the minimum number of animals to generate quality data, but there comes a time when you don't want to cut the corners too much," Foster said.

Bus said EPA and Canadian regulators, who reviewed data while the study was in progress, decided breeding a second generation wasn't warranted.

In 2010, Bus and his colleagues reported the results in a poster presentation at the Society of Toxicology's annual meeting. By then, Dow's field trials had demonstrated the genetically modified crops were viable, and the march of superweeds foretold potentially big sales.

Article continues below

The poster stated that 2,4-D did not cause immune, reproductive or neurological harm. Some rats experienced thyroid hormone changes, and some males had lighter-weight reproductive organs, but Dow scientists took the position that these effects were not adverse.

But they did find a problem with the kidneys. The poster said exposure-related kidney lesions occurred at a lower dose in male rat offspring than in their parents.

When two EPA scientists examined the Dow data that year, they came to the same conclusion. Both Dow and the EPA decided the no-adverse-effect level was the smallest dose tested in the offspring, an amount equivalent to about 7 mg/kg, records show.

Then something curious happened. The EPA and Dow scientists changed their minds.

More becomes OK

Six months later, the same EPA scientists revised the executive summary of their report, changing the crucial measure of toxicity.

The lesions that Dow scientists found in offspring at 7 mg/kg weren't harmful after all, EPA scientists Linda Taylor and Elizabeth Mendez wrote. They changed the no-adverse-effect level so that it was the same for both the rat offspring and parents: an amount equivalent to 21 mg/kg.

Dana Vogel, who oversees the EPA division that assesses herbicide health effects, told the Tribune the original report by Taylor and Mendez was based on "preliminary data — not the entire study but the first part of the study that came in."

In fact, there was nothing preliminary about the data, and no details were missing. The facts that Taylor and Mendez later cited to justify the change were all part of their original 108-page report, which scrutinized blood test results, organ weights and microscopic analysis at every stage of life.

Their observations were minutely detailed, describing the kidney problem as "a degenerative lesion involving the proximal convoluted tubules in the outer stripe of the outer zone of the medulla, which was multifocal in distribution."

What really led to the change of heart, interviews and an EPA document show, was a phone call from a Canadian pesticide regulator.

Lauri Stachiw was the Canadian government toxicologist who reviewed Dow's data as the study was unfolding. Stachiw told the Tribune she called Taylor and Mendez because she disagreed with their report.

Stachiw noted that Dow researchers found the kidney lesions only in male offspring at that lower dose and classified them as "very slight to slight degeneration" rather than severe. Those rats didn't have heavier kidneys, a different sign of trouble. For true toxicity, Stachiw said, she would expect moderate or severe lesions as well as heavier kidneys in those rats.

Though Dow scientists thought the lesions were harmful, Stachiw said: "I think they were just trying to be as conservative as possible, but being as conservative as possible isn't always correct science."

Stachiw, now retired, added, "If you cut your finger, it's an effect. Is it adverse compared to cutting your finger off? No."

In an interview, Mendez said she and Taylor looked at the data again after Stachiw called. Mendez said they decided the lesions Dow had labeled as toxic effects were actually a healthy response.

"It's a good thing that the kidney is gearing itself up for battle to get rid of the compound from the body," she said. Taylor declined to comment.

Bus, the Dow consultant, said the company did not influence Stachiw or the EPA. He said Dow was surprised when the EPA revised the no-adverse-effect level.

"We were totally out of the loop," Bus said.

Article continues below

When the Society of Toxicology's journal published the Dow study results in 2013, the article said the kidney lesions in the rat offspring dosed with 7 mg/kg "were judged to be not treatment related."

Bus said he and his colleagues adopted the position of the Canadian and EPA scientists. "It's not uncommon for reviewers to say, 'Wait a minute, we have an alternative interpretation of your data,'" he said. "... I would not have serious disagreement with how they interpreted that data."

Industry-funded researchers have found kidney trouble before in animals consuming low doses of 2,4-D, the Tribune found. An industry group representing Dow and other 2,4-D manufacturers submitted five studies to the EPA in the 1980s that documented kidney abnormalities in rats and mice at doses far lower than the one the agency now is using to set safety levels for people.

EPA scientists and the trade group agreed three decades ago that the kidney was the "target organ for toxicity" with anomalies seen at doses as low as 5 mg/kg, records show.

Bus said of those studies: "Earlier conclusions that might have been interpreted as adverse may not be considered adverse in more modern science."

Asked whether studies should be discounted when they're that old, the National Toxicology Program's Foster said, "You can look at the differences in study quality, but the way we remove kidneys and look at them under a microscope has not changed in the last 60 or 70 years."

The EPA's Mendez said her agency considered the "whole gamut of studies."

When she and Taylor raised the no-adverse-effect level to 21 mg/kg, they paved the way for the agency to reduce consumer protections.

EPA scientists had no remaining questions about the chemical's harmful effects, and there was no longer evidence of the special susceptibility of children because the revised view of the Dow study held that the toxic effects in the offspring occurred at the same dose as in the parents. So, the agency dropped the tenfold child-safety factor.

Rather than dividing the rat dose by 1,000, as it had done a decade ago, the agency divided only by 100, resulting in a far less protective limit. Regulators set the allowable daily intake of 2,4-D for people at 0.21 mg/kg, 41 times more than the government had previously considered safe.

This was a victory for Dow because the calculations made it easier for the EPA to approve the new uses of 2,4-D the company needed in order to market its genetically modified crops. The agency could tell consumers these new uses wouldn't be harmful.

The Environmental Working Group, a nonprofit that is among those suing the EPA for approving Enlist Duo, scrutinized the Dow study results outlined in the EPA's official human health risk assessment. That document didn't mention that Taylor and Mendez had revised their interpretation.

Even so, a scientist for the nonprofit independently settled on the same measure of toxicity that the EPA and Dow initially had used: 7 mg/kg.

The group concluded that agency officials had "contradicted standard scientific practice" in choosing as their no-adverse-effect level a dose at which rats actually suffered multiple toxic effects — not just the kidney lesions but also the thyroid and reproductive organ changes.

That group also argued that the agency by law must apply the child-safety factor to its risk calculations because the offspring were more susceptible than the parents. Under that reasoning, the allowable daily intake would be 0.007 mg/kg.

The EPA's own worst-case exposure estimates, included in the official human health assessment, found toddlers could wind up consuming three times more than that.

Yet the agency, responding to critics, reassured the public that its scientists had determined that nobody would consume too much, even using the hypothetical limit of 0.007 mg/kg.

When the Tribune asked how that could be possible, the agency said its scientists made additional calculations based on more realistic assumptions of exposure, describing that step as a standard practice.

Those calculations, records show, estimated that toddlers could consume 0.0066 mg/kg of 2,4-D — just four ten-thousandths shy of the hypothetical limit.

The math, once again, worked in 2,4-D's favor.

Article continues below

A chemical future

At last year's Farm Progress Show in the heart of Iowa, lines of farmers gazed at Dow's vision of the future of American agriculture: rows of lush soybeans and towering corn plants genetically engineered to withstand 2,4-D and glyphosate.

This year, Dow didn't bother to plant those crops for the farm show held in Decatur, Ill. On display instead was an air of inevitability.

Ben Kaehler, Dow AgroSciences' U.S. sales leader, was there to extol the benefits of the crops. But rather than convincing farmers that the technology works, Kaehler tried to persuade them to plant Dow's offerings rather than Monsanto's proposed crops, which are immune to glyphosate and dicamba, a 1960s weedkiller.

The question wasn't whether to plant the next generation of genetically modified crops — it was which of those crops to plant.

On a faux brick wall in the Dow tent, a baseball-style scoreboard pitted Dow against Monsanto. Each inning featured a question about the crops or the different weedkillers, with salespeople revealing the answers one by one. Overhead, a banner beckoned: "Grow your field of dreams."

At that point, the only holdup for Dow was China, a major buyer of U.S. crops. Grain elevators here still are waiting for China's approval before agreeing to handle the new crops.

Now Dow also must address the concerns EPA raised last week about Enlist Duo's effects on endangered plants. An agency scientist noticed that a patent application for the product said it had "synergistic weed control" properties that made glyphosate and 2,4-D "more effective in combination than when applied individually."

Previously, the agency had maintained that the two chemicals were no more toxic together than they were on their own. That's why the health assessment of Dow's weedkiller hinged solely on the new risks posed by 2,4-D. Glyphosate already is widely used on corn and soybeans.

The EPA has asked the appellate court to rescind its approval of Enlist Duo while agency scientists decide whether a bigger no-spray zone is needed near the edge of farm fields. Dow said it's confident the issue can be resolved before spring planting.

The EPA told the Tribune it isn't reopening its human health risk assessment. William Jordan, deputy director of the agency's Office of Pesticide Programs, said the combination of 2,4-D and glyphosate doesn't create added risk for people. Jordan cited tests in which researchers gave large one-time doses of Enlist Duo to rats, rabbits, birds and fish, then monitored the animals for two weeks. There was no increased toxicity from the mixture, he said.

Landrigan, the pediatrician whose work led to the lead-paint ban, is more concerned about the

long-term health effects of the chemical mixture. One-time doses and short-term monitoring don't address that.

The EPA said it has no plans to ask Dow for studies that chronically dose rats with the combination of 2,4-D and glyphosate.

For anyone concerned about exposure to toxic weedkillers, a different disclosure in Dow's patent applications may be more telling.

The company's application for its genetically modified corn and soybeans foreshadows the day when weeds develop resistance to glyphosate and 2,4-D. Dow, these records show, envisions adding traits to corn and soybeans so they can survive being sprayed with weedkillers from up to 17 different chemical families.

pcallahan@tribpub.com

Twitter @TribuneTrish

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This article is related to: Environmental Science, Animal Research, Endangered Species, Medical Research, U.S. Environmental Protection Agency, Canada, Lymphoma

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Message

From: Perron, Monique [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=CC557ABE34854B1AA08F00AB01474FF8-PERRON, MONIQUE]
Sent: 8/26/2016 7:43:49 PM
To: Jones, Jim [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=c32c4b9347004778b0a93a4cbd83fc8a-JJONES1]; Wise, Louise [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=cf7be035da4b45a3a7d45c84c9f4b4a3-LWise]; Mojica, Andrea [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=f47e2a2bfbc4434aa9cc1e8c2a385da3-Andrea Mojica]; Housenger, Jack [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=e5840e7ccea94f6b89471abd355dceb7-Jack E. Housenger]; Keigwin, Richard [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=151baabb6a2246a3a312f12a706c0a05-Richard P Keigwin Jr]; Lowit, Anna [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=1d3428a2c0b84d5099124a0460babd53-Anna B. Lowit]; Guilaran, Yu-Ting [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a698774e93e34a2b9181d4b3032b8a32-ytguilar]; Vogel, Dana [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=8fa57c9380b2438895809b525dd668ea-Dana Vogel]; Smith, Charles [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=74d894a08f0b4d079b1632049bc5ebf4-Charles William Smith]; Lowe, Kelly [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=0ed25a8b48b1425a803ec6bbbe1e2590-Kelly M Lowe]; Dawson, Jeffrey [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=b7281288675c408d9667266072f0ae21-Jeffrey Dawson]; Burke, Thomas [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=39ffc3dd34ea495b9a31e61b778fbbec-Burke, Thom]; McQueen, Jacqueline [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=3a023f4d48ee4e1f8b758fa87310f703-McQueen, Jackie]; Flowers, Lynn [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=1a4411c874d041b9a8badfc32b91bd70-Flowers, Lynn]; Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Dzubow, Rebecca [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=403ca1721f3d43d38de9189a93a95b76-Dzubow, Rebecca]
CC: Dinkins, Darlene [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=5e8ce07dbbcc49ce86097f4a1f207bd6-Darlene R. Dinkins]
Subject: RE: Glyphosate
Attachments: Glyphosate draft SAP whitepaper_8.29.16 Meeting.pptx

Attached please find slides to guide our discussion on Monday.

Thank you,
Monique

Glyphosate draft SAP whitepaper_...

-----Original Appointment-----
From: Jones, Jim
Sent: Thursday, August 18, 2016 10:51 AM
To: Jones, Jim; Wise, Louise; Mojica, Andrea; Housenger, Jack; Keigwin, Richard; Lowit, Anna; Guilaran, Yu-Ting; Vogel, Dana; Perron, Monique; Smith, Charles; Lowe, Kelly; Dawson, Jeffrey; Burke, Thomas; McQueen, Jacqueline; Flowers, Lynn; Etzel, Ruth; Dzubow, Rebecca

Cc: Dinkins, Darlene
Subject: Glyphosate
When: Monday, August 29, 2016 2:00 PM-3:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: RM3156 EPA East

Call in number Ex. 6 access code Ex. 6

Message

From: Landrigan, Philip [philip.landrigan@mssm.edu]
Sent: 12/9/2015 11:23:16 PM
To: 'Spire, Paul' [PSpire@aap.org]
CC: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Lowry, Jennifer [jlowry@cmh.edu]
Subject: RE: Emerging Technologies and Materials chapter for revision
Attachments: 52 Emerging Technologies.docx; 52 Emerging Technologies.docx

Dear Paul

Here is my revised, slightly expanded and updated chapter.

My thanks again to you, Ruth and Jennifer for having invited me to do this

Phil Landrigan

Philip J. Landrigan, MD, MSc, FAAP
Dean for Global Health
Arnhold Institute for Global Health
Professor of Preventive Medicine and Pediatrics
Icahn School of Medicine at Mount Sinai
12 16 Fifth Avenue, Room 556
New York, NY 10029

Tel: Ex. 6

phil.landrigan@mssm.edu

WHO Collaborating Centre in Children's Environmental Health

From: Spire, Paul [mailto:PSpire@aap.org]
Sent: Wednesday, October 07, 2015 11:25 AM
To: Landrigan, Philip
Cc: Etzel, Ruth; Lowry, Jennifer
Subject: Emerging Technologies and Materials chapter for revision

Hi Dr. Landrigan.

Thanks much for your support and for your quick reply.

Attached please find a Word versions of the "Emerging Technologies and Materials" chapter from the previous edition green book to use as a starting point for revision. Track Changes has been enabled, and if you are comfortable doing so, it would be helpful if you could update the document using this feature.

The revised draft chapters are requested by January 29, 2016.

Thanks again for your help. If you have any questions or need anything more, please do not hesitate to let me know.

Many thanks,

Paul

From: Landrigan, Philip [mailto:phil.landrigan@mssm.edu]
Sent: Friday, October 02, 2015 2:09 PM
To: Spire, Paul <PSpire@aap.org>
Cc: Etzel, Ruth <etzel.ruth@epa.gov>; Lowry, Jennifer <jlowry@cmh.edu>
Subject: RE: Invitation to contribute to the AAP's Pediatric Environmental Health, 4th Ed manual (Green Book)

Paul, Ruth and Jennifer,

I am honored and delighted to accept this assignment

Phil

Philip J. Landrigan, MD, MSc, FAAP
Dean for Global Health
Arnhold Institute for Global Health
Professor of Preventive Medicine and Pediatrics
Icahn School of Medicine at Mount Sinai
12 16 Fifth Avenue, Room 556
New York, NY 10029

Tel: Ex. 6

phil.landrigan@mssm.edu

WHO Collaborating Centre in Children's Environmental Health

From: Spire, Paul [mailto:PSpire@aap.org]
Sent: Thursday, October 01, 2015 6:21 PM
To: Landrigan, Philip
Cc: Etzel, Ruth; Lowry, Jennifer
Subject: Invitation to contribute to the AAP's Pediatric Environmental Health, 4th Ed manual (Green Book)

Dear Dr. Landrigan,

I am writing on behalf of Editor Dr. Ruth Etzel and AAP Council on Environmental Health Chairperson Dr. Jennifer Lowry to invite your participation in the development of the 4th Edition of the AAP's landmark *Pediatric Environmental Health* manual.

Pediatric Environmental Health, often referred to as "The Green Book," is the comprehensive AAP guide to the identification, prevention, and treatment of pediatric environmental health problems. Authored under the leadership of

the AAP's Council on Environmental Health, the manual will be fully updated and substantially expanded for the forthcoming 4th edition, including new chapters on personal care products, alternative nicotine products, obesity, and fracking. The book will be published in both hard-copy and e-book formats. Development of a companion mobile app is also being actively explored.

We would like to invite your participation in revising or developing the following chapter:

- **Emerging Technologies and Materials** (revision)

In considering this opportunity, please note the following:

- Drafts chapters should be developed in Microsoft Word. For chapters that existed in the 3rd edition, the previous version will be provided in Word format to serve as a starting point for revision.
- Draft chapters are requested by January 29, 2016.
- A model chapter outline is attached.
- Draft chapters will be edited by the Green Book editorial team and by the Council on Environmental Health Executive Committee. Additionally, chapters will be subject to the Academy's internal stakeholder and policy development review, and you may be requested to help address issues identified through these processes. The AAP Board of Directors retains the final determination and approval of all manual content.
- Your contribution will be acknowledged in the compiled list of contributors that appears at the beginning of the book, but individual chapters will not be attributed to specific authors per Academy policy. All chapters and overall manual authorship will be attributed to the AAP Council on Environmental Health.

The Pediatric Environmental Health manual plays an important role in protecting children from environmental health hazards by providing a recognized, authoritative, and well-regarded resource for education and policy on these critically important issues. We hope you will support and contribute to the effort to update and expand this essential resource.

Your response to this invitation is requested by Friday, October 16. If you have any questions regarding the manual or the development process, please do not hesitate to contact Drs. Etzel or Lowry through my attention at pspire@aap.org.

Sincerely,

Paul

Paul Spire
Manager, Division of Technical & Medical Services
American Academy of Pediatrics
phone: Ex. 6
email: pspire@aap.org

Message

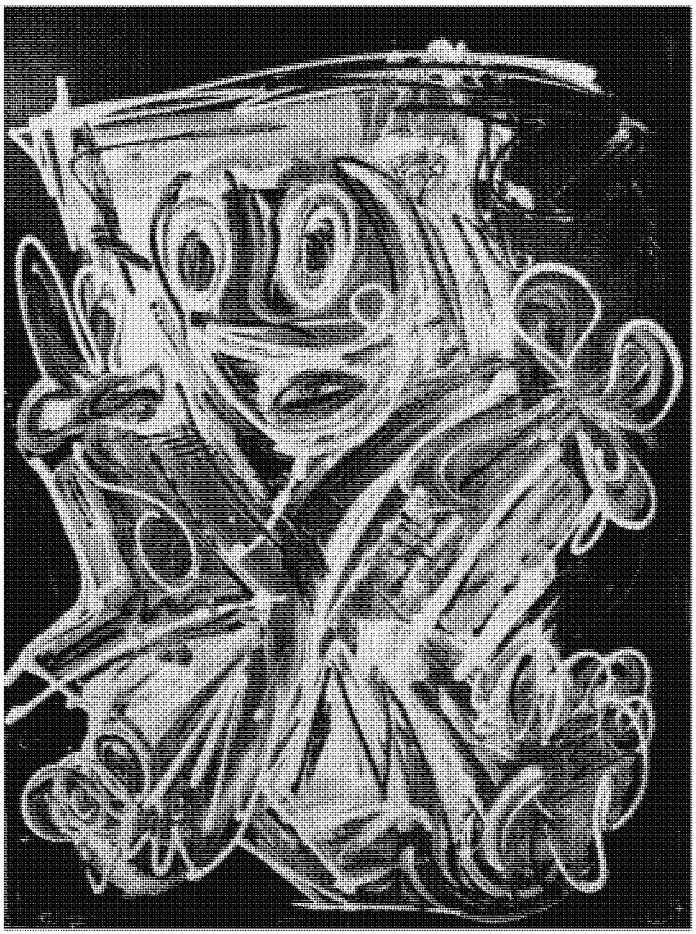
From: Olga Nunez - ACTIVA Congresos [olga@activacongresos.com]
Sent: 9/9/2016 10:03:23 AM
To: Olga Nunez - ACTIVA Congresos [olga@activacongresos.com]
Subject: 8th INTERNATIONAL CONFERENCE ON CHILDREN'S HEALTH AND THE ENVIRONMENT - PROGRAMME
Attachments: layout porgramme INCHES Conference programme 5 september.doc

Dear Sir/Madam,

Please, find attached the updated version of the programme, wich is also uploaded in the conference website: http://inchesnetwork.net/conference-2016/

Sincerely,

Olga Núñez
Technical Secretariat
ACTIVA Congresos
Phone + Ex. 6
E-mail: inches2016@activacongresos.com



8th INTERNATIONAL CONFERENCE ON CHILDREN'S HEALTH AND THE ENVIRONMENT

14th – 16th of September 2016

Location: Parc de Recerca Biomèdica de Barcelona - PRBB
Doctor Aiguader, 88 (at ISGLOBAL), Barcelona

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Children and all humans are under the influence of multiple environmental stressors. However, children are not little adults. Their organs and metabolism are under formation and their capacity to face pollutant stress is different. Exposure to deleterious compounds already starts in the preconceptional and fetal stage. In the first years of life children are affected by exposure to toxic chemical products present in air, water, soil, domestic dust, toys, clothes, furniture and diet. The nature of pollution is changing. In rapidly developing countries. Urbanization, climate change, increasing motor vehicle use and the wide spread of toxic chemicals use, pesticides and polluting industries, levels of ambient and indoor biomass air pollution and soil pollution are increasing sharply the exposure for the most vulnerable. Moreover, some polluting agents are incorporated together with nutrients in the same ingestion processes, e.g. during breastfeeding. Some food items such as fish, the main source of omega 3 fatty acids, also carry pollutants such as organochlorine compounds and methylmercury. Health effects of these toxic compounds may not be noticed directly or shortly after exposure. Damage in growing organisms may result in delayed disorders later in life, e.g. during adolescence, reproductive period or maturity. The effects of pollutants on children's health also depend on individual susceptibility. Full understanding of health impacts requires studies integrating gene-environment interactions. The details will provide more and more proof that we need to protect children.

The Scientific Program

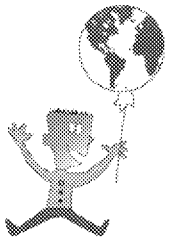
The 8th International Conference on Children's Environment and Health is organized by the International Network on Children's Health, Environment and Safety (INCHES) and the Institute of Environmental Assessment and Water Research (IDAEA) and Spanish Council for Scientific Research (CSIC). The scientific program of the 8th INCHES Conference includes about 140 lectures, short oral presentations and posters presented by scientists from 34 countries covering a broad spectrum of topics. Abstracts of these presentations appear in a final form after the conference in the Journal of Health and Pollution. The meeting provides an international forum for the latest research findings in children's environmental health. Specific attention is devoted to identify opportunities to minimize childhood prenatal and postnatal exposure to environmental contaminants, to provide insight in the field of science and policy interface and to develop a greater awareness among health professionals about children's health. The topics are related to: Health effects of pollutants in children (pesticides, heavy metals, air pollution, tobacco) prenatal exposures, reproductive health, cancer, obesity, biomonitoring, Children Environmental Health Centres and Specialty Units, children's environmental rights, climate change, sustainable development, e-waste, radiology, safety and injury prevention, training for pediatricians and health policy regarding Children Environmental Health.

The objectives of the conference

- Provide an international forum for the latest research findings in children's environmental health;
- Define the relationship between environmental contaminants and children's health;
- Strengthen the importance of prenatal exposure to environmental factors on pregnancy outcome and children's health;
- Identify opportunities to minimize childhood prenatal and postnatal exposure to environmental contaminants;
- Provide insight in the activities in the field of science and policy interface;
- Build a platform of knowledge at an international level;
- Develop a greater awareness among health professionals about children's health, environment and safety;
- Initiate future directions and international collaborations in research in the field of children's environmental health.

Practical information

The posters will be presented on boards in the square of the building. The lunches will be served on the balcony at the seafront on the first floor in front of the entrance to the Auditorium. Photo and video recording will be done during the conference and shared in the internet. Out of this we will make a video declaration of the conference in Barcelona. Attendees might be asked to give statements on certain issues.

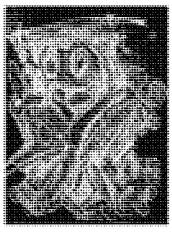


8th INTERNATIONAL CONFERENCE ON CHILDREN'S HEALTH AND THE ENVIRONMENT

14th – 16th of September 2016

Location: **Parc de Recerca Biomèdica de Barcelona - PRBB**

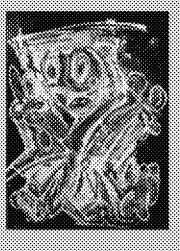
Doctor Aiguader, 88 (at ISGLOBAL), Barcelona



Wednesday 14th of September 2016

9:00-9:20 **Opening Session**	**Welcome and announcements** Joan Grimalt (chair organising committee) Peter van den Hazel (chair board INCHES) Mark Nieuwenhuijsen (host organization ISGLOBAL)	
09.20-10.45	**Session 1 (Auditorium) Environmental Determinants of Child Health** Chair: Stephan Böse-O'Reilly (Germany) and Mark Nieuwenhuijsen (Spain) Brainy approaches to children's environmental health – Philippe Grandjean (Denmark) Environmental Pollution and Children's Health – Phil Landrigan (USA) Pollution: the biggest killer on the planet. A summary of the upcoming Lancet report - Rich Fuller (USA) Environmental Health Issues for Spain – Joan Grimalt (Spain)	
10.45- 11.10	**Opening Ceremony (Auditorium)** Peter van den Hazel – INCHES President Joan Grimalt, chair Organising Committee **Opening speech:** ms. Gemma Tarafa**,** Commissioner of Health, City Hall of Barcelona	
11.10 -11.30	**Break**	
11.30-13.00	**Session 2 (Auditorium) Epidemiological longitudinal studies of child health and environment** – **birth cohorts- child cohorts** Chair: Ruth Etzel (USA) and Isabella Annesi-Maesano (France) Ambient air pollution and onset of asthma in birth cohorts. The rise and fall of evidence - Achim Heinrich (Germany) Current findings on maternal gut microbiome and PCBs concentration in birth cohort study with omics analysis: Chiba Study of Mother and Children's Health (C-MACH) - Chisato Mori (Japan) Preventing Exposure to Environmental Hazards -- Role of Primordial Prevention - Ruth Etzel (USA) Association between breastfeeding duration and cognitive development, autistic traits and ADHD symptoms: a multicenter study in Spain - Jordi Julvez (Spain) Maternal exposure to particulate matter and birth weight in Dutch children - Margot van de Bor (Netherlands) Birth Cohort Consortium of Asia (BiCCA) on Children's Environmental Health – Pau-Chung Chen (Taiwan)	**Session 3 (Darwin) Child labour** and other topics Chair: Stephan Böse- O'Reilly (Germany) and Rich Fuller (Pure earth / Blacksmith. Environmental justice) Poor education, poor job, poor health. Hanns Moshammer (Austria) Occupational injuries among child labourers: results from a cross-sectional study in Peru - Tobias Weinmann (Germany) Minamata Convention on mercury and vulnerable population - Yuyun Ismawati (Indonesia) TiPP TAPP - first steps into life – Claudia Gerken Childless , Workless, Worthless - Jürgen Bilger (Germany) Dietary Environment in Preventing Allergic Airway Diseases - H Paramesh (India)
13.00-14.00	**Lunch** **Seminar/discussion session on ° Communicating Radiation Risks in Paediatric Imaging (Room Darwin)** organised and presenterd by Maria Perez (WHO) and Donald Frush (USA), starts at 13.15 hrs	

14.00-15.30	**Keynote speech:** Dr. Maria Neira (WHO, Switzerland) –CEH an dopportunities for action under SDG era **Session 4 (Auditorium) Developing countries and CEH: examples of action on emerging issues by WHO and partners** Chair: Marie Noel Brune Drisse (WHO, Switzerland) and Dr. Maria Neira (WHO, Switzerland) WHO's work on early life exposures and future health –prevention for future generation - Emiko Todaka (WHO) Radiation imaging communication in paediatric: situation in developing countries and focus on action - Donald Frush (USA) E-waste and child health WHO global initiative -Marie-Noel Bruné (WHO, Switzerland) Air pollution and CEH action in Brazil - Emerson da Silva (Brazil)	
15.30- 15.45	**Break**	
15.45 -16.30	**Poster pitch session A (Auditorium)** **Chairs:** Peter van den Hazel (Netherlands) and Merce Gari (Spain) Prenatal exposure to environmental chemicals: associations with neurotransmitter levels in cord blood - *Margot van de Bor* Cognitive effects after low - to moderate dose exposure: study plan in a cohort of childhood cancer survivors - *Elisa Pasqual* Children exposure to phthalates and bisphenol A in LIFE PERSUADED project: preliminary results on biomonitoring and case-control studies - *Cinzia La Rocca* Mercury concentrations in commercial seafood from the western Mediterranean Sea - *Rosa Maria Llull Cantallops* A review on managing and treating mercury emissions in small artisanal gold mining - *Tara Rava Zolnikov* Acotinine, cadmium and pahs levels in children's urine as a result of environmental tobacco smoke exposure in two spanish locations - *Helena Garcia* Autistic Symptoms Associated with Childhood Lead Poisoning - *Wan Nedra Komaruddin* Organohalogenated pollutants in Argentinean postpartum women living in Salta and Ushuaia - *Natalia Bravo* Considerations for policies design aimed to promote drinking water consumption in Mexican children and adolescents: Santa Fe, CDMX - *Arely Vergara-Castañeda* Prenatal early exposure to the environmental endocrine disruptors - *Joaquim Rovira*	**Poster pitch session B (Darwin)** **Chairs:** Stephan Böse-O'Reilly (Germany) and Barend van Drooge (Spain) School children exposure to particulate matter (coarse, fine, and quasi-ultrafine) around petrochemical complex. Respiratory tract dosimetry - *Joaquim Rovira* Noise prevention in kindergarten - *Takacs Katharina* Effect of diet on allergies among preschool children - *Sandra Andrusaityte* Smoking cessation consultation in pediatrics - *Miguel Felipe Sánchez Sauco* Pilot phase of TNG STUDY - *Pavel Piler* Health and safety predictors of parental attitudes towards children's school travel - *Jacques Bergeron* School environmental health: the first steps towards environmental health - *Miguel Felipe Sánchez Sauco* When parents NGOs, environmental NGOs and experts join forces to impulse actions to protect children's environmental health - *Catherine Bouland* Hazards and Risks in the Glyphosate Debate - *Karl Ernst v. Mühlendahl*
16.30 -18.00	**Session 5 (Auditorium) Toxic Metals Intoxication** Chair: Wojciech Hanke (Poland) and Mahmood Khwaja (Pakistan) High Risk for Neural Tube Defects from Arsenic in Drinking Water and Rice in Asia - Yona Amitai (Israel) Lead intoxicated children in Kabwe/ Zambia – Stephan Böse- O'Reilly (Germany) Children and ASGM in West Sumbawa Regency, Indonesia - Children and ASGM in West Sumbawa Regency, Indonesia - Baiq	**Session 6 (Darwin) Burden of disease** Chair: Peter van den Hazel (Netherlands) and Kinga Polanska (Poland) What is Environmental Burden of Disease? An animated video gives an answer - MyriamTobollik (Germany) Children's environmental burden of disease: Review of key findings - Nadine Steckling (Germany) Quantifying the burden of disease due to environmental risk factors in children and adolescents in Germany: the UKAGEP project -

	Dewi Krisnayanti (Indonesia) Low level arsenic exposure during pregnancy in the 3xG cohort in Flanders: less efficient detoxification is associated with higher oxidative stress – Nathalie Lambrechts (Belgium) Prenatal mercury exposure and fetal development and birth outcomes: results from INMA cohort – Ferran Ballester (Spain) Lead in soil; how can we reduce exposure to young children – Martin Eggens (Netherlands) Blood lead concentrations from children practicing airgun shooting - Rudolf Schierl (Germany)	Myriam Tobollik (Germany) The burden of infectious diseases on congenital malformations: the case of Zika virus and microcephalia in Brazil – Roberto Ronchetti (Italy) 
20.00	**Conference Dinner at El Cangrejo Loco - Moll de Gregal, 29-30 Port Olímpic 08005 Barcelona**	
Thursday 15h of September 2016		
8.45 – 10.00	**Session 7 (Auditorium) Pollutants at schools and homes** Chair: Achim Heinrich (Germany) and Rudolf Schierl (Germany) Indoor air and children's health, SINPHONIE and SEARCH projects – Eva Csobod (Hungary) Engaging schoolchildren in understanding the indoor environment using citizen science - Núria Castell (Norway) Polycyclic aromatic hydrocarbons from traffic exhausts in primary schools and cognitive development of children – Barend van Drooge (Spain) Multi residue and non-target screening for characterization of organic chemicals in indoor dust – Garry Codling (Czech republic) Assessment of Indoor Air Quality in Air - Conditioned and Naturally ventilated Schools in Delhi - Pratima Singh (India)	**Session 8 (Darwin) Biomonitoring and Spatial Analysis** Chair: Hanns Moshammer (Austria) and Merce Gari (Spain) Early-life exposure to multiple environmental contaminants and birth weight: pooled analysis in four Flemish birth cohorts - Eva Govarts (Belgium) Spatial Pattern Analysis of Hepatitis A Cases in Children by using Geostatistical Analysis of GIS in Turkey - Ahmet Ozgur Dogru (Turkey) Prenatal exposure assessment approaches need to consider spatio-temporal variation of air pollution - Andrea Ranzi (Italy) Spatial clustering of childhood leukemia in the Region of Murcia, Spain (1998-2010) - Alberto Cárceles Álvarez (Spain)
10.00 -10.30	**Poster pitch session C (Auditorium)** Chair: Ruth Etzel (USA) and Yona Amitai (Israel) Mobile phone and other digital technology use in UK adolescents: The SCAMP Cohort - *Pippa Douglas* Quality of life of childhood brain tumor survivors: intervention, analysis and results - *Alberto Cárceles Álvarez* Transgenerational effects of treatment with antiepileptics in pregnancy: behavioural and molecular markers in a mouse study - *Gemma Calamandrei* Forests for health with the environmental midwife - *Lizbeth Álvarez Gómez* Modifiable factors related to low water intake in Mexican children and adolescents - *María de los Angeles Peña Farfán* Exposure to arsenic and mercury: associated pregnancy outcomes, and early infant	**Poster pitch session D (Darwin)** Chair: Jamie Pearce (UK) and David Bellinger (USA) Occupational noise exposure during pregnancy - new aspects in childs language acquisition - *Soile Jungewelter* Factors influencing breastfeeding initiation - *Lizbeth Álvarez Gómez* Neuropsychological profile of an adopted patient with Fetal Alcohol Spectrum Disorder - *Esther Tobarra Sánchez* Environmental screening on girls with early puberty disorders - *Ferran Campillo i López* Where physical environment is the major culprit: Mapping child health determinants against health-related policies and programs in an East African pastoralist community - *Lioul Berhanu Alemie* Mismatch of classroom furniture and student body dimensions in schools of Delhi - *Dr. Meghna*

	developmental outcomes in gold mining areas in Tanzania - *Elias Charles Nyanza*	
10.30- 10.45	Break	
10.45 -12.00	**Session 9 (Auditorium) Cognitive development of children in relations to environmental exposures** Chair: Yona Amitai (Israel) and Phil Landrigan (USA) The impact on chemical pollution into child development from in utero to adolescence - Jordi Sunyer (Spain) Maternal lifestyle during pregnancy and child neurodevelopment - Kinga Polanska (Poland) Lifelong Exposure to Green Space and Attentional Development: A Prospective Birth Cohort Study - Payam Dadvand (Spain) The role of local natural space in children's social, emotional and behavioural development in Scotland: a longitudinal study – Jamie Pearce (United Kingdom) Prenatal exposure to outdoor airborne trace elements and cognitive and psychomotor development during childhood in four European birth cohorts - Malgorzata Joanna Lubczynska (Poland)	
12.00 -13.15	**Session 10 (Auditorium) Endocrine disruptors and epigenetics** Chair: Emiko Todaka (WHO, Europe) and Chisato Mori (Japan) Temporal trends of organochlorine compounds and PBDEs from utero until 4 years of age in the Asturias INMA cohort - Mercè Garí (Spain) Early life exposure to organochlorine pesticides and behavioral development in children – Margot van de Bor (Netherlands) Endocrine Disrupting Chemicals (EDCs) and children's daily exposure: Physicians, scientists, NGOs and media - working together for a better policy and more protection - Johanna Hausmann (Germany) Persistent Organic Pollutants in women's breast milk and proximity to Municipal Waste Incinerators in the UK - Phillipa Douglas (United Kingdom)	**Session 11 (Darwin) Environmental Pediatrics for Pediatric residents** Chair: Ruth Etzel (USA) and Donald Frush (USA) CEH training in Brazil - Emerson Da Silva (Brazil) Strategies for Use of medical Imaging and Radiation Risk: What the Care Provider Should Know - Donald Frush (USA) Autism Spectrum Diseases, including Asperger Syndrome. Fairy Tales and Facts about Environment and Genetics - Karl Ernst von Mühlendahl (Germany) Environmental consulting nursing : health from the beginning - Miguel Felipe Sanchez Sauco (Spain) Empowering Youth and Communities to promote health and environment- The Bangalore Experience - Elizabeth Cherian Paramesh (india)
13.15-14.15	Lunch	
14.15-15.30	**Session 12 (Auditorium) Asthma and Respiratory Diseases** Chair: Hanns Moshammer (Austria) and Martin Eggens (Netherlands) An unexpected epidemic of respiratory distress. Hanns Moshammer (Austria) Changing kindergarten practices with localized real-time information on outdoor air: The experience of CITI-SENSE project in Oslo, Norway - Núria Castell (Norway) Impact of air pollution to oxidative damage in newborns and mothers – Katerina Honkova for Radim Sram (Czech republic) Lung function growth trajectories in children in relation to prenatal exposure to particulate matter - Cracow cohort study - Renata Majewska (Poland) Rapid Urbanisation and changing Prevalance of Chronic Cough in children – H. Paramesh	**Session 13 (Darwin) Environment and childhood cancer** Chair: Juan Antonio Ortega (Spain) and Elisa Pasqual (Spain) Environment and childhood cancer survivors: PLASECAP MUR - Alberto Cárceles Álvarez (Spain) How can the increase in childhood cancer be explained? The role of transplacental and ctransgenerational carcinogenesis– Ernesto Burgio (Italy) Health related quality of life of survivors of childhood extracranial neoplasms - Alberto Cárceles Álvarez (Spain) Descriptive analysis from a hospital based childhood cancer survivors cohort: report from the project Spain-CCSS - Elisa Pasqual (Spain) Secondhand tobacco smoke and survival in children with acute lymphoblastic leukemias in the region of Murcia (SPAIN) - Alberto Cárceles

	(India)	Álvarez (Spain)
15.30 -15.45	Break	
15.45 -16.30	**Poster pitch session E (Auditorium)** Chair: Joan O. Grimalt (Spain) and Joaquim Rovira (Spain) Particulate matter characterisation in the schools located around petrochemical industrial complex. Infiltration of particle from outdoor to indoor air - *Joaquim Rovira* Personal exposure to PM2.5 and benzo[a]pyrene in Ostrava, Czech Republic - *Katka Honkova* AIDS orphans in Sub-Saharan Africa: A systematic review on differences between rural and urban environments - *Tara Rava Zolnikov* Training modules for paediatricians - Health effects of climate change - *Colin O'Reilly* Reality of children's new environment and future policy needs - *Marija Jevtić* Study of childhood illness for the period 2009-2011, meeting the city. Sofia & Pleven with view to effective health promotion - *P. Karadzhova* Promoting Health: Recommendations of food consumption as a tool to minimize exposure of pollutants to the children's population - *Rosa Maria Llull Cantallops* Lead and mercury exposure are associated with low resting heart rate in community children - *Naixue Cui* Potential Environmental Hazards on Child Health in a Prospective Mining Area in North Sumatra, Indonesia - *Levina Khoe* Mapping child health against health related policies and programs in East African pastoralist communities - *Lioul Berhanu Alemie*	**Poster pitch session F (Darwin)** Chair: Johanna Hausmann (Germnay) and Nuria Castell (Norway) Birth weight in relation to cord blood levels of selected elements in Slovenian mother-child pairs - *Marta Jagodic* Birth and Growth without OH: Detection and follow up from pregnancy until the end of adolescence of children at risk of neurobehavioral disorders through exposure of alcohol and illegal drugs - *Maria Luisa Azurmendi* The mercury pollution and child birth defects - *Unursaikham Surenyah* Prenatal exposure to particulate matter and the occurrence of wheezing in chest in children - *Agnieszka Pac* The role of trace elements, antioxidants and oxidative stress in very low birth weight infants - *Beatrice Bocca* The PERSIAN birth cohort; A Work in Progress - *Payam Dadvand* Psychosocial stress and obesity in Kaunas children - *Regina Grazuleviciene* Lifestyles of survivors of childhood hematologic neoplasms - *Mayra Alejandra Orozco Llamas* Air pollutants exposure and functional repair activity in placenta - *Nurulshyha Md Yatim* The role of perinatal essential fatty acids in attention deficit and hyperactivity disorder symptoms and cognitive functions - *Mónica López-Vicente* Maternal Environmental Exposure to Organochlorine Pesticides and its Effects on Birth weight - *Madhu Anand*
16.30 -18.00	**Session 14 (Auditorium) Exposome research in children** Chair: Mark Nieuwenhuijsen (Spain) and Denis Sarigiannis (Greece) Human biomonitoring data analysis for metals in an Italian adolescents cohort: an exposome approach – Alberto Gotti (Italy) Assessing the impact of hazardous waste on children's health: the exposome paradigm – Denis Sarigiannis (Greece) Quantitative profiling of metabolic markers to assess dietary and microbiota related exposure factors - Zdenek Spacil (Czech republic) Persistent pollutants in food items from Menorca Island - Eva Junqué (Spain) Prenatal exposure to perfluoroalkyl substances and cardio-metabolic risk components during early childhood - Cyntia B. Manzano-Salgado (Spain)	**Session 15 (Darwin) Miscellaneous** Chair: Payam Dadvand (Spain) and Tara Zolnikov (USA) Health effects of consuming desalinated Sea water - implications for children - Yona Amitai (Israel) Maternal cell phone use during pregnancy and child behavior problems in five birth cohorts – Laura Birks (Spain) Determining the impact of smoking point of sale legislation among youth (Display) study: new findings from Scotland – Jamie Pearce (UK) Impact of prenatal exposure to environmental pollutants on autism spectrum disorder: A case report - Esther Tobarra Sánchez (Spain) BORN WITHOUT OH: an innovating model for preventing and managing the neurodevelopmental disorders caused by alcohol and drug prenatal exposure in a Mediterranean region - María Luisa Azurmendi Funes (Spain)

Friday 16th of September 2016	
8.45-10.15	**Session 16 (Auditorium) Children's environmental health policy topics** Chair: David Bellinger (USA) and Karl Ernst von Mühlendahl (Germany) Minamata Convention on mercury vulnerable population – Mahmood Khwaja (Pakistan) Children's environmental right - Jonas Schubert (Germany) Environment exposure and neuro-development in MOCEH – Mina Ha (Korea) Improved Relationships in Eastern Kenya From Water Interventions and Access to Water - Tara Rava Zolnikov (USA) Relations between the exposure of factory air polution with asthma impacted in children who live in shelter Around the district of industrial area in Jakarta, Indonesia Trial District In Jakarta Indonesia - Wan Nedra Komaruddin (Indonesia)
10.15 -10.30	Break
10.30 -12.00	**Session 17 (Auditorium) Children's Health and the environment in the Mediterranean** Chair: Denis Sarigiannis (Greece) and Gemma Calamandrei (Italy) The NAC-II birth cohort in Friuli Venezia Giulia Region: prenatal and childhood exposure to metals and neuropsychological maturation at 7 years – Gemma Calamandrei (Italy) Internal dosimetry metrics for risk assessment of endocrine disruptors – the case of bisphenol A – Denis Sarigiannis (Greece) Urine total arsenic and arsenic species in children from Northern Italy – Beatrice Bocca (Italy) Neurodevelopment, low level mercury exposure and genetic polymorphisms in birth cohort from Slovenia and Croatia - Janja Snoj Tratnik (Slovenia) Children exposure to PAH and potential carcinogenic risk assessment from biomass burning incorporating internal dosimetry metrics – Spyros Karakitsios (Greece) Influence of gestational weight gain on the transfer of organochlorine pollutants into infants – Joan Grimalt (Spain)
12.00 -13.15	**Session 18 (Auditorium) Final session** Chair: Wojtek Hanke (Poland) and Stephan Böse-O'Reilly (Germany) Protecting children's health from environmental harm - the perspective of WHO Regional Office for Europe – Dorota Jarosinska (WHO, Europe) INMA overview - Jordi Sunyer (Spain) Societal burden of children's exposures to neurotoxicants - David Bellinger (USA) Thinking of the relationship between children's health and the environment as a rights issue - The UN Committee on the Rights of the Child Day of General Discussion on Children's Rights and the Environment on 23 September 2016 - Jonas Schubert (Germany)
13.15 -13.30	**Closing Ceremony:** **The Barcelona Declaration on Children Environmental Health** **The 9th International Conference on Children's Environmental Health**

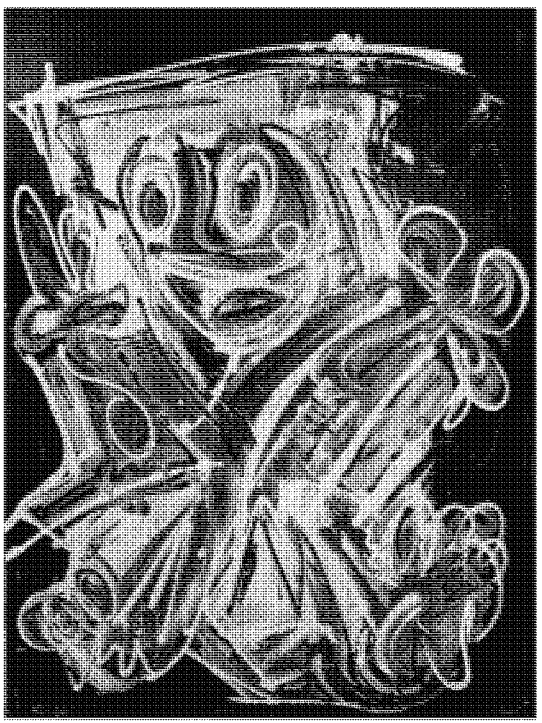
The International Network on Children's Health, Environment and Safety (INCHES) (http://www.inchesnetwork.net) was founded at a workshop meeting before the 1st International Conference on Children's Environmental Health, August 1998 in Amsterdam, the Netherlands, where WHO, European Environmental Agency (EEA), US Environmental Protection Agency (USEPA) and other organisations had an active participation, stressing the growing importance of CEH as a global health issue.

The International Network on children's Health, Environment and Safety (INCHES) is a global network with the following goals:

1) increase understanding of and accord on how environmental factors influence child health;
2) create a global dissemination of research and information on children's environmental health;
3) educate and facilitate information exchange on the best practices and policies in children's environmental health;
4) identify information gaps and stimulate to new research; and
5) advocate for children's environmental health in the intergovernmental arena.

Some highlights of INCHES activities since its formation in 1998 include:

- There are now about 150 organizational members, some of which are well structured, established and active as national NGOs interested in an intensified international cooperation.
- More than 30,000 individual members (most of them health professionals) within these member organizations.
- Strong contacts in several countries where national children's environmental health networks have been founded or under creation.
- Excellent international contact in the field of children, environment and health in the intergovernmental, governmental and NGO circles.
- Some official contacts in the field (relations with WHO, EEA, membership in European Health and Environment Alliance network, International Society of Doctors for the Environment).
- Several members in the medical scientific community covering most aspects of environmental health able and ready to give foundation to the content of INCHES' work.
- Training programs in cooperation with several universities in some countries have been conducted as a project.
- INCHES initiated several projects funded by the European Union.
- INCHES organized or co-organized several conferences on children's environmental health the last two decades.
- INCHES collaborates with similar networks in North America: Children's Environmental Health Network, International Society for Children's Health and the Environment and the Canadian Institute of Child Health.



Message

From: Arnold P. Wendroff, PhD [mercurywendroff@mindspring.com]
Sent: 1/22/2016 3:00:46 AM
To: Enck, Judith [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=3db0c221d8194266b9568fa8961b6cca-Enck, Judith]; Maddaloni, Mark [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=b49225c65f43422ea68433b7058af1c0-Maddaloni, Mark]; Mccarthy, Gina [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=51ee957b10cb49a0b2ff98174ae44a46-Mccarthy, Regina]; Emerson, Michael [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=23d3009028994a4daa16f96aba2ff173-Emerson, Michael]; Fritz, Matthew [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=0593db850724461799cb78eacbd5e461-Fritz, Matthew]; gochfeld@rutgers.eohsi.edu; lemuel.srolovic@ag.ny.gov; galantd@montclair.edu; amditisj@mail.montclair.edu; Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Tejada, Matthew [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=6559971c9dcd4c689ca6ec6b2a8cb0ee-Tejada, Matthew]; minava@nytimes.com; baptista@newschool.edu; acarpi@jjay.cuny.edu [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=6a5cf3442ec347cd843c94f6775b7ed1-acarpi@jjay]; Ash, Christine [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=722e1ae6cf144067907c9b4052bda56b-Ash, Christine A.]; Coopwood, Theodore [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=2b197ea0ed734df49ccf4d1aeae0662e-Tcoopwoo]; Brown, Deborah [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=b035a59cfb95439b9d94f5ee233814df-Brown, Deborah]; editor@citylimits.org; garcia.lisa@epa.gov; Lee, Charles [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=bb6f13c5a0ab453c8492636a72ffa3c2-Lee, Charles]; asi.ofosu@mail.house.gov; luisa.borrell@lehman.cuny.edu; adam.glantz@hud.gov; david.pristin@nycha.nyc.gov; cdandrea@health.nyc.gov; eroh@health.nyc.gov; luis.ponce@nycha.nyc.gov; sandra.howard@hhs.gov; arc@angusrchen.com; agreene@pubadvocate.nyc.gov; mathieu.eugene@council.nyc.gov; dcruz@norwoodnews.org; jaschner@montefiore.org; 'Jeremy Magliaro' [Jeremy.Magliaro@ag.ny.gov]; cgoldpond@council.nyc.gov; cjohnso2@ramapo.edu; burger@biology.rutgers.edu; ophipps@doi.nyc.gov; specialeducationreform@schools.nyc.gov; Poliwka, Annette [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=6940d0a1862240d0b1d4e702c6f01a8f-Poliwka, Annette]; peggy@weact.org [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=1e74fbcd27b048d7b4db635dfdb5b86a-peggy@weact.org]; tstecker@eenews.net
CC: mercurywendroff@mindspring.com
Subject: EPA R2 REGIONAL ADMINISTRATOR HAS EQUALLY DAMNING REASONS FOR RESIGNING AS WELL.
Attachments: GOVERNMENT KNEW OF GM 03 31 14.docx; NOVELLO SURGEON GENERAL 10 16 90.pdf; ZAYAS & OZUAH 1996 condensed.pdf; US ATTORNEY NEW JERSEY re LOCKHEED MARTIN 03 08 07.doc; EPA INSPECTOR GENERAL REPORT 08 31 06.pdf; EPA RARE GRANT PROPOSAL 2010.pdf; MERCER ET AL ACRODYNIA RI CASE 2012.pdf; WENDROFF COMMENTS MERCER et al 03 12.docx; BRANNAN, SU, ALVERSON RI MERCURY PEC 08 12.pdf; WENDROFF COMMENTS BRANNAN et al 08 12.docx; SIKORSKI WOMEN DENTAL 1987.pdf; UNEP MODULE 5 CULTURAL USES OF MERCURY 2008.pdf; KNOBLAUCH Envtl Health News 05 05 09.doc; WENDROFF NATURE 10 18 90.pdf; ATSDR TOX PROFILE EXCERPTS + APW COMMENTS.docx; ATSDR CHILDREN'S Hg EXPOSURE 2009 EXCERPTS & APW COMMENTS.doc; NOVELLO SURGEON GENERAL 10 16 90.pdf; WENDROFF LANCET NEUROLOGY 07 14.docx; WENDROFF NATURE 10 18 90.pdf; VITA APW 05 03 15.doc; SCIAMMARELLA MERCURY USE CHICAGO 2000.doc; RITTER Chicago Sun Times 07 18 97.pdf

To: enck.judith@epa.gov; maddaloni.mark@epa.gov; mccarthy.gina@epa.gov; Emerson, Michael; fritz.matthew@epa.gov; gochfeld@rutgers.eohsi.edu; lemuel.srolovic@ag.ny.gov; galantd@montclair.edu; amditisj@mail.montclair.edu; etzel.ruth@epa.gov; 'Tejada, Matthew'; minava@nytimes.com; baptista@newschool.edu; acarpi@jjay.cuny.edu; ash.christine@epa.gov; coopwood.theodore@epa.gov; brown.deborah@epa.gov; editor@citylimits.org; garcia.lisa@epa.gov; lee.charles@epa.gov; asi.ofosu@mail.house.gov; luisa.borrell@lehman.cuny.edu; adam.glantz@hud.gov; david.pristin@nycha.nyc.gov; cdandrea@health.nyc.gov; eroh@health.nyc.gov; luis.ponce@nycha.nyc.gov; sandra.howard@hhs.gov; arc@angusrchen.com;

agreene@pubadvocate.nyc.gov; mathieu.eugene@council.nyc.gov; dcruz@norwoodnews.org; jaschner@montefiore.org; 'Jeremy Magliaro'; cgoldpond@council.nyc.gov; cjohnso2@ramapo.edu; burger@biology.rutgers.edu; ophipps@doi.nyc.gov; specialeducationreform@schools.nyc.gov; poliwka.annette@epa.gov; peggy@weact.org; tstecker@eenews.net

From: Arnold P. Wendroff, PhD, **Mercury Poisoning Project** (718) 499-8336 **www.mercurypoisoningproject.org** Key Words < mercury Santeria >

Dear All,

EPA's R5 Regional Administrator has set a good example for those of you who have been aware of the high probability, in fact virtual certainty,
that many homes, mostly in poor Caribbean and Latino communities, are contaminated with mercury. Most of the current exposures are at second-
hand, in the form of developmentally neurotoxic levels of mercury vapor emanating from ritualistic (cultural, magico-religious) spills by some prior
occupant.

As the EPA and many other city, state and federal agencies have been aware of these ritualistic mercury spills for the past quarter of a century, there is
plenty of blame to go around. In the case of Regional Administrator Enck's involvement, please see her attached letter to me "EPA RARE GRANT PROPOSAL 2010"
which was bogus from the beginning, and was not funded. EPA at the national as well as regional levels (including R5 as witness my last two attachments)
has been guilty of downplaying the ritualistic mercury contamination problem, but the research proposed by the ATSDR in1999, was never undertaken.
stated that:

> A unique exposure pathway that has received little research attention is the exposure to children from religious and ethnic uses in homes and cars or in remedies containing metallic mercury (ATSDR 1997; Johnson [in press]; Wendroff 1990, 1991). In some religious practices of Latin American or Caribbean origin, there are traditional rituals or remedies that involve mercury. These include intentional sprinkling of liquid elemental mercury on the floor, burning candles made with mercury, using mercury in baths, adding it to perfume, or wearing small containers of mercury around the neck for good luck. **There is an urgent need to obtain information on the levels of exposure from these practices to determine if children or adults are at risk.** Mercury vapor concentrations may be much higher after use during the winter months when the heat is turned on and the windows are closed, so data that reflect a variety of possible exposure scenarios are also needed.
>
> **TOXICOLOGICAL PROFILE FOR MERCURY U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES**
> **Public Health Service Agency for Toxic Substances and Disease Registry March 1999 p. 480**

Yet this 1999 need was, and is, as urgent as the need to measure lead (Pb) levels in the water of Fling, MI homes.

Many of you readers are, and have been, aware of these "potential" ritualistic mercury vapor exposures, and as in the case of your
environmental colleagues in Michigan, have chosen to ignore them, allowing similar, albeit latent damage to the mostly Caribbean
and Latino fetuses, infants and children who have been, currently are, and continue to be exposed to mercury vapor in their homes.

It is never too late to act to prevent these exposures, beginning by implementing the methodology that Dr. Maddaloni spells out
in his attached EPA RARE GRANT PROPOSAL, and in my enclosed summary "MAGICO-RELIGIOUS MERCURY USE AND
ENVIRONMENTAL HEALTH: THE PROBLEM AND SUGGESTED SOLUTIONS" which most of you have read before and ignored.

Sincerely yours,

Arnold Wendroff

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From: Arnold P. Wendroff, PhD [mailto:mercurywendroff@mindspring.com]
Sent: Thursday, **January 21, 2016 8:53 PM**
To: tstecker@eenews.net
Cc: mercurywendroff@mindspring.com
Subject: EPA R2 REGIONAL ADMINISTRATOR HAS EQUALLY DAMNING REASONS FOR RESIGNING AS WELL.

To: Tiffany Stecker, E&E Reporter, ***Environment & Energy Publishing***

From: Arnold P. Wendroff, PhD, **Mercury Poisoning Project** (718) 499-8336 **www.mercurypoisoningproject.org** Key Words < mercury Santeria >

Dear Ms. Stecker,

There is just as much, if not more, reason for the EPA R2 Regional Administrator to resign, as witness the enclosed, attached and linked documents, including one
by one (2009, attached) of E&E's own Jessica Knoblauch.

The 'rot' goes all the way up the ladder, to Gina McCarthy herself, as I will demonstrate in a second email.

Sincerely,

Arnold Wendroff

PS: Note the last two of the attachments, documenting magico-religious mercury use in Chicago (EPA R5) and as with lead (Pb) in Flint,
EPA (as well as other federal, state and local environmental and health agencies did nothing of a substantive nature to assess the issue,
let alone address it and act to prevent ongoing mostly second-hand exposures to mercury vapor in previously mostly poor Caribbean and Latino mercury contaminated homes.

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http://www.eenews.net/greenwire/stories/1060031014

FLINT CRISIS:

EPA regional administrator to resign amid scandal

Tiffany Stecker, E&E reporter tstecker@eenews.net
Published: January 21, 2016 at 6:26 PM

U.S. EPA Region 5 Administrator Susan Hedman will resign effective Feb. 1 in response to the ongoing water crisis in Flint, Mich.

"It is with sadness that I write to let you know that I have accepted the resignation of Susan Hedman as Regional Administrator in Region 5," EPA Administrator Gina McCarthy wrote in a memo.

McCarthy noted Hedman's accomplishments in protecting the Great Lakes, pollution cleanups and brownfields development.

The Detroit News reported Tuesday that Hedman knew in April about lead contamination in Flint's drinking water but did not tell the public.

McCarthy requested that **EPA's Office of Inspector General** investigate Region 5's public water system supervision program under the Safe Drinking Water Act.

Flint has been struggling with contaminated water stemming from a 2014 decision to switch the source from Lake Huron to the Flint River.

McCarthy has asked Region 5 Deputy Regional Administrator Bob Kaplan to serve as acting regional administrator.

EPA tonight issued a Safe Drinking Water Act emergency order, which gives the agency the authority to mandate response actions in Flint. Under the order, EPA will implement sampling and analysis of lead levels in the city's public water system and publish those results online.

Twitter: @TiffanyStecker Email: tstecker@eenews.net

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There seems ample justification for a programme to measure mercury vapour levels and to test exposed individuals. Sociologial research is also required to develop an effective health-education programme for botanica owners and their clients.

ARNOLD P. WENDROFF

"Domestic mercury pollution" Wendroff, ***Nature*** **October 18, 1990**

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A unique exposure pathway that has received little research attention is the exposure to children from religious and ethnic uses in homes and cars or in remedies containing metallic mercury (ATSDR 1997; Johnson [in press]; Wendroff 1990, 1991). In some religious practices of Latin American or Caribbean origin, there are traditional rituals or remedies that involve mercury. These include intentional sprinkling of liquid elemental mercury on the floor, burning candles made with mercury, using mercury in baths, adding it to perfume, or wearing small containers of mercury around the neck for good luck. **There is an urgent need to obtain information on the levels of exposure from these practices to determine if children or adults are at risk.** Mercury vapor concentrations may be much higher after use during the winter months when the heat is turned on and the windows are closed, so data that reflect a variety of possible exposure scenarios are also needed.

TOXICOLOGICAL PROFILE FOR MERCURY
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service Agency for Toxic Substances and Disease Registry March 1999 **p. 480**

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THE CITY OF NEW YORK
DEPARTMENT OF HEALTH
OFFICE OF THE COMMISSIONER

125 WORTH STREET
NEW YORK, NY 10013

NEAL L. COHEN, M.D.
COMMISSIONER
TEL (212) 788-5261
FAX (212) 964-0472

January, 2000

Dear Colleague:

Enclosed is a brochure developed by the New York City Department of Health describing a route of exposure to metallic mercury that may affect some of your patients. It has been reported that in some Latin American and Caribbean communities in the city, metallic mercury available in botanicas and religious stores is used in religious or ethnomedical practices in a manner that may adversely affect health.

The type of damage to the body caused by this form of mercury is dependent on how much and for how long a person is exposed to it. Mercury vapors can persist in indoor environments for long periods of time, and, because the vapors are invisible, people who live in or regularly visit homes where mercury is used may not be aware that they are being exposed. Unfortunately, metallic mercury has the greatest effect on the developing central nervous systems of fetuses and young children.

In order to ensure the well-being of your patients and their families, they should be made aware of the potential dangers of mercury use. You can respect your patients' religious and cultural beliefs and still provide effective care. The first step is to ask patients about their use of traditional/folk treatments and whether they use metallic mercury. The enclosed brochure includes more information on the health effects of mercury, how to test for absorption and how to address patient concerns.

In addition, the New York City Department of Health has prepared patient-education brochures in English, Spanish, and Haitian Creole. Sample copies are enclosed. Please call (212) 788-4290 to request additional copies. Thank you for your attention to this problem and your efforts to improve the health of all New York City residents.

Sincerely,

Neal L. Cohen, M.D.
Commissioner

NLC/nj

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DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

The Surgeon General of the
Public Health Service
Rockville MD 20857

OCT 16 1990

Arnold Wendroff, Ph.D.
298 Marlborough Road
Brooklyn, NY 11226

Dear Dr. Wendroff:

We received your letter in which you expressed concern about the risk of domestic mercury vapor exposure. The ritual of sprinkling mercury on the floor to ward off 'evil spirits' is practiced by selected minority groups and may pose potential hazards to those who encounter the mercury.

The Agency for Toxic Substances and Disease Registry (ATSDR) within the Public Health Service is the Agency that specifically is charged with preventing or mitigating the adverse human health effects and diminished quality of life that result from exposure to hazardous substances in the environment and I understand that you have already contacted them. Dr. Cynthia Harris, Ph.D., Chief of the Community Health Branch, Division of Health Assessment and Consultation, ATSDR, is following up on this matter and should be back in touch with you in the near future.

Also, for the past 10 months, Dr. Ruth Etzel, M.D., Ph.D., has been conducting research in the area of mercury exposure. Dr. Etzel is employed at the Centers for Disease Control (CDC), Center for Environmental Health and Injury Control, Division of Environmental Hazards. The CDC is also an Agency within the Public Health Service. We are currently awaiting results from that research. I am confident that these two Agencies will remain vigilant in the pursuit of this potential health threat.

I appreciate your interest and encourage you to continue your efforts to help protect the public's health. Please feel free to contact the above-mentioned resource persons if you have further questions.

Sincerely,

Antonia C. Novello, M.D., M.P.H.
Surgeon General

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MAGICO-RELIGIOUS MERCURY USE AND ENVIRONMENTAL HEALTH: THE PROBLEM AND SUGGESTED SOLUTIONS

Problems posed by magico-religious mercury use

There is **a latent epidemic of mercury poisoning** in some **Caribbean-Latino communities**, just as the current epidemic of pediatric lead poisoning was latent some 40 years ago. Research has demonstrated that elemental mercury (Hg) is put to a variety of magico-religious uses in Cuban, Dominican, Haitian, Puerto Rican, etc. communities, where in the context of folk magic, as well as in religions including Espiritismo, Santeria and Voodoo, mercury metal is generically believed to attract good and repel evil. Many of these ritualistic uses expose mercury to indoor air, where its developmentally neurotoxic vapor escapes and contaminates the dwelling. The most problematic, and one of the more common practices, is to sprinkle mercury on floors and furnishings of homes, and in the interior of automobiles. As this mercury is not cleaned up, it remains in porous surfaces such as flooring for decades. When disturbed, as by walking, sweeping, or vacuuming, the mercury liberates developmentally neurotoxic levels of mercury vapor. Therefore, the majority of the mercury vapor exposures are at second-hand, from 'historic' ritualistic mercury spills. Those exposed can have no idea that their dwelling is contaminated, as the mercury droplets are hidden in crevices in the floor, and mercury vapor is invisible and odorless.

Ritualistic mercury exposure is overwhelmingly via inhalation, ~80% of inhaled mercury vapor entering the lungs is absorbed into the blood, where, prior to its oxidation, it is transported throughout the body. Being fat soluble, the elemental mercury passes into all tissues, including the brain, and via the placenta into the fetal circulation and the developing brain. In the tissues, mercury atoms combine with the molecules of intracellular structures, damaging them while forming insoluble mercury compounds, which remain in the damaged cells.

The EPA's evacuation level for mercury vapor in a dwelling is 10 micrograms of mercury per cubic meter of air, and the reoccupation level after cleanup, is 1 microgram per of mercury per cubic meter of air. Mercury contamination is time-consuming and expensive to remediate. A small apartment that had ~10 grams of mercury sprinkled on its floor some years ago could easily cost several tens of thousands of dollars to decontaminate.

What we know about magico-religious mercury use

Elemental mercury is well documented as a potent toxin, especially to the central nervous system, although most of the data is from adult exposures and relatively little data exists on maternal-fetal and pediatric exposure. However, there is an enormous literature, and commensurate concern, on maternal-fetal and pediatric methylmercury exposure. Much of this literature is applicable to mercury vapor exposure, as it is the mercury atoms/ions that are toxic. There is no question that if mercury is sprinkled in homes in mean weights of ~10 grams, those homes will be semi-permanently contaminated with developmentally neurotoxic levels of mercury vapor.

Survey research has demonstrated the widespread nature of ritualistic mercury sales and use in some Caribbean-Latino communities. The best data on sales and presumed use are from the Bronx, NY, where 1n 1995 35 of 38 botanicas sold between ~25,000 and ~155,000 ~9 gram mean weight containers of mercury in 1995. Between ~8,000 and ~50,000 Bronx homes are believed to have had ~9 grams of that mercury sprinkled on their floors in 1995.

The best data on mercury use are from Lawrence, MA, where of 898 Dominicans interviewed, 12% had sprinkled mercury around a child's crib; 12% had sprinkled it in a car; 10% swallowed it in a drink; and 17% burned it in a candle or oil lamp.

We have data on elevated mercury vapor levels in public hallways of housing in two heavily Caribbean-Latino (~80% Cuban and Dominican) communities in New Jersey where mercury was widely sold for ritualistic uses.
We have data from children in the Bronx, NY where 5 of 100 had clinically elevated urine mercury levels believed to be from ritualistic exposure.

We have data on elevated mercury levels believed due to ritualistic use in wastewater emanating from Caribbean-Latino communities in New York City, and in water and sediments in the NY/NJ harbor.

An index case of a 3 year old Puerto Rican girl presumably poisoned by ritualistic mercury use was published in *Pediatric Dermatology* (03/12) and in *Pediatric Emergency Care* (08/12). Neither paper mentioned that her 8 and 10 year old siblings, and her 32 year old mother had highly elevated mercury burdens, necessitating the chelation of the siblings. Had not the 3 year old exhibited the signs of acute mercury toxicity (acrodynia), the family would have remained exposed to mercury vapor levels ranging from 10 to 34 μ/m^3 !

Barriers to addressing the problem

The inherent political incorrectness of the issue, namely that poor ethnic and religious minorities are contaminating their own and their successor's homes with a potent neurotoxin within the context of their religious and magical beliefs.

The total lack of advocacy on the part of the Caribbean-Latino community, especially of their political, environmental, and medical elites, who are too embarrassed by these magico-religious practices to assess and address them.

The mandated domestic evacuation level of 10 micrograms per cubic meter of mercury vapor.

The enormity of the cost of remediating mercury-contaminated housing, which government would incur.

The impacted nature of the problem, which had been identified over two decades ago (in *Nature* October 18, 1990), and which, if real, will subject government to enormous legal and financial exposure, as well as embarrass individuals and organizations who have failed to act to assess and address this obvious environmental health threat.

Proposed steps to address the problem

The key to addressing the issue is to demonstrate (or disprove) that housing in Caribbean-Latino communities is contaminated with mercury as a result of its magico-religious use. This is simple and cheap to do using a portable mercury-vapor analyzer to non-invasively measure mercury levels in the public hallways of a representative sample of heavily Caribbean-Latino apartment buildings (especially public housing) in communities (Bronx, NY; Union City, & West New York, NJ; Lawrence, MA) where ritualistic mercury was known to have been sold and used. Occupants of apartments emitting high levels of vapor would be notified, and requested to allow measurements of the vapor levels inside their homes. Occupants of contaminated apartments would be tested for elevated mercury levels and diagnosed for symptoms and signs of mercury poisoning.

Several local, state and federal government agencies have a mandate to perform such research, but to date have refrained from doing so. It has long been apparent to all familiar with the problem, that should this research be carried out, it would almost certainly result in demonstrating that very large numbers of homes are contaminated, and so would require their evacuation and decontamination, as well as demonstrating the failure of the environmental health system.

The utility of mercury vapor filters needs to be assessed, which if placed in mercury-contaminated homes, would allow their occupants to remain in them until the dwellings could be decontaminated.

Any health education programs must be based on informing the mercury-exposed communities of the reality of their mercury exposure and of its effects. The majority are exposed at second-hand, and are not ritualistic mercury users, and in many cases not of Caribbean or Latino ethnicity.

Health care providers serving mercury-contaminated communities need to be informed of these exposures and their clinical picture. This will raise their clinical suspicion and enable them to diagnose exposures which they are currently missing. Two examples of such attempts are www.state.nj.us:80/health/eoh/cehsweb/hcp_culturalmercury.html from New Jersey,
and www.mercurypoisoningproject.org/pdf/metallic99.pdf ; www.mercurypoisoningproject.org/pdf/booklet99.pdf from New York City. Government agencies (CDC, EPA, HUD, NIEHS) should issue requests for proposals from the environmental medical community to work collaboratively with community organizations to collect data on mercury vapor levels in housing, mercury levels in occupants of mercury-contaminated housing, and health effects of these domestic mercury vapor exposures.

"A unique exposure pathway that has received little research attention is the exposure to children from religious and ethnic uses in homes and cars or in remedies containing metallic mercury (ATSDR 1997; Johnson [in press]; Wendroff 1990, 1991). In some religious practices of Latin American or Caribbean origin, there are traditional rituals or remedies that involve mercury. These include intentional sprinkling of liquid elemental mercury on the floor, burning candles made with mercury, using mercury in baths, adding it to perfume, or wearing small containers of mercury around the neck for good luck. **There is an urgent need to obtain information on the levels of exposure from these practices to determine if children or adults are at risk.** Mercury vapor concentrations may be much higher after use during the winter months when the heat is turned on and the windows are closed, so data that reflect a variety of possible exposure scenarios are also needed." **TOXICOLOGICAL PROFILE FOR MERCURY** March 1999 page 480
CDC / Agency for Toxic Substances and Disease Registry

Arnold P. Wendroff, PhD **Mercury Poisoning Project** November 18, 2009, Revised: March 27, 2014

www.mercurypoisoningproject.org mercurywendroff@mindspring.com (718) 499-8336 Key Words < mercury Santeria >

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From: Arnold P. Wendroff, PhD [mailto:mercurywendroff@mindspring.com]
Sent: Wednesday, April 02, 2014 6:44 PM
To: enck.judith@epa.gov; 'Maddaloni, Mark'
Cc: mercurywendroff@mindspring.com
Subject: FW: EAGERLY AWAITING THE NYSAG's INFORMED AND APPROPRIATE RESPONSE Re: RITUALISTIC MERCURY CONTAMINATON OF HOUSING, HUMANS, AND THE ENVIRONMENT

To: Judith Enck, Regional Administrator, **EPA R2**

To: Mark Maddaloni, PhD, Toxicologist, **EPA R2**

From: Arnold P. Wendroff, PhD, **Mercury Poisoning Project** (718) 499-8336 **www.mercurypoisoningproject.org** Key Words < mercury Santeria >

Dear Judith and Mark,

The current brouhaha over the failure of a federal agency (the NHTSA) to act to protect the public from faulty automotive ignition switches, even when a reasonable amount of data

suggesting such action was warranted, reminded me of EPA's similarly failing to act on the far less dramatic, but far more consequential issue, of the widespread, and serious
contamination of housing with elemental mercury originating from its magico-religious use.

EPA has been aware of the problem for over two decades, has recognized the need to measure mercury vapor in housing, yet has failed to perform such measurements.

Sooner or later the mercury will hit the fan, just as the ignition switch debacle has.

Perhaps you will both be retired by then? Let's hope so!

Sincerely,

Arnold

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From: Arnold P. Wendroff, PhD [mailto:mercurywendroff@mindspring.com]
Sent: Wednesday, **April 02, 2014** 2:05 PM
To: Lemuel.Srolovic@ag.ny.gov; 'Jeremy Magliaro'
Cc: mercurywendroff@mindspring.com
Subject: EAGERLY AWAITING THE NYSAG's INFORMED AND APPROPRIATE RESPONSE Re: RITUALISTIC MERCURY CONTAMINATON OF HOUSING, HUMANS, AND THE ENVIRONMENT

To: Lemuel Srolovic, JD, Bureau Chief, Environmental Protection, **New York State Attorney General** (518) 474-8096 / (212) 416-8446

To: Jeremy E. Magliaro, Environmental Policy Analyst, **New York State Office of Attorney General** (518) 402-4957 **www.ag.ny.gov/bureau/environmental-protection-bureau**

From: Arnold P. Wendroff, PhD, **Mercury Poisoning Project** (718) 499-8336 **www.mercurypoisoningproject.org** Key Words < **mercury Santeria** >

Dear Messrs. Srolovic & Magliaro,

The current news stories of the failure of the National Highway Traffic Safety Administration to act on available evidence of faulty ignition switches in some GM automobiles
has a parallel in the **failure of a multiplicity of city, state, and federal agencies** to act on the evidence first brought to the NYSAG's Office in mid 1990 of the major environmental
health threat posed by the widespread and serious contamination of housing by the magico-religious use of elemental mercury in some Caribbean and Latino communities here
in New York City, as well as in similar ethnic communities around the mainland USA and in Puerto Rico.

Your agency appears to have followed the lead of the NHTSA and other city and state agencies, including the NYC DOHMH, NYC DEP, NYCHA, NYS DOH and NYS DEC,
as well as federal oversight agencies including EPA and CDC/ATSDR, HHS, NIEHS etc. in failing to act to ensure that this latent environmental health disaster is assessed and
addressed, so as to prevent the ongoing exposure of mothers to be and their fetuses, infants, and children to neurodevelopmentally toxic inhalation exposures to mercury
vapor in their homes, emanating from 'historical' ritualistic mercury spills by prior occupants.

Mr. Magliaro wrote to me on March 21st:

> Please rest assured that my office has not forgotten or misplaced your inquiry.
> As you know, your inquiry is multi-faceted and goes back several years.
> We thank you for your patience so that we may respond in an informed and appropriate manner.
>
> Thank you again for bringing this issue to our attention and for your continued understanding.

I am sure that the NYSAG is engaging in some creative assessment of my inquiry/complaint, and that AG Schneiderman will exercise his bully pulpit in an attempt to ensure that
the environmental health, the civil rights and the environmental justice issues that I have raised will be addressed by the several responsible agencies so as to measure mercury
vapor levels in housing and decontaminate such housing found to be contaminated with actionable levels of mercury vapor, etc.

So, I am eagerly awaiting your informed and appropriately worded response, while reminding you that that while the AG's leisurely response is gestating, tens of thousands of NYC
residents are continuing to inhale neurotoxic levels of mercury vapor, and our Harbor continues to be polluted with ritualistic mercury.

Sincerely yours,

Arnold Wendroff

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http://www.nytimes.com/2014/03/31/business/us-regulators-declined-full-inquiry-into-gm-ignition-flaws-memo-shows.html?ref=todayspaper&_r=1

U.S. Agency Knew About G.M. Flaw but Did Not Act

[U.S. Agencies Knew About Magico-Religious Mercury Contamination of Housing in 1990, But Did Not Act!]

By MATTHEW L. WALD MARCH 31, 2014 ***The New York Times*** page A1

Federal regulators decided not to open an inquiry on the ignitions of Chevrolet Cobalts and other cars even **after their own investigators reported in 2007** that they knew of four fatal crashes, 29 complaints and 14 other reports that showed the problem disabled air bags, according to a memo released by a House subcommittee on Sunday. [Concerns over the mercury contamination of Caribbean and Latino housing from the magico-religious use of elemental mercury were put to the **New York State Attorney General's Office** in mid **1990**, and the first report of the phenomenon was published in Nature in October **1990**. It was also reported to the **Surgeon General of the Public Health Service**, who on October 16, 1990 wrote:

> We received your letter in which you expressed concern about the risk of domestic mercury exposure.
> The ritual of sprinkling mercury on the floor to ward off "evil spirits" is practiced by selected minority groups and may pose
> potential hazards to those who encounter the mercury. ... We are currently awaiting results from that [**CDC/ATSDR**] research.
> I am confident that these two Agencies will remain vigilant in the pursuit of this potential health threat. ...
> **Antonia C. Novello, MD, MPH, Surgeon General** (Letter attached)

In January 1996, a study published in the *American Journal of Public Health* (which is read by health departments in New York City, New York State, and federal agencies including the **CDC/ATSDR** and **NIEHS**, among others), stated that in the Bronx, NY,

> mercury [for magico-religious uses] is quite easy to purchase , and the manner of use may create situations of constant exposure
> to potentially high levels of mercury vapors in the immediate atmosphere. ... As providers of community health and mental health
> services in underserved areas, we recognize the public health threat of dispensing [for magico-religious use].
> (Zayas & Ozuah, ***AJPH*** January **1996** p.111-112)

This study found that in 1995, somewhere between 25,000 and 155,000 9 gram units of mercury were sold in the Bronx, and between 8,000 and 50,000 of these units were recommended to be sprinkled on floors of homes

In January 1999, The U.S. Environmental Protection Agency's (**EPA**) Office of Emergency and Remedial Response (OERR) convened the Task Force on Ritualistic Uses of Mercury .. to recommend an appropriate course of action regarding the use of elemental mercury as part of certain spiritual practices and folk traditions. (EPA Superfund **TASK FORCE ON RITUALISTIC USES OF MERCURY REPORT** (December **2002** **http://www.epa.gov/superfund/community/pdfs/mercury.pdf**)

In March **1999** the **ATSDR** wrote of:

> A unique exposure pathway that has received little research attention is the exposure to children from religious and ethnic uses in homes and cars or in remedies containing metallic mercury (ATSDR 1997; Johnson [in press]; Wendroff 1990, 1991). In some religious practices of Latin American or Caribbean origin, there are traditional rituals or remedies that involve mercury. These include intentional sprinkling of liquid elemental mercury on the floor, burning candles made with mercury, using mercury in baths, adding it to perfume, or wearing small containers of mercury around the neck for good luck. **There is an urgent need to obtain information on the levels of exposure from these practices to determine if children or adults are at risk.**
>
> Mercury vapor concentrations may be much higher after use during the winter months when the heat is turned on and the windows are closed, so data that reflect a variety of possible exposure scenarios are also needed. (**Toxicological Profile for Mercury** **ATSDR** March **1999** page 480 excerpts attached **http://www.atsdr.cdc.gov/toxprofiles/tp.asp?id=115&tid=24**)]

Then in 2010, the safety agency came to the same decision after receiving more reports that air bags were not deploying. [In **2002**, the **New York Academy of Sciences**, under contract to **EPA R2**, found that the median source of mercury entering the NY/NJ Harbor was in essence a tie, with slightly more mercury from religious and cultural uses contaminating the Harbor's waters than from emanations from coal-fired electric power plants. Each was estimated as about 400 kilograms per year, and each had an identical error bar or range of between 200 and 600 kilograms per year. (POLLUTION PREVENTION AND MANAGEMENT STRATEGIES FOR MERCURY IN THE NEW YORK/NEW JERSEY HARBOR May 14, **2002** **http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CCgQFjAA&url=http%3A%2F%2Fwww.nyas.org%2Fasset.axd%3Fid%3D14310d9e-41c9-48db-8ba1-bc2204fc6689&ei=Wbc5U8XBOqq30AHkgoHwAQ&usg=AFQjCNGex1JQECs1kcKAv0T8IlX0Xuuoiw&bvm=bv.63808443,d.dmQ**)

In **2009**, the **ATSDR** observed that:

> Some Caribbean religions and folk healers use mercury for religious or ceremonial purposes [Wendroff 2005]. The ceremonial uses of mercury include applying it to the skin, adding it to candles, or sprinkling it around the home. Elemental mercury is easily dispersed into fine beads that sink into carpets, furniture, cracks in the floor, or other porous materials (Figure 1a, 1b). Mercury tracked from room to room produces widespread contamination throughout the house. These practices can potentially expose practitioners and their children. Following indoor spills, mercury can persist for months and even years [Carpi and Chen 2001]. Therefore ceremonial use of mercury in the home could also expose future occupants and their children.
>
> Although the extent of mercury use in the home for religious purposes is not well characterized, such use may lead to chronic mercury exposure among those who use it in this manner and for subsequent occupants of the contaminated homes. Some evidence suggests that attempting to ban mercury could drive its use and sales underground, making the risks of using mercury and the benefits of mercury-free alternatives difficult for local health officials to communicate [Riley et al. 2001]. The individuals affected are most likely to be members of minority populations, raising concerns about environmental injustice in these communities.]

The memo also revealed that General Motors approved the faulty design of the switch in 2002 even though the company that made the part, **Delphi, warned the automaker that the switch did not meet specifications.** This followed a warning the year before — when the Saturn Ion was being developed — but G.M. said that "a design change had solved the problem," according to the memo. [Despite being warned of the illegal sale of unlabeled elemental mercury by botanicas around the USA, and specifically in NYC, it took years before any effort was made by federal (CPSC) and local (NYCDOH) agencies to enforce existing labeling regulations for botanicas selling mercury to unsuspecting clients.]

The striking new details in the memo bolster the contention that both G.M. and the National Highway Traffic Safety Administration, more than previously acknowledged**, ignored or dismissed warnings for more than a decade** about a faulty ignition switch that, if bumped, could turn off, shutting the engine and disabling the air bags. General Motors has recalled nearly 2.6 million cars and has linked 13 deaths to the defect. [The NYC DOHMH, the NYC DEP, the NYS DOH, the NYS DEC, the EPA, the CDC/ATSDR, the NIEHS, the HHS (Office of Minority Health & Office of Civil Rights), the CA DOH, the Chicago DPH, the MA DPH, the FL DOH, the RI DOH & RI DEM, all knew of the potential health threat posed by ritualistic mercury contamination of housing and of the larger environment for periods of up to 23 years, yet none have substantively assessed the levels of contamination, and hence the levels of human contamination.]

Late Sunday, the safety agency said in a statement, "As we have stated previously, the agency reviewed data from a number of sources in 2007, but the data we had available at the time did not warrant a formal investigation." [The aforementioned local, state and federal agencies have all echoed the NHTSA's statement, that they have reviewed data and it did not warrant a program to assess mercury vapor levels in occupied Caribbean and Latino housing as recommended by the **ATSDR** in **1999**.]

In a statement, General Motors said, "We deeply regret the events that led to the recall. We are fully cooperating with N.H.T.S.A. and the Congress and **we welcome the opportunity to help both have a full understanding of the facts."** Company officials have promised fuller responses at the hearing. [The EPA, in a pretense of acquiring a "full understanding of the facts", or rather of generating the facts, conducted a so called simulation study of the evolution of mercury vapor from a ritualistic spill. Their report was issued in 2004, and it transpired that it was not a valid simulation. They, and their contractor the Lockheed Martin company, repeatedly failed to disturb the mercury in their simulation of a spill in an occupied dwelling, and repeated this failure over the course of three years. They found that the levels of mercury vapor which were initially far above the mandated evacuation level of 10 micrograms per cubic meter (10μg/m^3) rapidly declined to below the reoccupancy level of 110μg/m^3. However when it was pointed out to them that this was not representative of real world spills, where the mercury droplets would be disturbed by walking, sweeping, and vacuuming, they changed their conclusions to state that:

> Even the source of undisturbed, the concentration decreases over time and generally falls below the residential occupancy level. It is unlikely, however, that mercury would remain undisturbed in a residential setting. (**EPA/OSWER/Superfund**. Ritualistic Use of Mercury Simulation: A Preliminary Investigation of Metallic Mercury Vapor Fate and Transport in a Trailer. page 21 September **2004**)

An accusation of fraud and collusion by and between EPA and Lockheed Martin was filed with EPA's Office of Inspector General, who wrote that:

> What We Found
>
> EPA staff and the Mercury Poisoning Project representative agree that the ritual use of mercury poses a health risk. Those who use mercury in folk remedies and religious practices, as well as others who live in buildings where such rituals are performed, may be exposed to mercury vapors. However, EPA and the representative differ in how EPA should address the risks. The representative believes EPA's actions are insufficient and wants EPA to:
>
> - regulate the use of mercury, and
> - be prepared to address what he believes to are many homes throughout the United States that are contaminated by the ritual use of mercury.
>
> On the other hand, EPA staff:
>
> - believe that EPA regulations are not warranted at this time, and starting the process would drive the practice underground, and
> - have addressed the issue by providing community education and outreach, and sponsoring research and environmental monitoring,

and purchasing 63 portable mercury vapor analyzers for measuring mercury levels. (EPA, Office of Inspector General, Public

Liaison Report EPA Is Properly Addressing the Risks of Using Mercury in Rituals Report No. 2006-P-00031 August 31, 2006 page 3)

Despite these protestations on the part of the EPA and the IG, the reality is different, as neither the EPA or any other government agency has engaged in any substantive and effective "community education and outreach," as it is not possible to do so without the hard evidence that housing is contaminated from ritualistic mercury use, and evidence that such contamination results in the contamination of the occupants of said housing. As proof of this failure to conduct such substantive research the **EPA R2 Administrator, Judith Enck**, wrote to me in **2010**:

Dear Dr. Wendroff:

... EPA has an ongoing concern about potential mercury (Hg) exposure associated with its use in ritualistic practices. Conceivably, such exposures can even extend to non-users through a scenario where ritualistic Hg practices by previous occupants of residential dwellings have contaminated the living space of the current unsuspecting residents. EPA Region 2 is exploring ways to characterize this potential exposure scenario. ... (**Judith Enck, EPA R2 Administrator**. Letter to Arnold P. Wendroff, PhD, July 13, 2010)

Regional Administrator Enck's letter was succeeded by a document sent to me by EPA R2's Office of Research and Development, which fleshed out Administrator Enck's letter, and illustrated the failure of EPA and other government agencies to make a substantive assessment of the severity of magico-religious mercury contamination of housing, and its sequelae.

U.S. EPA / Region2/Office of Research and Development
FY11 Regional Applied Research Effort Proposal

PROJECT TITLE AND REGIONAL CONTACT: **Mercury Vapor Sampling in Targeted Housing: Investigation of Ritualistic Mercury Use. Mark Maddaloni - Office of Strategic Programs, Office of the Regional Administrator**
(212) 637-3590 ...

PROJECT DESCRIPTION:

Science and Environmental Issues: Elemental mercury plays a role in several related Afro-Caribbean religions including Santeria (NJDEP, 2003). Such practices include the sprinkling of mercury in residential dwellings. Air monitoring data in the hallways of buildings in areas with a large Afro-Caribbean population in NJ have provided strong evidence that at least 2% of apartments in these areas have an ongoing historic presence of mercury, consistent with such cultural use, which exceeds the background in non Afro-Caribbean areas (NJDEP, 2003; NJDEP, 2007). Such uses potentially pose a health hazard, not only to those who engage in these practices, but to subsequent occupants of these dwellings.

Research Objectives and Expected Outcomes: Despite knowledge of the existence of ritualistic practices involving mercury, no data exist on levels if in-dwelling exposure. A study conducted previously by NJDEP relied on indirect indicators outside apartments of conditions inside apartments and could not provide an estimate of the airborne concentration of mercury inside the apartments. **Measurement of mercury vapor inside a dwelling, at the point of exposure is the best environmental indicator of potential hazard. This pilot level study of targeted housing will inform the potential extent and magnitude of mercury vapor contamination secondary to ritualistic practices by directly measuring mercury vapor concentration in targeted housing units.** [Compare this statement with the afore cited March 1999 admonition of the ATSDR!]

This proposal acknowledges that EPA nor any other governmental or non-governmental agency has taken the trouble to measure indoor air mercury vapor levels which are the essential and basic data needed not only to address the risk, but for any so-called education and outreach program that has a chance of convincing the lay public as well as health care providers of the dangers of ritualistic mercury contamination. Needless to state, this research proposal was never funded. The EPA decided that it was a higher public health priority to measure methylmercury levels in fish sold in NYC markets (a plethora of such data exists) as opposed to measure mercury vapor in Caribbean and Latino dwellings. (Fish Tissue Analysis for Mercury and PCBs from a New York City Commercial Fish/Seafood Market EPA/600/R-11066F October **2013**)]

A House subcommittee, which gathered more than 200,000 pages of documents from G.M. and 6,000 pages from the agency, will hold a hearing on Tuesday. Mary T. Barra, General Motors' chief executive, and David Friedman, the acting administrator of the safety agency, are scheduled to testify. Both are also scheduled to testify before a Senate panel on Wednesday. [There is a wealth of documentation of ritualistic mercury use, and of government's failure to substantively assess and address it available on the World Wide Web / Internet. The best source to my knowledge is in Google Scholar, using the key words < mercury Santeria >.]

"The problems persisted over a decade, the red flags were many, and yet those responsible failed to connect the dots," Fred Upton, a Republican of Michigan and the chairman **of the House Energy and Commerce Committee,** said in a statement. [Let me repeat: "**The problems persisted over a decade, the red flags were many, and yet those responsible failed to connect the dots**." In the case of ritualistic mercury contamination this failure to connect the dots was and is due to a) the intentional refusal to connect the dots, and b) to the lack of dots/data on mercury vapor levels in Caribbean dwellings, due to the large governmental disincentives to gather such data.]

The most damaging finding in the memo concerned the four fatal crashes **that went unheeded by regulators.** [The putative index case of acute mercury poisoning attributable to a ritualistic mercury spill by a prior occupant was published in two separate papers in March and August 2012. The case was reported by me to the CDC/MMWR, the ATSDR, the EPA R1, EPA R2, and EPA HQ, as well as the RI DOH and the RI DEM. None of these agencies showed the least interest in further investigating the case. The case involved an ethnically Puerto Rican family of five, living in Cumberland, RI, of which the youngest, a three year old girl, exhibited a variety of signs and symptoms which her primary care physician was unable to diagnose. She was referred to a Brown University teaching Hospital in Providence, where a diagnosis of acrodynia was confirmed by her notifiable urine mercury level. Mercer et al. noted the source of the girls exposure was in her apartments mercury-contaminated carpeting, as identified by the RI DOH and RI DEM. These authors speculated that the origin of the mercury might have been resulted from "sprinkl[ing] elemental mercury about the home to ensure health, wealth and happiness," citing the aforementioned 1996 reference by Zayas and Ozuah (Mercer et al. "Acrodynia and Hypertension in a Young Girl Secondary to Elemental Mercury Toxicity Acquired in the Home" *Pediatric Dermatology* March/April **2012**). Mercer et al's. colleagues were more specific in their identification of the of the source of the mercury. They wrote that the RI DOH and the RI DEM found highly elevated mercury vapor levels in the girl's apartment, and that the neighbors stated that the prior [Dominican] occupant "practiced rituals in the home that involved the use of mercury. Such practices are well described in the literature, and elemental mercury is obtainable at community botanicas." Brannan et al. went on to note that:

> Clinical suspicion for mercury toxicity should remain high in the absence of risk factors. The use of mercury in religious practice is well described; however, the extent of this problem is hard to understand or measure. Sale of elemental mercury from botanicas for the purpose of sprinkling about the home is not uncommon. One screening study in New York City demonstrated that 5% of healthy pediatric volunteers had unexpected elevated urinary mercury levels. (Brannan et al. "Elemental Mercury Poisoning Presenting as Hypertension in a Young Child." *Pediatric Emergency Care* August **2012**)

What Mercer et al, and Brannan et al intentionally omitted in their Case Presentation and Illustrative Case, was that that not only was the 3 year old girl they treated acutely poisoned from mercury vapor inhalation, but her 8 year old sister, 10 year old brother and 32 year old mother all had highly elevated UMLs, of 73, 38 and 49µg/L respectively. The notifiable level is 20µg/L. The three were asymptomatic, as far as any clinical investigation was made. The authors intentionally failed to mention these levels, which illustrate the latent nature of the putative epidemic of mercury poisoning, similar to that of pediatric lead poisoning prior to the publication of Needleman et al's 1979 paper in the NEJM on learning and behavioral anomalies in otherwise asymptomatic young children exposed to lead.]

In a presentation dated Nov. 17, 2007, the safety agency's investigators reported to its Office of Defects Investigation on the fatal crashes, as well as broad range of complaints and other reports about cars shutting off.

"The panel did not identify any discernible trend and decided not to pursue a more formal investigation," the House memo said. The findings reinforce an analysis by The New York Times published March 8 that found the agency had received more than 260 complaints about Cobalts, Ions and other cars in the recall, citing potentially dangerous shutdowns. [The local, state and federal agencies with oversight of ritualistic mercury contamination of housing and the larger environment have for the past 24 years, failed to pursue a more formal investigation of mercury vapor levels in housing, as recommended by both the ATSDR in 1999, and the EPA R2 in 2010, because they don't want to know!]

On Friday, the recall was expanded to nearly 2.6 million cars, to cover vehicles that might have been repaired with defective switches.

The Times reviewed almost 8,000 complaints about the recalled models to look for examples when drivers may have been affected by a faulty ignition. [No one but me has complained about these domestic exposures to mercury from magico-religious use, but numerous researchers have voiced their concern in the learned journals, all to no substantive avail. The circumstantial research has long been performed, but the conclusive evidence remains hidden in mercury-contaminated dwellings which government has the mandate to assess, but refuses to do so, just as the NHTSA had failed to investigate the GM ignition switch failures until forced to do so by the highly publicized deaths. The literature suggests an excess of fetal deaths due to maternal inhalation of mercury vapor (Sikorski et al. "Women in dental surgeries: reproductive hazards in occupational exposure to metallic mercury" *International Archives of Occupational and Environmental Health* **1987**).]

The safety agency, however, consistently responded that there was not enough evidence to warrant a safety investigation. In a statement in early March, **agency officials said they used "a number of tools and techniques to gather and analyze data and look for trends that warrant a** vehicle safety **investigation** and possibly a recall." [Although the ATSDR (1999) and the EPA R2 (2010) both strongly recommended that mercury vapor levels in occupied dwellings be measured, they have failed to do so, as have numerous other city and state health and environmental agencies.

In 2008, the United Nations Environment Program recommended that:

For Governments and Health Care Workers

Identify communities or cultural groups that use mercury for cultural/religious purposes and **investigate the impacts.**

Measure mercury [vapor] concentrations in dwellings and commercial establishments in the affected area and **use this information to communicate risks.**

(United Nations Environment Programme. Awareness Raising Package: Mercury: A priority for action. Module 5: Cultural Uses of Mercury. **http://www.unep.org/chemicalsandwaste/Mercury/MercuryPublications/ReportsPublications/AwarenessRaisingPackage/tabid/4022/language/en-US/Default.aspx 2008**)]

But the safety agency has often opened investigations based on far less information. [If one were to assess the overall economic and health impact of a few dozen deaths and injuries arising from faulty ignition switches in GM automobiles, and compare them with the loss of IQ points and associated neurodevelopmental deficits and other diseases due to exposure to ritualistic mercury, it is probable that the impact of the latter is far greater than the former, as witness the case of pediatric lead poisoning. I had long ago petitioned EPA to make such an economic assessment, but they refused.]

In 2012, for example, it opened an investigation into air bag problems on some Hyundai models based on one complaint from an owner whose ear was slightly cut when an air bag deployed. That led to the recall last year of 190,000 vehicles.

The memo also described more clearly the factors that G.M. used in deciding not to recall the cars.

In March 2005, for example, after considering a number of fixes to the problem, engineers determined that "none of the solutions represents an acceptable business case." But the memo notes that none of the documents explain the criteria for what would have prompted to G.M. to initiate a recall.

Later that year, a division of the company identified as "Brand Quality" noticed a higher level of buybacks of the cars — meaning owners who turned them in under lemon laws or for other reasons — and urged that "the issue be reopened," according to Google Scholar

< mercury Santeria >

About 522 results (**0.07** sec)

Mercury use and exposure among **Santeria** practitioners: religious versus folk practice in northern New Jersey, USA
CA Newby, DM Riley, TO Leal-Almeraz - Ethnicity and Health, 2006 - Taylor & Francis
Objective. To understand and characterize exposure to and use of elemental **mercury** among practitioners of Afro-Cuban religions in Hudson County, New Jersey, USA. Design. Participant observation and open-ended interviews with 22 religious supply store **...**
Cited by 11 Related articles BL Direct All 6 versions Cite
[PDF] from mercurypoisoningproject.org**[PDF]**

Elemental **mercury** use in religious and ethnic practices in Latin American and Caribbean communities in New York City
C Johnson - Population & Environment, 1999 - Springer
... The Connecticut study focused on the use of **mercury** among **Santeria** believers in the Hispanic community of Hartford. **...** (1994). Use of azogue (metallic **mercury**) in **santeria** practices of residents of Hartford, Connecticut. US Public Health Service, Atlanta, Georgia. **...**
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[PDF] from nih.gov**[PDF]**

Assessing elemental **mercury** vapor exposure from cultural and religious practices.
DM Riley, CA Newby, TO Leal-Almeraz... - Environmental Health ..., 2001 - ncbi.nlm.nih.gov
... Popular books for home practition- ers of **Santeria** (8,9) include spells that use **mercury**, but do not comment on the risks it poses. **...** Key words: cultural, exposure, **mercury**, religious, **Santeria**. Environ Health Perspect 109:779–784 (2001). **...**
Cited by 57 Related articles BL Direct All 32 versions Cite
[PDF] from nih.gov**[PDF]**

A cluster of pediatric metallic **mercury** exposure cases treated with meso-2, 3-dimercaptosuccinic acid (DMSA)
J Forman, J Moline, E Cernichiari... - Environmental health ..., 2000 - ncbi.nlm.nih.gov
... The neigh- bor reportedlyoperated a business preparing **mercury**-filled amulets for practitioners of the Afro- Caribbean religion **Santeria**. At diagnosis, urinary **mercury** levels in the children ranged from 61 to 1,213 pgg creatinine, with a geometric mean of 214.3 pg creatinine. **...**
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[HTML] from pediatricsdigest.mobi**[HTML]**

Technical report: **mercury** in the environment: implications for pediatricians
LR Goldman, MW Shannon - Pediatrics, 2001 - pediatricsdigest.mobi
... Pediatricians need to be aware of traditional folk uses of **mercury** like in **Santeria** or in ethnic remedies and work sensitively with such families, who may initially be unwilling to discuss such factors with physicians and with people outside of their cultural group. **...**
Cited by 93 Related articles BL Direct All 9 versions Cite
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Folk use of elemental **mercury**: a potential hazard for children?
PO Ozuah - Journal of the National Medical Association, 2001 - ncbi.nlm.nih.gov
... case report of metallic mercurypoisoning involv- ing nine children and their mother."I The source of exposure in this report was a vial of metallic mer- cury taken from the home of a neighbor who oper- ated a business preparing **mercury**-filled amulets for practitioners of **Santeria**. ...
Cited by 9 Related articles BL Direct All 5 versions Cite

Santeria and Palo Mayombe: skulls, **mercury**, and artifacts
JR Gill, CW Rainwater, BJ Adams - Journal of forensic ..., 2009 - Wiley Online Library
Abstract: **Santeria** and Palo Mayombe are syncretic religions created in the New World based upon African religious beliefs combined with Christianity. The main worship of Palo Mayombe involves religious receptacles that may contain earth, sticks, varied artifacts, ...
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[HTML] Subcutaneous injection of **mercury**:"Warding off evil"
VL Prasad - Environmental health perspectives, 2004 - ncbi.nlm.nih.gov
... awareness among pediatricians about the possibility of toxic exposure to **mercury** in children, Goldman (2001) reported on the use of **mercury** in **Santeria** among immigrants from Haiti and other Caribbean nations, in which elemental **mercury** was sprinkled around the house. ...
Cited by 14 Related articles BL Direct All 35 versions Cite
[PDF] from ait.ac.th**[PDF]**

Cases of **mercury** exposure, bioavailability, and absorption
M Gochfeld - Ecotoxicology and Environmental Safety, 2003 - Elsevier
... with. Cultural practices such as **Santeria** also result in household exposures to elemental **mercury**. Breakage of thermometers and spills from gas meters during their removal are infrequent but important sources of **mercury**. When ...
Cited by 203 Related articles All 8 versions Cite
[PDF] from mercurypoisoningproject.org**[PDF]**

Incorporating ethnographic methods in multidisciplinary approaches to risk assessment and communication: cultural and religious uses of **mercury** in Latino and ...
DM Riley, CA Newby, TO Leal-Almeraz - Risk analysis, 2006 - Wiley Online Library
... The Chicago Department of Health (39) states: "In the religious community of '**Santeria**,' **mercury** is believed to be a source of power and luck. Believers ... Table III. **Mercury** Uses in **Santeria** Reported by Interview Participants. Container, ...
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bing mercury Santeria

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Mercury Poisoning From Santeria Ritual - Moms Clean Air ...

www.momscleanairforce.org/latino-custom-poses-mercury-poisoning-risk

Learn about a **Santeria** ritual practiced in some Latino communities that puts participants at risk for **mercury** poisoning and find alternatives.

1. ## Mercury use and exposure among Santeria practitioners ...

   www.ncbi.nlm.nih.gov/pubmed/16774879

   Mercury use and exposure among **Santeria** practitioners: religious versus folk practice in Northern New Jersey, USA. Alison Newby C(1), Riley DM, Leal-Almeraz TO.

2. [PDF]

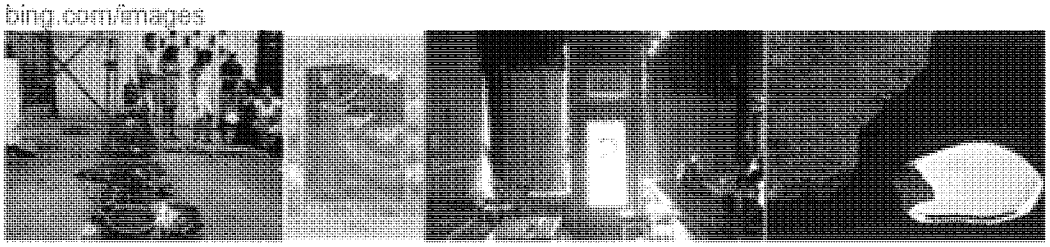
   ## Mercury Use and Exposure among Santeria Practitioners ...

   www.mercurypoisoningproject.org/pdf/2006Aug_Newby_Riley_Leal_Art.pdf

   Mercury Use and Exposure among **Santeria** Practitioners: Religious versus Folk Practice in Northern New Jersey, USA C. Alison Newby, Donna M. Riley &

3. ## Images of mercury santeria

   bing.com/images

   See more images of **mercury santeria**

4. ## Afro-Cuban Santeria

   macaulay.cuny.edu/student-projects/science-in-ny/mercury/Santeria...

   Santeria, commonly referred to as Latin American magic, is a fused religion that intertwines aspects of Roman Catholicism as it is practiced in Cuba with "magic."

5. ## Santeria and Palo Mayombe: skulls, mercury, and artifacts.

   www.ncbi.nlm.nih.gov/pubmed/19804524

   Santeria and Palo Mayombe: skulls, **mercury**, and artifacts. Gill JR, Rainwater CW, Adams BJ. New York City Office of Chief Medical Examiner and Department of ...

6. ## Santeria and Palo Mayombe: skulls, mercury, and artifacts.

   www.medscape.com/medline/abstract/19804524

   View This Abstract Online; **Santeria** and Palo Mayombe: skulls, **mercury**, and artifacts. J Forensic Sci. 2009; 54(6):1458-62 (ISSN: 1556-4029)

7. ## Mercury Use and Exposure among Santeria Practitioners ...

   www.tandfonline.com/doi/abs/10.1080/13557850600565616

   Objective. To understand and characterize exposure to and use of elemental **mercury** among practitioners of Afro-Cuban religions in Hudson County, New Jersey, USA.

8. Mercury Use and Exposure among Santeria Practitioners ...

www.academia.edu/5621647/Mercury_Use_and_Exposure_among_Santeria...

Mercury Use and Exposure among **Santeria** Practitioners: Religious versus Folk Practice in Northern New Jersey, USA

the memo.

A fix was again proposed, this time by changing the key ring slot to a hole and using a smaller ring. But again, G.M. declined to make the fix.

"G.M. acknowledges that this proposal was approved, but later canceled," the memo said.

The chairman of **the Oversight and Investigations subcommittee,** Tim Murphy, Republican of Pennsylvania, who will lead Tuesday's hearing, said in a statement that G.M. and the safety agency had produced documents by the boxful so far in response to extensive requests from the committee. [The issue of the failure of federal agencies to act on their mandate to at the very least assess these domestic exposures to mercury has been put to both the Oversight and Investigations Subcommittee, as well as to the House Energy and Commerce Committee, to no avail.]

"Although we have had the documents for less than a week," he said, "they paint an unsettling picture."

Neither of the two people scheduled to testify, Ms. Barra and Mr. Friedman, were in their jobs during most of the period in question, so the testimony might not establish how the critical decisions were made — or not made, as seems to be the case.

Like the two timelines that G.M. has previously submitted to the N.H.T.S.A., the committee's prehearing report gives dates, but not names; it has not released the supporting documents.

Christopher Jensen contributed reporting.

A version of this article appears in print on **March 31, 2014**, on page A1 of the New York edition of ***The New York Times*** with the headline: U.S. Agency Knew About G.M. Flaw but Did Not Act.

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THE LANCET Neurology

http://www.thelancet.com/journals/laneur/article/PIIS1474-4422(14)70116-4/fulltext

The Lancet Neurology, Volume 13, Issue 7, Pages 646 - 647, July 2014

doi:10.1016/S1474-4422(14)70116-4Cite or Link Using DOI

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Neurodevelopmental toxicity: still more questions than answers

Arnold P Wendroff a

In their Review, Grandjean and Landrigan expressed concern about the neurodevelopmental toxicity of methylmercury,[1] but did not assess the dangers of serious and widespread inhalation exposures to elemental mercury vapour (Hg0) from its magico-religious uses in some Caribbean and Latino communities and the presumptive associated latent epidemic of developmental neurotoxicity this constitutes.

In the belief that it attracts good and repels evil, practitioners of folk magic and Caribbean religions including Espiritismo, Santería, and Voodoo, sprinkle mercury on floors and furnishings where it accumulates levels of mercury vapour, about 80% of which is inhaled or absorbed. The Hg_+ ion is the toxic moiety in methylmercury. Mercury vapour, like methylmercury, is lipophilic and readily crosses the placental and blood—brain barriers and enters breast milk. The mean weight of mercury sold by botanicas for ritualistic use is about 10 g. Mercury spilt during ritualistic ceremonies that permeates flooring and furnishings can persist for decades, during which time it continually produces mercury vapour. Hence, most exposures are probably second-hand, from ritualistic spills by previous occupants of an individual's dwelling.[2, 3] Unlike methylmercury ingested in seafood, occupants of such contaminated dwellings cannot control their inhalation exposure and will be unaware of the neurotoxicity of residual mercury in flooring.

Mercury sales in The Bronx in New York (USA), where many people of Caribbean origin live, suggest that in 1995 alone,[4] between 25 500 and 155 000 homes might have been contaminated with mercury and data from similar Caribbean communities in New Jersey showed that at least 2% of apartments had mercury vapour consistent with its cultural use.[5]

Environmental health scientists, long aware of the hazards posed by ritualistic mercury use and its probable neurodevelopmental sequelae, have not put into action the "precautionary approach that emphasizes prevention and does not require absolute proof of toxicity" advocated for by the authors.[1] Despite Grandjean's previous observation that in "some ethnic groups, metallic mercury is used for magical purposes that may cause substantial exposure to mercury vapor",[6] these exposures and their neurodevelopmental affects are not routinely assessed.

That ritualistic mercury exposure contributes to the "silent pandemic of neurodevelopmental toxicity"[1] is suggested by a case of acute magico-religious mercury poisoning in a 3-year-old Puerto Rican girl, apparently due to ritualistic mercury spills by the previous Dominican occupants of the apartment in which she lived.[2, 3]

Despite more than two decades of awareness of these ritualistic practices and a variety of research on ritualistic mercury sales, use, and reported environmental and clinical mercury levels, the authors' observation that recognition of widespread subclinical toxicity often did not occur until decades after the initial evidence of neurotoxicity is exemplified by the failure of government agencies and the environmental medical community to substantively assess these exposures.

I declare no competing interests.

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a Mercury Poisoning Project, 544 8th Street, Brooklyn, NY 11215, USA

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http://www.thelancet.com/journals/laneur/article/PIIS1474-4422(14)70121-8/fulltext

The Lancet Neurology, Volume 13, Issue 7, Pages 648 - 649, July 2014

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doi:10.1016/S1474-4422(14)70121-8 Cite or Link Using DOI
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Neurodevelopmental toxicity: still more questions than answers — Authors' response

Original Text

Philippe Grandjean a b, Philip J Landrigan c

We are grateful for the comments on our review.1 Our aim was to present a balanced assessment based on our best professional judgement concerning toxicity of industrial chemicals to the developing human brain. The diversity of opinion expressed in these letters reflects the serious absence of neurotoxicity information about most chemicals, but we interpret all four letters as supportive of a call for intensified research.

Goldstein and Saltmiras echo Monsanto's oft-repeated defence that glyphosate is a safe herbicide. Still, the toxicity documentation publicly available on this widely used substance is limited. We have been unable to find documentation of any neurotoxicity testing of glyphosate considered valid by the US Environment Protection Agency. Experimental evidence lends support to the likelihood of neurotoxicity.2 On the basis of clinical reports mentioned by Goldstein and Saltmiras, we therefore believe that glyphosate should be considered a neurotoxic hazard. Monsanto's argument for safety relies on the relative absence of research results rather than on data documenting safety.

We agree with Feldman that fluoride is important for children's oral health. However, the fact that a trace element has beneficial effects at low doses in specific tissues does not negate the possibility that neurotoxicity might also be occurring, especially at increased levels of exposure. Indeed, concerns about fluoride toxicity were already raised by a National Research Council expert committee.[3] Feldman describes the recent meta-analysis[4] as selective and based on old, confounder-ridden studies. In support of her claims, she refers to two previous reports that reviewed some of the same studies, although without access to important background information. Feldman makes other serious errors—eg, by linking, without justification, a rise in population mean intelligent quotient (IQ) to the introduction of water fluoridation.

Similarly, Gelinas and Allukian dispute the validity of previous studies on fluoride exposure and neurobehavioural deficits. We do not deny the importance of a dose-response relation, which has been a unifying concept in toxicology since the time of Paracelsus. However, as we emphasised in our Review, emerging evidence on developmental neurotoxicity makes it clear that the timing of exposure is also of great importance, especially during highly vulnerable windows of brain development. Due to the growing evidence on adverse effects, US authorities now recommend that fluoridation of community water should not exceed 0·7 mg/L.[5]

We agree with Wendroff's perspective, but have been unable to identify epidemiological support for a claim of developmental neurotoxicity from exposure to mercury vapour. As elemental mercury might soon be added to the list of confirmed developmental neurotoxicants, we support the evidence-informed prevention of mercury exposures suggested by Wendroff.

In writing our Review, we have tried to steer a middle course between advocates for particular public-health actions and spokespersons for the chemical industry. We believe that sufficient evidence is already available that industrial chemicals endanger human brain development and that unrestrained production and release of such chemicals are short-sighted, dangerous, unsustainable, and fundamentally immoral. We call for a thorough revision of chemical safety policies and for the establishment of a documentation centre on developmental neurotoxicity modelled after the International Agency for Research on Cancer.
We declare no competing interests.

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A LATENT EPIDEMIC OF NDURODEVELOPMENTAL DEFICITS DUE TO EXPOSURE TO MERCURY PUT TO MAGICO-RELIGIOUS USE IN CARIBBEAN & LATINO COMMUNITIES

Initial Draft: letter to editor -- ***The Lancet Neurology*** -- in press for July 2014

Clinicians concerned about neurodevelopmental toxicity of methylmercury,[1] have neglected to assess serious and widespread inhalation exposures to elemental mercury vapor (Hg^0) emanating from its magico-religious uses in some Caribbean and Latino communities, and its presumptive associated latent epidemic of developmental neurotoxicity. The Hg^+ ion is the toxic moiety in methylmercury. Mercury vapor, like methylmercury, is lipophilic, readily crossing placental and blood-brain 'barriers', and entering breast milk.

In the belief that it attracts good and repels evil, practitioners of folk magic, Caribbean religions including Espiritismo, Santeria and Voodoo,[a] sprinkle mercury on floors and furnishings, where it evolves developmentally neurotoxic levels of mercury vapor, ~80% of which inhaled is absorbed.

The mean weight of mercury sold by botanicas for ritualistic use is ~10g.[a,b] Ritualistic spills permeate flooring and furnishings, persisting for decades, while continually evolving mercury vapor.[c] Hence, most exposures are likely at second-hand, from ritualistic spills by prior occupants.[2,3,d] Unlike methylmercury ingested in seafood, occupants of ritualistically-contaminated dwellings cannot control their inhalation exposure, are unaware of residual mercury in flooring, and of the existence and neurotoxicity of mercury vapor.

Mercury sales in the heavily Caribbean Bronx, New York, suggest that in 1995 alone, 2% to 12% of homes were ritualistically contaminated,[e] and data from similar Caribbean communities in New Jersey, found at least 2% of apartments with the presence of mercury vapor consistent with its cultural use.[f,g,h]

Environmental health scientists, long aware of hazards posed by ritualistic mercury use,[a] and likely neurodevelopmental sequelae, have failed to operationalize the "precautionary approach that emphasizes prevention and does not require absolute proof of toxicity."[1] Despite Grandjean's observation that "In ... some ethnic groups, metallic mercury is used for magical purposes that may cause substantial exposure to mercury vapor,"[4] these exposures and their neurodevelopmental impact have yet to be assessed. They have been no measurements of mercury vapor levels in occupied dwellings, and of their correlation with biomarker mercury levels and neurodevelopmental sequelae of exposed occupants.

That ritualistic mercury exposure contributes to the "silent pandemic of neurodevelopmental toxicity"[1] is suggested by a case of acute magico-religious mercury poisoning of a three year-old Puerto Rican girl, apparently due to ritualistic mercury spills by the prior Dominican occupant of her apartment. [2,3] Although neither paper mentioned it, her eight and ten year-old siblings and 32 year-old mother had highly elevated urine mercury levels of 73, 38 and 49µg/L respectively, yet were asymptomatic, albeit with no neurological assessment.[5]

Despite over two decades of awareness of these practices, and a variety of published research on ritualistic mercury sales, use, and associated environmental and clinical mercury levels,[i] the authors' observation that "recognition of widespread subclinical toxicity often did not occur until decades after the initial evidence of neurotoxicity," is exemplified by the failure of government agencies and the environmental medical community to substantively assess these exposures, due to a variety of political and economic, as opposed to medical, rationales.[j]

Documentation of the environmental health threat posed by magico-religious mercury use is accessible using the key words < **mercury Santeria** >.

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Arnold P. Wendroff, Ph.D.
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Message

From: Spire, Paul [PSpire@aap.org]
Sent: 2/1/2018 5:35:27 PM
To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Balk, Sophie [sbalk@montefiore.org]
CC: Jennifer Lowry [jlowry@cmh.edu]
Subject: Green Book - "Endocrine Disrupting Chemicals" chapter - stakeholder feedback for editor review
Attachments: 29 - Endocrine Disrupting.docx; 29 - comments.docx

Dear Ruth and Sophie,

I am writing to provide the attached stakeholder feedback for the "Endocrine Disrupting Chemicals" chapter. Also attached is a copy of the chapter as it was distributed for stakeholder review, which should serve as the starting point for any further revision.

The reviewer comments, unless specifically labeled "significant concerns," are to be considered advisory suggestions or requests, not mandates. Nonetheless, it is expected that all comments will be given serious consideration and accommodated where possible. We are also asked to provide a brief response under each comment, indicating whether the suggestion was incorporated, what was done, or a brief justification for not including. (The reviewer comments and COEH responses will travel forward with the book through the review and approval process.)

For each chapter, a decision will need to be made whether the editorial team may be able to address the comments, or if there will be a need to reach-out to the original author or perhaps the COEH executive committee for assistance.

Thanks again for all of your work on the book!

Best,

Paul

Message

From: Mehta, Suril [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=70A0BD6E57724484AACB0E03149B548D-MEHTA, SURIL]
Sent: 7/8/2015 1:09:36 PM
To: Dzubow, Rebecca [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=403ca1721f3d43d38de9189a93a95b76-Dzubow, Rebecca]; AO-OCHP-Everyone [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=222d03d48d634481af638d4892296469-AO-OCHP-Everyone]
Subject: RE: Propoxur Restrictions

To follow up from last week (good job Rebecca and Kathy) –

Notice of Receipt of Requests To Voluntarily Cancel Certain Pesticide Registrations and Amend Registrations To Terminate Certain Uses

SUMMARY: In accordance with the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), EPA is issuing a notice of receipt of requests by the registrants to voluntarily cancel their registrations of certain products containing the pesticides carfentrazoneethyl, chlorsulfuron, dichlorprop-p, flufenpyr-ethyl, flutolanil, glyphosate, metsulfuron, MGK 264, paraquat dichloride, piperonyl butoxide, propoxur, pyrethrins, quizalofop, thifensulfuron-methyl, and tribenuronmethyl and to amend their malathion, propoxur, and sulfur dioxide product registrations to terminate one or more uses. The requests are to terminate the malathion use in or on cull fruits and vegetable dumps and terminate the sulfur dioxide use in or on grapes. The request would also terminate all indoor aerosol, spray, and liquid formulations of propoxur, terminate its use in food handling establishments, and terminate indoor crack and crevice use. The requests do not seek to cancel the last carfentrazone-ethyl, chlorsulfuron, dichlorprop-p, flutolanil, glyphosate, metsulfuron, MGK 264, paraquat dichloride, piperonyl butoxide, propoxur, pyrethrins, quizalofop, thifensulfuron-methyl, and tribenuronmethyl products registered for use in the United States. The requests, if granted, would terminate the last flufenpyr-ethyl products registered in the United States. EPA intends to grant these requests at the close of the comment period for this announcement unless the Agency receives substantive comments within the comment period that would merit its further review of these requests, or unless the registrants withdraw their requests. If these requests are granted, any sale, distribution, or use of products listed in this notice will be permitted after the affected registrations have been cancelled or uses terminated only if such sale, distribution, or use is consistent with the terms described in the final cancellation order.

DATES: Comments must be received on or before August 7, 2015.

http://www.gpo.gov/fdsys/pkg/FR-2015-07-08/pdf/2015-16405.pdf

and...

Registration Review; Draft Human Health and Ecological Risk Assessments; Notice of Availability

SUMMARY: This notice announces the availability of EPA's draft human health and ecological risk assessments for the registration reviews of flufenacet, flurprimidol, propoxur, and sodium acifluorfen, and opens a public comment period on these documents. In addition, this notice announces both the opening of the registration review docket for thidiazuron and the availability of the registration review draft human health and ecological risk assessments for thidiazuron. The Agency is opening a public comment period on both the Preliminary Work Plan and the draft risk assessments for thidiazuron. Through this program, EPA is ensuring that each pesticide's registration is based on current scientific and other knowledge, including its effects on human health and the environment.

DATES: Comments must be received on or before September 8, 2015.

http://www.gpo.gov/fdsys/pkg/FR-2015-07-08/pdf/2015-16422.pdf

Suril Mehta
Health Scientist
Office of Children's Health Protection
Office of the Administrator/ U.S. EPA
Ph: (202)566-1925

From: Dzubow, Rebecca
Sent: Wednesday, July 01, 2015 2:03 PM
To: AO-OCHP-Everyone
Subject: FW: Propoxur Restrictions

Also – since there is a 30 day public comment period, can you send to your respective parties?

Thanks,
Rebecca

~~~~~~
Rebecca C. Dzubow, MPH, MEM
Health Scientist
U.S. EPA Office of Children's Health Protection | Regulatory Support and Science Policy Division
1200 Pennsylvania Avenue, NW (1107T) | Washington, DC 20460
(202) 564-0967

From: Dzubow, Rebecca
Sent: Wednesday, July 01, 2015 1:58 PM
To: AO-OCHP-Everyone
Subject: FW: Propoxur Restrictions

Good news for children!

Kathy and I reviewed the propoxur risk assessment in February which utilized a "highly refined" dietary assessment and indicated dietary exposure concerns for children 1<2 years old and inhalation concerns for children 11<16 years old from bed bug treatment when there is a potential for this age group to reside in university dorms (e.g., during summer camps).

~~~~~~
Rebecca C. Dzubow, MPH, MEM
Health Scientist
U.S. EPA Office of Children's Health Protection | Regulatory Support and Science Policy Division
1200 Pennsylvania Avenue, NW (1107T) | Washington, DC 20460
(202) 564-0967

From: EPA Media Relations [mailto:noreply-subscriptions@epa.gov]
Sent: Wednesday, July 01, 2015 1:43 PM
To: Dzubow, Rebecca
Subject: Propoxur Restrictions

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FOR IMMEDIATE RELEASE

July 1, 2015

EPA Proposes to Cancel Some Uses of an Insecticide Commonly Used for Residential, Industrial and Commercial Purposes

The agency found unacceptable risks to human health when sprayed indoors

WASHINGTON -- The U.S. Environmental Protection Agency (EPA) is proposing to cancel certain uses of the insecticide propoxur after preliminary human health assessment found risks from certain applications.

"Today, we are taking strong steps to protect human health—especially the health of children—from this widely used insecticide," said Jim Jones, assistant administrator for the Office of Chemical Safety and Pollution Prevention. "The agency will continue its work to reduce exposure from pesticides that pose the greatest risk to those who are the most vulnerable."

From 1995 to 2013, EPA has reduced exposure from carbamates, the class of insecticide that includes propoxur. The use of carbamates has fallen by 70 percent.

EPA and the registrant reached an agreement to voluntarily cancel certain uses of propoxur. At the same time, EPA is proposing to cancel certain other pesticide registrations. Voluntary cancellation is the quickest way to fully address these risks, and best protect public health. EPA is proposing to cancel all indoor aerosol, spray and liquid formulations of propoxur inside hospitals and other commercial or institutional facilities where children may be present and all use in food-handling establishments.

After these cancellations, there would be no remaining food uses, and no tolerances levels for propoxur. In 2007, EPA cancelled the use of propoxur sprays inside homes, day care facilities, and schools, and in 2014, EPA cancelled propoxur pet collars. Today's action was conducted as part of the agency's registration review program.

EPA is requesting a 30 day comment period that will begin upon publication in the Federal Register at: www.regulations.gov and searching for EPA-HQ-OPP-2015-0296.

EPA is posting a pre-publication copy at: http://www2.epa.gov/safepestcontrol/proposed-cancellation-certain-uses-propoxur

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Message

From: Kristin Schafer [kristins@panna.org]
Sent: 12/3/2015 4:21:28 PM
To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]
CC: Foos, Brenda [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=18b24f2f79414190852a748bf650d2b9-Bperkovi]; Dzubow, Rebecca [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=403ca1721f3d43d38de9189a93a95b76-Dzubow, Rebecca]; Reed, Khesha [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=c62327cee1fd4da29a1cc485efe546f7-Reed, Khesha]
Subject: Article on 2,4D decision in Tribune

Dr Etzel & team,

Passing along this article from this morning's Chicago Tribune, outlining the very concerning process that allowed Dow's Enlist Duo to be approved - and how OPP specifically overlooked harms to children.

Very concerning. I'd be interested in your perspective.

All best,

- Kristin

"...EPA now says it is safe to allow 41 times more 2,4-D...the agency's scientists changed their analysis of a pivotal rat study by Dow, tossing aside signs of kidney trouble that Dow researchers said were caused by 2,4-D.... a $1 billion product"

http://www.chicagotribune.com/news/watchdog/ct-gmo-crops-pesticide-resistance-met-20151203-story.html

Chicago Tribune

3 December

Watchdog: EPA tosses aside safety data, says Dow pesticide for GMOs won't harm people

A Chicago Tribune investigation finds that the Environmental Protection Agency discounted safety data for a World War II-era chemical called 2,4-D that has been linked to cancer and other health problems. It soon could be available for use as a weedkiller on genetically modified crops.

By Patricia Callahan

When Monsanto genetically engineered corn and soybeans to make them immune to its best-selling weedkiller, the company pitched the technology as a way to reduce overall use of herbicides and usher in an environmentally friendly era of farming.

Instead of relying on older, more harmful chemicals, farmers could douse their fields with Roundup, a product that Monsanto once advertised as less toxic than table salt.

Two decades later, overuse of Roundup on genetically modified crops has spawned weeds that can survive spraying to grow 8 feet tall with stems as thick as baseball bats. To kill those so-called superweeds, chemical giants are giving the next wave of genetically modified corn and soybeans immunity to the weedkillers of generations past.

The technology that was supposed to make those older herbicides obsolete soon could make it possible for farmers to use a lot more.

For use on its new genetically engineered corn and soybeans, Dow Chemical Co. is reviving 2,4-D, a World War II-era chemical linked to cancer and other health problems.

If these crops are widely adopted, the government's maximum-exposure projections show that U.S. children ages 1 to 12 could consume levels of 2,4-D that the World Health Organization, Russia, Australia, Korea, Canada, Brazil and China consider unsafe.

The U.S. Environmental Protection Agency had considered that exposure dangerous for decades as well. But the Obama administration's EPA now says it is safe to allow 41 times more 2,4-D into the American diet than before he took office.

To reach that conclusion, the Tribune found, the agency's scientists changed their analysis of a pivotal rat study by Dow, tossing aside signs of kidney trouble that Dow researchers said were caused by 2,4-D.

The EPA scientists who revised that crucial document were persuaded by a Canadian government toxicologist who decided that Dow — a company that has a $1 billion product at stake — had been overly cautious in flagging kidney abnormalities that she deemed insignificant.

When Dow later published this study, the company's scientists likewise dismissed their earlier concerns and changed the most important measure of the chemical's toxicity so it agreed with the EPA's less stringent view.

These decisions paved the way for the EPA to approve Dow's weedkiller, Enlist Duo, last year and reassure the public that a surge in 2,4-D use wouldn't hurt anyone.

Girding that reassurance are two calculations: How much of the herbicide is safe for human health, and how much will Americans wind up consuming? There are ways to tweak each of those risk calculations. With 2,4-D, the Tribune found, the EPA's math favored a dramatic increase in the weedkiller.

Federal law has required the EPA to protect children from pesticides — chemicals that kill weeds, insects or other harmful organisms — since a National Research Council panel warned lawmakers in the 1990s that exposing fetuses and young kids to these compounds can cause lifelong damage at doses that wouldn't hurt their parents.

Dr. Philip Landrigan, the pediatrician who chaired that panel, is so alarmed by the potential spike in children's exposure to 2,4-D that for the last year he has urged EPA Administrator Gina McCarthy to reject the "notoriously toxic herbicide." He is calling for the federal National Toxicology Program to assess the safety of the mix of weedkillers that would be used on new genetically modified crops.

When Landrigan learned from the Tribune that EPA and Dow scientists had changed their minds about kidney anomalies found in exposed rats, he was shocked.

"If the tables were turned, and a group of scientists published a paper showing some adverse effect from 2,4-D, I have no doubt that Dow would say a second and third study were needed," said Landrigan, whose research on childhood lead exposure helped prompt the removal of lead from gasoline and paint. "And yet, Dow is saying we need to trust this one study where results were reinterpreted midstream. There's reason to raise doubt here."

Dow said 2,4-D is safe and is one of the most extensively studied pesticides in history. James Bus, a former Dow toxicologist who worked on the company's recent rat study, said the EPA's evaluation of 2,4-D relies on state-of-the-art science and "stands as an example of how it should be done."

"We know from 70 years of exposure that 2,4-D has not presented health problems," Bus said. Studies that suggest such a link are flawed, and increased use will not put anyone at risk, he added.

For its part, the EPA said its scientific vetting ensures that any pesticide residues left in food and water won't cause harm. The Dow rat study reveals that 2,4-D is less toxic to people than once thought, agency officials say.

"It is EPA's understanding that other governments do agree with our interpretation of the new study, but have not yet incorporated the results into their 2,4-D reviews," EPA spokeswoman Cathy Milbourn said in a written statement.

In a surprise move last week, the EPA asked the U.S. 9th Circuit Court of Appeals to vacate the agency's approval so its scientists could review new data. But EPA officials made it clear they don't intend to bar the product permanently.

The holdup has nothing to do with human health. Enlist Duo combines 2,4-D and glyphosate, the main ingredient in Roundup, and the agency said it wanted to iron out concerns that the two chemicals combined are more toxic to endangered plants than either of the chemicals separately.

As far as people's health is concerned, though, the agency maintains that Enlist Duo is perfectly safe. Even if American farmers spray 2,4-D on every acre of corn and soybeans — crops that serve as the building blocks of processed foods and fatten farm animals — it still won't harm consumers, the EPA said.

So confident is Dow that the agency's concerns about endangered plants can be resolved quickly that the title of its news release last week read: "Dow Expects Enlist Duo to be Available for the 2016 U.S. Crop Season."

Today 94 percent of soybeans and 89 percent of corn planted in the U.S. are genetically engineered to survive herbicides, primarily the glyphosate in Roundup. But no one is comparing glyphosate to table salt anymore, with the WHO's cancer research agency now labeling it a probable carcinogen. And no one is hailing it as an agricultural savior.

More than 60 million acres of U.S. cropland are being choked by weeds that glyphosate can't kill. In response, chemical companies and federal regulators are advising farmers not to substitute one weedkiller for another but to add more.

Even some scientists who have spent their professional lives eradicating weeds oppose the new genetically modified crops and the chemical future they foreshadow.

"Those herbicide increases are not OK," said David Mortensen, a professor of weed and applied plant ecology at Pennsylvania State University. "To me, that is unconscionable that we can be OK with that, and I'm not an anti-chemical radical."

How much is too much?

Many people complain that eating genetically modified food could endanger their health. But it's the weedkillers used on genetically modified crops, not the corn and soy, that scientists have repeatedly found to cause harm.

Herbicides linger in the water Americans drink, in the air they breathe and on the foods they eat. Children are especially vulnerable because they take in more food, water and air, relative to their weight, than adults.

That's why scientists study weedkillers so closely and why regulators scrutinize them more heavily than other industrial chemicals.

The fact that 2,4-D was a main component of the Vietnam War-era defoliant Agent Orange made the chemical infamous, even though it was dioxin contamination of a different ingredient that brought harm to troops and villagers.

Over the years, federal and university researchers showed 2,4-D was worrisome on its own. Studies found increased odds of developing non-Hodgkin lymphoma, hypothyroidism and Parkinson's disease among people who used the chemical as part of their jobs. In June, the WHO's cancer research agency ruled that 2,4-D is a possible carcinogen.

But EPA scientists aren't convinced that 2,4-D causes any of those diseases because other studies reached different conclusions.

Though it wasn't widely used on corn and soybeans, 2,4-D has been a go-to chemical for wheat growers, ranchers and golf course groundskeepers. When the EPA in the early 2000s revisited the safety of 2,4-D as part of a wider review of pesticides long on the market, the goal was to determine from animal testing how much 2,4-D people could safely consume.

Such tests are carried out or commissioned by chemical-makers, even though they have a vested interest in the results.

The EPA relied on a 1995 Dow study that found rats dosed daily with 75 milligrams of pure 2,4-D per kilogram of body weight (or mg/kg) over a two-year period gained less weight and experienced changes in kidney, thyroid, liver, lung, reproductive organ and blood chemistry measures compared with untreated rats.

Rats that consumed the next lowest dose — 5 mg/kg — showed no ill effects. This is called the "no observed adverse effect level," and it's the most important measure in a pesticide toxicity study.

Next came a series of math exercises. As they always do, EPA officials divided that dose by a factor of 100 to account for the fact that rats and humans are different and some people have heightened sensitivity to chemicals.

Since the mid-1990s, the EPA has been required to divide again — this time by a factor of 10 — because Landrigan's panel found children are more vulnerable than adults. This protection may be removed only if "such margin will be safe for infants and children."

In the case of 2,4-D, the EPA kept it in place because its scientists couldn't tell whether 2,4-D disrupts hormones, immunity and neurological development.

When the dividing was done, the EPA under President George W. Bush set the acceptable daily intake of 2,4-D at 0.005 mg/kg. Separate calculations showed that nobody was consuming too much, the EPA said at the time.

That same year, 2005, the EPA ordered the manufacturers to conduct two new studies that could answer the remaining questions about safety — research that ultimately would lead to the weakening of consumer protections.

One study was to expose adult rats and two generations of offspring to 2,4-D while looking for immune system problems, thyroid effects and toxicity in other organs. Another would scrutinize neurological development in offspring.

But with the EPA's permission, Dow rolled the studies into one and halted what would become the most important evaluation of 2,4-D after breeding just one generation of rats.

Dow's study design, which called for breeding a second generation only if certain problems were evident in the first, was crafted by a committee of the ILSI Health and Environmental Sciences Institute, a nonprofit that receives much of its funding from chemical, food and pharmaceutical companies.

The committee included scientists from pesticide giants Dow, Syngenta, Bayer and DuPont, as well as one from Exponent, a scientific consulting firm. In addition to providing regulatory help to pesticide-makers and other companies, Exponent is "the go-to firm at the top of the pyramid" for companies that face a lawsuit, a product recall or a government crackdown, Exponent's financial chief told Wall Street analysts this year.

One of the few EPA members on the committee later went to work for Exponent. Bus, who helped lead the Dow study, joined Exponent after he retired; he still consults for Dow on 2,4-D.

Officials from the EPA and Dow say the committee's study design rigorously assesses many potential toxic effects from conception to adulthood while sacrificing fewer animals. The Organization for Economic Cooperation and Development, consisting of 34 countries, agrees and uses it as an international testing guideline.

But Paul Foster, a top toxicologist at the National Toxicology Program, said the study design has such "serious scientific weaknesses" that his arm of the federal government won't use it in its research. For example, the Dow study exposed rats to 2,4-D for four weeks before they mated. Foster said dosing should last 10 weeks to cover the entire time it takes rats to make sperm.

Moreover, though a 2011 analysis of 498 studies concluded the second generation "will very rarely provide critical information," Foster said it's important to find those rare instances of harm.

"Everyone wants to use the minimum number of animals to generate quality data, but there comes a time when you don't want to cut the corners too much," Foster said.

Bus said EPA and Canadian regulators, who reviewed data while the study was in progress, decided breeding a second generation wasn't warranted.

In 2010, Bus and his colleagues reported the results in a poster presentation at the Society of Toxicology's annual meeting. By then, Dow's field trials had demonstrated the genetically modified crops were viable, and the march of superweeds foretold potentially big sales.

The poster stated that 2,4-D did not cause immune, reproductive or neurological harm. Some rats experienced thyroid hormone changes, and some males had lighter-weight reproductive organs, but Dow scientists took the position that these effects were not adverse.

But they did find a problem with the kidneys. The poster said exposure-related kidney lesions occurred at a lower dose in male rat offspring than in their parents.

When two EPA scientists examined the Dow data that year, they came to the same conclusion. Both Dow and the EPA decided the no-adverse-effect level was the smallest dose tested in the offspring, an amount equivalent to about 7 mg/kg, records show.

Then something curious happened. The EPA and Dow scientists changed their minds.

More becomes OK

Six months later, the same EPA scientists revised the executive summary of their report, changing the crucial measure of toxicity.

The lesions that Dow scientists found in offspring at 7 mg/kg weren't harmful after all, EPA scientists Linda Taylor and Elizabeth Mendez wrote. They changed the no-adverse-effect level so that it was the same for both the rat offspring and parents: an amount equivalent to 21 mg/kg.

Dana Vogel, who oversees the EPA division that assesses herbicide health effects, told the Tribune the original report by Taylor and Mendez was based on "preliminary data — not the entire study but the first part of the study that came in."

In fact, there was nothing preliminary about the data, and no details were missing. The facts that Taylor and Mendez later cited to justify the change were all part of their original 108-page report, which scrutinized blood test results, organ weights and microscopic analysis at every stage of life.

Their observations were minutely detailed, describing the kidney problem as "a degenerative lesion involving the proximal convoluted tubules in the outer stripe of the outer zone of the medulla, which was multifocal in distribution."

What really led to the change of heart, interviews and an EPA document show, was a phone call from a Canadian pesticide regulator.

Lauri Stachiw was the Canadian government toxicologist who reviewed Dow's data as the study was unfolding. Stachiw told the Tribune she called Taylor and Mendez because she disagreed with their report.

Stachiw noted that Dow researchers found the kidney lesions only in male offspring at that lower dose and classified them as "very slight to slight degeneration" rather than severe. Those rats didn't have heavier kidneys, a different sign of trouble. For true toxicity, Stachiw said, she would expect moderate or severe lesions as well as heavier kidneys in those rats.

Though Dow scientists thought the lesions were harmful, Stachiw said: "I think they were just trying to be as conservative as possible, but being as conservative as possible isn't always correct science."

Stachiw, now retired, added, "If you cut your finger, it's an effect. Is it adverse compared to cutting your finger off? No."

In an interview, Mendez said she and Taylor looked at the data again after Stachiw called. Mendez said they decided the lesions Dow had labeled as toxic effects were actually a healthy response.

"It's a good thing that the kidney is gearing itself up for battle to get rid of the compound from the body," she said. Taylor declined to comment.

Bus, the Dow consultant, said the company did not influence Stachiw or the EPA. He said Dow was surprised when the EPA revised the no-adverse-effect level.

"We were totally out of the loop," Bus said.

When the Society of Toxicology's journal published the Dow study results in 2013, the article said the kidney lesions in the rat offspring dosed with 7 mg/kg "were judged to be not treatment related."

Bus said he and his colleagues adopted the position of the Canadian and EPA scientists. "It's not uncommon for reviewers to say, 'Wait a minute, we have an alternative interpretation of your data,'" he said. "... I would not have serious disagreement with how they interpreted that data."

Industry-funded researchers have found kidney trouble before in animals consuming low doses of 2,4-D, the Tribune found. An industry group representing Dow and other 2,4-D manufacturers submitted five studies to the EPA in the 1980s that documented kidney abnormalities in rats and mice at doses far lower than the one the agency now is using to set safety levels for people.

EPA scientists and the trade group agreed three decades ago that the kidney was the "target organ for toxicity" with anomalies seen at doses as low as 5 mg/kg, records show.

Bus said of those studies: "Earlier conclusions that might have been interpreted as adverse may not be considered adverse in more modern science."

Asked whether studies should be discounted when they're that old, the National Toxicology Program's Foster said, "You can look at the differences in study quality, but the way we remove kidneys and look at them under a microscope has not changed in the last 60 or 70 years."

The EPA's Mendez said her agency considered the "whole gamut of studies."

When she and Taylor raised the no-adverse-effect level to 21 mg/kg, they paved the way for the agency to reduce consumer protections.

EPA scientists had no remaining questions about the chemical's harmful effects, and there was no longer evidence of the special susceptibility of children because the revised view of the Dow study held that the toxic effects in the offspring occurred at the same dose as in the parents. So, the agency dropped the tenfold child-safety factor.

Rather than dividing the rat dose by 1,000, as it had done a decade ago, the agency divided only by 100, resulting in a far less protective limit. Regulators set the allowable daily intake of 2,4-D for people at 0.21 mg/kg, 41 times more than the government had previously considered safe.

This was a victory for Dow because the calculations made it easier for the EPA to approve the new uses of 2,4-D the company needed in order to market its genetically modified crops. The agency could tell consumers these new uses wouldn't be harmful.

The Environmental Working Group, a nonprofit that is among those suing the EPA for approving Enlist Duo, scrutinized the Dow study results outlined in the EPA's official human health risk assessment. That document didn't mention that Taylor and Mendez had revised their interpretation.

Even so, a scientist for the nonprofit independently settled on the same measure of toxicity that the EPA and Dow initially had used: 7 mg/kg.

The group concluded that agency officials had "contradicted standard scientific practice" in choosing as their no-adverse-effect level a dose at which rats actually suffered multiple toxic effects — not just the kidney lesions but also the thyroid and reproductive organ changes.

That group also argued that the agency by law must apply the child-safety factor to its risk calculations because the offspring were more susceptible than the parents. Under that reasoning, the allowable daily intake would be 0.007 mg/kg.

The EPA's own worst-case exposure estimates, included in the official human health assessment, found toddlers could wind up consuming three times more than that.

Yet the agency, responding to critics, reassured the public that its scientists had determined that nobody would consume too much, even using the hypothetical limit of 0.007 mg/kg.

When the Tribune asked how that could be possible, the agency said its scientists made additional calculations based on more realistic assumptions of exposure, describing that step as a standard practice.

Those calculations, records show, estimated that toddlers could consume 0.0066 mg/kg of 2,4-D — just four ten-thousandths shy of the hypothetical limit.

A chemical future

At last year's Farm Progress Show in the heart of Iowa, Dow unveiled its vision of the future of American agriculture: rows of lush soybeans and towering corn plants genetically engineered to withstand 2,4-D and glyphosate.

This year, Dow didn't bother to plant those crops for the farm show held in Decatur, Ill. On display instead was an air of inevitability.

Ben Kaehler, Dow AgroSciences' U.S. sales leader, was there to extol the benefits of the crops. But rather than convincing farmers that the technology works, Kaehler tried to persuade them to plant Dow's offerings rather than Monsanto's proposed crops, which are immune to glyphosate and dicamba, a 1960s weedkiller.

The question wasn't whether to plant the next generation of genetically modified crops — it was which of those crops to plant.

On a faux brick wall in the Dow tent, a Wrigley Field-style scoreboard pitted Dow against Monsanto. Each inning featured a question about the crops or the different weedkillers, with salespeople revealing the answers one by one. Overhead, a banner beckoned: "Grow your field of dreams."

At that point, the only holdup for Dow was China, a major buyer of U.S. crops. Grain elevators here still are waiting for China's approval before agreeing to handle the new crops.

Now Dow also must address the concerns EPA raised last week about Enlist Duo's effects on endangered plants. An agency scientist noticed that a patent application for the product said it had "synergistic weed control" properties that made glyphosate and 2,4-D "more effective in combination than when applied individually."

Previously, the agency had maintained that the two chemicals were no more toxic together than they were on their own. That's why the health assessment of Dow's weedkiller hinged solely on the new risks posed by 2,4-D. Glyphosate already is widely used on corn and soybeans.

The EPA has asked the appellate court to rescind its approval of Enlist Duo while agency scientists decide whether a bigger no-spray zone is needed near the edge of farm fields. Dow said it's confident the issue can be resolved before spring planting.

The EPA told the Tribune it isn't reopening its human health risk assessment. William Jordan, deputy director of the agency's Office of Pesticide Programs, said the combination of 2,4-D and glyphosate doesn't create added risk for people. Jordan cited tests in which researchers gave large one-time doses of Enlist Duo to rats, rabbits, birds and fish, then monitored the animals for two weeks. There was no increased toxicity from the mixture, he said.

Landrigan, the pediatrician whose work led to the lead-paint ban, is more concerned about the long-term health effects of the chemical mixture. One-time doses and short-term monitoring don't address that.

The EPA said it has no plans to ask Dow for studies that chronically dose rats with the combination of 2,4-D and glyphosate.

For anyone concerned about exposure to toxic weedkillers, a different disclosure in Dow's patent applications may be more telling.

The company's application for its genetically modified corn and soybeans foreshadows the day when weeds develop resistance to glyphosate and 2,4-D. Dow, these records show, envisions adding traits to corn and soybeans so they can survive being sprayed with weedkillers from up to 17 different chemical families.

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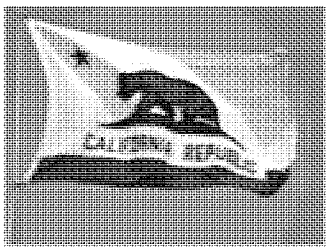
Message

From: Schroeder, Kathleen [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=0DB676B2FADE4B54BEBCC7B6E664FC94-SCHROEDER,]
Sent: 9/9/2015 12:41:15 PM
To: AO-OCHP-Everyone [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=222d03d48d634481af638d4892296469-AO-OCHP-Everyone]
Subject: California to Put Four Pesticides on Cancer List

Pesticides
California to Put Four Pesticides on Cancer List



BNA Snapshot
California Pesticide Regulation
Key Development: The California Environmental Protection Agency says it will place four pesticides, including Monsanto's **glyphosate**, onto its list of carcinogenic chemicals.
Potential Impact: Beginning 12 months after their listing, discharges of these four pesticides into drinking water will be illegal, and businesses must provide extensive public notification before using them.
What's Next: CalEPA could list the pesticides as early as Oct. 5, at the end of a 30-day public comment period.
By David Schultz
Sept. 8 — California's impending decision to place on its list of carcinogenic chemicals four widely used pesticides—including Monsanto's glyphosate, the most widely used pesticide in the country—has uncertain ramifications for the state's agriculture industry.
If the state's Environmental Protection Agency, also known as CalEPA, places the four pesticides on its list, any knowing discharges of the chemicals into drinking water would become illegal. Also, farmers, pest control companies and any other businesses that want to use the pesticides would first have to provide "clear and reasonable warnings" to the public, according to state law.
Sam Delson, a deputy director in CalEPA's scientific review office, told Bloomberg BNA he was unsure if the drinking water restrictions would apply to runoff of pesticides from farms.
CalEPA will accept comments from the public for the next 30 days on whether to list the four pesticides: **glyphosate, malathion, parathion and tetrachlorvinphos** (173 DEN A-6, 9/8/15).
However, a formal listing of these chemicals is all but certain, Delson said. "It's fair to say that it's very likely that this will become final."
Automatic Decision
Delson can speak with confidence on this because of the process California uses for listing potentially cancer-causing chemicals.
The process was created in 1986 by the state's Proposition 65, also known as the Safe Drinking Water and Toxic Enforcement Act. The voter-approved measure required the state to maintain and to update at least annually a list of carcinogenic chemicals. Chemicals on the list are subject to drinking water restrictions and use notification requirements.
There are several ways for a chemical to get on California's list; one of those ways is if a chemical is found to be carcinogenic to humans or animals by an "authoritative body."
These bodies include various federal agencies, such as the U.S. Environmental Protection Agency or the Food and Drug Administration, as well as the World Health Organization's International Agency for Research on Cancer.
Earlier this year, the IARC issued a finding that the four pesticides at issue here are probably carcinogenic to humans based off of several studies of lab animals exposed to the chemicals (59 DEN A-10, 3/27/15).

As a result, the IARC's findings triggered an almost automatic decision by California to place the four pesticides on its list. In a sign of just how automatic this decision is for the state, Delson said CalEPA will only consider comments on whether the IARC did or didn't find the pesticides to be carcinogenic, not on whether the IARC's findings are correct.

Safe Harbor

After the pesticides are listed, California businesses will have 20 months to come into compliance with the drinking water restrictions and 12 months to begin notifying the public when they use the pesticides.

Businesses with fewer than 10 employees are exempt from complying with these rules. Also, businesses that use the chemicals at levels below a state-developed threshold are exempt.

That threshold is called in California regulations a "safe harbor." Delson said CalEPA has established safe harbor levels for less than half of the more than 800 chemicals on its cancer-causing list. Dozens more chemicals are prioritized on a wait list.

Despite this, Delson said CalEPA will "definitely" establish safe harbor thresholds for glyphosate and for malathion, the two more widely used of the four pesticides, within one year of their formal listing. If the agency fails to do this, no amount of these pesticides would be permitted in drinking water, and the use of any amount would trigger the public notification requirements.

"We do have limited resources, but that's a priority," Delson said.

Depending on how high the state sets its safe harbor levels, tens of thousands of farms and other businesses many find themselves unaffected by CalEPA's listing.

Public Perception

While it's still unclear how the listing of these chemicals will affect industry, it's already having a negative impact in the court of public opinion. News stories about California's move, which it announced Sept. 4, circulated widely online, briefly making Monsanto a trending topic on Facebook over the Labor Day weekend.

Monsanto developed the herbicide glyphosate in the 1970s and currently sells the weed killer under the trade name Roundup. However, the company's patent on the chemical has long since expired, and it is now widely used in numerous products produced by dozens of pesticide companies, including Dow AgroSciences, Syngenta, Bayer CropScience and many others.

Many of these companies also produce genetically modified crops that are engineered to withstand glyphosate, which allows farmers who plant them to spray the chemical broadly without inadvertently killing their crops. As a result of the widespread adoption of these GM crops, glyphosate use has skyrocketed over the past 20 years.

Glyphosate's Effect on Humans

Another reason for its wide adoption was the belief that glyphosate posed almost no toxicity risk to humans. It kills plants by preventing them from internally synthesizing certain vital proteins; humans, however, get these proteins externally through food.

However, since the IARC findings were announced in March, many are beginning to take a second look at how glyphosate affects humans.

Charla Lord, a Monsanto spokeswoman, said her company "continues to join with the agricultural industry in strongly disagreeing with IARC's classification."

"Glyphosate is an effective and valuable tool for farmers and other users, including many in the State of California," she told Bloomberg BNA in an e-mail. "We will provide detailed scientific information to [CalEPA] about the safety of glyphosate and work to ensure that any potential listing will not affect glyphosate use or sales in California."

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Message

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Subject: Part 2 on workplace exposures to unborn children

http://www.publicintegrity.org/2015/07/01/17562/impenetrable-world-mark-flores

The impenetrable world of Mark Flores

Yvette Flores unknowingly worked around lead and other harmful substances while she was pregnant; a severely disabled son was the result

By Jim Morris email

3 hours, 28 minutes ago *Updated: 3 hours, 26 minutes ago*

SAN JOSE, California — In the photograph, a frozen moment of optimism, Yvette Flores is smiling.

It's the summer of 1979. Yvette, in a flower-patterned dress, is 22 years old and five months pregnant. To her right is her husband, David, a big man wearing tinted aviator glasses, a T-shirt and an inscrutable expression. They have no idea what's coming.

Mark Rueda Flores was delivered at the Kaiser Permanente Santa Clara Medical Center on December 3, 1979. There were many problems from the start: His eyes were crossed. His testicles had failed to descend. His hips were dislocated. He was unable to suck on a breast or bottle. His head was covered with large blood blisters, known as hematomas.

By the time Mark was 4, it was clear that he was profoundly disabled. He was still crawling. He wasn't talking normally. "The words were coming out like a foreign language," Yvette said.

In December, Mark turned 35. He is six feet tall. Before he had gall bladder surgery last summer he weighed nearly 400 pounds. He speaks mostly in monosyllables, often repeating the last word or phrase his mother says. He watches *Sesame Street* on a loop and likes trains, forklifts and Chuck E. Cheese. Not long ago, he learned to draw a circle.

For the first 29 years of Mark's life, Yvette had no reason to suspect his condition was the product of anything other than misfortune. Had she not heard a radio ad 6 ½ years ago, she might believe that still.

The ad was sponsored by a law firm. As Yvette remembers it, the announcer asked, "Have you worked in the electronics industry? Do you have a child with these defects?" Yvette: "I go, 'Yeah, yeah.' " She wrote down the phone number and called a few days later.

Risks to workers and their offspring

When it comes to protection against toxic hazards, workers in America are treated differently — that is to say, more callously — than the general public. This legal disparity allows someone who toils inside a factory to face higher risks of cancer and other maladies than someone who lives just beyond the plant fence.

The damage, it turns out, isn't confined to the workers themselves. Building on science more than a century old, recent studies have found ties between parental exposures and childhood afflictions such as brain tumors, malformations and learning disabilities. A bicoastal consortium of toxic-tort lawyers has begun targeting electronics manufacturers, blaming chemical-intensive processes for skeletal abnormalities, developmental delays, heart defects and other problems in workers' children.

The little-publicized litigation comes on the heels of hundreds of lawsuits filed against IBM Corporation and its chemical suppliers in the late 1990s on behalf of cancer-stricken workers and their injured offspring. It raises questions about the control of teratogens — substances, such as lead, which can interfere with tightly sequenced fetal development — in the workplace.

Across all industries, air samples testing positive for lead by the Occupational Safety and Health Administration from 1984 through 2013 exceeded the exposure limit 40 percent of the time, a Center for Public Integrity analysis shows. Just how many workers have been exposed to unsafe levels of lead in electronics manufacturing is unclear because the sampling was so much more limited.

"There are not enough government protections for the types of exposures that occur," said Tracey Woodruff, director of the Program on Reproductive Health and the Environment at the University of California, San Francisco. "OSHA's not even really dealing with cancer, so this is another order down."

Indeed, OSHA itself says that many of its exposure limits for dangerous substances don't offer sufficient protection for workers. Parsing 30 years of agency data, the Center found that when air samples across all industries tested positive for teratogenic mercury vapor, they were above the legal limit less than 1 percent of the time. But a third of the samples topped the much stricter limit recommended by the National Institute for Occupational Safety and Health.

The placenta was long thought to provide a barrier against most toxic insults to the fetus. Scientists now understand that "it's nowhere close to a closed system," said Emilie Rissman, who heads the biological sciences department at North Carolina State University. "It has to get nutrition from the mom and has to get rid of waste, so there is some exchange that has to happen. In the same way that nutrients and oxygen get to the fetus, other things in the mom can come in."

A father's exposures also can cause trouble, Rissman said, given that an embryo gets its DNA from both parents. Mutagenic chemicals like dioxins can affect the ability of sperm to fertilize eggs and also can alter genetic material, leading to embryo loss or disease in babies.

'I never questioned anything'

Mark Flores' mother was born Yvette Yturralde in Carlsbad, New Mexico, on May 27, 1957. Her family moved to San Jose when she was 2. Her father, Santana, was a

plasterer. Her mother, Velma, was a seasonal cannery worker. She had two brothers and one sister.

By the time she was 18, in 1975, Yvette was a few credits short of completing high school. She enrolled in a program that helped her get a GED diploma and find a job. She landed at a company called Spectra-Physics, which made lasers at a plant in Mountain View, northwest of San Jose in what was becoming known as Silicon Valley.

For 4 ½ years, eight to 10 hours a day, five or six days a week, Yvette worked in a small, stuffy room in Building 5, fusing together glass tubes at a precise angle. A man worked behind her.

Yvette sat at her assembly station with a spray gun, applying a greenish adhesive to the glass tubes and using a blow torch to cure it. A fan turned weakly above her. “It was like no air was coming in there,” she said. When it got too bad, she’d flee to the larger glass-blowing area in Building 5 for relief.

Yvette mixed the adhesive in a beaker using powder from a box and liquid chemicals. “I was never told to cover myself up or anything when I did that,” she said. She would learn many years later that she was being exposed to lead and the solvent methanol, both of which can sabotage a fetus. At the time, she said, “I never questioned anything.”

In 1978, the year before she gave birth to Mark, Yvette had a miscarriage in the women’s restroom at Spectra-Physics. “I had severe cramping. … I went in there and I was bleeding and I just remember being in such excruciating pain.” None of her managers ever followed up to ask if she was all right, she said. She recalls going back to work two days later.

Early evidence of fetal harm

Decades before Yvette Flores became pregnant a second time, researchers knew that a parent’s exposure could impair, and perhaps kill, an unborn child.

In a 1911 lecture to the Eugenics Education Society in London, Sir Thomas Oliver, a physician, spoke of his hard-won success "in securing the emancipation of female labour from the dangerous processes of lead-making .... Lead hits hard the reproductive powers of man and woman, but especially of woman."

In the 1950s came alarming reports out of Minamata Bay, Japan, where a chemical manufacturer had dumped an estimated 27 tons of methyl mercury over nearly four decades, contaminating fish, a staple of the local diet. More than 900 people died of mercury poisoning and some 2 million suffered neurological damage or permanent disability. Babies born to mothers who had eaten the tainted fish also developed symptoms, akin to cerebral palsy, of what became known as Minamata disease.

Around the same time, thousands of children worldwide whose mothers who had taken the drug Thalidomide for morning sickness during pregnancy were born with limb deformities.

Over the course of a year, beginning in June 1975, the children of three men who worked in the same building at a GAF Corporation chemical plant in Rensselaer, New York, were born with heart ailments. Suspicion fell on a herbicide, oryzalin, which was made in the building. Federal health investigators later confirmed what they called an "unusual cluster of birth defects" at the plant but stopped short of blaming oryzalin.

One of the GAF babies, Brian Purcell, died at five days old. "Nobody expects to lose a child that quick," said Brian's father, Doug, now retired. "He was delivered by C-section, and once his heart problems developed they moved him to another hospital. We never got a chance to say goodbye." He and his wife had no more children.

In early 1979, just before Mark Flores was conceived, newspapers including *The Washington Post* and *The Wall Street Journal* carried a story out of Willow Island, West Virginia. Female workers of childbearing age at an American Cyanamid chemical plant said the company had pressured them to undergo sterilization so they could continue to work around lead in the plant's pigments division. Those who refused were told they'd be reassigned to lesser-paying jobs or fired. Five women went through with the procedure.

Yvette knew none of this, logging her hours in Building 5 to the very end of her pregnancy with Mark. Had she suspected her work could hurt him, “I would have run out of that place,” she said. “I would have worked in fast food.”

Rude encounters

As Mark grew, his parents came to anticipate his quirks and deficiencies. He’d take off running and have to be chased down. He could ride a tricycle but couldn’t stop. He could be coaxed into talking only with an offer of food and began putting on weight. His father, David, a truck driver, once told Yvette, “I would give my right eye, my arm, anything, just to go for a minute into his brain and see what he’s thinking.”

Yvette and David insisted that Mark get out in the world. This policy led to some uncomfortable, occasionally unnerving, encounters. People would stare rudely. When Mark was 12, he accidentally bumped into a woman at a crowded Target store. The woman’s husband, convinced that Mark had acted intentionally, became enraged and was preparing to punch him when Yvette stepped in.

The episode appears to have traumatized Mark. As Yvette was recounting it last summer, Mark, sitting next to her on the sofa in their mobile home, snapped out of his torpor and began crying. “Mom, I’m sorry,” he said, putting his head on Yvette’s left shoulder. She assured him it wasn’t his fault. “Mama takes care of you. It’s you and me, right?”

Mark was especially close to his father, whom people called Güero — Spanish slang for someone who’s light-skinned. After David died in a motorcycle accident on December 23, 2007, Mark was beside himself and began ransacking the house. “He was very physical because he couldn’t verbalize,” Yvette said.

He found solace at the Multiple Intelligence Training Center, an adult day care center founded by one of his former teachers. He joined the other clients in dancing, singing and gardening. On holidays, Yvette has him draw pictures for his father. “He does 75 pages of circles. I say, ‘OK, put them by your bed and the angels will come and pick them up and take them to your daddy up there in heaven.’”

From canneries to Silicon Valley

The revelatory radio ad Yvette heard in December 2008 was sponsored by Waters & Kraus, a personal-injury law firm based in Dallas. After answering a series of questions, she was contacted by Amanda Hawes, a lawyer in San Jose.

Hawes, who prefers to be called Mandy, is gaunt and barely five feet tall. She talks fast and says she has a photographic memory.

A native of Bergen County, New Jersey, Hawes graduated from Harvard Law School in 1968 and moved to the Bay Area, where she joined the San Francisco Neighborhood Legal Assistance Foundation. She started off representing people of limited income, mostly immigrant pensioners, who were being evicted from residential hotels in the city's Yerba Buena district in the name of redevelopment. A settlement with the city put them in decent, affordable housing.

In the early 1970s Hawes moved to the Legal Aid Society of Alameda County in the East Bay, where she began representing women, most of them Hispanic or African-American, who performed grueling, low-paying seasonal work at fruit and vegetable canneries throughout Northern California. "Most of the year-round jobs were for the white guys," Hawes said. "Women's labor was always welcome if it was a shitty job that no one else wanted." It was typical for women in the canneries to work 12-hour shifts in hot, noisy conditions with no overtime; some experienced sexual harassment of the crudest sort, an invitation to "get into the camper with the supervisor," as Hawes put it, in exchange for a marginally better job. Hawes helped scores of them file discrimination claims with the Equal Employment Opportunity Commission and win back pay.

As the canneries began to relocate to California's Central Valley and Mexico, the electronics industry was booming in the Santa Clara Valley south of San Francisco. Companies that made the brains of computers and other devices — semiconductors, circuit boards, disk drives — were in need of what Hawes calls "cheap, malleable labor." Women who'd been pitting apricots soon were spin-coating chemically complex and highly reactive "photoresist" mixtures onto silicon wafers, cleaning them with solvents, baking them, dipping them in acids. The clamor of the conveyor belt was replaced by the calm of

the so-called clean room, where the primary goal was to protect the product against any particle contamination, from dust to dandruff, by using equipment made expressly for this purpose. The workers themselves were largely an afterthought, breathing re-circulated air that, unbeknownst to them, was laced with chemicals.

In 1977, Hawes went into private practice in San Jose and began representing female electronics workers. Her first three clients in this field had worked in an R&D laboratory at Signetics, a semiconductor manufacturer in Sunnyvale. They'd been reassigned to the cafeteria and given essentially nothing to do after complaining of being made sick by acids, solvents and heavy metals. They were fired after the company said it couldn't find work for them. Hawes filed workers' compensation claims and a lawsuit on their behalf; all were settled.

Investigators with the National Institute for Occupational Safety and Health — NIOSH — visited the Signetics building on several occasions in 1979. They interviewed five employees who complained of severe and lingering headaches, tightness of the chest, metallic tastes in their mouths and nosebleeds. The investigators concluded that "a significant occupationally related health problem exists at the Signetics Sunnyvale facility" and suggested that the company improve ventilation.

Mounting evidence

Workers in a wide range of industries may be exposed to chemicals and metals that can harm the unborn child. Research on substances that can impair fetal development or damage DNA is advancing. Here are summaries of some recent studies:

2015: Genital defects and occupational exposures to endocrine disruptors

Researchers studied more than 600 boys in the south of France and found that mothers exposed to endocrine-disrupting chemicals were more likely to have sons with genital defects. The risk for exposed boys was 68 percent higher than for those who hadn't been exposed. The children were more likely to be affected if their mother worked as a cleaner, hairdresser or beautician or lived in a heavily polluted area. The defect, hypospadias, is a condition where the opening of the urethra is on the underside of the penis and can usually be helped by surgery. Previous studies in England and Italy found that mothers

exposed to endocrine-disrupting chemicals were three to four times as likely to have sons with hypospadias. Read the abstract here.

2014: Childhood brain tumors and occupational exposure to solvents

Researchers in Australia found an increased risk of childhood brain tumors in households in which parents were exposed to solvents at work. Solvents comprise a wide range of chemicals including benzene, toluene and hexane. Exposures can occur in a variety of jobs, such as painting and dry cleaning, and in industries such as chemical manufacturing and petroleum refining. The study found that maternal exposures to solvents at any time before birth suggested an increased risk of childhood brain tumors, though the risk was greatest with exposure to chlorinated solvents. Paternal exposures to all solvents prior to the child's birth appeared to create a risk as well, with the strongest link occurring when the father was exposed to benzene or other aromatics in the year before conception. Readthe abstract here.

2012: Maternal chemical exposure associated with abdominal birth defect

Exposure to a group of chemicals called polycyclic aromatic hydrocarbons (PAHs) is likely in work settings such as oil and gas production, coal-fired power plants and restaurants. Using national birth defect data and maternal occupational histories, researchers studied whether mothers exposed to PAHs at work were more likely to give birth to children with gastroschisis, a condition in which a baby's intestines stick outside of its body. They found that PAH-exposed mothers over 20 years old were more than twice as likely to have children with gastroschisis. Read the abstract here.

2011: Pesticide exposure impacts child cognitive ability

A study of Latino farmworker families in Salinas Valley, California, measured maternal exposures to widely used organophosphate pesticides and their effects on children's cognitive abilities from birth to seven years of age. Prenatal exposure to the pesticides — assessed by measuring dialkyl phosphate metabolites (DAP) in urine from mothers and children — was associated with lower scores in working memory, processing speed, verbal comprehension, perceptual reasoning and IQ. A tenfold increase in DAP

concentrations was associated with a decrease of 5.6 IQ points, and there was a seven IQ-point difference between children in the highest quintile of prenatal DAP levels and those in the lowest quintile. Read the abstract here.

2008: Scientific review of environmental exposures and adverse pregnancy outcomes

In light of mounting evidence that ambient exposures to chemicals could cause birth defects, scientists did a review of research assessing the impacts of chemical hazards and other environmental agents on pregnancy outcomes. Among the findings the review highlighted was a strong link between maternal occupational exposure to industrial solvents and birth anomalies: In 1999, a 10-year study of pregnant women in Toronto revealed a 13-fold risk of major malformations in offspring of exposed women compared with controls. The review also made note of research showing a connection between cardiac defects in children and parental exposures to the solvent trichloroethylene. Read the abstract here.

In 1981, the California Department of Industrial Relations published the results of a survey of workers in semiconductor chip manufacturing. The survey revealed a range of cancer-causing chemicals used in the industry — including arsenic, chromium, asbestos, beryllium and nickel. The same year, 65,000 customers of the Great Oaks Water Company in south San Jose learned that their drinking water supply had been contaminated with trichloroethylene and other solvents that had leaked from underground storage tanks at plants owned by IBM and Fairchild Semiconductor. Two epidemiological studies later confirmed what some residents had suspected: There were increased rates of miscarriage — also known as spontaneous abortion — among women who'd drunk the water, and of congenital malformations, such as holes in the heart, among children exposed in the womb.

The tainted-groundwater incident "started to change the landscape," Hawes said. People stopped thinking of companies like IBM, whose landscaped grounds looked like college campuses, as benign neighbors. "The chemicals don't really end up in the product, so where do they go? Well, they either end up as hazardous waste that you've got to do

something about, they evaporate into the air, they go into the water or they go into workers' bodies."

In 1988, researchers with the University of Massachusetts published a study that found elevated miscarriage rates among workers in clean rooms and other departments at a Digital Equipment Corporation factory in Hudson, Massachusetts. The authors cautioned that the study population was small and recommended that it be repeated with a larger number of workers and better exposure data. They offered no conclusions about possible triggers for the miscarriages, though they noted that a group of solvents called ethylene glycol ethers, used in photoresist, had been flagged as teratogens in animal experiments and also had been seen to cause atrophy of the testicles, behavioral abnormalities and bone marrow depression. Workers' exposures to these chemicals appeared to be "well below federal industrial standards," suggesting that such standards might be too weak.

The Digital study led to two bigger ones in the 1990s: one commissioned by IBM and the other by the Semiconductor Industry Association, a trade group. Both drew a connection between miscarriage and exposure to ethylene glycol ethers. Katharine Hammond, now a professor of environmental health sciences at the University of California, Berkeley, worked on the SIA study, which involved 14 companies. Hammond went into the project convinced that "we're not going to find anything," she said. Instead, she and her co-investigators documented a nearly twofold risk of spontaneous abortion among women who'd been exposed to selected solvents, and a nearly threefold risk among those exposed to the highest levels of ethylene glycol ethers.

Even the highest exposures were only fractions of federal limits, which had been established to protect workers from acute effects — headaches, nausea — and not carcinogenic or reproductive ones. "Teratogens are very poorly understood," Hammond said. "I don't see employers necessarily being evil in these cases. I think they do care. It's just that we have a huge ignorance here."

The industry responded to the findings by phasing out ethylene glycol ethers, leaving the impression that the problem had been addressed. No follow-up studies were done to see if the miscarriage rates declined. No one looked at birth defects.

In 1970, Dr. Joseph LaDou opened a medical practice in Sunnyvale, 12 miles northwest of San Jose. Many of his patients worked in the electronics industry. “From the outset I saw an extraordinary number of injuries and a high rate of occupational illness,” said LaDou, now retired. Workers, he said, would be overcome by fumes and vapors and be “standing in the parking lot” in a state of fear when he arrived on the scene. There were many cases of asthma and bronchitis. Some workers had solvent exposures so intense that they arrived at his office “in the first stage of anesthesia. They were driving drunk from solvent fumes.”

LaDou, a former professor of medicine at the University of California, San Francisco, and former editor of the *International Journal of Occupational and Environmental Health*, said he began pressing companies to tell him which chemicals they were using and to share any exposure data they had. “I was completely, totally blocked by the industry,” he said.

The excessive secrecy continues today, LaDou said: “People have just gotten tired of not being told what the companies use.”

In a written statement to the Center, the Semiconductor Industry Association said its members have “a legitimate business need to protect proprietary chemical formulations as confidential business information.” Federal regulations require companies to provide workers with safety data sheets listing ingredients in their products, the SIA said, though some “trade secret” ingredients are exempt from such disclosure.

In addition to eliminating ethylene glycol ethers, the industry began using “enclosed processes that reduce routine exposures to process chemicals including potential reproductive [and] developmental toxins,” the SIA said. Its members adopted “policies that offered pregnant employees (and those trying to become pregnant) the choice to opt out of working in the [fabrication-room] environment during these time periods.”

The group said it didn’t pursue birth-defect studies because companies had taken protective measures and because of “the complexity of studying birth defects and the limited number of exposed study participants.”

"What we have seen is a pattern of the industry as a whole ignoring the rights and safety of their employees and their employees' unborn children for the sake of profit."

- David Bricker, plaintiff's lawyer.

'It was a catastrophe'

In the late 1990s, IBM workers who believed they had developed cancer or their children had suffered defects because of chemical exposures began filing legal claims. An expert hired by the plaintiffs, epidemiologist Richard Clapp of Boston University, reviewed an internal IBM "corporate mortality file" unearthed during discovery. Analyzing nearly 32,000 worker deaths between 1969 and 2001, Clapp found significant excesses of brain, kidney and pancreatic cancer, along with melanoma, in male manufacturing workers. Female workers had higher-than-expected numbers of deaths from kidney cancer, lymphoma and leukemia. Clapp detailed his results in a 2006 paper whose publication IBM tried to block.

"Initially, it was a group of guys with testicular cancer, a ridiculously large number, just an improbable cluster," said Steven Phillips, a toxic-tort specialist in New York who worked on the cases with Hawes and other lawyers. "It was rapidly turning into birth-defect litigation, because as we started investigating, all these birth defects came jumping out. They were so severe and unusual, and there were so many of them. It was a catastrophe."

One case against IBM was filed on behalf of Kate and Kelly Daley, twins born in 1979 with a rare skin disease called epidermolysis bullosa, or EB, which caused a whole-body blistering requiring constant care and countless surgeries. Their father, Chris, was a technician who delivered chemicals and disposed of waste at the IBM plant in East Fishkill, New York. He'd started at IBM in 1971.

"He would spill things on him during the day," said his wife, Nancy. "Early in his career he would bring those clothes home and they would go into the [washer] with the rest of the laundry."

The Daley twins' affliction would punish them physically and emotionally until their deaths 13 days apart in 2006, though they managed to graduate from college and become eloquent writers and speakers. "If you ask a burn victim what it's like to be burned — that's the level of suffering they experienced their entire lives," their mother said. "Each one could take up to eight hours for wound care. EB became their job."

In 2003, Chris Daley was diagnosed with non-Hodgkin lymphoma, a blood cancer associated with exposure to benzene and other organic solvents. He sued IBM's chemical suppliers; like other workers, he was barred by the New York workers' compensation statute from suing his employer. He died not quite a year after his daughters.

The twins' lawsuit against IBM and their father's case against the suppliers were resolved under terms that are confidential.

Only two of the IBM cases went before a jury. The plaintiffs were Jim Moore, who was dying of non-Hodgkin lymphoma, and Alida Hernandez, who'd had breast cancer; both had worked at the company's disk drive plant in San Jose. Hawes, who helped represent them, was able to overcome the workers' comp bar in California by claiming IBM had fraudulently concealed the chemical sources of Moore's and Hernandez's illnesses, causing their conditions to worsen.

The four-month trial ended in February 2004, the jury siding with IBM. Hawes blamed the defeat on the judge's refusal to allow jurors to consider crucial evidence, notably the corporate mortality file. An IBM lawyer called the verdict "a slam dunk" for the company.

Moore died not long after the trial. Hernandez, who worked for IBM from the late 1970s to the early 1990s, is convinced she lost a breast because of the company's failure to warn her about chemicals. "There were lots of women who were losing their babies, lots of young men who were getting sterile," she said. "They kept it all quiet." Her comp claim against IBM and lawsuits against the chemical suppliers were settled out of court.

IBM spokesman Todd Martin said in a written statement that the company "is committed to the safe operation of all its facilities, as well as to the health and well-being of our

employees." IBM, Martin wrote, "has been transparent in addressing" matters raised by the 1990s litigation "and the quality of our operations and health and safety programs are well documented."

Martin did not respond to a question about a 2014 NIOSH study that found a higher-than-expected number of deaths from non-Hodgkin lymphoma and other cancers, and more frequent occurrence of testicular cancer, among 34,494 workers employed at an IBM plant in Endicott, New York, from 1969 to 2001.

He also did not respond to a request to disclose the names of chemicals used at IBM facilities today.

New claims on behalf of children

All the IBM litigation was resolved by the mid-2000s. Then, a few years later, came another round of lawsuits with a different set of defendants. Lawyers who had brought the IBM cases began representing workers at other electronics companies who'd had children with severe developmental or structural defects.

Dozens of claims have been filed against Motorola Solutions, successor to Motorola Inc., which at one time operated a series of semiconductor manufacturing plants in the Phoenix area and Austin. The complaints allege an array of defects among workers' progeny: spina bifida, leaking heart valves, cerebral palsy, club foot, blindness, seizures. They maintain that Motorola officials allowed workers to be exposed to ethylene glycol ethers — despite having been "personally warned" by a federal health investigator in 1981 that the chemicals were reproductive hazards — and that the company tracked the "incidence of adverse reproductive outcomes among the offspring of its employees." Workers also were exposed to solvents such as benzene, heavy metals such as arsenic and many other toxic substances, the complaints charge.

"What we have seen is a pattern of the industry as a whole ignoring the rights and safety of their employees and their employees' unborn children for the sake of profit," said one of the plaintiff's' lawyers, David Bricker of Los Angeles. "We have families who are living in poverty because everything they have goes toward caring for a profoundly injured child."

Co-counsel Phillips said that while ethylene glycol ethers were phased out by U.S. semiconductor manufacturers in the 1990s, "the use of [other] crappy solvents and these heavy metals is continuing ....If you're standing over one of these goddamned vats, dipping [components] all day long, you're getting a snoot full — I mean, huge levels, gigantic levels." The so-called bunny suits worn by the workers "are designed to keep your noxious body parts, like dandruff or eyelashes, off the product," Phillips said. "In no way do they keep the vapors from getting into your lungs."

In a written statement, Motorola Solutions spokeswoman Tama McWhinney said the company does not comment on pending litigation and has not been in the semiconductor business for more than a decade. In a court filing, it denied the allegations in the lawsuits, saying "it is Motorola's policy to conduct all its operations in a responsible manner free from recognized hazards."

A legal case stalls — and is revived

Mandy Hawes approached the Mark Flores case in 2009 as she had many others of its ilk. She knew she'd have to track down Yvette's ex-colleagues, dredge up internal documents — assuming they hadn't been lost or destroyed — and depose uncooperative or forgetful defense witnesses. The odds of success weren't good, given that Yvette had worked in the stuffy room at Spectra-Physics 30 years earlier. "I thought, 'How are we gonna figure this out?' " Hawes said.

She went forward with a lawsuit, reasoning that Mark's mental disability likely came from something his mother worked with while she was pregnant. Mark's brother and sister, both younger than he, were normal; they'd been conceived years after Yvette left Spectra-Physics at the end of 1979. Hawes was especially curious about the green powder Yvette had mixed with the liquid chemicals and used, day after day, to fuse small pieces of beveled glass onto the tips of laser tubes, the guts of barcode scanners that were beginning to be installed at grocery stores.

Early in her investigation, Hawes sent a request to the company for any air sampling data taken, or written descriptions of chemicals used, during the four-plus years Yvette was there. "All we got was, 'Well, we can confirm she worked here as a laser assembler,' "

Hawes said. Her attempts to find former co-workers proved fruitless, and the case stalled. Lawyers for Spectra-Physics asked the court to throw it out.

Then, in 2013, two breakthroughs: A woman named Dora Jimenez, who'd worked with Yvette in Building 5, called her to say she'd been contacted by a defense investigator. Yvette asked Jimenez if she'd be willing to speak with Hawes, and she agreed. Jimenez gave a deposition and was a strong witness, Hawes said. "She remembered that shitty little room where Yvette worked. She remembered the extent of safety training was being told not to touch something so hot it would burn your fingers."

A representative of Newport Corporation, a successor company to Spectra-Physics, also proved unexpectedly helpful. In a deposition, David Marshall, like an earlier defense witness, used the word "frit" to describe the green powder Yvette had handled. Hawes already had a 1985 company document showing frit contained more than 1 percent lead oxide, a teratogen, but found it to be of little value. Marshall produced another document from 2007 that put the proportion at less than 75 percent. "Well, that's kind of different from 'more than 1 percent,'" Hawes said. Accounting for its other constituents, like silicon dioxide, and doing some simple math, she concluded that frit was about 62 percent lead oxide.

Marshall also confirmed the use of organic solvents, mainly methanol, in Yvette's former work area.

Hawes knew she had something at this point. Lead's savage effects on fetuses were well documented, and solvents, as she put it, had their own "affinity for brain tissue."

Still, she needed to connect Yvette's exposures with Mark's problems. This was where the medical experts came in.

Among them was Dr. Cynthia Bearer, chief of the Division of Neonatology at the University of Maryland School of Medicine. In a May 2013 declaration, Bearer explained that fetuses are "exquisitely sensitive to environmental toxicants" such as lead and methanol, and that fetal harm could occur even when workplace exposure levels were well below legal limits. In Yvette's case, methanol levels regularly were above the limit, Bearer wrote, citing

exposure estimates from another expert; the hematomas on Mark's oversized head at birth, she wrote, were classic signs of methanol poisoning.

While Mark has many burdens — poor vision, skeletal anomalies, undescended testicles — his "most disabling feature is his extensive cognitive impairment," Bearer wrote. "He is and will always be totally dependent on a small group of trusted family members and service providers for help in all aspects of daily living, from feeding, dressing, undressing, bathing, urinating and defecating to crossing a street, finding words to express needs, and protecting himself from strangers."

The doctor wrote that *in utero* lead exposure could produce these very deficits and that Yvette's body was a "toxic warehouse before Mark was conceived, upon conception and throughout Mark's gestation because of the release of stored lead from her bones into her blood stream and across the placenta into Mark's blood stream and the amniotic fluid in which he was contained."

There was no evidence of a genetic flaw, Bearer wrote. "To attribute all of Mark's problems to a purely genetic cause requires a suspension of disbelief that Yvette Flores' exposure to lead and methanol had any impact or played any part in the severe damage apparent in Mark from birth onward."

A defense expert, pediatric geneticist Gregory Enns with the Stanford School of Medicine, disagreed. "I think that Mr. Flores has a genetic condition," Enns testified in an April 2013 deposition. "I do not think that any environmental exposures explain any of his condition." Mark, he speculated, might have fallen victim to a de novo mutation — i.e., "something spontaneous" — carried by one or both of his parents but not expressed in the genes of either. In short, bad luck.

Under questioning by Hawes, Enns said that he and his Stanford colleagues tracked their patients' symptoms, diagnoses, inheritance patterns and ethnicities, but not their parents' occupations. Could he estimate how many worked in electronics, with its attendant metals and solvents, or agriculture, where pesticide exposures were common? "You can ask me about any profession," Enns told Hawes, "and I wouldn't know."

The Flores case was settled out of court in July 2013, shortly before trial was to begin. Hawes declined to disclose the details.

Calls and emails to Newport Corporation and its lawyers in the Flores case were not returned. In a court filing prior to the settlement of the case, the company asserted that Mark's condition was "not known to be caused by chemical exposure" and was, "more likely than not, the result of genetic or other factors."

'He's taught me patience'

As a result of his gall bladder surgery and some dietary changes, Mark Flores' weight has dropped to 218 pounds, according to his mother. The legal settlement enabled her to buy a dark-gray Toyota Tundra pickup truck, and she's in the market for a three-wheeled bike Mark can ride. Longer term, she wants to move from their mobile home in south San Jose into a house. "I want a big backyard for Mark," said Yvette, whose own health is frail. "That's my dream."

Yvette, who admits to feeling exhausted and depressed at times, nonetheless says that caring for Mark has been a blessing. "He notices the small things that we all tend to forget sometimes," she said. "He's taught me patience."

As Yvette eyes the future, scientists and regulators are making incremental progress on the sorts of workplace poisons that debilitated Mark.

NIOSH researchers are collaborating with others in government to add questions about occupational exposures to large studies of birth outcomes and children's health, and to analyze occupational data already captured.

"There's a lot of work happening, but there's still a long way to go," NIOSH epidemiologist Carissa Rocheleau said. "While we can easily detect the dramatic examples like Thalidomide, subtle impairments in children as they are developing might not be easy to detect."

The state of California, acting on evidence that lead is harmful at far lower levels than once believed, is nearing the end of a five-year process to tighten its occupational lead standard — and not by a little.

The state's, and the federal government's, current limits for lead are 50 micrograms per cubic meter of air and 30 per deciliter in a worker's blood. California is moving to change those to 10 and 10 — the strictest in the nation. Recent studies have shown "significant health outcomes" at even those low numbers, said Steve Smith, manager of the Research and Standards Health Unit in the state's Division of Occupational Safety and Health. Among them: high blood pressure, heart disease, decreased brain function and reproductive effects.

Hawes, who has been representing women in workplace litigation for more than 40 years, is unsympathetic to employers who try to blame conditions like Mark Flores' on happenstance. By the late 1970s, she said, it would have been almost impossible for managers at companies like Spectra-Physics not to know that lead could injure fetuses; OSHA recognized the threat and began working on a well-publicized lead standard in 1975. The following year, *The New York Times* reported that General Motors Corporation in Canada had "ordered that no women of childbearing age work at its battery plant because of the danger." In 1978, OSHA director Eula Bingham warned in a memorandum that infants who survived "the lead intoxication of their parents may be mentally retarded or physically disabled."

Mark Flores was conceived the year after that.

Jamie Smith Hopkins and Maryam Jameel contributed to this story.

From: Miller, Gregory
Sent: Tuesday, June 30, 2015 3:40 PM
To: AO-OCHP-Everyone
Subject: Slate.com article on workplace exposures

"The second part, which will run Wednesday, focuses on the risks unborn children face from their parents' exposures."

Working to Death

Tens of thousands of workers suffer and die from toxic chemicals, fumes, and dusts each year. And the government's system to protect them is tragically broken.

By Jamie Smith Hopkins, Maryam Jameel, and Jim Morris

PORT BYRON, New York—Six weeks before Chris Johnson was born in 1974, the U.S. government **issued a warning** about a substance that would nearly kill him 30 years later.

The substance was silica, a component of rock and sand that is the scourge of miners, sandblasters, and other workers who breathe it in. When pulverized into dust, it can cause silicosis—a scarring of the lungs that leads to slow suffocation—as well as lung cancer.

This was no newly discovered hazard. The ancient Greeks and Romans were **mindful of it**. Labor Secretary Frances Perkins launched a **national campaign** against it in the 1930s after the knifelike particles dispatched hundreds of tunnel workers in West Virginia.

The 1974 warning by the National Institute for Occupational Safety and Health said the workplace exposure limit for silica put people in danger. NIOSH urged the Department of Labor's Occupational Safety and Health Administration to cut the limit in half.

OSHA finally did so in 1989, only to see its work undone by a **court decision**. It didn't try again until 2011. In the interim, Johnson became a bricklayer and developed acute silicosis after a five-month job that enshrouded him in dust. He's 40 and, on paper, can expect to survive less than five years.

As Johnson's experience shows, inaction has consequences. Silica—which OSHA says threatens **2.2 million workers, mostly in construction**—is a striking example of the government's failure to properly regulate toxic substances in American workplaces. The silica rule still isn't finished. If it is enacted despite industry protests, it will be only the 37th health standard issued by the agency in its **44-year history**.

It's an ignominious record given the human and economic costs of work-related disease in the United States. According to a widely cited University of California–Davis **study**, an estimated 53,000 people died in 2007 from on-the-job exposures—**outnumbering** those killed in suicides, motor vehicle accidents, falls, or homicides. More than 400,000 others got sick. The price tag: an estimated $58 billion. OSHA puts the **annual toll** at more than 50,000 deaths and 190,000 illnesses.

The government has failed for 40 years to more strictly control silica, exposing countless workers to this lethal substance.

An 18-month investigation by the Center for Public Integrity has found that the epidemic of occupational disease in America isn't merely the product of neglect or misconduct by employers. It's the predictable result of a bifurcated system of hazard regulation—one for the general public and another, far weaker, for workers. Risks of cancer and other illnesses considered acceptable at a workplace wouldn't be tolerated outside of it.

For years the best OSHA has been able to do is set chemical limits so that no more than one extra cancer case would be expected among every 1,000 workers exposed at the legal maximum over their entire careers. The U.S. Environmental Protection Agency's standards for the public are 10 to 1,000 times more protective. The real gap is often worse, a former OSHA official says.

"I can't see any justification for treating people that differently," said Adam M. Finkel, who heads the **Penn Program on Regulation** at the University of Pennsylvania Law School and was director of health standards programs at OSHA from 1995 to 2000.

Bricklayer Chris Johnson contracted acute silicosis triggered by silica dust exposure on the job. The U.S. government has failed for 40 years to more strictly control silica in American workplaces—exposing countless other workers to this lethal substance—and leaving Johnson with a life expectancy of 45 years.

Among the Center's findings:

- Most of OSHA's 470 chemical exposure limits are, by the agency's own admission, grossly outdated and don't protect workers from a variety of ailments. Cancer, for instance: The agency's own analyses of 16 substances estimate that cancer risks associated with legal exposures to workers over their careers are as high as 6 in 10. Analyses of an additional 31 exposure limits by the Center and Finkel found cancer risks above 1 in 10 for nearly half the chemicals.
- The vast majority of the tens of thousands of chemicals made or used in the U.S., including some very common and toxic substances, have no workplace exposure limits. The lung-ravaging food flavoring diacetyl. The widely used herbicide glyphosate, recently named a probable carcinogen by the World Health Organization. The agents in chemotherapy drugs, hazardous to the health care workers preparing and handling them.
- Even apparent success stories—rare cases in which chemical limits were tightened—can be Pyrrhic victories. OSHA's own calculations suggest, for example, that the cancer risk for hexavalent chromium, a metal used in specialty paints and coatings, was as high as 1 in 3 at the limit in effect from 1971 to 2006. At the current, stricter standard, the risk is still as high as 1 in 22, OSHA acknowledges.
- Sampling for chemicals has fallen over the last three decades as workplaces multiplied but OSHA's staff levels stagnated. Even so, OSHA still finds exposures above legal limits, a Center analysis found. One in 6 samples containing hexavalent chromium, taken after the 2006 rule change, topped the limit of 5 micrograms per cubic meter of air. Samples containing lead, a brain-damaging metal that can accumulate on a worker's clothing and hurt the whole family, have exceeded the limit 40 percent of the time since 1984.
- NIOSH last did a nationwide workplace exposure survey more than three decades ago because it has not had the funding to update it. Critical information on both old and emerging chemical hazards across industries is missing, putting regulators and researchers at a disadvantage.

A profound toll

Job-related illness is a slow-motion tragedy few seem to understand or acknowledge. Its victims usually die one by one, out of public view, though disease clusters emerge on occasion.

More than 50 cases of bladder cancer, for example, have been **tied to a small Goodyear chemical plant** in Niagara Falls, New York, far above the expected number in the general population. NIOSH investigators identified the suspect chemical years ago: ortho-toluidine, used to keep tires from cracking. Exposures in the plant weren't extreme; in fact, they were "well below" the legal limit, the **investigators reported**.

Goodyear, which made changes to its factory after the problem came to light, **said in a statement** that all but one of the 54 bladder cancer cases identified through its own screening program involved workers who came to the plant before 1990.

"While the ortho-toluidine exposure levels in the plant have generally been far below the permissible exposure limits, engineering controls were put in place in the 1980s to further reduce levels in the plant," the company said.

Steve Wodka, a lawyer in New Jersey who represented about half the Goodyear victims in claims settled out of court, said he knows of 62 bladder cancer cases from the plant. He calls that cluster "probably the best example of the inadequacy of the system."

Ortho-toluidine is in a family of chemicals—aromatic amines—known since the 1930s to cause bladder cancer, Wodka said. Yet its exposure limit of 5 parts per million, adopted by OSHA in 1971, was fashioned only to protect workers from the chemical's acute effects, not cancer.

"It remains the law of the land today," Wodka said.

The blight of disease contracted on the job isn't confined to factory workers. It consumes hairdressers, grocery store meat wrappers, scientists, and people in a variety of other professions. Many are stricken by middle age.

The panoply of illnesses, from **nerve damage** to **dementia** to virulent **cancers**, takes a profound toll on workers and their families. Careers are lost, finances shredded, marriages tested. In some cases, workers opt for macabre, last-ditch procedures to try to save their lives.

"They basically clean you out like a fish," cancer victim Mike Dennen, who worked in asbestos-contaminated textile factories, said of his 2013 surgery. "They tell you before surgery you can end up without a bladder, you can end up without your intestines."

Federal regulators are overwhelmed by the scope of the problem, **which didn't materialize by chance**. Congress has exacerbated the situation by refusing to fortify the weak 1970 law specifying what OSHA can do. Trade groups have challenged health standards in court while workers have lost their lives. The White House's Office of Management and Budget is a vortex that sucks in proposed agency rules and doesn't spit them out for months—or years.

David Michaels, head of OSHA since 2009, speaks frankly about the results.

"With a few exceptions, OSHA's standards to protect workers from chemical exposures are weak and out of date, or simply nonexistent," he said in a recent interview.

He cited as an example the solvent hexane, which can **wreck the nervous system**. OSHA's exposure limit for the chemical is **500 parts per million**, 10 times the level NIOSH says is safe.

"We know workers get sick at levels below 500 parts per million," Michaels said. "We can't do anything about that."

David Michaels, head of OSHA since 2009, told the Center for Public Integrity that "with a few exceptions, OSHA's standards to protect workers from chemical exposures are weak and out of date, or simply non-existent."
Photo by Jamie Smith Hopkins/Center for Public Integrity

OSHA's exposure limits almost all date to its founding in 1971, he noted, when the agency adopted 1960s-era voluntary numbers **embraced by industry**. Few have been updated since, and only those few became full standards with specific technological and medical requirements.

"The law under which OSHA operates … forces us to go through a very, very complex, onerous process for regulating any individual chemical," Michaels said. "It takes many years and millions of dollars in studies to issue one standard. And that's why we've got only a few dozen standards."

An ancient hazard

Silicosis and other dust-related diseases, the 1974 NIOSH document reported, "have probably existed since man began to dig into the earth's crust." Silica was a cruelly efficient killer of stonecutters in the 17th century; slicing through the workers' lungs during necropsy was "like cutting a mass of sand," a Dutch physician reported in 1672. It silenced 19th-century sandstone masons in England long before they reached old age.

Silica also precipitated America's worst industrial disaster: the deaths of more than 750 workers—many black—who drilled a water-diversion tunnel through silica-rich rock near Gauley Bridge, West Virginia, in the early 1930s. Death estimates reached as high as 2,000, but the full count will never be known. Sick workers were booted out of company housing. Some who died on site were carted off to unmarked graves.

Four decades after that, in December 1974, Christopher Scott Johnson was born in Auburn, New York. His life almost perfectly tracks silica's tortured regulatory history.

The month of Johnson's birth, OSHA published an "advance notice of proposed rulemaking," indicating movement toward a new silica standard. That effort fizzled due to a lack of funds, according to the head of OSHA at the time.

Silica-related death and disease continued. As bad as things were in foundries and other dusty, fixed establishments, where workers legally could be exposed to twice the NIOSH-recommended silica limit, construction was far worse. Employers in that sector could subject workers to five times the recommended limit without breaking the law.

That's still the case.

Johnson landed in the construction category in 1993. He became a bricklayer, also known as a mason, following in the footsteps of two uncles. He crafted sidewalks and floors with bricks and stone, and helped repair and put up buildings.

"I was very happy with my job," he said in an interview at his home in Port Byron, west of Syracuse. "I felt fulfillment."

Johnson said he was oblivious to silica's destructive properties. That didn't matter until he was assigned a job in Rome, New York, in April 2004. Standing on hydraulic lifts, Johnson and his co-workers at a small contracting firm removed and replaced damaged brick from the façades of three apartment buildings operated by the Rome Housing Authority.

The work, which lasted through September of that year, generated "a tremendous amount of dust," Johnson said. "You're in a basket that's maybe 6 feet wide and 2 or 3 feet deep, so you're pretty much stuck right there."

The workers were given disposable paper masks, known by experts to be ineffective against microscopic silica particles. The one half-face respirator on the job had a broken strap, "so we didn't really use it," Johnson said.

It's not just factory workers. It's hairdressers, grocery store meat wrappers, scientists, and more.

They had tools to suppress the dust: Their diamond-bladed, 14-inch demolition saws came equipped with hose attachments for "wet cutting." But the project manager for the Housing Authority refused to allow the practice, fearing it would "make too much of a mess," according to an **affidavit** given by a former co-worker in a **lawsuit** Johnson later filed against the authority. OSHA rules, moreover, don't require it.

Johnson did "about 90% of the saw cutting and grinding on the job," his former colleague said in the affidavit. "In fact, he was often so covered in dust we nicknamed him 'Dusty.' "

Jim Baldwin, who joined the Housing Authority as executive director years later, said he would have allowed wet cutting "because of the danger caused by the inhalation of the fine dust."

"Not having proper respirators on the job was certainly a factor in the worker's illness," he added by email. "For that I would have shut the job down until that equipment was made available and was being used."

There is no way to know how much silica Johnson inhaled. But the current rule for construction is so weak, even employers that stay within the legal limit can be "sentencing someone to death from lung disease," said **Celeste Monforton**, a lecturer at George Washington University and a former Labor Department analyst and adviser.

By the time the Rome job ended, "something was not right with me," Johnson said. He was short of breath, losing weight rapidly, unable to do simple tasks without exertion. "I had no clue what was going on."

The answer came early in a three-week stay at the University of Rochester's Strong Memorial Hospital in December 2004. Johnson's parents drove him there after his right lung collapsed following a biopsy, and further tests showed he had acute silicosis triggered by mixed dust exposure.

He underwent an unusual procedure called a lavage, in which his lung was flushed of sticky material filling up the air sacs and robbing him of oxygen. He stayed on a ventilator for nine days.

"None of the doctors really even knew if he was going to pull through or not," said his wife, Beverly.

Chris Johnson and his wife, Beverly, in February 2015.

Photo by Maryam Jameel/Center for Public Integrity

The procedure didn't help much. Johnson continued to struggle for air as he rested fitfully at home in early 2005. He was a candidate for a double lung transplant, a prospect he found unappealing once he learned the odds of survival: Less than half of patients would live five years, and less than a quarter would survive 10.

He opted instead for a second lavage at the Cleveland Clinic in May 2005. This one took. By 2006 his lung disease had stabilized, though it hadn't been cured.

Internist and lung specialist Dr. William Beckett treated Johnson in Rochester and was so struck by the severity of the young mason's condition that he co-authored an article about it for a medical journal. In an interview, he noted the banality of the substance that had gummed up Johnson's lungs.

"This is not an unusual material. It's not exotic," Beckett, now affiliated with Harvard Medical School and Mount Auburn Hospital in Cambridge, Massachusetts, said of silica. "It's something that everybody is around, but the people who cut through it or work with it are susceptible to getting disease from it."

Beckett chaired an American Thoracic Society committee that called for a stricter OSHA silica limit in 1997. To his dismay, the old one is still in place.

"There are many, many, I'm sure, young men in the United States who are doing the same kind of job [Johnson did]," he said, "and probably getting the same kinds of exposures."

Forty years of futility

OSHA's 40-years-and-counting quest to keep silica from killing workers is a study in inertia and frustration. The agency tried to tighten exposure limits for silica and 375 other substances in a 1989 rule, but a federal appeals court **struck it down**, saying the analyses OSHA used to justify the rule weren't detailed enough.

It took OSHA nearly two decades to regroup, even though it deemed silica a regulatory priority in **1995** and **2002**. In the meantime, **evidence hardened** that silica could cause **lung cancer** in addition to silicosis.

It's unlikely any group of workers has felt the sting of lax silica controls more than **sandblasters**, who use pressurized guns to shoot sand at corroded surfaces to prepare them for painting. The sand breaks apart as it strikes metal, creating clouds of dust laced with invisible shards of quartz that scar the lungs.

NIOSH, **noting available alternatives** such as nut shells and sawdust, suggested in 1974 that sandblasting with silica be **banned**. Britain and a swath of mainland Europe had **already done so** by that point.

But industry groups in the United States, like the euphemistically named Silica Safety Association, composed of purveyors and beneficiaries of sandblasting, lobbied successfully in the 1970s to fend off a ban, predicting economic hardship.

In February 2011, OSHA finally sent a proposed silica rule to the Office of Management and Budget for vetting. It emerged **921 days later** in 2013. OMB officials will not say why it took so long; 90 days, plus a single 30-day extension, is supposed to be the maximum unless the rulemaking agency asks for more time.

Apart from trimming the silica exposure limit to the NIOSH-recommended number for all workers, the **proposed standard** would require employers to control dust with methods such as water or vacuum systems and provide medical monitoring for highly exposed workers. OSHA predicted it would save nearly 700 lives and prevent 1,600 new cases of silicosis per year.

The Labor Department held **14 days** of hearings in Washington, D.C., in the spring of 2014. Among the witnesses was construction worker Santiago Hernandez, who'd come to the United States five years earlier from Tlaxcala, Mexico, expecting to find safer conditions.

Instead, he said in **written testimony**, "things are actually much worse here than in Mexico. ... The protections you receive here are useless. Employers give you a little paper mask that, when you finish, is just as dirty and dusty on the inside as on the outside."

Dale McNabb, a tile setter from Warren, Michigan, **spoke** of developing "breathing problems at night" in his 20s. "By the time I was 30 I felt it more. I could hear my labored breathing and wheezing, and it shocked me."

In 2008, when he was 42, he volunteered to use a grinder to remove thinset—a mortar made of cement and sand—from a wall over the course of several weeks. "At the end of the project I was feeling pretty bad," McNabb testified. Tests showed "shadowing in my pleural membrane so severe that the membrane was almost opaque, and there were several lesions on my lungs.

"When I get exposed to dust now—and not just silica dust, any dust—it feels like I have a plastic bag around my head and someone's trying to pull it shut on me," McNabb said. He got a job as a shuttle bus driver, then in financial services, and is thankful he can work. But the stress that followed his health crisis left a lasting mark. "In the end, silica exposure cost me my job, my health and also my marriage."

Industry witnesses also shared doleful stories—what would happen to companies if they had to comply with the proposed rule.

The American Foundry Society, **disputing** OSHA's cost estimates, said the standard would eat up 10 percent of the industry's revenue and "threaten the viability of foundries across the country."

The American Chemistry Council, the chemical industry's main trade group, **said** the silicosis death rate has dropped more than 90 percent since 1968. Neil King, a lawyer for the council, blamed newer cases on exposures "that occurred decades ago" and more recent exposures that far exceeded the current limit—something that happens regularly, he said.

And the U.S. Chamber of Commerce, which represents more than 3 million businesses, suggested that OSHA ought to take more time on an effort already four decades old.

"We have serious concerns about this rulemaking being rushed," said Henry Chajet, a lawyer who **spoke** for the chamber.

Industry groups have kept up the pressure as the rule has inched toward final form.
That **includes** pointed **comments** from the chamber, a lobbying powerhouse **that spent $124 million** to press for its members' interests in 2014—more than the next four top-ranked groups combined.

About 30 people march outside the U.S. Chamber of Commerce on June 5 to protest the chamber's opposition to a stricter silica standard. Marc Freedman, the trade group's executive director for labor law policy, watched from the steps and chuckled. "It's lame," Freedman told a Center reporter. "Why do they think the chamber is the reason this [standard] hasn't happened?"

Photo by Maryam Jameel/Center for Public Integrity

OSHA's **economic analysis** projected that while affected businesses would spend an estimated $664 million annually to comply with the proposal—about **$1,242 for the average workplace**—the net benefits would range from about $2.9 billion to $4.7 billion a year, values OSHA applied to avoided disease.

In a congressionally requested **1995 review** of past OSHA actions, the since-**dismantled** Office of Technology Assessment found that the agency tended to overestimate the cost its health rules would impose on industry—often in a big way.

Nonetheless, in March the Construction Industry Safety Coalition, composed of 25 trade groups, said its **own study** concluded that a new silica standard would cost construction companies nearly $5 billion a year—10 times what OSHA had calculated for that industry. It could be "the most expensive OSHA standard ever for the construction industry," the coalition **warned**.

OSHA is undeterred, Michaels told the Center. "President Obama has made it very clear he is committed to getting the silica standard out while he's president." A final rule is expected by the end of 2016, a Labor Department spokeswoman said.

But the Senate Appropriations Committee last week approved an **appropriations bill rider** that would require more study before the rule could be issued, which would put the proposal at the mercy of the next president. And even if the rule is enacted, that may not be the final word. Industry almost always challenges OSHA standards in court, which can delay or overturn them.

Reports from public health officials, meanwhile, show that silica remains a workplace menace.

Congress has exacerbated the situation by refusing to fortify the weak 1970 law specifying what OSHA can do.

In 2012, NIOSH researchers said they collected 116 air samples at sites in five states where shale deposits were tapped with the oil and gas extraction technique known as hydraulic fracturing, or fracking. Vast quantities of high-silica sand are used to hold open fissures underground, allowing the product to flow into wells; the NIOSH team **found** that nearly half the samples were above the current OSHA exposure limit, creating an "inhalation health hazard."

Almost 80 percent were above the NIOSH-recommended limit—the number OSHA wants to enact.

Another group of NIOSH researchers **reported in June** that silicosis deaths, after decreasing for years, are rising again. Silicosis was listed as the underlying or contributing cause of death for 88 people in the U.S. in 2011, **down from 164** a decade earlier, but such deaths rose to 103 in 2012 and 111 in 2013.

Those who died during the three-year period included a dozen people younger than 45. Researchers called this "concerning," saying it suggested that intense exposures, of the sort that sickened Chris Johnson, were occurring. Their data didn't reflect other illnesses linked to silica, such as lung cancer, chronic obstructive pulmonary disease, and kidney disease.

The five-decade plunge in silicosis deaths cited by trade groups reflects a shift from manufacturing to service jobs, NIOSH said in a statement to the Center.

"That does not mean that the risk for developing silica-related diseases … is acceptable in those that still work in dusty trades," the agency said.

"Scott's not here"

Last summer, encouraged by his tolerable if imperfect state of health, Johnson tried to get back into masonry. The experiment lasted a few weeks.

"I just couldn't do it anymore," he said. "And then I did try to do a factory job, and that didn't work."

A stepfather to three boys, Johnson lifts weights, runs on a treadmill, and busies himself with household projects. Six feet tall and 250 pounds, he betrays no outward sign of infirmity. Having settled his lawsuit against the Rome Housing Authority, he's in decent financial shape and is determined to exceed his predicted life span of 45 years.

Still, Johnson said, "I'm affected a lot by my lungs now. I'm constantly getting sick." A cold that would sideline the average person for a day or two immobilizes him for weeks. "It puts me right down to where I have no energy," he said.

But Johnson is grateful to be alive. He's already had more time than some workers struck with silicosis.

Bricklayer Scott Whipps, shown here with his dog Maddy, died of silicosis at 38 in 2006.

Photo courtesy of Judy Schoon

Scott Allen Whipps—like Johnson, a mason—died at 38 in 2006, four years after being diagnosed with the disease. His final months were agonizing.

"He coughed nonstop," said his mother, Judy Schoon of Fergus Falls, Minnesota. "He coughed up blood. He coughed so much that he'd vomit."

Schoon and her husband, Jim, Whipps' stepfather, witnessed it all firsthand. They'd taken in Whipps during those last months, and his bedroom was next to theirs.

"The goal was always a lung transplant, but he could never get the infection out of his body, so he couldn't be considered for one," Judy Schoon said.

One of his lungs turned gangrenous, and shortly after surgery, his condition deteriorated until his hold on life was "very tenuous," according to a doctor's report. Whipps would wake up screaming in the hospital for his mother. Doctors tried another surgery to save him, to no avail. He died an hour and a half after medical personnel unhooked him from life support, his family telling him to go where the pain would not follow.

It's been nine years. Judy Schoon still hasn't processed her son's early death. Losing a child, she said, is "unnatural."

"I wake up sometimes," Schoon said, "and think, 'Oh—Scott's not here.' "

This story was **published** *by the* **Center for Public Integrity**, *a nonprofit, nonpartisan investigative news organization in Washington.* **It part of** a **series** examining the epidemic of work-related disease in America. The second part, which will run Wednesday, focuses on the risks unborn children face from their parents' exposures. For more on its investigation, follow the Center for Public Integrity on **Twitter** and join the conversation on its **Worker Safety Facebook group**.

Jamie Smith Hopkins is a reporter for the Center for Public Integrity's environmental health and labor desk.

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Message

From: Foos, Brenda [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=18B24F2F79414190852A748BF650D2B9-BPERKOVI]
Sent: 9/8/2015 7:31:20 PM
To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Dzubow, Rebecca [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=403ca1721f3d43d38de9189a93a95b76-Dzubow, Rebecca]; Schroeder, Kathleen [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=0db676b2fade4b54bebcc7b6e664fc94-Schroeder,]; Davis, Matthew [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=84111ec08c504b6baae0510b2d2ce46a-Davis, Matthew]
Subject: FW: Slides for Tuesday's 2 pm meeting
Attachments: 2015 Briefing Milk Study_OCHP_Sept_8_2015.pdf

Ruth, Attached please find the breast milk slides, and I will also put a copy in your reading folder. We were asked not to share them outside our office.

We will be happy to go over these with you if you like. Things that I thought were of note include that this effort was initially undertaken as a feasibility study Ex. 5 - Personal Privacy their results did not exceed the acceptable risks for pesticides in food for the current use pesticides, and the glyphosate analysis were an add-on that did not detect any samples with glyphosate.

Thanks, Brenda

****

Brenda Foos
Director, Regulatory Support and Science Policy Division
US EPA Office of Children's Health Protection
202-564-2707

From: Miller, Wynne
Sent: Tuesday, September 08, 2015 11:20 AM
To: Dzubow, Rebecca; Miller, David; Foos, Brenda; Reed, Khesha; Schroeder, Kathleen; Davis, Matthew
Cc: Nguyen, Thuy; Miller, David
Subject: RE: Slides for Tuesday's 2 pm meeting

Hi All,
Here's a revised PDF. **Ex. 5 - Deliberative Process**
Ex. 5 - Deliberative Process
Wynne

From: Miller, Wynne
Sent: Friday, September 04, 2015 2:22 PM
To: Nguyen, Thuy; Vogel, Dana; Guilaran, Yu-Ting; Dzubow, Rebecca; Miller, David; Foos, Brenda; Reed, Khesha; Schroeder, Kathleen; Davis, Matthew
Subject: Slides for Tuesday's 2 pm meeting

Hi All,

Attached are the materials for Tuesday's 2 pm meeting. Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Regards,
Wynne Miller, Deputy Director
Biological and Economic Analysis Division (BEAD)
Office of Pesticide Programs (OPP)
Office of Chemical Safety and Pollution Prevention (OCSPP)
(Phone) 703-308-8111
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Mail code 7503P
Room # PY S9724

Message

From: Landrigan, Philip [philip.landrigan@mssm.edu]
Sent: 11/21/2015 6:05:11 PM
To: Gutierrez, Claudia [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=03e596afea504f91a6c5bb3857a6fea6-Gutierrez, Claudia]; Sheffield, Perry [perry.sheffield@mssm.edu]; jlg23@cornell.edu [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=66db8de0199c40349a82b1308d937670-jlg23@cornell.edu]; Timothy H. Madere [thmadere@nola.gov]
CC: Fessler, Andrew [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=291c205e558f4b12a45f8e95e7d5e088-Fessler, Andrew S.]; Enck, Judith [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=3db0c221d8194266b9568fa8961b6cca-Enck, Judith]; Plevin, Lisa [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=51f620a4345d4e7daa180e57d3de2e9f-Plevin, Lisa]; Beck, Nancy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=c3ce90f43765480d93ea4c95e8c92c07-Beck, Nancy]; Soltani, Beth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=03064c9196634648b70375f541a7d07e-Soltani, Beth A.]; Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]
Subject: RE: IPM conference
Attachments: PESTICIDES.USVI.ppt

Claudia

Wonderful conference. Thank you so much for all your hard work in having organized. Here are my slides

Phil

Philip J. Landrigan, MD, MSc, FAAP
Dean for Global Health
Arnhold Institute for Global Health
Professor of Preventive Medicine and Pediatrics
Icahn School of Medicine at Mount Sinai
12 16 Fifth Avenue, Room 556
New York, NY 10029

Tel: Ex. 6

phil.landrigan@mssm.edu

WHO Collaborating Centre in Children's Environmental Health

From: Gutierrez, Claudia
Sent: Friday, November 20, 2015 11:13 AM
To: Landrigan, Philip <phil.landrigan@mssm.edu>; Sheffield, Perry <perry.sheffield@mssm.edu>; Etzel, Ruth <Etzel.Ruth@epa.gov>; jlg23@cornell.edu; Timothy H. Madere <thmadere@nola.gov>
Cc: Fessler, Andrew <Fessler.Andrew@epa.gov>; Enck, Judith <Enck.Judith@epa.gov>; Plevin, Lisa

<Plevin.Lisa@epa.gov>; Beck, Nancy <Beck.Nancy@epa.gov>; Soltani, Beth <Soltani.Beth@epa.gov>
Subject: IPM conference

Hello,
I cannot thank you enough. The conference was a huge success. We briefly looked at the evaluation forms, and I can tell you that the reviews were great! We will get you exact numbers next week. Please send me your presentations, at your earliest convenience. We'd like to email presentations to the attendees.

Also, stay tuned for the next three conferences, which will be held in March 2016. One in St. Croix, and two in Puerto Rico. They will be on the same week to save on travel cost to the Caribbean.

Happy Thanksgiving to you and yours!
Warm regards,

Claudia Gutierrez, Senior Advisor
Office of the Regional Administrator
212-637-5036 (O)
Ex. 6 *(C)*

HEALTH IMPACTS OF PESTICIDE EXPOSURE

Philip J. Landrigan, MD, MSc, FAAP
Dean for Global Health
Professor of Preventive Medicine and Pediatrics
Icahn School of Medicine at Mount Sinai

Reducing Pesticides in the US Virgin Islands
Charlotte Amalie, USVI
November 18, 2015

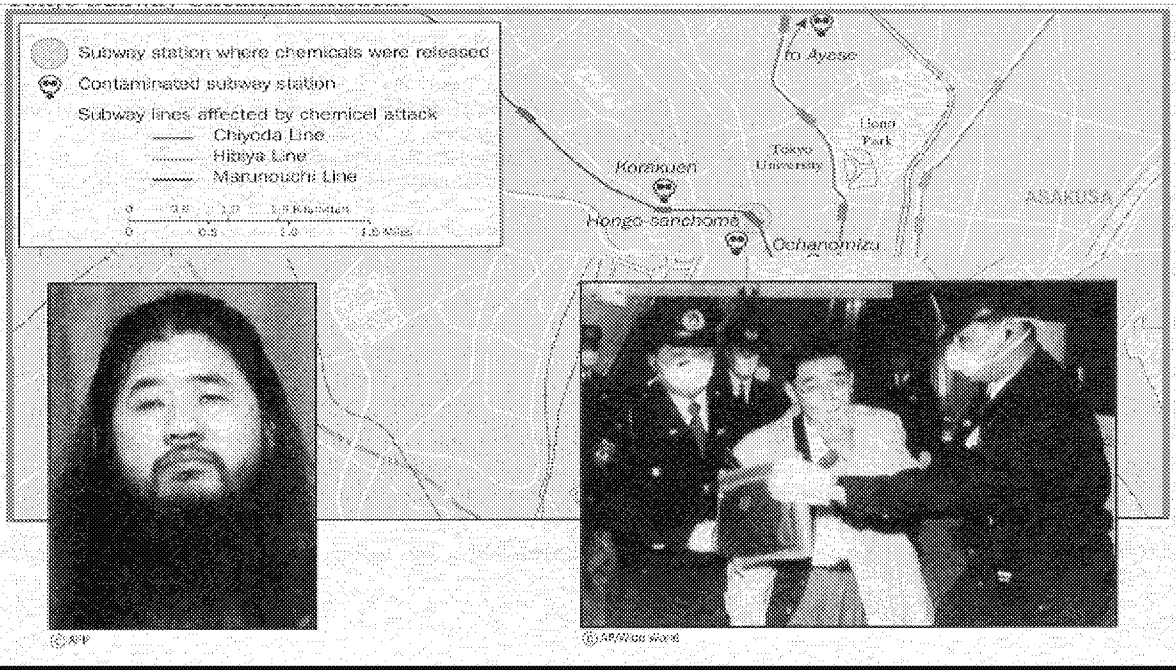
ED_001703B_00007916_00_5ebcfdb1-c91f-c3b7-1a78-352626c2a9a9

WHAT ARE PESTICIDES?

- Chemicals specifically designed to kill living things
- Include insecticides, herbicides, fungicides and rodenticides
- More than 600 individual pesticide chemicals and many thousands of commercial pesticide products with many different names are on the market
- More than 1 billion lbs. applied each year in USA alone and increasing
- Pesticides can cause acute poisoning and chronic disease. Children and pesticide applicators are at highest risk

<<READ SLIDE.>>

PESTICIDES ARE INTENDED TO BE TOXIC
War Gases are Potent Pesticides



© AFP

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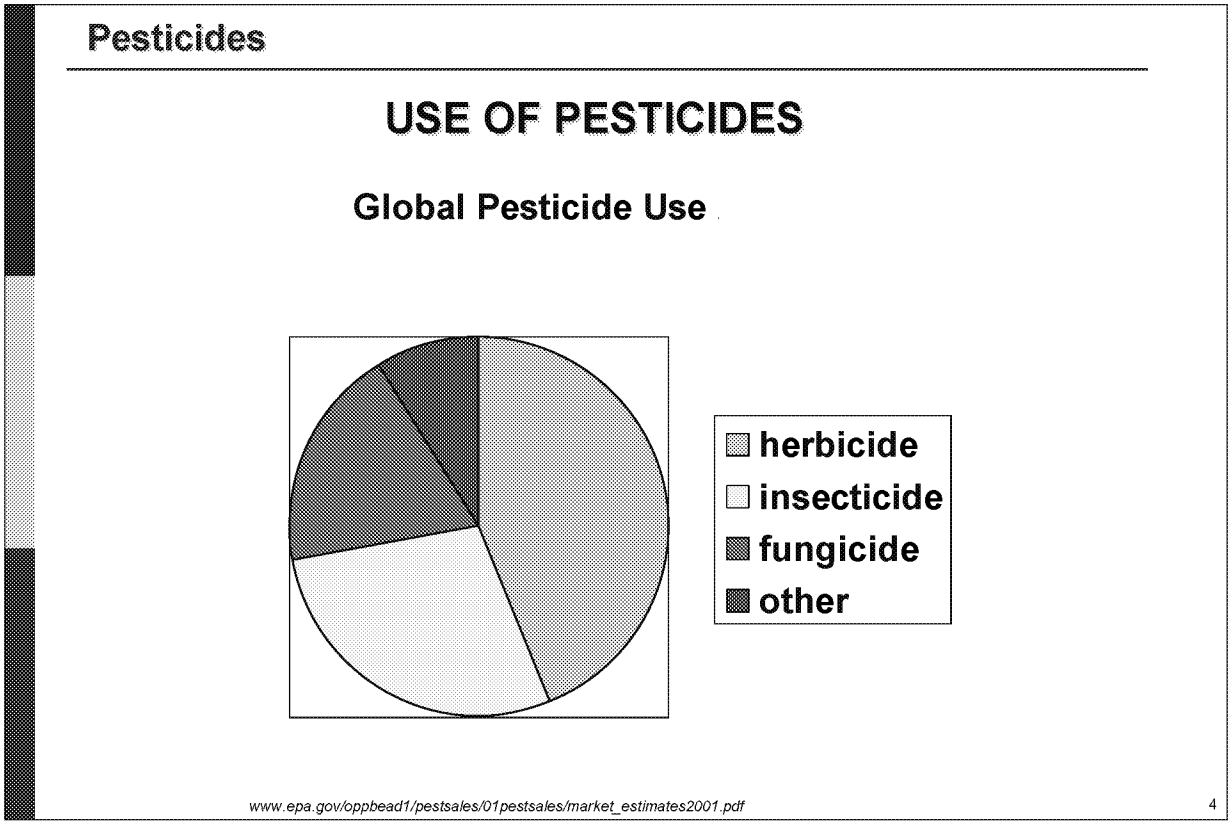


The pie chart shows the global use of pesticides and the different types.
Insecticides are mostly used in developing countries and fungicides/herbicides in developed countries.

<<READ SLIDE.>>

Refs:

American Academy of Pediatrics Committee on Environmental Health. Pesticides. In: Etzel RA ed. Pediatric Environmental health. 2nd ed. Elk Grove Village, American Academy of Pediatrics, 2003.

Jeyaratnam. Acute pesticide poisoning: a major global health problem. World Health Stat Quarterly, 1990.

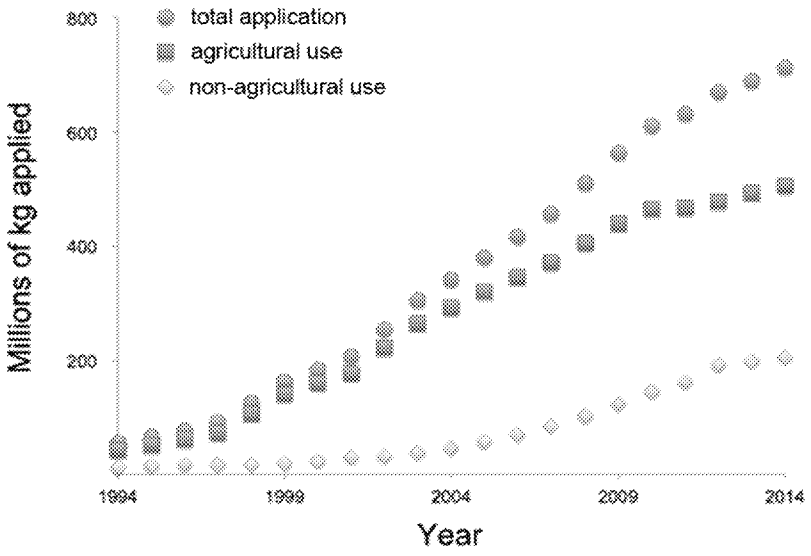
UNEP United Nations Children´s Fund and WHO. Children in the new millennium: environmental impact on health. UNEP, UNICEF, WHO, 2002.

US EPA Pesticides industry sales and usage: 2000 & 2001 market estimates: (www.epa.gov/oppbead1/pestsales/01pestsales/market_estimates2001.pdf).

Vaagt. New code of conduct on pesticide adopted. FAO Newsroom (www.fao.org/english/newsroom/news/2002/10525-en.html).

Pesticides

INCREASING USE OF GLYPHOSATE - ROUNDUP



PESTICIDES – RISKS AND BENEFITS

BENEFITS

- Crop protection
- Food preservation
- Material preservation
- Disease control – dengue and malaria

RISKS

- Toxic to humans
- Long-lasting impacts on environment and ecosystems

Pesticides have numerous beneficial effects. These include crop protection, preservation of food and materials and prevention of vector-borne diseases.
For example pesticides may be used in the prevention of malaria, which kills up to 1 million children per year, and for preventing other vector-borne diseases such as dengue, leishmaniasis and Japanese encephalitis.
Pesticides are toxic by design – they are BIOCIDES, designed to kill, reduce or repel insects, weeds, rodents, fungi or other organisms that can threaten public health and the economy.
Their mode of action is by targeting systems or enzymes in the pests which may be identical or very similar to systems or enzymes in human beings and therefore, they pose risks to human health and the environment.
Pesticides are ubiquitous in the environment and most are synthetic.
There is growing concern about children's exposure to pesticides and their special susceptibility. Children are not little adults, and may have higher exposures and greater vulnerability at both high and low levels of exposure.

Ref:
National Resource Council. Pesticides in the diets of infants and children. National Academy Press, Washington, DC, 1993.

HISTORY OF PESTICIDE USE

- Lead arsenate was the first pesticide – high acute toxicity
- First use of synthetic pesticides: 1940, DDT, malaria control during WW II. Phased out - persistence
- Organophosphate insecticides: 1970s. Many uses phased out – too toxic, but still used in agriculture
- Carbamate insecticides: Increasing use since 2000
- Pesticide consumption increasing worldwide, especially herbicides
  - 2.26 million tons of active ingredients used annually
  - 25% of the world production used in developing countries... where 99% of deaths due to pesticides occur!

<<READ SLIDE.>>

a) First use of synthetic pesticides: 1940

b) Consumption increased substantially over time, for example, in the USA, the use of pesticides doubled from 1960 to 1980, but total use has since remained stable or fallen. Most pesticides are used in agriculture, but in 1999 about 74% of households in USA were reported to use at least one pesticide in the home.

c) Use has risen in developing countries and the fastest growing markets in Africa, Asia, South and Central America, Eastern Mediterranean. There is a high pesticide use on crops grown for export (Dr. N. Besbelli, WHO, personal communication).

d) Although developing countries use only 25% of the pesticides produced worldwide, they experience 99% of the deaths. This is because use of pesticides tends to be more intense and unsafe, and regulatory, health and education systems are weaker in developing countries.

Refs:

American Academy of Pediatrics Committee on Environmental Health. Pesticides. In: Etzel RA ed. Pediatric Environmental health. 2nd ed. Elk Grove Village, American Academy of Pediatrics, 2003.

Jeyaratnam J. Acute pesticide poisoning: a major global health problem. World Health Stat Quarterly, 1990.

UNEP United Nations Children´s Fund and WHO. Children in the new millennium: environmental impact on health. UNEP, UNICEF, WHO, 2002.

US EPA Pesticides industry sales and usage: 2000 & 2001 market estimates: (www.epa.gov/oppbead1/pestsales/01pestsales/market_estimates2001.pdf).

Vaagt G. New code of conduct on pesticide adopted. FAO Newsroom (www.fao.org/english/newsroom/news/2002/10525-en.html).

Pesticides

Historical use of DDT...

Norsk Barnemuseum

8

Fig: Norsk Barnemuseum. www.norskbarne.museum.no/html/barn100.htm Used with copyright permission.

CHILDREN'S EXPOSURE TO PESTICIDES

A cause of concern

- Multiple chemicals
- Multiple sources of exposure
- Multiple routes of exposure
- Multiple effects

WHO

Pesticides are considered an important environmental threat to children's health in rural areas. This is because:
A large variety of chemicals and mixtures are used as pesticides.
Many pesticides are used at the same time in the same place (agricultural regions).
They are ubiquitous in the environment – and in individual environments (micro-environments) of children – there may be several sources of exposure to the same or a different chemical.
Multiple exposures may occur from the preconception period throughout the child's growth into adolescence and adulthood.

Pesticides may also be heavily used indoors in urban areas, so this is not solely a rural issue.

CHILDREN'S EXPOSURES TO PESTICIDES

- **Locations:** Homes and schools, playgrounds, parks fields, hospitals and other public places
- **Activities:** Work places, farms, agricultural areas (rural setting)
- **Sources of exposure:** Air, soil, food, water, parents' clothing and shoes, other objects…

Exposure scenarios:

- ACUTE high-level exposure, overt poisoning
- CHRONIC low-level, chronic exposure, delayed efects

Children are exposed in different settings and by a variety of routes.
Pesticides may be unsafely used in the home, by parents who want to protect their children from mosquitoes, cockroaches or rodents. Different pesticides may be stored within the reach of children. They are used in schools and playgrounds (in treated wood) and in green areas (parks and playing fields) to destroy weeds. Hospitals are intended to be places of healing, yet many are using hazardous pesticides).
Living on farms or in agricultural areas, where pesticides are frequently and heavily used, is a high-risk scenario for exposure. Children may also undertake work in the agricultural industry, where they may participate in directly applying pesticides to crops or working in the field immediately after pesticide application.
Potential for "take home" of pesticides on parents'/childs clothing or shoes.
Pesticides may be present in food and water, either as residues from treatment of crops or at higher levels, as a result of contamination.
In some areas, there is a potential for release into the environment during production and formulation of pesticides (in factories).
These are the circumstances under which children may receive acute and high-level exposure leading to poisoning or chronic, low-level exposures linked to more subtle, developmental and other effects. (See next slide)

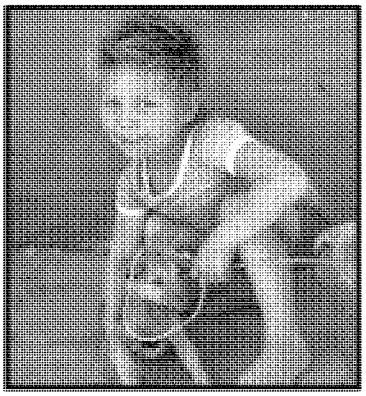
Pesticides

SOURCES AND SETTINGS OF CHILDREN'S EXPOSURE...

HOME, SCHOOL, DAY-CARE, INSTITUTIONS, ...

Indoor and outdoor application

- **Mosquito control**
- **Professional/domestic application**
- **Structural applications – termites**
- **Hotels and rental properties**



WHO

Health uses

- **Lice or scabies**
- **Fleas or ticks on pets**

Pesticide residues

- **Dust, soil, furniture, carpets, toys, food**
- **Playgrounds, playing fields, lawns, gardens**
- **Wood preservatives in play structures (e.g. PCP: pentachlorophenol)**

11

A survey by the U.S. Environmental Protection Agency regarding pesticides used in and around the home revealed some significant findings:

Almost half (47%) of all households with children under the age of five had at least one pesticide stored in an unlocked cabinet, less than 4 feet off the ground (i.e., within the reach of children).

Approximately 75% of households without children under the age of five also stored pesticides in an unlocked cabinet, less than 4 feet off the ground (i.e., within the reach of children). This number is especially significant because 13% of all pesticide poisoning incidents occur in homes other than the child's home.

Pesticide application

Professional application of pesticides both indoors and outdoors is used increasingly commonly for the control of rodents, cockroaches, ants, termites, earwigs and other pests. Signs and symptoms of pesticide-related-illnesses have been described after indoor and outdoor spraying.

Domestic use of insecticides is also a source of exposure. Insecticides formulated as sprays, strips and baits are widely available.

Certain topical pharmaceuticals for direct application on children's skin or scalp contain insecticides to control lice or scabies. Their use carries a risk of acute (chronic if repeated) overexposure. High doses or applications lasting a long time have caused acute poisoning. There are many pharmaceuticals described in the International pharmacopoeia that contain organophosphorus (malathion) and organochlorine (lindane) pesticides still being used to treat head lice. Such products may contains up to 2% of pesticide.

Dogs and cats are often treated with insecticides to control fleas or ticks. Veterinary products can be as concentrated as agricultural ones. Pet dips for treatment of flea infestations usually contain organophosphate and pyrethroid pesticides. Children are often involved in pet care.

Pesticide residues

Insecticides may persist in house dust, in soil tracked in from outdoors, in carpets, toys, food and furniture.

High levels of insecticides have been measured for weeks after professional application.

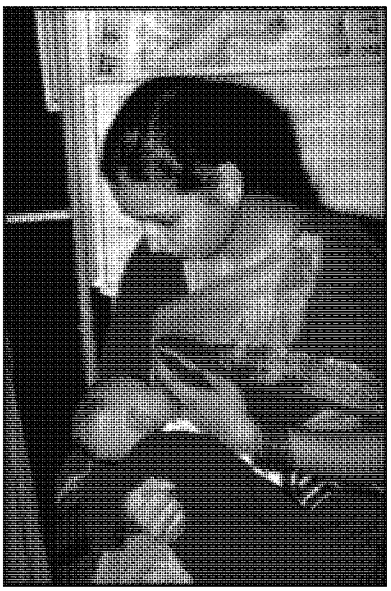
Residues of organophosphorus insecticides sprayed in indoor environments have been reported to occur on floors,

carpets, children's toys, furniture, bed covers and in dust.
Poor hygiene habits or houses that are difficult to clean increase the risk of exposure.
Playgrounds, playing fields, lawns and gardens may be routinely sprayed in order to keep insects away.
Pesticides are found in recreational waters (lakes, rivers and in pools (algaecides)).
Persistent wood preservatives such as arsenic/ copper/chromium mixtures have been used on play structures.
The persistent organic pollutants (POPs) include nine pesticides.

Refs:
www.epa.gov/pesticides/factsheets/childsaf.htm
Bass JK et al. What is been used at home: a household pesticide survey. Rev Panam Salud Publica, 2001, 9:138.
CDC Surveillance for acute insecticide related illness associated with mosquito control efforts Nine States 1999–2002 (www.cdc.gov/mmwr/preview/mmwrhtml/mm5227a1.htm).
Fields S. Caution – children at play: How dangerous is CCA? EHP, 2001, 109 A262 (ehp.niehs.nih.gov/docs/2001/109-6/focus.html)
Forrester MB et al. Epidemiology of lindane exposures for pediculosis reported to poison centers in Texas, 1998–2002. J Toxicol - Clin Toxicol, 2004, 42:55.
Lemus R et al. Chlorpyrifos: an unwelcome pesticide in our homes. Rev Environ Health, 2000, 15:421.
WHO. The physical school environment, information series on school health, Document 2. Geneva, World Health Organization, 2003.
Picture: WHO

ROUTES OF PERINATAL EXPOSURE

- **Mother's intake and body burden is transferred across the placenta**
- **Breast milk may be contaminated**
  "The very top of the food chain"



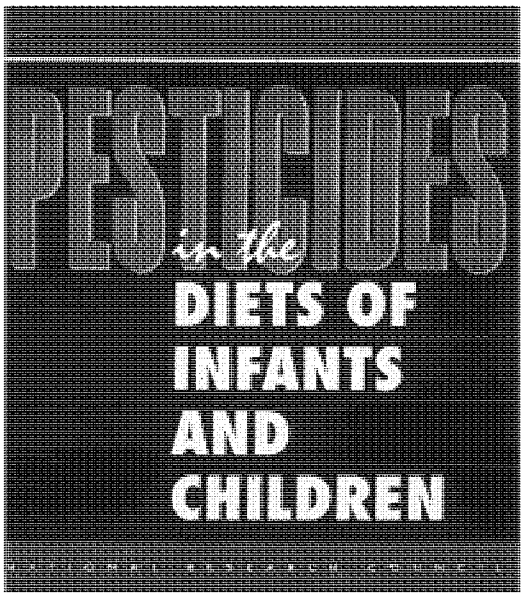
Pesticides can cross the placenta:
They have been detected in cord blood samples, amniotic fluid and body tissues of human foetuses even during early stages of prenatal life.
Pesticides have also been found in the meconium.
Measuring organophosphate compounds (OP) metabolites in meconium is considered a good biomarker of prenatal exposure because meconium starts to accumulate in the 16th week of pregnancy and is eliminated following delivery.

Breast milk may be contaminated and represents the very top of the food-chain:
Residues of organochlorine pesticides and POPs have been detected in breast milk (including DDT, HCB and HCH isomers) in contaminated areas.
There is currently no developed method to measure OPs in breast milk.
(Please see the module on Children and Chemicals.)

Refs:
Pronczuk J et al. Global perspectives in breast milk contamination infectious and toxic hazards. Environ Health Perspect, 2002, 110:A349.
Whyatt RM et al. Measurement of organophosphate metabolites in postpartum meconium as a potential biomarker of prenatal exposure. A validation study. Env Health Perspect, 2001, 109:417.

Picture: WHO, P. Virot. Portrait of a young baby breastfeeding, Delhi, India, Asia, November 2002.

CHILDREN ARE HIGHLY VULNERABLE TO PESTICIDES

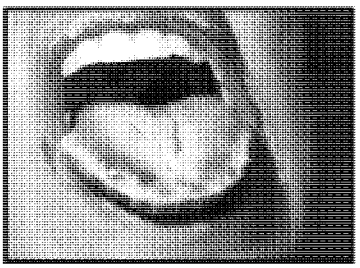


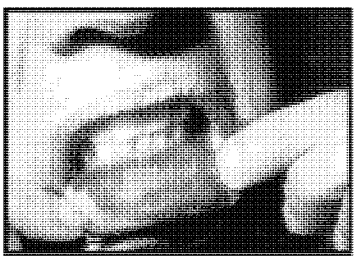
- Greater exposures pound-for-pound than adults. Exploratory behaviors.
- Reduced capacity to detoxify most pesticides.
- Developing organ systems are highly vulnerable
- More years of future life

CHILDREN ARE NOT LITTLE ADULTS

ACUTE PESTICIDE-RELATED ILLNESSES

- Skin and eye irritation
- Upper and lower respiratory tract irritation
- Allergic responses / asthma
- Gastrointestinal symptoms
- Neurological symptoms
- Specific syndromes
  - Cholinergic crisis (organophosphorus pesticides)
  - Bleeding (warfarin-based rodenticides)
  - Caustic lesions and pulmonary fibrosis (herbicide, paraquat)





The signs and symptoms of pesticide poisoning depend upon the pesticide involved and the type and magnitude of exposure.
In general the signs and symptoms are:
dermal and ocular irritation (or allergic response)
upper and lower respiratory tract irritation
allergic responses and asthma
gastrointestinal symptoms: usually vomiting, diarrhoea and abdominal pain
neurological symptoms: excitatory signs in the case of exposure to organochlorines, lethargy and coma; also polyneuritis
specific syndromes:
- cholinergic crisis (organophosphorus pesticides)
- bleeding (warfarin-based rodenticides)
- caustic lesions and pulmonary fibrosis (paraquat)

<<NOTE TO USER: Refer to those pesticides commonly used in the country/area.>>
<<NOTE TO USER: insert local photo.>>
<<READ SLIDE.>>

Refs:
American Academy of Pediatrics Committee on Environmental Health. Pesticides. Chapter 24. In: Etzel RA. ed. Pediatric Environmental Health, 2nd Ed. Elk Grove Village Il. American Academy of Pediatrics, 2003.
CDC. Surveillance for acute insecticide-related illness associated with mosquito-control efforts--nine states, 1999–2002. MMWR Morb Mortal Wkly Rep, 2003, 52:629.
Salameh PR et al. Respiratory symptoms in children and exposure to pesticides. Eur Respir J , 2003, 22:507.
Sanborn MD et al. Identifying and managing adverse effects: 4 Pesticides. CMAJ, 2002, 166:1431.
Pictures: Courtesy of Dr. J. Pronczuk. Lesion caused by paraquat.

ACUTE POISONING BY "ACCIDENTAL" INGESTION

- Storage of leftover pesticide in a medicine or soft drink bottle
- Confusion with pharmaceutical
- Pesticide container reused for storing drinks or food
- Pesticide container present in the child's environment

Bottles containing pharmaceuticals and the pesticide chlorpyriphos
Laborde, CIAT, Montevideo

Acute poisoning results from "accidental" (non-intentional) exposure in toddlers and small children. Ingestion occurs, for example, when:

Pesticides have been stored in a medicine or soft drink bottle.

The pesticide bottle is similar to a bottle used for pharmaceuticals.

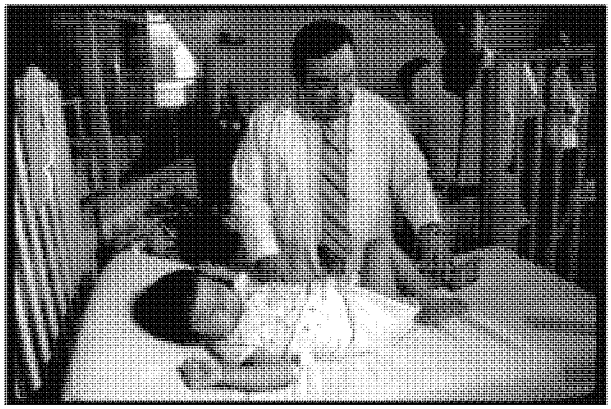
Pesticide containers are reused for storing drinks or food.

Pesticide containers are easily accessible in the child's environment.

Photo: Bottles containing pharmaceuticals and the pesticide chlorpyriphos
Courtesy of Laborde, CIAT, Montevideo

DIAGNOSIS OF EXPOSURE

- History of exposure
  - Availability of pesticides
  - Recent application
- Signs and symptoms
  - May be misdiagnosed!
- Laboratory tests



WHO

<<READ SLIDE.>>
The diagnosis is based upon the history of exposure (e.g. pesticides are available in the home, recently applied, or child was found playing with containers), signs and symptoms of exposure (see next slides) and laboratory measurements. Diagnosis also requires a high index of suspicion. Even after acute exposures, pesticide poisoning may be misdiagnosed as a viral illness (e.g. infectious diarrhoea rather than organophosphate poisoning) resulting in inadequate treatment and potentially returning children to a setting where exposure will be ongoing or recur.
Pesticides and/or their metabolites can be measured in samples of blood, urine, breast milk, amniotic fluid or meconium. This can confirm the diagnosis.
Laboratory tests are available to assess exposure to organophosphates, organochlorine, dicarboximide fungicides, carbamates, dipyridyl herbicides (e.g. paraquat) and pyrethroids.

Ref:
American Academy of Pediatrics Committee on Environmental Health. Pesticides. Chapter 24. In: Etzel RA. ed. Pediatric Environmental Health, 2nd Ed. Elk Grove Village Il. American Academy of Paediatrics, 2003.
Picture: WHO, C. Gaggero. Health child examination, Peru.

Pesticides

PRECONCEPTIONAL PRENATAL EXPOSURE

Pesticide exposure before or during pregnancy has been associated with increased risk of:

- **Infertility**
- **Perinatal death**
- **Spontaneous abortion**
- **Premature birth**
- **Fetal growth retardation**
- **Congenital malformations**
- **Early childhood cancer**

WHO 17

Exposure of either mother or father to pesticide before conception, or exposure of the mother during pregnancy, has been associated with an increased risk of fetal death, spontaneous abortion and early childhood cancer.
There is increasing evidence that in utero exposure increases the risk of growth retardation: a small-for-gestational age baby, low birth weight, reduced length and small head circumference (see photo).
Significant increases in the risk of congenital anomalies have also been reported. These include: eye defects, limb reduction, urogenital defects, hypospadias, cryptorchidism, orofacial clefts, central nervous system defects and heart defects.

Refs:

Bell EM et al. A case-control study of pesticides and fetal death due to congenital anomalies. Epidemiology, 2001, 12:148.
Berkowitz GS et al. In utero pesticide exposure, maternal paraoxonase activity, and head circumference. Environ Health Perspect, 2004, 112:388.
Eskenazi B et al. Association of in utero organophosphate pesticide exposure and fetal growth and length of gestation in an agricultural population, Environ Health Perspectives, 2004, 112 (10): 1116-1124.
Garcia AM et al. Parental agricultural work and selected congenital malformations. Am J Epidemiol 1999, 149:64.
Heeren GA et al. Agricultural chemical exposures and birth defects in the Eastern Cape Province, South Africa. A case - control study. Environ Health, 2003, 2:11.
Nurminen T. Maternal pesticide exposure and pregnancy outcome. J Occup Environ Med, 1995, 37:935.
Rojas A et al. Malformaciones Congenitas y exposicion a pesticidas. Rev Med Chilena, 2000, 128:399.
Schreinemachers DM. Birth malformations and other adverse perinatal outcomes in four U.S. Wheat-producing states. Environ Health Perspect , 2003, 111 :1259.
Weidner IS et al. Cryptorchidism and hypospadias in sons of gardeners and farmers. Environ Health Perspect, 1998, 106:793.
Whyatt RM et al. Prenatal insecticide exposures birth weight and length among an urban minority cohort. Environ Health Perspect , 2004, 112:1125.

CHRONIC NEUROLOGICAL EFFECTS OF ACUTE PESTICIDE EXPOSURE

- Neurological sequelae of acute poisoning
- Neurological symptoms due to high indoor levels of pesticides
- Subtle changes in memory and attention

It may be difficult to differentiate the effects of prenatal exposure from exposure in early childhood, or sequelae of non-fatal acute poisonings.
Chronic neurobehavioural and neurological effects after acute poisoning with organophosphorus pesticides have been reported in adults.
Memory and concentration problems, unusual fatigue, irritability and depression, visual difficulties and delayed polyneuropathy have been described.
In a well-documented case of chronic organophosphorus pesticide poisoning, the house of an infant with hypertonia, first diagnosed as cerebral palsy, was found to have high levels of chlorpyrifos weeks after a professional application (Wagner, 1994).
Few studies have examined the neurobehavioural effects of postnatal exposure to pesticides.
Subtle changes in short-term memory and attention may be associated with application of organophosphorus pesticides in the home.
There is increasing evidence, particularly from animal models, about neurobehavioural effects of long-term exposure to low levels of pesticides.

Refs:
American Academy of Pediatrics Committee on Environmental Health. Pesticides. Chapter 24. In: Etzel R. ed. Pediatric Environmental Health 2nd Ed Elk Grove Village Il, American Academy of Pediatrics, 2003.
Eskenazi B et al, Exposures of children to organophosphate pesticides and their potential adverse health effects. Environ Health Perspect, 1999, 107(3):409–419.
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Ruckart PZ et al. Long-term neurobehavioral health effects of methyl parathion exposure in children in Mississippi and Ohio. Environ Health Perspect, 2004, 112:46.
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94:94.

PESTICIDES AND CHILDHOOD CANCER

Some studies have found an association between postnatal pesticide exposure and an increased risk of pediatric cancer

- **Brain tumors**
- **Acute lymphocytic leukaemia**
- **Non-Hodgkin lymphoma**

A number of epidemiologic studies have found a significant association between cancer and domestic exposure to pesticides.
Evidence is increasing, but still limited because of the methodological weaknesses of the research.
Investigations in children living in the rural areas of developed countries have also produced limited evidence.

Refs:
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Pogoda JM et al. Household pesticides and risk of pediatric brain tumors. Environ Health Perspect, 1997, 105:1214.

ENDOCRINE DISRUPTION

- Low doses of certain pesticides may mimic or block hormones or trigger inappropriate hormone activity
- Endocrine disruption may alter development and reproduction and induce birth defects
- Endocrine disruption has been linked to:
  - Infertility
  - Low sperm count
  - Early puberty
  - Hormone-dependent cancers (testicular, breast, prostate)
  - Altered sex ratio

Endocrine disruption is not an effect, but a mechanism of toxicity that may have different effects.
Evidence of the effect related to this mode of toxicity in children is still limited.
There is experimental evidence of endocrine disruption. Pesticides may have:
estrogenic effects (DDT, dieldrin, endosulfan, methoxychlor)
anti-androgenic effects (DDT, vinclozilin, procymidone)
anti-thyroid effects (ethylenethiourea (ETU), maneb, zineb metabolites)
anti-progestin effects (DDT).
Synthetic pesticides may interfere with the natural process of development.

Refs:

Baskin LS et al. Hypospadias and endocrine disruption, is there a connection? Environ Health Perspect, 2001, 109:1175.
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OBSOLETE AND BANNED PESTICIDES

Obsolete and banned pesticides are pesticides that can no longer be used for their intended purpose or any other purpose.

They may include:

- Pesticides stored in empty and contaminated pesticide containers
- Pesticides in heavily contaminated soil
- Buried pesticides
- Pesticides saved after a ban
- Pesticides imported from developing countries

Why are some pesticides obsolete and banned?:

- Use prohibited for health/environmental reasons – too toxic
- Product deteriorated as result of improper or prolonged storage
- Product not suitable for intended use and cannot be used for other purposes, nor can it easily be modified to become usable.

Obsolete, unwanted and banned pesticides are serious environmental hazards. Leaking and corroding metal drums filled with obsolete and dangerous pesticides dot urban and rural landscapes of developing countries around the world. These chemical leftovers have become villains in the agricultural world they were designed to help, affecting not only a nation's agriculture and its environment, but also fundamentally the health of its people and consequently development in general be it in rural areas or under urban conditions.

This global environmental tragedy is a direct result of several decades of mishandling and misuse, but is most dramatic in the developing world where there is no awareness of the inherent danger of pesticides. The unaware therefore draw water from contaminated site for own survival and that of their animals.

Obsolete pesticides may include: <<READ SLIDE>>

Most of the affected countries are under tropical conditions where agricultural and vector pests flourish both in diversity and numbers. Migratory pests such as locusts, grasshoppers, grain eating birds, storage pests, rodents, etc. inflict untold damage to agriculture and bring about hunger or misery when they are at their peak.

Poor nations have been led to believe that the only alternative to combat pests agricultural or otherwise effectively is only by using pesticides. The poor or the unaware never think for a moment that pesticides are poisonous and that they are dangerous to life. Most believe that pesticides are like medicines. They consider that they kill pests selectively and are therefore less harmful to humans, animals and plants. Governments save budgets to purchase pesticides on regular basis. Also constantly plead to donors and organizations for assistance either for direct supply of pesticides or for contributions of financial support for purchasing them. In response, donors and organizations supply pesticides. Recipient countries anxious to minimize pest damages to the minimum or, being less aware of the negative consequences, usually receive pesticides from every possible source and direction. This leads to uncoordinated influx of pesticide donations and trading, subsequently giving rise to excessive supply. While some of the donations are genuine, others take the opportunity to dump unwanted and illegal pesticides on the poor and unsuspecting countries. Pesticides reach individual farmers or household dwellers that value pesticides dearly. They keep them in their houses, with their food and animals. Pesticide vendors take the opportunity to promote pesticides aggressively. It is not uncommon to find pesticides being stored in the open or in heavily populated zones and usually in substandard stores and sold along with

food and drinks, etc. Children are used in advertising sales of pesticides and often get easy access to pesticides. They play with empty pesticide cans and use them for drinking water or milk. Most pesticide cans litter streets or are simply dumped in open municipality dumps for subsequent open burning leading to serious emissions of dioxins affecting child waste pickers (scavengers) working in the informal recycling sector. Obsolete pesticides found in open waste sites may also be used/sold by waste pickers and re-introduce them into the agricultural sector.

Common causes of obsolete pesticides include the following:

Use of the product has been prohibited or severely restricted for health or environmental reasons (e.g. through banning; withdrawal of registration, or policy decision by relevant government agencies)

The product has deteriorated as a result of improper or prolonged storage and can no longer be used according to its label specifications and instructions for use, nor can it easily be reformulated to become usable again.

The product is not suitable for its intended use and cannot be used for other purposes, nor can it easily be modified to become usable.

Other possible reasons for why we have obsolete pesticide include:

Banning of pesticides that are still kept in store.

Aggressive pesticide sales, promotions and distributions by the Chemical Industry.

Difficulties in forecasting outbreaks of pest.

Inappropriate assessment of pesticide requirements.

Insufficient application capacity.

Inappropriate formulations or substandard containers.

Excessive donations: these are usually inappropriate because they are not received when needed most (i.e. late arrival of donations or out of season delivery), or are uncoordinated with similar donations from various sources. Such are tantamount to dumping.

Inadequate storage facilities and lack of staff trained in storage management (i.e. poor stock taking and lack of records).

Ineffective distribution or poor marketing systems for pesticides (government or private sector or both).

Lack of awareness of the inherent dangers of pesticides.

Misuse of pesticide containers (e.g. for a variety of domestic uses, water containers, food storage, use for pot plants, etc.).

Notes from FAO: www.fao.org/WAICENT/FAOINFO/AGRICULT/AGP/AGPP/Pesticid/Disposal/index_en.htm

ACUTE OCCUPATIONAL HAZARDS TO PESTICIDE APPLICATORS

- Acute poisoning while applying pesticides as a result of inhaling aerosols
- Contamination of exterminators during the mixing of concentrated hazardous pesticides
- Skin contact or ingestion of pesticides due to contamination, splashing, or spills
- Accidental inhalation of pesticide spray (caused by a sudden change of wind
- Accidental swallowing of a liquid pesticide mistakenly thought to be water
- Bursting of overpressurized spraying vessels
- Acute intoxication as a result of release into the atmosphere of hazardous materials

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DEATH IN A PESTICIDE APPLICATOR

- A young Mexican laborer was employed by a California company that processes edible nuts. When insects got into the nuts, it was customary to fumigate under tarps with methyl bromide.
- This young man had been assisting with fumigation
- He became ill rather suddenly at home that evening and died within a few hours
- The cause of death was discovered only after the coroner's office sent specimens to the State Health Department Laboratory which detected high concentrations of bromide
- A diagnosis was made of methyl bromide poisoning

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CHRONIC OCCUPATIONAL HAZARDS TO PESTICIDE APPLICATORS

- Increased risk for chronic neurodegenerative disease – Parkinson Disease
- Increased risk of cancer – leukemia and lymphoma
- Sterility - DBCP
- Increased risk of cancer in applicators' children
  - **Leukemia**
  - **Brain cancer**
  - **Hodgkin and non-Hodgkin lymphomas**
  - **Kidney cancer**

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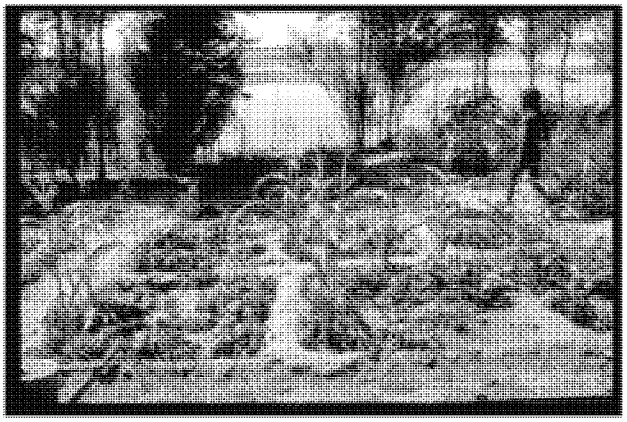
PREVENTION OF EXPOSURE

What can be done to prevent pesticide exposure and poisoning ?

- Take action at
  - Local level
  - National level
  - International



WHO

<<READ SLIDE.>>

Because of the potential for long-term damage to critical structures such as the nervous system, immune system and endocrine system, prevention of all acute poisoning events as well as of exposure to low doses during development is a high priority for ensuring children's environmental health. There are many steps that can be taken at the local/practice level, national/government level and international treaty/trade levels to decrease exposure to pesticides and related illnesses.

Picture: WHO, L. De Toledo. Ethiopia

Pesticides

PREVENTION – LOCAL LEVEL

Use pesticides ONLY when the benefits outweigh the risks

- Avoid cosmetic or routine use of pesticides in the home
- Use integrated pest management (IPM), non-chemical pest controls

If pesticides are necessary:

- Store in original containers with child-proof seals, out of reach, in a locked cabinet
- Educate on the safe use of pesticides
  - Follow manufacturer's instructions
  - Use protective equipment
  - Respect re-entry times
  - Pregnant women should not apply pesticides
- Use least hazardous chemicals, least dangerous mode of application
- Beware of moving day

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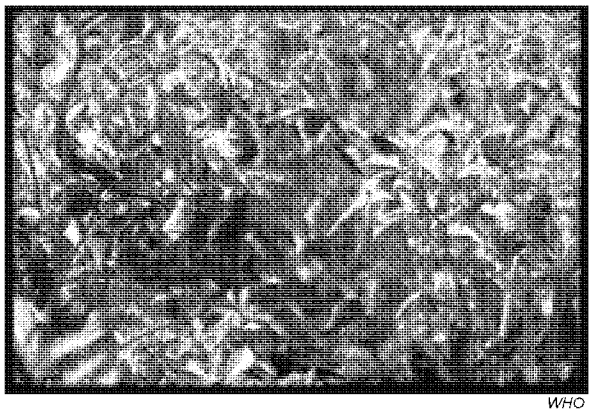
Pesticides should be used only when the benefits outweigh the risks, and non-chemical pest control procedures have failed.
Cosmetic use of pesticides, that is their use to control aesthetically unpleasant plants or non-dangerous insects such as crickets or house millipedes, should be completely avoided.
Integrated pest management (IPM) procedures which include hygiene, sealing of cracks and crevices, screening of doors and windows, and other measures should be the first line of defence for pest management.
If pesticides must be used, they should be stored only in their original containers with manufacturer's labels intact, preferably with child-proof seals, out of the reach of children and in locked cabinets or cupboards.
Users should always follow the safety precautions specified by the manufacturer and observe all safety recommendations including use of gloves, masks, protective clothing and observation of re-entry times (the time when it is safe to return to a treated area).
Pregnant women should not apply pesticides and particular care should be taken to determine appropriate re-entry times for pregnant women, infants and small children. These times may be considerably longer than for less vulnerable individuals.
If chemicals are required, the least hazardous chemical (when there is scientific evidence of less toxicity) should be used with the most contained mode of distribution considered effective. For example, fogs and bombs should not be used. Bait stations are preferable to baseboard sprays or crack and crevice treatment. Granules and bait stations should be used only if they are inaccessible to babies, toddlers and small children (and pets).

Refs:
UNEP Chemicals. Childhood Pesticides Poisoning. Information for Advocacy and Action. May 2004 (www.who.int/ceh/publications/en/pestpoisoning.pdf).
US EPA Webpage for Integrated Pest Management (www.epa.gov/pesticides/food/ipm.htm).

PREVENTION – COMMUNITY LEVEL

- **Integrated pest management (IPM)**
  - **Homes**
  - **Schools**
  - **Public buildings**
  - **Health centres**
  - **Public parks**
- **Community activities**
  - **Community campaigns**
  - **School activities**
  - **Local awards or contests**
  - **Pesticide-free "zones"**
  - **Support organic farming**



WHO

Many organizations (especially FAO and WHO) promote alternative non-chemical forms of pest-control and there is increasing engagement in non-pesticide dependent agriculture and integrated pest management (IPM).
A variety of local initiatives involving the community can help to create an environment that promotes decreased dependence on pesticides in homes, schools, public areas, health facilities and parks.

Examples of community activities include:
community campaigns and school activities
local awards or contests
pesticide-free "zones“
support for organic farming

FAO: Food and Agriculture Organization

<<READ SLIDE.>>
Picture: WHO, P. Virot. Plants at the Biofarm, Ethiopia, June 2002.

PREVENTION – NATIONAL LEVEL

- Education campaigns aimed at pesticide users, general population and children
- Restrict availability or limit use of most toxic pesticides
- Establish and monitor maximum residue limits
- Surveillance and epidemiological vigilance for acute and chronic related illness
- Build treatment capacities
  - Emergency services
  - Poison control centres
  - Education of health care providers

Education is a key component of safe pesticide use and prevention of toxic exposures. Farmers, pesticide applicators and their families need to be informed and educated on how to recognize and prevent pesticide poisonings. Trained or licensed pesticide applicators can maximize preventive measures. Educating mothers on home prevention strategies is particularly important.

Bans and restrictions on use of pesticides found to be highly toxic or persistent in the environment have been successful; severe poisonings are seen less frequently than in the past. For example, organochlorine poisoning no longer occurs in countries that restrict their uses to a specific agricultural application and have banned domestic use.

A major change in regulatory approaches to pesticides occurred when the US Congress passed the Food Quality Protection Act in 1996. This law requires the US Environmental Protection Agency to set residue levels for foods to protect the most vulnerable populations, specifically infants, children and fetuses (pregnant mothers) from harm due to cumulative exposure taking into account all routes of exposure. This law has led to the restrictions on use and voluntary withdrawal from the market by manufacturers of several previously widely used pesticides (e.g. chlorpyrifos and diazinon).

Pesticide manufacturers and governments should follow the voluntary FAO International Code of Conduct on the Distribution and Use of Pesticides.

Refs:

UNEP Chemicals. Childhood Pesticides Poisoning. Information for Advocacy and Action. May 2004 (www.who.int/ceh/publications/en/pestpoisoning.pdf).

US EPA Website Food Quality Protection Act, 1996 (www.epa.gov/oppfead1/fqpa/backgrnd.htm).

Pesticides

PREVENTION – INTERNATIONAL LEVEL

- **Persistent organic pollutants (POPs)**
  Stockholm Convention
- **Hazardous chemicals and pesticides**
  Rotterdam Convention (PIC)
- **International organizations:**
  WHO, IFCS, FAO, ILO

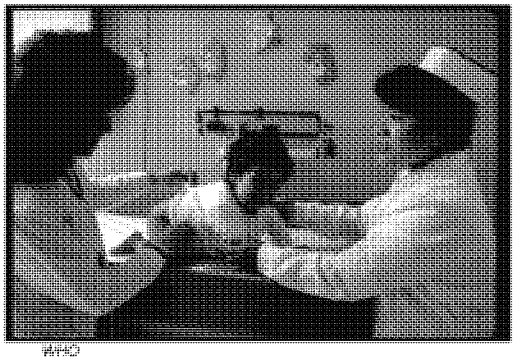
Pronczuk 29

Nine of the 12 persistent organic pollutants (POPs) included in the Stockholm Convention, are pesticides (aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, mirex, toxaphene and hexachlorobenzene). This convention, under the auspices of United Nations Environmental Programme became effective in May 2004, after it was signed by 50 countries. The Rotterdam Convention on the Prior Informed Consent (PIC) procedure for certain hazardous chemicals and pesticides was adopted in September 1998, and has been signed by 73 countries. The convention establishes a first line of defence against toxic chemicals, giving importing countries the power to receive information and decide which potentially hazardous chemicals they want to receive. It also covers labelling requirements. The convention includes 22 pesticides.
Other international organizations such as the Intergovernmental Forum for Chemical Safety (IFCS), the International Labour Organization (ILO) and others are working towards safer use and monitoring of pesticides at the global level.

IFCS: Intergovernmental Forum for Chemical Safety
FAO: Food and Agriculture Organization
ILO: International Labour Organization

Refs:
UNEP Chemicals. Childhood Pesticides Poisoning. Information for Advocacy and Action. May 2004 (www.who.int/ceh/publications/en/pestpoisoning.pdf).
www.pic.int

CRITICAL ROLE OF HEALTH AND ENVIRONMENT PROFESSIONALS



- Diagnose and treat
- Publish, research
  - Sentinel cases
  - Community-based interventions
- Educate
  - Patients and families
  - Colleagues and students
- Advocate
- Provide role model

Health and environment professionals have a critical role to play in maintaining and stimulating changes that will restore and protect children's environmental health, and protect them from pesticide exposure.
Health care providers can do something. At the one-to-one level with the patient, they can include pesticide poisoning in the differential diagnoses and in preventive advice.
They can be dissatisfied with the diagnosis of "idiopathic" in cases of paediatric disease and look harder for evidence pointing to pesticides as a potential cause of disease and disability.
They can ask specific questions about the use of pesticides within the home, in the garden or farming areas, or about potential pesticide residues in fruit and vegetables. Which pesticides are being used? When? Where? How? What safety and hygiene measures are being taken? Are the instructions being read and followed?
They can publish sentinel cases and develop and write about community-based interventions in relation to pesticides.
They can educate patients, families, colleagues and students didactically to diagnose, treat and prevent pesticide poisonings and exposures.
They can discourage chemical pesticide use and encourage integrated pest management.
They can also provide information about the local Poisons Centre or other sources of information on pesticides.
As professionals with an understanding of both health and the environment, health care providers are powerful role models who can practice integrated pest management, be advocates for strict pesticide laws and regulations, proper labeling of pesticide products and child-proof containers for all pesticide products.

THANK YOU

Message

From: Miller, Gregory [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=0E889CDC40224A5484182092E4824FA7-GMILLE03]
Sent: 6/30/2015 7:40:10 PM
To: AO-OCHP-Everyone [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=222d03d48d634481af638d4892296469-AO-OCHP-Everyone]
Subject: Slate.com article on workplace exposures

"The second part, which will run Wednesday, focuses on the risks unborn children face from their parents' exposures."

http://www.slate.com/articles/business/moneybox/2015/06/osha_regulations_of_silica_and_other_substances_they_re_out_of_date_and.single.html

Working to Death

Tens of thousands of workers suffer and die from toxic chemicals, fumes, and dusts each year. And the government's system to protect them is tragically broken.

By Jamie Smith Hopkins, Maryam Jameel, and Jim Morris

PORT BYRON, New York—Six weeks before Chris Johnson was born in 1974, the U.S. government **issued a warning** about a substance that would nearly kill him 30 years later.

The substance was silica, a component of rock and sand that is the scourge of miners, sandblasters, and other workers who breathe it in. When pulverized into dust, it can cause silicosis—a scarring of the lungs that leads to slow suffocation—as well as lung cancer.

This was no newly discovered hazard. The ancient Greeks and Romans were **mindful of it**. Labor Secretary Frances Perkins launched a **national campaign** against it in the 1930s after the knifelike particles dispatched hundreds of tunnel workers in West Virginia.

The 1974 warning by the National Institute for Occupational Safety and Health said the workplace exposure limit for silica put people in danger. NIOSH urged the Department of Labor's Occupational Safety and Health Administration to cut the limit in half.

OSHA finally did so in 1989, only to see its work undone by a **court decision**. It didn't try again until 2011. In the interim, Johnson became a bricklayer and developed acute silicosis after a five-month job that enshrouded him in dust. He's 40 and, on paper, can expect to survive less than five years.

As Johnson's experience shows, inaction has consequences. Silica—which OSHA says threatens **2.2 million workers, mostly in construction**—is a striking example of the government's failure to properly regulate toxic substances in American workplaces. The silica rule still isn't finished. If it is enacted despite industry protests, it will be only the 37th health standard issued by the agency in its **44-year history**.

It's an ignominious record given the human and economic costs of work-related disease in the United States. According to a widely cited University of California–Davis **study**, an estimated 53,000 people died in 2007 from on-the-job exposures—**outnumbering** those killed in suicides, motor vehicle accidents, falls, or

homicides. More than 400,000 others got sick. The price tag: an estimated $58 billion. OSHA puts the **annual toll** at more than 50,000 deaths and 190,000 illnesses.

The government has failed for 40 years to more strictly control silica, exposing countless workers to this lethal substance.

An 18-month investigation by the Center for Public Integrity has found that the epidemic of occupational disease in America isn't merely the product of neglect or misconduct by employers. It's the predictable result of a bifurcated system of hazard regulation—one for the general public and another, far weaker, for workers. Risks of cancer and other illnesses considered acceptable at a workplace wouldn't be tolerated outside of it.

For years the best OSHA has been able to do is set chemical limits so that no more than one extra cancer case would be expected among every 1,000 workers exposed at the legal maximum over their entire careers. The U.S. Environmental Protection Agency's standards for the public are 10 to 1,000 times more protective. The real gap is often worse, a former OSHA official says.

"I can't see any justification for treating people that differently," said Adam M. Finkel, who heads the **Penn Program on Regulation** at the University of Pennsylvania Law School and was director of health standards programs at OSHA from 1995 to 2000.

Bricklayer Chris Johnson contracted acute silicosis triggered by silica dust exposure on the job. The U.S. government has failed for 40 years to more strictly control silica in American workplaces—exposing countless other workers to this lethal substance—and leaving Johnson with a life expectancy of 45 years.

Among the Center's findings:

- Most of OSHA's 470 chemical exposure limits are, by the agency's own admission, grossly outdated and don't protect workers from a variety of ailments. Cancer, for instance: The agency's own analyses of 16 substances estimate that cancer risks associated with legal exposures to workers over their careers are as high as 6 in 10. Analyses of an additional 31 exposure limits by the Center and Finkel found cancer risks above 1 in 10 for nearly half the chemicals.
- The vast majority of the tens of thousands of chemicals made or used in the U.S., including some very common and toxic substances, have no workplace exposure limits. The lung-ravaging food flavoring diacetyl. The widely used herbicide glyphosate, recently named a probable carcinogen by the World Health Organization. The agents in chemotherapy drugs, hazardous to the health care workers preparing and handling them.
- Even apparent success stories—rare cases in which chemical limits were tightened—can be Pyrrhic victories. OSHA's own calculations suggest, for example, that the cancer risk for hexavalent chromium, a metal used in specialty paints and coatings, was as high as 1 in 3 at the limit in effect from 1971 to 2006. At the current, stricter standard, the risk is still as high as 1 in 22, OSHA acknowledges.
- Sampling for chemicals has fallen over the last three decades as workplaces multiplied but OSHA's staff levels stagnated. Even so, OSHA still finds exposures above legal limits, a Center analysis found. One in 6 samples containing hexavalent chromium, taken after the 2006 rule change, topped the limit of 5 micrograms per cubic meter of air. Samples containing lead, a brain-damaging metal that can accumulate on a worker's clothing and hurt the whole family, have exceeded the limit 40 percent of the time since 1984.
- NIOSH last did a nationwide workplace exposure survey more than three decades ago because it has not had the funding to update it. Critical information on both old and emerging chemical hazards across industries is missing, putting regulators and researchers at a disadvantage.

A profound toll

Job-related illness is a slow-motion tragedy few seem to understand or acknowledge. Its victims usually die one by one, out of public view, though disease clusters emerge on occasion.

More than 50 cases of bladder cancer, for example, have been **tied to a small Goodyear chemical plant** in Niagara Falls, New York, far above the expected number in the general population. NIOSH investigators identified the suspect chemical years ago: ortho-toluidine, used to keep tires from cracking. Exposures in the plant weren't extreme; in fact, they were "well below" the legal limit, the **investigators reported**.

Goodyear, which made changes to its factory after the problem came to light, **said in a statement** that all but one of the 54 bladder cancer cases identified through its own screening program involved workers who came to the plant before 1990.

"While the ortho-toluidine exposure levels in the plant have generally been far below the permissible exposure limits, engineering controls were put in place in the 1980s to further reduce levels in the plant," the company said.

Steve Wodka, a lawyer in New Jersey who represented about half the Goodyear victims in claims settled out of court, said he knows of 62 bladder cancer cases from the plant. He calls that cluster "probably the best example of the inadequacy of the system."

Ortho-toluidine is in a family of chemicals—aromatic amines—known since the 1930s to cause bladder cancer, Wodka said. Yet its exposure limit of 5 parts per million, adopted by OSHA in 1971, was fashioned only to protect workers from the chemical's acute effects, not cancer.

"It remains the law of the land today," Wodka said.

The blight of disease contracted on the job isn't confined to factory workers. It consumes hairdressers, grocery store meat wrappers, scientists, and people in a variety of other professions. Many are stricken by middle age.

The panoply of illnesses, from **nerve damage** to **dementia** to virulent **cancers**, takes a profound toll on workers and their families. Careers are lost, finances shredded, marriages tested. In some cases, workers opt for macabre, last-ditch procedures to try to save their lives.

"They basically clean you out like a fish," cancer victim Mike Dennen, who worked in asbestos-contaminated textile factories, said of his 2013 surgery. "They tell you before surgery you can end up without a bladder, you can end up without your intestines."

Federal regulators are overwhelmed by the scope of the problem, **which didn't materialize by chance**. Congress has exacerbated the situation by refusing to fortify the weak 1970 law specifying what OSHA can do. Trade groups have challenged health standards in court while workers have lost their lives. The White House's Office of Management and Budget is a vortex that sucks in proposed agency rules and doesn't spit them out for months—or years.

David Michaels, head of OSHA since 2009, speaks frankly about the results.

"With a few exceptions, OSHA's standards to protect workers from chemical exposures are weak and out of date, or simply nonexistent," he said in a recent interview.

He cited as an example the solvent hexane, which can **wreck the nervous system**. OSHA's exposure limit for the chemical is **500 parts per million**, 10 times the level NIOSH says is safe.

"We know workers get sick at levels below 500 parts per million," Michaels said. "We can't do anything about that."

David Michaels, head of OSHA since 2009, told the Center for Public Integrity that "with a few exceptions, OSHA's standards to protect workers from chemical exposures are weak and out of date, or simply non-existent."

Photo by Jamie Smith Hopkins/Center for Public Integrity

OSHA's exposure limits almost all date to its founding in 1971, he noted, when the agency adopted 1960s-era voluntary numbers **embraced by industry**. Few have been updated since, and only those few became full standards with specific technological and medical requirements.

"The law under which OSHA operates … forces us to go through a very, very complex, onerous process for regulating any individual chemical," Michaels said. "It takes many years and millions of dollars in studies to issue one standard. And that's why we've got only a few dozen standards."

An ancient hazard

Silicosis and other dust-related diseases, the 1974 NIOSH document reported, "have probably existed since man began to dig into the earth's crust." Silica was a cruelly efficient killer of stonecutters in the 17th century; slicing through the workers' lungs during necropsy was "like cutting a mass of sand," a Dutch physician reported in 1672. It silenced 19th-century sandstone masons in England long before they reached old age.

Silica also precipitated America's worst industrial disaster: the deaths of more than 750 workers—many black—who drilled a water-diversion tunnel through silica-rich rock near Gauley Bridge, West Virginia, in the early 1930s. Death estimates reached as high as 2,000, but the full count will never be known. Sick workers were booted out of company housing. Some who died on site were carted off to unmarked graves.

Four decades after that, in December 1974, Christopher Scott Johnson was born in Auburn, New York. His life almost perfectly tracks silica's tortured regulatory history.

The month of Johnson's birth, OSHA published an "advance notice of proposed rulemaking," indicating movement toward a new silica standard. That effort fizzled due to a lack of funds, according to the head of OSHA at the time.

Silica-related death and disease continued. As bad as things were in foundries and other dusty, fixed establishments, where workers legally could be exposed to twice the NIOSH-recommended silica limit, construction was far worse. Employers in that sector could subject workers to five times the recommended limit without breaking the law.

That's still the case.

Johnson landed in the construction category in 1993. He became a bricklayer, also known as a mason, following in the footsteps of two uncles. He crafted sidewalks and floors with bricks and stone, and helped repair and put up buildings.

"I was very happy with my job," he said in an interview at his home in Port Byron, west of Syracuse. "I felt fulfillment."

Johnson said he was oblivious to silica's destructive properties. That didn't matter until he was assigned a job in Rome, New York, in April 2004. Standing on hydraulic lifts, Johnson and his co-workers at a small contracting firm removed and replaced damaged brick from the façades of three apartment buildings operated by the Rome Housing Authority.

The work, which lasted through September of that year, generated "a tremendous amount of dust," Johnson said. "You're in a basket that's maybe 6 feet wide and 2 or 3 feet deep, so you're pretty much stuck right there."

The workers were given disposable paper masks, known by experts to be ineffective against microscopic silica particles. The one half-face respirator on the job had a broken strap, "so we didn't really use it," Johnson said.

It's not just factory workers. It's hairdressers, grocery store meat wrappers, scientists, and more.

They had tools to suppress the dust: Their diamond-bladed, 14-inch demolition saws came equipped with hose attachments for "wet cutting." But the project manager for the Housing Authority refused to allow the practice, fearing it would "make too much of a mess," according to an **affidavit** given by a former co-worker in a **lawsuit** Johnson later filed against the authority. OSHA rules, moreover, don't require it.

Johnson did "about 90% of the saw cutting and grinding on the job," his former colleague said in the affidavit. "In fact, he was often so covered in dust we nicknamed him 'Dusty.' "

Jim Baldwin, who joined the Housing Authority as executive director years later, said he would have allowed wet cutting "because of the danger caused by the inhalation of the fine dust."

"Not having proper respirators on the job was certainly a factor in the worker's illness," he added by email. "For that I would have shut the job down until that equipment was made available and was being used."

There is no way to know how much silica Johnson inhaled. But the current rule for construction is so weak, even employers that stay within the legal limit can be "sentencing someone to death from lung disease," said **Celeste Monforton**, a lecturer at George Washington University and a former Labor Department analyst and adviser.

By the time the Rome job ended, "something was not right with me," Johnson said. He was short of breath, losing weight rapidly, unable to do simple tasks without exertion. "I had no clue what was going on."

The answer came early in a three-week stay at the University of Rochester's Strong Memorial Hospital in December 2004. Johnson's parents drove him there after his right lung collapsed following a biopsy, and further tests showed he had acute silicosis triggered by mixed dust exposure.

He underwent an unusual procedure called a lavage, in which his lung was flushed of sticky material filling up the air sacs and robbing him of oxygen. He stayed on a ventilator for nine days.

"None of the doctors really even knew if he was going to pull through or not," said his wife, Beverly.

Chris Johnson and his wife, Beverly, in February 2015.

Photo by Maryam Jameel/Center for Public Integrity

The procedure didn't help much. Johnson continued to struggle for air as he rested fitfully at home in early 2005. He was a candidate for a double lung transplant, a prospect he found unappealing once he learned the odds of survival: Less than half of patients would live five years, and less than a quarter would survive 10.

He opted instead for a second lavage at the Cleveland Clinic in May 2005. This one took. By 2006 his lung disease had stabilized, though it hadn't been cured.

Internist and lung specialist Dr. William Beckett treated Johnson in Rochester and was so struck by the severity of the young mason's condition that he co-authored an article about it for a medical journal. In an interview, he noted the banality of the substance that had gummed up Johnson's lungs.

"This is not an unusual material. It's not exotic," Beckett, now affiliated with Harvard Medical School and Mount Auburn Hospital in Cambridge, Massachusetts, said of silica. "It's something that everybody is around, but the people who cut through it or work with it are susceptible to getting disease from it."

Beckett chaired an American Thoracic Society committee that called for a stricter OSHA silica limit in 1997. To his dismay, the old one is still in place.

"There are many, many, I'm sure, young men in the United States who are doing the same kind of job [Johnson did]," he said, "and probably getting the same kinds of exposures."

Forty years of futility

OSHA's 40-years-and-counting quest to keep silica from killing workers is a study in inertia and frustration. The agency tried to tighten exposure limits for silica and 375 other substances in a 1989 rule, but a federal appeals court **struck it down**, saying the analyses OSHA used to justify the rule weren't detailed enough.

It took OSHA nearly two decades to regroup, even though it deemed silica a regulatory priority in **1995** and **2002**. In the meantime, **evidence hardened** that silica could cause **lung cancer** in addition to silicosis.

It's unlikely any group of workers has felt the sting of lax silica controls more than **sandblasters**, who use pressurized guns to shoot sand at corroded surfaces to prepare them for painting. The sand breaks apart as it strikes metal, creating clouds of dust laced with invisible shards of quartz that scar the lungs.

NIOSH, **noting available alternatives** such as nut shells and sawdust, suggested in 1974 that sandblasting with silica be **banned**. Britain and a swath of mainland Europe had **already done so** by that point.

But industry groups in the United States, like the euphemistically named Silica Safety Association, composed of purveyors and beneficiaries of sandblasting, lobbied successfully in the 1970s to fend off a ban, predicting economic hardship.

In February 2011, OSHA finally sent a proposed silica rule to the Office of Management and Budget for vetting. It emerged **921 days later** in 2013. OMB officials will not say why it took so long; 90 days, plus a single 30-day extension, is supposed to be the maximum unless the rulemaking agency asks for more time.

Apart from trimming the silica exposure limit to the NIOSH-recommended number for all workers, the **proposed standard** would require employers to control dust with methods such as water or vacuum systems and provide medical monitoring for highly exposed workers. OSHA predicted it would save nearly 700 lives and prevent 1,600 new cases of silicosis per year.

The Labor Department held **14 days** of hearings in Washington, D.C., in the spring of 2014. Among the witnesses was construction worker Santiago Hernandez, who'd come to the United States five years earlier from Tlaxcala, Mexico, expecting to find safer conditions.

Instead, he said in **written testimony**, "things are actually much worse here than in Mexico. ... The protections you receive here are useless. Employers give you a little paper mask that, when you finish, is just as dirty and dusty on the inside as on the outside."

Dale McNabb, a tile setter from Warren, Michigan, **spoke** of developing "breathing problems at night" in his 20s. "By the time I was 30 I felt it more. I could hear my labored breathing and wheezing, and it shocked me."

In 2008, when he was 42, he volunteered to use a grinder to remove thinset—a mortar made of cement and sand—from a wall over the course of several weeks. "At the end of the project I was feeling pretty bad," McNabb testified. Tests showed "shadowing in my pleural membrane so severe that the membrane was almost opaque, and there were several lesions on my lungs.

"When I get exposed to dust now—and not just silica dust, any dust—it feels like I have a plastic bag around my head and someone's trying to pull it shut on me," McNabb said. He got a job as a shuttle bus driver, then in financial services, and is thankful he can work. But the stress that followed his health crisis left a lasting mark. "In the end, silica exposure cost me my job, my health and also my marriage."

Industry witnesses also shared doleful stories—what would happen to companies if they had to comply with the proposed rule.

The American Foundry Society, **disputing** OSHA's cost estimates, said the standard would eat up 10 percent of the industry's revenue and "threaten the viability of foundries across the country."

The American Chemistry Council, the chemical industry's main trade group, **said** the silicosis death rate has dropped more than 90 percent since 1968. Neil King, a lawyer for the council, blamed newer cases on

exposures "that occurred decades ago" and more recent exposures that far exceeded the current limit—something that happens regularly, he said.

And the U.S. Chamber of Commerce, which represents more than 3 million businesses, suggested that OSHA ought to take more time on an effort already four decades old.

"We have serious concerns about this rulemaking being rushed," said Henry Chajet, a lawyer who **spoke** for the chamber.

Industry groups have kept up the pressure as the rule has inched toward final form.
That **includes** pointed **comments** from the chamber, a lobbying powerhouse **that spent $124 million** to press for its members' interests in 2014—more than the next four top-ranked groups combined.

About 30 people march outside the U.S. Chamber of Commerce on June 5 to protest the chamber's opposition to a stricter silica standard. Marc Freedman, the trade group's executive director for labor law policy, watched from the steps and chuckled. "It's lame," Freedman told a Center reporter. "Why do they think the chamber is the reason this [standard] hasn't happened?"

Photo by Maryam Jameel/Center for Public Integrity

OSHA's **economic analysis** projected that while affected businesses would spend an estimated $664 million annually to comply with the proposal—about **$1,242 for the average workplace**—the net benefits would range from about $2.9 billion to $4.7 billion a year, values OSHA applied to avoided disease.

In a congressionally requested **1995 review** of past OSHA actions, the since-**dismantled** Office of Technology Assessment found that the agency tended to overestimate the cost its health rules would impose on industry—often in a big way.

Nonetheless, in March the Construction Industry Safety Coalition, composed of 25 trade groups, said its **own study** concluded that a new silica standard would cost construction companies nearly $5 billion a year—10 times what OSHA had calculated for that industry. It could be "the most expensive OSHA standard ever for the construction industry," the coalition **warned**.

OSHA is undeterred, Michaels told the Center. "President Obama has made it very clear he is committed to getting the silica standard out while he's president." A final rule is expected by the end of 2016, a Labor Department spokeswoman said.

But the Senate Appropriations Committee last week approved an **appropriations bill rider** that would require more study before the rule could be issued, which would put the proposal at the mercy of the next president. And even if the rule is enacted, that may not be the final word. Industry almost always challenges OSHA standards in court, which can delay or overturn them.

Reports from public health officials, meanwhile, show that silica remains a workplace menace.

Congress has exacerbated the situation by refusing to fortify the weak 1970 law specifying what OSHA can do.

In 2012, NIOSH researchers said they collected 116 air samples at sites in five states where shale deposits were tapped with the oil and gas extraction technique known as hydraulic fracturing, or fracking. Vast quantities of high-silica sand are used to hold open fissures underground, allowing the product to flow into wells; the NIOSH team **found** that nearly half the samples were above the current OSHA exposure limit, creating an "inhalation health hazard."

Almost 80 percent were above the NIOSH-recommended limit—the number OSHA wants to enact.

Another group of NIOSH researchers **reported in June** that silicosis deaths, after decreasing for years, are rising again. Silicosis was listed as the underlying or contributing cause of death for 88 people in the U.S. in 2011, **down from 164** a decade earlier, but such deaths rose to 103 in 2012 and 111 in 2013.

Those who died during the three-year period included a dozen people younger than 45. Researchers called this "concerning," saying it suggested that intense exposures, of the sort that sickened Chris Johnson, were occurring. Their data didn't reflect other illnesses linked to silica, such as lung cancer, chronic obstructive pulmonary disease, and kidney disease.

The five-decade plunge in silicosis deaths cited by trade groups reflects a shift from manufacturing to service jobs, NIOSH said in a statement to the Center.

"That does not mean that the risk for developing silica-related diseases … is acceptable in those that still work in dusty trades," the agency said.

"Scott's not here"

Last summer, encouraged by his tolerable if imperfect state of health, Johnson tried to get back into masonry. The experiment lasted a few weeks.

"I just couldn't do it anymore," he said. "And then I did try to do a factory job, and that didn't work."

A stepfather to three boys, Johnson lifts weights, runs on a treadmill, and busies himself with household projects. Six feet tall and 250 pounds, he betrays no outward sign of infirmity. Having settled his lawsuit against the Rome Housing Authority, he's in decent financial shape and is determined to exceed his predicted life span of 45 years.

Still, Johnson said, "I'm affected a lot by my lungs now. I'm constantly getting sick." A cold that would sideline the average person for a day or two immobilizes him for weeks. "It puts me right down to where I have no energy," he said.

But Johnson is grateful to be alive. He's already had more time than some workers struck with silicosis.

Bricklayer Scott Whipps, shown here with his dog Maddy, died of silicosis at 38 in 2006.

Photo courtesy of Judy Schoon

Scott Allen Whipps—like Johnson, a mason—died at 38 in 2006, four years after being diagnosed with the disease. His final months were agonizing.

"He coughed nonstop," said his mother, Judy Schoon of Fergus Falls, Minnesota. "He coughed up blood. He coughed so much that he'd vomit."

Schoon and her husband, Jim, Whipps' stepfather, witnessed it all firsthand. They'd taken in Whipps during those last months, and his bedroom was next to theirs.

"The goal was always a lung transplant, but he could never get the infection out of his body, so he couldn't be considered for one," Judy Schoon said.

One of his lungs turned gangrenous, and shortly after surgery, his condition deteriorated until his hold on life was "very tenuous," according to a doctor's report. Whipps would wake up screaming in the hospital for his mother. Doctors tried another surgery to save him, to no avail. He died an hour and a half after medical personnel unhooked him from life support, his family telling him to go where the pain would not follow.

It's been nine years. Judy Schoon still hasn't processed her son's early death. Losing a child, she said, is "unnatural."

"I wake up sometimes," Schoon said, "and think, 'Oh—Scott's not here.' "

This story was **published** *by the* **Center for Public Integrity**, *a nonprofit, nonpartisan investigative news organization in Washington.* **It part of** a **series** examining the epidemic of work-related disease in America. The second part, which will run Wednesday, focuses on the risks unborn children face from their parents' exposures. For more on its investigation, follow the Center for Public Integrity on **Twitter** and join the conversation on its **Worker Safety Facebook group**.

Jamie Smith Hopkins is a reporter for the Center for Public Integrity's environmental health and labor desk.

Maryam Jameel is a reporter for the Center for Public Integrity's environmental health and labor desk.

Jim Morris is the managing editor of the Center for Public Integrity's environmental health and labor desk.

Message

From: Spire, Paul [PSpire@aap.org]
Sent: 8/21/2015 4:32:38 PM
To: Ahdoot, Samantha [Ex. 6]; John.Balbus@nih.gov [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=2c555339753d4bedb1a7a321779b25f6-John.Balbus@nih.gov]; Baum, Carl [carl.baum@yale.edu]; Bernstein, Aaron [Aaron.Bernstein@childrens.harvard.edu]; Bole, Aparna [Aparna.Bole@UHhospitals.org]; Brubaker, Todd [Ex. 6]; Brumberg, Heather [Heather_Brumberg@NYMC.edu]; Campbell, Carla C [Ex. 6]; DeNicola, Nate [Ex. 6]; Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Gadhia, Ami [agadhia@aap.org]; Lanphear, Bruce [blanphear@sfu.ca]; Laris, Zachary [zlaris@aap.org]; Lowry, Jennifer [jlowry@cmh.edu]; Mortensen, Mary [zeo4@CDC.GOV]; Pacheco, Susan [Susan.E.Pacheco@uth.tmc.edu]; Spanier, Adam [aspanier@peds.umaryland.edu]; Trasande, Leo [leonardo.trasande@nyumc.org]; Ward, Mary [wardm@mail.nih.gov]
Subject: FW: AAP Pediatric Dermatology publication, COEH review thru 9/4
Attachments: removed.txt; Chapter 43.docx; Chapter 44.docx; Chapter 45.docx; Pesticides - Ped Env Health, 3rd Ed.pdf

Dear COEH,

I am writing to forward the attached 3 draft chapters from the forthcoming new edition of the AAP's Pediatric Dermatology manual. These 3 chapters were identified for COEH because of their discussion of the use of pesticides (Permethrin, Lindane, DEET, etc.), which are also addressed in COEH-authored policy documents including the "Pesticides" policy statement and technical report, and the green book chapter on Pesticides. The review being requested of COEH is primarily with regard to the conformance (or if there is any disconnect) with existing AAP policy around these issues. Please note that the Committee on Infectious Diseases has information on these topics in the Red Book and the Council on School Health recently published an updated head lice statement, so I believe these groups are reviewing as well.

Information about the review process is below. Please "respond to all" on this email with any input by Friday, Sept 4. I will then compile all input and submit to the publications folks.

For convenience, the green book chapter is attached.

The Pesticides policy statement is here:
http://pediatrics.aappublications.org/content/130/6/e1757.full

The technical report:
http://pediatrics.aappublications.org/content/130/6/e1765.full

Many thanks,

Paul

Thank you for agreeing to review the attached text sections within the upcoming 3rd edition of this AAP publication from the Section on Dermatology (titled: *Pediatric Dermatology: A Quick Reference Guide*). This popular book is designed to be a practical, easy-to-use tool for the busy practitioner. It is not an exhaustive reference; instead it provides a concise summary of the most common dermatologic disorders, with a standardized format that includes a brief background, physical findings, diagnostic modalities, and treatment approaches.

In your role as a reviewer, we're hoping that you will be an extra set of eyes to look over the text prior to publication, helping to ensure that the content is medically accurate and consistent with current AAP recommendations. This step

should not involve writing or rewriting - you will simply be asked to provide specific suggestions for the editors to consider in developing the final text. Please note that the manuscript does include design/production instructions, which you can disregard. The important requested turnaround date for your review comments is **Friday, Sept. 4, 2015** (the close of the review period) - your assistance is very much appreciated.

Chapter 43: Head Lice
Chapter 44: Insect Bites and Papular Urticaria
Chapter 45: Scabies

You can feel free to make your edits, comments, or suggestions using Track Changes in Microsoft Word to be e-mailed as an attachment to Peter Lynch (plynch@aap.org).

Peter Lynch
Manager, Digital Strategy and Product Development
American Academy of Pediatrics
141 Northwest Point Blvd.
Elk Grove Village, IL 60007

Ex. 6

New Sites! New Features! Visit today!

Message

From: Firestone, Michael [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=32A70F97969D462DA98320E25D27FE23-MFIRESTO]
Sent: 6/30/2015 6:15:41 PM
To: Johnson, Barnes [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=c39e9338cbf04dc3b4b29f78e5213303-Johnson, Barnes]; Morris, Jeff [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=55c34872e6ea40cab78be910aec63321-Morris, Jeff]; Hauchman, Fred [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=f8bf9785f32048ccad5f60b25a72017d-Hauchman, Fred]; Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Coleman, Cheryl [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a002614aa0b240d698f09e4a7eafc8da-Coleman, Cheryl]; Mooney, Charlotte [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=74344eb699144ed98c9afaaf63139307-CMOONEY]; Villamizar, Nicole [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=1b7e94810445483f920aa968955481b9-NVillami]; Chow, Rita [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=bc5346c7ded647bbb87b4a09b4118cbd-RCHOW]
CC: ORCR IO [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=feb18e156b3547d1881d93c5893396f8-ORCR IO]
Subject: WHO adds one of world's most popular weedkillers to list linked to cancer

FYI from the Washington Post

WHO adds one of world's most popular weedkillers to list linked to cancer

By Ariana Eunjung Cha June 23

Pesticide warning sign on a bright green lawn. (Bigstock)

A weedkiller sprayed widely on farms and used in a number of popular lawn-care products has been designated as "possibly" carcinogenic to humans by a World Health Organization research arm.

The analysis, published in Tuesday's the Lancet Oncology, showed that there is strong evidence that the herbicide, 2,4-D, causes an imbalance in the body called oxidative stress, and moderate evidence that it leads to immunosuppression, but the panel concluded that there was insufficient information to make a stronger link to cancers.

The WHO's International Agency for Research on Cancer also classified the insecticide lindane, which was once used for insect control in agriculture and as a treatment for lice but is now restricted as a moderately hazardous substance, as carcinogenic for non-Hodgkin lymphoma — its strongest classification — and the insecticide DDT, introduced in World War II and later banned in many parts of the world, as "probably" carcinogenic. In March, the group also gave the "probably" carcinogenic label to glyphosate, the active ingredient in Monsanto's flagship herbicide Roundup, which had been the No. 1 weedkiller in the United States.

The addition of 2,4-D to the WHO group's cancer list is especially significant because it is so widespread in our environment today. The chemical, made by Dow AgroSciences and contained in products such as Ortho Weed B Gone Max and Bayer Advanced Lawn Weed & Crabgrass Killer, has been found on golf courses, in parks and other grassy areas and in waters used by recreational swimmers and treated for aquatic weeds. Low-level residue has also been documented in crops and drinking water.

In a 2012 article by a Natural Resources Defense Council (NRDC) researcher in the Atlantic, 2,4-D is referred to the "Agent Orange in Your Backyard:"

2,4-D was invented in the chemical boom during World War II, making it one of the oldest pesticides that's still legally on the market today. It was one of the two active ingredients in Agent Orange, the notorious Vietnam War defoliant. Despite decades of scientific studies showing links to non-Hodgkin's lymphoma in humans (and Canine Malignant Lymphoma in household dogs), this chemical survives and thrives as one of the top three pesticides sold in the United States today. Newer science shows that it's not just a cancer problem, but that this pesticide interferes with several essential hormones, thereby increasing the risks of birth defects and neurologic damage in children. Studies in Midwest wheat-growing areas (where 2,4-D is heavily used) have shown increased rates of certain birth defects, especially in male children, and lower sperm counts in adults.

Dow said in a statement obtained by Reuters that the new classification is "inconsistent with government findings in nearly 100 countries" that have affirmed the safety of 2,4-D when used as labeled.

The U.S. Department of Agriculture, in its most recent guidance on the chemical, notes that "'Agent Orange' was a mixture of herbicides 2,4,5-T and 2,4-D, kerosene and diesel fuel." However, the substance of concern is "high levels of dioxin, a contaminant found in 2,4,5-T that causes cancer and other health concerns in people."

The EPA stopped use of 2,4,5-T in 1985 because of these risk but considers 2,4-D "safe when used according to the EPA-approved labeling."

Michael P. Firestone, Ph.D.
Regulatory Support & Science Policy Division
Office of Children's Health Protection (MC 1107T)
Office of the Administrator
U.S. Environmental Protection Agency
Room 1130 EPA West Building
Washington, DC 20460
Office: 202-564-2199 (Monday thru Wednesday)
Cell: Ex. 6 (Thursday)
FAX: 202-564-2733

From: Johnson, Barnes
Sent: Tuesday, June 30, 2015 8:31 AM
To: Morris, Jeff; Hauchman, Fred; Etzel, Ruth; Coleman, Cheryl; Mooney, Charlotte; Villamizar, Nicole; Chow, Rita; Firestone, Michael
Cc: ORCR IO
Subject: FW: my draft memo to CPSC, and supporting documentation, attached

FYI – sharing this information with the crumb tire group.

Barnes Johnson
USEPA | Resource Conservation and Recovery | Tel 703-308-8895 | johnson.barnes@epa.gov

---

From: Walt Sanders [mailto:wsanders@vmgthehill.com]
Sent: Monday, June 29, 2015 10:19 PM
To: Johnson, Barnes
Cc: 'Rom Reddy'; 'Heard Smith'; 'Gill, Darren'
Subject: FW: my draft memo to CPSC, and supporting documentation, attached

Barnes,

I thought you would be very interested in Dr. Greene's response to the CPSC report on rubber mulch used in playgrounds.

Walt A. Sanders
Vice President Law & Government Affairs
Van Fleet Associates, Inc.
1800 Diagonal Road, Suite 600

Alexandria, VA 22314
Ex. 6 (O)
C)
(703)647-7531(fax)

From: Laura Green [mailto: Ex. 6
Sent: Monday, June 29, 2015 8:30 PM
To: Walt Sanders
Subject: Fwd: my draft memo to CPSC, and supporting documentation, attached

Dear Walt,
I thought that you might like to read the attached.

with best regards,
Laura

Laura C. Green, Ph.D., D.A.B.T.
Consulting toxicologist
106 Sumner Road
Brookline, MA 02445

Laura.Green@alum.MIT.edu

cell phone: Ex. 6
home office phone: Ex. 6

---------- Forwarded message ----------
From: **Laura Green** < Ex. 6
Date: Mon, Jun 29, 2015 at 4:35 PM
Subject: Fwd: my draft memo to CPSC, and supporting documentation, attached
To: clearinghouse@cpsc.gov

Dear Sir or Madam,
Attached please find my comments on

CPSC Report #20150608-22F81-2147431268:
An assessment of the risk of cancer posed by rubber mulch used in playgrounds

Thank you for the opportunity to provide these comments. Please call or write with any questions or concerns.

with thanks again and best regards,

Laura

Laura C. Green, Ph.D., D.A.B.T.
Consulting toxicologist
106 Sumner Road
Brookline, MA 02445

Laura.Green@alum.MIT.edu

cell phone: Ex. 6
home office phone: Ex. 6

Message

From: Spire, Paul [PSpire@aap.org]
Sent: 1/23/2018 11:22:46 PM
To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Balk, Sophie [sbalk@montefiore.org]
CC: Jennifer Lowry [jlowry@cmh.edu]
Subject: additional chapters back from copyediting
Attachments: 33 - Mercury.gbm.review.docx; 37 - POPs.gbm.review.docx; 46 - Arts and Crafts.gbm.review.docx; 54 - Emerging Technologies.gbm.review.docx; AppC - Curricula.gbm.review.docx

Dear Ruth and Sophie,

I am writing to forward the attached additional 5 chapters received back from the medical copy editor. (Along with the 8 chapters forwarded to you on Friday, this completes the first batch of 13 chapters sent to the medical copy editor.)

Please note that these were done over the weekend, before we had received your initial feed back on the first 8.

I have a meeting set-up on Thursday with Publications staff to discuss the recurring issues that have been noted so far: 1) Issues with broken URLs. 2) Questions about cross-referencing. We can talk about any other recurring issues on our editors call tomorrow (Wednesday). For these 5 chapters, I have tried to insert appropriate replacement URLs where the editor noted there were broken links.

As with the previous batch, if you agree with the copy editor suggested changes, please leave the chapter as it appears (ie, don't accept changes). If you have additional suggested changes or responses to queries, please be sure to do this in track changes (right on top of any track changes that Gayle entered, if necessary).

Once you approve these chapters, they will move to the pile for board review.

Many thanks,

Paul

From: Spire, Paul
Sent: Friday, January 19, 2018 5:31 PM
To: Etzel, Ruth <etzel.ruth@epa.gov>; Balk, Sophie <sbalk@montefiore.org>
Cc: Jennifer Lowry <jlowry@cmh.edu>
Subject: FW: Chapters back from copyediting

Dear Ruth and Sophie,

I am writing to forward the attached 8 chapters received back from the medical copy editors. The primary medical editor will be "Gayle," who is a freelancer hired to work on this book. You will also notice some comments/changes from Jason Crase on a few of the chapters, who is an AAP staffperson. I believe he was involved only to review Gayle's work as we get started. I don't believe he will be involved in reviewing all 69 chapters.

If you have any questions or concerns about the copyediting, things you would like to see done differently, or guidance that you would like to pass forward, please let me know and we can either email or arrange a conversation with Gayle through publications.

If you agree with the copy editor suggested changes, please leave the chapter as it appears (ie, don't accept changes). If you have additional suggested changes or responses to queries, please be sure to do this in track changes (right on top of any track changes that Gayle entered, if necessary).

Once you approve these chapters, they will graduate to the pile for board review.

Many thanks,

Paul

Message

From: US EPA Children's Health [kargbo.marcia@epa.gov]
Sent: 1/23/2018 10:00:32 PM
To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]
Subject: Welcome to the latest edition of the EPA's Children's Environmental Health Bulletin!

Office of Children's Health Protection

Children's Environmental Health Bulletin

Learn About Risk from Radon

You can't see, smell or taste radon, but it could be present at a dangerous level in your home. Radon is the leading cause of lung cancer deaths among nonsmokers in America and claims the lives of about 21,000 Americans each year. In fact, EPA and the U.S. Surgeon General urge all Americans to protect their health by testing their homes, schools and other buildings for radon.

Exposure to radon is a preventable health risk and testing radon levels in your home can help prevent unnecessary exposure. If a high radon level is detected in your home, you can take steps to fix the problem to protect yourself and your family.

Learn more

Dear Ruth,

We want to hear from you! EPA's Office of Children's Health Protection is in the process of making changes to the Children's Environmental Health Bulletin to ensure we continue to provide relevant, current, and clear public health information to the general public. If you have any comments on the layout, content or structure of the bulletin, please email them to Marcia Kargbo at Kargbo.Marcia@epa.gov.

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Announcements & Updates

Agricultural Worker Protection Standard; Reconsideration of the Requirement for Minimum Age of 18 for Pesticide Handlers

EPA is providing notice to the public that it has initiated a rulemaking process to revise certain requirements in the Agricultural Worker Protection Standard (WPS), in particular the establishment of a minimum age of 18 years for pesticide handlers and for early entry workers. EPA received comments on the WPS requirements. **For more information concerning the comments received see:** https://www.regulations.gov/searchResults?rpp=25&po=0&s=EPA-HQ-OA-2017-0190.&dct=PS under Public Submissions. The 2015 WPS established a minimum age of 18 years for pesticide handlers and for early entry workers, with an exemption for owners of agricultural establishments and their immediate family members.

For more information, see: https://www.gpo.gov/fdsys/pkg/FR-2017-12-21/pdf/2017-27303.pdf

Certification of Pesticide Applicators Rule; Reconsideration of the Minimum Age Requirements

EPA is providing notice to the public that it has initiated a rulemaking process to revise the minimum age requirements in the Certification of Pesticide Applicators rule. **For information about the rule, see:** https://www.epa.gov/pesticide-worker-safety/revised-certification-standards-pesticide-applicators. EPA expects to publish a Notice of Proposed Rulemaking in FY 2018 to solicit public input on these proposed revisions to the rule.

For more information, see: https://www.gpo.gov/fdsys/pkg/FR-2017-12-19/pdf/2017-27302.pdf

EPA Launches Cross-Agency Effort to Address Polyfluoroalkyl Substances

On December 4, 2017, EPA announced a cross-agency effort to address per and polyfluoroalkyl substances (PFAS). PFAS, which includes PFOA, PFOS and GenX, are a diverse group of compounds resistant to heat, water, and oil that are persistent in the environment and resist degradation.

If humans ingest PFASs (by eating or drinking food or water that contain PFASs), the PFASs are readily absorbed, and can accumulate in the body over time. Exposures to PFASs are known to have a number

of adverse effects in laboratory animal and human epidemiology studies including reproductive and developmental (e.g., low infant birth weight in human studies), liver, kidney, and immunological effects.

As part of the agency's work, EPA will:

- Identify a set of near-term actions that EPA will take to help support local communities.
- Enhance coordination with states, tribes and federal partners to provide communities with critical information and tools to address PFAS.
- Increase ongoing research efforts to identify new methods for measuring PFAS and filling data gaps.
- Expand proactive communications efforts with states, tribes, partners and the American public about PFAS and their health effects.

For more information, see: https://www.epa.gov/newsreleases/epa-launches-cross-agency-effort-address-pfas

Pesticide Final Interim Decisions and Case Closures

Registration review is EPA's periodic review of pesticide registrations to ensure that each pesticide continues to satisfy the statutory standard for registration; that is, the pesticide can perform its intended function without causing unreasonable adverse effects on human health or the environment. Through this program, EPA is ensuring that each pesticide's registration is based on current scientific and other knowledge, including its effects on human health and the environment. (Please note that only children's health concerns are highlighted here).

EPA has announced the availability of EPA's final interim registration review decision for the following pesticides: Bifenazate (EPA-HQ-OPP-2012-0633), Clethodim (EPA-HQ-OPP-2008-0658), Ethalfluralin, (EPA-HQ-OPP-2011-0094), Fenitrothion (EPA-HQ-OPP-2009-0172), and Pirimiphos-methyl (EPA-HQ-OPP-2009-0056). There are no children's health concerns for these pesticides that would require mitigation.

EPA has also announced the case closure for Metiram (EPA-HQ-OPP-2015-0290) because all of the U.S. registrations for this pesticide have been canceled.

For more information, see: https://www.gpo.gov/fdsys/pkg/FR-2017-12-15/pdf/2017-27095.pdf and www.regulations.gov for each docket.

Public Comment Opportunities

Draft Human Health Risk Assessments for Pesticide Registration Reviews Public Comment

Registration review is EPA's periodic review of pesticide registrations to ensure that each pesticide continues to satisfy the statutory standard for registration, that is, the pesticide can perform its intended function without unreasonable adverse effects on human health or the environment. As part of the registration review process, the Agency has completed comprehensive draft human health and/or ecological risk assessments for a number of pesticides. (Please note that only children's health concerns are highlighted here.)

Comment Period Until February 13, 2018. For additional information, see: https://www.gpo.gov/fdsys/pkg/FR-2017-12-15/pdf/2017-27098.pdf

- **Abamectin** is an **insecticide** and miticide registered for use on numerous agricultural field crops, nursery and greenhouse ornamentals, non-bearing trees and shrubs, turf (golf course greens, tees, and fairways), Christmas trees, seed treatments, and insect baits, and is proposed as a spot and crack and crevice treatment against household pests. Spot use on carpets

resulted in risk estimates of concern for children 1<2 years old. For the Draft Human Health Risk Assessment for Abamectin, see: https://www.regulations.gov/document?D=EPA-HQ-OPP-2013-0360-0032

- **Bifenthrin** is a pyrethroid used as an insecticide, miticide, and termiticide used on various agricultural field and orchard/vineyard crops, ornamentals, Christmas tree farms, turf, outdoor perimeter treatments; as a dog shampoo; as an indoor/outdoor surface treatment; and as a seed treatment for various food/feed crops. There are additional proposed food crop uses. For existing and proposed uses, the acute dietary endpoint is not of concern when a preharvest interval of 7 days is required for the *Brassica* leafy subgroup 4-16B crops. Risk estimates of concern for children 1 < 2 years of age were identified from residential use on lawns/turf and spray drift from agricultural use on tobacco. For the Draft Human Health Risk Assessment for Bifenthrin, see: https://www.regulations.gov/document?D=EPA-HQ-OPP-2010-0384-0247

- **Buprofezin** is an insect growth regulator used on a variety of food/feed crops and ornamentals. Its metabolite, aniline, formed in food as a result of cooking, is classified as a probable human carcinogen. There are no dietary risks of concern and no residential exposures. However, a spray drift assessment for use on orchards/vineyards resulted in risks of concern for children 1 < 2 years of age. For the Draft Human Health Risk Assessment for Buprofezin, see: https://www.regulations.gov/document?D=EPA-HQ-OPP-2012-0373-0029

- **Chlorpropham** is a plant-growth regulator used on post-harvest potatoes, Easter lilies, and ginkgo trees. There are no dietary risks of concern and no residential exposures. However, a spray drift assessment for use on Easter lilies resulted in risks of concern for children 1 < 2 years of age. For the Draft Human Health Risk Assessment for Chlorpropham, see: https://www.regulations.gov/document?D=EPA-HQ-OPP-2010-0923-0027

- **Cyfluthrin and Beta-Cyfluthrin** are non-systemic pyrethroid insecticides used on a wide variety of food/feed crops, as a seed treatment, and in a variety of commercial and residential settings. The acute dietary analysis is just below the level of concern for children 1<2 years old. Certain residential uses result in risk estimates of concern for children 1 < 2 years old, including indoor broadcast use, indoor perimeter/spot/bedbug treatment using coarse spray, episodic ingestion of granules, and outdoor aerosol space spray. Excluding these uses, aggregate risk estimates remain of concern for liquid and solid turf applications, indoor bedbug and fogger uses. For the Draft Human Health Risk Assessment for Cyfluthrins, see: https://www.regulations.gov/document?D=EPA-HQ-OPP-2010-0684-0102

- **Flupicolide** is a fungicide used on a wide variety of food crops as well as on non-agricultural sites. Fluopicolide shares a residue of concern, 2,6-dichlorobenzamide (BAM), with another active ingredient, dichlobenil. The acute dietary (food and drinking water) analysis for BAM is just below the level of concern for infants less than one year. For the Draft Human Health Risk Assessment for Flupicolide see: https://www.regulations.gov/document?D=EPA-HQ-OPP-2013-0037-0016

- **Methiocarb** is restricted use pesticide used for control of insects and mollusks on ornamentals. There are no food or residential uses. A spray drift assessment resulted in risk estimates of

concern for children 1 < 2 years of age. For the Draft Human Health Risk Assessment for Methiocarb, see: https://www.regulations.gov/document?D=EPA-HQ-OPP-2010-0278-0020

- **Norflurazon** is an herbicide used on various agricultural crops as well as on-farm non-crop land areas. There is uncertainty concerning norflurazon about potential thyroid function disruption. Normal thyroid function is necessary for optimal brain development in infants and children. The EPA considers norflurazon to be a "possible human carcinogen." Chronic dietary exposure from food and water, and from water alone, resulted in risks of concern for all populations, including infants and children. Spray drift resulted in risks of concern for children 1 < 2 years of age. For the Draft Human Health Risk Assessment for norflurazon, see: https://www.regulations.gov/document?D=EPA-HQ-OPP-2012-0565-0025

- **Oryzalin** is an herbicide used on food crops, ornamental plants, and trees. Oryzalin has been classified by the Agency as "likely to be carcinogenic to humans." Use on turf resulted in a risk estimate of concern for children 1 to < 2 years old. For the Draft Human Health Risk Assessment for Oryzalin, see: https://www.regulations.gov/document?D=EPA-HQ-OPP-2010-0940-0038

- **Piperonyl butoxide (PBO)** is a synergist used in combination with a wide variety of insecticides such as pyrethrins and carbamates. There are risk estimates of concern to children 1 < 2 years from indoor space sprays; indoor surface directed sprays; outdoor residential misting systems; dust formulations used on treated pets; and mosquito foggers. There are risk estimates of concern for children 3 < 6 years from the animal barn misting system use. For the Draft Human Health Risk Assessment for Piperonyl Butoxide, see: https://www.regulations.gov/document?D=EPA-HQ-OPP-2010-0498-0021

- **Pyriproxyfen** is a broad spectrum insect growth regulator used on numerous crops, in outdoor commercial and residential settings, as well as in food-handling establishments, pet collars and pet spot-on treatments. Several long-term scenarios for pet collars have risks of concern for children 1 < 2 years of age. For the Draft Human Health Risk Assessment for Pyriproxyfen, see: https://www.regulations.gov/document?D=EPA-HQ-OPP-2011-0677-0021

- **Other Draft Human Health Risk Assessments are available for:** 2,4-D (EPA-HQ-OPP-2012-0330); Emamectin Benzoate (EPA-HQ-OPP-2011-0483); Fludioxonil (EPA-HQ-OPP-2010-1067); Fluridone (EPA–HQ–OPP–2009–0160); Quinoxyfen (EPA–HQ–OPP–2013–0771)

Comment Period Until February 20, 2018. For more information, see: https://www.gpo.gov/fdsys/pkg/FR-2017-12-21/pdf/2017-27520.pdf

- **Thiamethoxam** is an insecticide currently registered for use on a variety of agricultural food crops, for livestock, on turf, ornamental plants, Christmas trees, for bed bugs, and as an indoor and outdoor structural/perimeter pest control. EPA is now taking comment on the draft human health and non-pollinator ecological risk assessments for registration review. There are no dietary, residential use, or spray drift exposures for infants and children, but there are occupational risk estimates of concern due to adverse male reproductive effects that are not relevant to young children as described in Appendix A.4. For the Draft Human Health Risk

Assessment for Thiamethoxam, see: https://www.regulations.gov/document?D=EPA-HQ-OPP-2011-0581-0096

- **Imidacloprid** is an insecticide used on agricultural crops; on pets (spot-on treatment and collars) and in kennels, forestry, textiles, and rights of way; on ornamentals, residential lawns and gardens, indoor areas for bed bugs and crack-and-crevice treatments; pre- and post-construction termiticide and wood preservative; and for burrowing shrimp in intertidal oyster beds of Washington State's Willapa Bay and Grays Harbor. EPA is now taking comment only on the ecological non-pollinator risk assessment for registration review. EPA previously took comment on the human health risk assessment and found risks of concern for children 1<2 years old from use in pet collars, and acute dietary exposure is just below the level of concern for children 1<2 years old. For the Draft Human Health Risk Assessment for Imidacloprid, see: https://www.regulations.gov/document?D=EPA-HQ-OPP-2008-0844-1235

- **Other Draft Human Health and ecological non-pollinator Risk Assessments are available for:** Clothianidin (EPA-HQ-OPP-2011-0865-0243) and Dinotefuran (EPA-HQ-OPP-2011-0920-0620).

Comment Period – 60 days after publication in Federal Register

- **Glyphosate** is one of the most widely used agricultural herbicides in the United States. The draft human health risk assessment concludes that glyphosate is not likely to be carcinogenic to humans. The Agency's assessment found no other meaningful risks to human health when the product is used according to the pesticide label. For more information, see: https://www.epa.gov/ingredients-used-pesticide-products/glyphosate, www.epa.gov/ingredients-used-pesticide-products/draft-human-health-and-ecological-risk-assessments-glyphosate and docket EPA-HQ-OPP-2009-0361 on www.regulations.gov in early 2018.

Proposed Interim Decisions for Pesticide Registration Reviews – Comment Period Until February 13, 2018

Registration review is EPA's periodic review of pesticide registrations to ensure that each pesticide continues to satisfy the statutory standard for registration; that is, the pesticide can perform its intended function without causing unreasonable adverse effects on human health or the environment. Through this program, EPA is ensuring that each pesticide's registration is based on current scientific and other knowledge, including its effects on human health and the environment. (Please note that only children's health concerns are highlighted here.) EPA has announced the availability of a proposed interim registration review decision for a 60-day public comment period for the following pesticides:

- **Cyprodinil** (EPA-HQ-OPP-2011-1008) is a fungicide with registered uses on a variety of food crops and ornamentals, and has no residential uses. The chronic dietary analysis is just below the level of concern for children 1<2 years old, and no risk mitigation is required. For the Proposed Interim Decision for Cyprodinil, see: https://www.regulations.gov/document?D=EPA-HQ-OPP-2011-1008-0030

- **Metalaxyl and Mefenoxam** (EPA–HQ–OPP–2009–0863) are fungicides used on food, feed, and nonfood crops; agricultural seed treatment; and greenhouse nonfood crops. When both parent metalaxyl and the degradate were included in the acute dietary assessment, acute

dietary risks were of concern for all infants less than one-year-old. EPA has since evaluated a recent submission of several toxicity studies for the metabolite and determined it presents negligible risk to humans and should not be considered as a residue of concern in drinking water. When only parent metalaxyl is included in the dietary assessment, the acute dietary risk is below the level of concern, and no risk mitigation is required. For the Proposed Interim Decision for Metalaxyl and Mefenoxam, see: https://www.regulations.gov/document?D=EPA-HQ-OPP-2009-0863-0035

- **Other Proposed Interim Decisions are available for:** Cloransulam-methyl, (EPA-HQ-OPP-2010-0855-0018); Cymoxanil (EPA–HQ–OPP–2012–0148-0031); Diethylene Glycol Monomethyl Ether (DGME) (EPA–HQ–OPP–2010–0694-0006); Dimethomorph (EPA–HQ–OPP–2013–0045-0034); Fomesafen (EPA–HQ–OPP–2006–0239); Kresoxim-methyl (EPA–HQ–OPP–2012–0861); Mineral Acids (EPA–HQ–OPP–2008–0766). For more information, see: https://www.regulations.gov/document?D=EPA-HQ-OPP-2010-0855-0014 and www.regulations.gov for each docket.

Asbestos-Containing Materials in Schools Rule and Revised Asbestos Model Accreditation Plan Rule – Comment Period Until March 5, 2018

In compliance with the Paperwork Reduction Act (PRA), EPA is announcing plans to submit an Information Collection Request (ICR) to the Office of Management and Budget (OMB). The ICR, entitled: "*Asbestos-Containing Materials in Schools Rule and Revised Asbestos Model Accreditation Plan Rule*" and identified by EPA ICR No. 1365.11 and OMB Control No. 2070-0091, represents the renewal of an existing ICR that is scheduled to expire on August 31, 2018.
Before submitting the ICR to OMB for review and approval, EPA is soliciting comments on or before March 5, 2018 on specific aspects of the proposed information collection that is summarized in the supporting documents. The ICR and accompanying material are available in the docket for public review and comment.

For more information, see: https://www.gpo.gov/fdsys/pkg/FR-2018-01-02/html/2017-28316.htm or www.regulations.gov docket EPA-HQ-OPPT-2017-0319.

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Message

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Subject: Emailing: House Science Committee Wants to Investigate a Government Scientist for Doing Science.htm
Attachments: House Science Committee Wants to Investigate a Government Scientist for Doing Science.htm

Republicans on the House Science Committee are accusing Linda Birnbaum, director of the National Institute of Environmental Health Sciences, of lobbying. In letters sent to the Inspector General and acting secretary of the Department of Health and Human Services, Reps. Lamar Smith and Andy Biggs wrote that they were "conducting oversight" of Birnbaum's activity in response to a editorial she wrote in a scientific journal.

Birnbaum's editorial, which the journal PLOS Biology published in December, addressed the gaps in the regulation of toxic chemicals. Though there are more than 85,000 chemicals approved for use in commerce, she noted in the piece, "U.S. policy has not accounted for evidence that chemicals in widespread use can cause cancer and other chronic diseases, damage reproductive systems, and harm developing brains at low levels of exposure once believed to be harmless."

Birnbaum called for more research on the risks posed by chemicals and, in the sentence that the representatives appear to consider lobbying, noted that "closing the gap between evidence and policy will require that engaged citizens – both scientists and non-scientists – work to ensure that our government officials pass health-protective policies based on the best available scientific evidence."

A toxicologist who has headed NIEHS and the National Toxicology Program since 2009, Birnbaum received no funding for writing the editorial, as she notes in the piece, nor does she recommend any specific policy, piece of legislation, or action in it beyond being engaged citizens.

Nevertheless, Biggs and Smith, who have both received money from Koch Industries, Exxon Mobil, and other companies that have a financial interest in limiting research on the environmental effects of chemicals, noted that their "committee suspects this activity may be a violation of the anti-lobbying act." The two Republican members of Congress also called on the DHHS Inspector General to analyze their concerns so that he might "launch a full-scale review of the situation."

The Union of Concerned Scientists's Andrew Rosenberg dismissed the representatives' letters as "codswallop."

"I don't see how in any sense it is lobbying," Rosenberg said of Birnbaum's editorial. "Science itself is not lobbying. It is reporting on evidence." A spokesperson for the NIEHS, which is part of the National Institutes of Health, said that Birnbaum was unavailable for comment because of the government shutdown.

This isn't the first time the House Science Committee has gone after Birnbaum for bringing attention to environmental science that raises the need for increased regulation. In 2013, then-committee Chairs Larry Bucshon and Paul Broun, expressed outrage about a 2012 article, in which she described the harms of endocrine-disrupting chemicals.

"The proliferation of inadequately tested chemicals in commerce may be contributing to the skyrocketing rates of disease," Birnbaum wrote in that paper. The idea that low doses of chemicals are causing widespread health effects was by then already widely accepted by independent scientists and has since been echoed by the United Nations Environmental Program and the European Commission.

But industry groups and manufacturers of chemicals have continually challenged endocrine disruption and other science showing the danger of chemicals. And Smith, who became chair of the House Science Committee in 2013, has taken their side in the fight. The Texas representative, who has also aggressively attacked climate science and climate scientists, has promoted legislation that would essentially replace independent scientists with industry representatives on Environmental Protection Agency advisory boards; the EPA has since implemented that policy. In November, Smith wrote another letter to DHHS, this one questioning the International Agency for Research on Cancer's 2015 evaluation of glyphosate as a probable carcinogen. (IARC responded to his charges earlier this month.)

Smith's committee has also taken aim at a program at the heart of EPA's ability to regulate chemicals – holding a hearing in September about the Integrated Risk Information System, or IRIS, a division of the EPA that evaluates the toxicity of substances. The 2018 Senate Appropriations Bill has since proposed eliminating IRIS and giving its workload to another division of the EPA, a move that some environmental scientists fear would weaken seriously undermine the program.

Republicans on the Science Committee invited chemical industry consultants Kenneth Mundt and James Bus to testify at the IRIS hearing. Although the hearing was supposed to be on the overall integrity of IRIS, Mundt, a consultant who has worked for Philip Morris and the chemical industry, used his time before the committee to criticize the program' s evaluation of a particular chemical, chloroprene. The hearing came less than three months after residents of a Louisiana community beset by both illness and chloroprene emissions sued DuPont and another company, Denka. Mundt, who has been paid to work on chloroprene by both companies, argued that the safety threshold IRIS set for chloroprene was 156 times too high.

Smith and Bigg' s attack on Birnbaum seems less designed to exonerate a particular chemical. In the editorial that caused the most recent stir in the House committee, Birnbaum introduced an issue of the journal that covered a broad range of environmental science problems from the challenges of setting drinking water limits for PFOA to the need clarify the relationship between the dose and response of certain chemicals.

Even the best scientific evidence doesn' t necessarily result in regulation, as another piece about the failure to ban chlorpyrifos made clear. That article traced the evidence that low levels of the pesticide can cause developmental harm in children – and Scott Pruitt' s decision decision last year to nevertheless reverse a proposed ban on it. Scientists have a responsibility to speak up in such cases, the author, Leonardo Trasande, argued. But his encouragement to his colleagues came with a warning: " Scientists who raise their voices should be prepared to face criticism from those who have substantial vested interests."

Top photo: Linda Birnbaum, director of the National Institute of Environmental Health Sciences and National Toxicology Program at a Senate Environment and Public Works Committee hearing on " Public Health and Drinking Water Issues."

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House Science Committee Wants to Investigate a Government Scientist for Doing Science

Sharon Lerner

Sharon Lerner

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Photo: Louie Palu/Zuma

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Top photo: Linda Birnbaum, director of the National Institute of Environmental Health Sciences and National Toxicology Program at a Senate Environment and Public Works Committee hearing on "Public Health and Drinking Water Issues."

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Message

From: Etzel, Ruth [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=96A20535ABB54ED4ABF1E40D2AA916D9-ETZEL, RUTH]
Sent: 3/20/2017 3:43:20 PM
To: Stilp, Mark [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=eb174399b2084a7c87d4d584e6f7fbca-Stilp, Mark]
Subject: RE: Litigation Hold, EELI v. EPA, FOIA re Ramazzini, glyphosate, risk assessments

Hi Mark,

Ex. 5 - Attorney Client

Sincerely,

Ruth A. Etzel, MD, PhD

From: Stilp, Mark
Sent: Thursday, March 16, 2017 5:43 PM
To: Etzel, Ruth <Etzel.Ruth@epa.gov>
Subject: RE: Litigation Hold, EELI v. EPA, FOIA re Ramazzini, glyphosate, risk assessments

Ex. 5 - Attorney Work Product

Ex. 5 - Attorney Work Product

From: Etzel, Ruth
Sent: Thursday, March 09, 2017 4:36 PM
To: Stilp, Mark <Stilp.Mark@epa.gov>
Subject: RE: Litigation Hold, EELI v. EPA, FOIA re Ramazzini, glyphosate, risk assessments

Hi Mark,

Sure, I am here now. 202-566-1530

Best,

Ruth

From: Stilp, Mark
Sent: Thursday, March 09, 2017 4:36 PM
To: Etzel, Ruth <Etzel.Ruth@epa.gov>
Subject: RE: Litigation Hold, EELI v. EPA, FOIA re Ramazzini, glyphosate, risk assessments

Hi Dr. Etzel-

Thanks for reaching out to me. The plaintiff in the above referenced Freedom of Information Act (FOIA) litigation asked that you be included as a potential custodian of records responsive to their FOIA request.

Do you have a few minutes to chat yet today or sometime on Friday? Early next week would be OK too. I'd like to explain a few things and it's often easiest to do by phone.

Thanks.

-Mark Stilp

Mark Stilp | Attorney-Adviser | Office of General Counsel | U.S. Environmental Protection Agency | 1200 Pennsylvania Ave. NW | Washington, DC 20460 | mail code: 2377A | office: 202.564.4845 | cell: Ex. 6

From: Etzel, Ruth
Sent: Thursday, March 09, 2017 1:45 PM
To: Stilp, Mark <Stilp.Mark@epa.gov>
Subject: RE: Litigation Hold, EELI v. EPA, FOIA re Ramazzini, glyphosate, risk assessments

Hi Mark,

I have received the message below and reviewed it; I am writing to let you know that I believe it may have been sent to me in error. I am not in EPA's Office of Research and Development, nor am I in the Office of Air and Radiation or the Office of Chemical Safety and Pollution Prevention's Office of Science Coordination. I do not know of anything that I have that is relevant to this.

Sincerely,

Ruth A. Etzel, MD, PhD
Director
Office of Children's Health Protection
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460
Phone: 202-564-2188

From: stilp.mark@epa.gov [mailto:stilp.mark@epa.gov]
Sent: Thursday, March 02, 2017 5:20 PM
To: Etzel, Ruth <Etzel.Ruth@epa.gov>
Subject: Litigation Hold, EELI v. EPA, FOIA re Ramazzini, glyphosate, risk assessments

Ex. 5 - Attorney Work Product

Message

From: Etzel, Ruth [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=96A20535ABB54ED4ABF1E40D2AA916D9-ETZEL, RUTH]
Sent: 10/14/2016 4:11:50 PM
To: Dzubow, Rebecca [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=403ca1721f3d43d38de9189a93a95b76-Dzubow, Rebecca]
Subject: FW: Next steps - Papers for OCHP review
Attachments: Issue Paper_Chlorpyrifos_4 October 2016.docx; Issue Paper_Glyphosate_ 4 October 2016_clean.docx; Issue Paper_Zika_4 October 2016.docx; Lead Transition Paper_4 October 2016_HK-dan.docx; PCBs Schools Transition Paper_4 October 2016 -dan.docx; TSCA Issue Paper_4 October 2016 -dan.docx

Would you please have time to review?

From: Wiggins, Lanelle
Sent: Friday, October 14, 2016 12:04 PM
To: Reed, Khesha <Reed.Khesha@epa.gov>; Etzel, Ruth <Etzel.Ruth@epa.gov>
Cc: Allen, Reginald <Allen.Reginald@epa.gov>
Subject: Fw: Next steps - Papers for OCHP review

Hi,

Attached are the Transition Issue papers that OCHP requested to review (for which I am the POC). You have, or will soon, receive the others from the other respective POCs. Please forward your comments on these to me no later than **mid day Monday (10/17).**

Thanks,
Lanelle Wiggins
202-566-2372

From: "Reed, Khesha" <Reed.Khesha@epa.gov>
Date: October 13, 2016 at 5:25:26 PM EDT
To: "Gentile, Laura" <Gentile.Laura@epa.gov>
Subject: FW: DAA/DRA -- Call for Transition Issue Papers by Oct 4

Laura,

Apologies if you already received this email from me. Below is the list of Transition Papers that OCHP would like to review.

Thanks for your help.

Khesha Ex. 6 cell

On Oct 5, 2016, at 7:14 AM, Allen, Reginald <Allen.Reginald@epa.gov> wrote:

Here is the excel sheet with all the papers – sorry to say that most were due in yesterday.

I am checking the OP Transition POCs to determine the best wayahead to allow OCHP input.

In the mean time you or Khesha can reach out to the POC and check and maybe work it that but in any case it would have to a quick turn.

Sorry for getting this to you late.

Reggie

Reginald E. Allen

Director, Administrative and Executive Services

Office of the Administrator

U.S. Environmental Protection Agency

Office 202-564-0444

Direct 202-564-1029

Cell Ex. 6

AO SharePoint Site

From: Etzel, Ruth
Sent: Thursday, September 29, 2016 4:38 PM
To: Allen, Reginald <Allen.Reginald@epa.gov>
Cc: Reed, Khesha <Reed.Khesha@epa.gov>
Subject: FW: DAA/DRA -- Call for Transition Issue Papers by Oct 4

Hi Reggie,

Khesha and I appreciated the opportunity to review the list of transition issue papers. We would like you to ask that OCHP be added as a collaborator on the following issue papers:

Chlorpyrifos & Glyphosate

Lead

New TSCA

PCBs in schools

Zika

Climate Resilience

Tire Crumb

Emerging Drinking Water Contaminants

East Chicago

Flint

Would you happen to have a list of the point person for each issue paper? Given the short time frame, I'd like to call them directly, if possible.

Many thanks!

Ruth

From: "Allen, Reginald" <Allen.Reginald@epa.gov>
Date: September 29, 2016 at 9:56:19 AM EDT
To: "Reed, Khesha" <Reed.Khesha@epa.gov>
Subject: FW: DAA/DRA -- Call for Transition Issue Papers by Oct 4

As discussed

Reginald E. Allen

Director, Administrative and Executive Services

Office of the Administrator

U.S. Environmental Protection Agency

Office 202-564-0444

Direct 202-564-1029

Cell Ex. 6

AO SharePoint Site

From: Kenny, Shannon
Sent: Friday, September 16, 2016 12:11 PM
To: DAA-Career <DAACareer@epa.gov>; DRA <DRA@epa.gov>; Hull, George <Hull.George@epa.gov>; Richardson, RobinH <Richardson.RobinH@epa.gov>; Caraballo, Mario <Caraballo.Mario@epa.gov>
Cc: Transition Coordinators <Transition_Coordinators@epa.gov>; 2016OPTransitionTeam <2016OPTransitionTeam@epa.gov>; Grantham, Nancy <Grantham.Nancy@epa.gov>; Siciliano, CarolAnn <Siciliano.CarolAnn@epa.gov>
Subject: DAA/DRA -- Call for Transition Issue Papers by Oct 4

All,

Thank you again for all of your thoughtful input on the transition effort to date.

Our next step is to begin drafting short **issue papers** on key topics. Attached please find the list of 30 papers we ask that you develop - along with a lead office or region, and a suggested list of collaborating offices/regions, for each paper - by **October 4**. We have also included a **2-page template** we ask that you follow.

The list was developed based upon your input, input from your transition coordinators, OPA, OCIR, and OP, as well as information about the campaigns and our learning from previous landing teams.

My team will work through your Transition Coordinators to provide clear instructions for putting these draft papers into Sharepoint for review no later than October 4.

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Please note that this is not a complete inventory of the briefing materials to be provided to the landing team. I will be in touch with many of you soon to discuss what additional materials we want to work on.

Please give me a call anytime if you would like to discuss.

Shannon

<Issue Papers_All_Issues_Final.xlsx>

Message

From: Etzel, Ruth [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=96A20535ABB54ED4ABF1E40D2AA916D9-ETZEL, RUTH]
Sent: 12/21/2017 2:50:28 PM
To: Spire, Paul [PSpire@aap.org]
CC: Sophie Balk [SBALK@montefiore.org]; Jennifer Lowry [jlowry@cmh.edu]
Subject: RE: Green Book - Endocrine Disrupting Chemicals chapter - editor review
Attachments: 29 - Endocrine Disrupting - editor review sjb122017 rae122117.docx

Hi Paul,

I think Sophie's edits are excellent. I have added just a few of my own, the only major one being that I moved PEHSU fact sheets to the box that points to resources, and labelled them as PEHSU resources (does that seem like a reasonable approach to you, Sophie?)
If so, this is ready for stakeholder review.

Happy holidays!

Ruth

From: Sophie Balk [mailto:SBALK@montefiore.org]
Sent: Wednesday, December 20, 2017 5:57 PM
To: Etzel, Ruth <Etzel.Ruth@epa.gov>; Lowry, Jennifer <jlowry@cmh.edu>
Cc: Spire, Paul <PSpire@aap.org>; Sophie Balk <SBALK@montefiore.org>
Subject: Re: Green Book - Endocrine Disrupting Chemicals chapter - editor review

Ruth and Paul,
Please see attached in marked up and clean versions - changes made for readability and to clarify certain things.
Paul, both of Maida's versions you sent appeared the same to me. I worked from one of them.
Ruth, in FAQ's, Maida added some fact sheets - this is not what we have done in other chapters. Please let me know what you would like to do with them.

Thanks, please comment on changes. if needed.

Thanks,
Sophie

Sophie J Balk MD
Attending Pediatrician
Children's Hospital at Montefiore
Professor of Pediatrics
Albert Einstein College of Medicine
Ex. 6
718 405-8091 (fax)

From: Etzel, Ruth <Etzel.Ruth@epa.gov>
Sent: Tuesday, December 19, 2017 7:44 PM
To: Sophie Balk
Cc: Spire, Paul
Subject: Re: Green Book - Endocrine Disrupting Chemicals chapter - editor review

CAUTION: This email comes from an external source; the attachments and/or links may compromise our secure environment. Do not open or click on suspicious emails. Please click on the "Phish Alert" button on the top right of the Outlook dashboard to report any suspicious emails.

Hi Sophie,

That would be terrific! Thank you.

Best,

Ruth

On Dec 19, 2017, at 6:38 PM, Sophie Balk <SBALK@montefiore.org> wrote:

> Ruth,
> OK with you if I review within the next couple of days and get this back to you with any edits and comments?
>
> Sophie
>
> Sophie J Balk MD
> Attending Pediatrician
> Children's Hospital at Montefiore
> Professor of Clinical Pediatrics
> Albert Einstein College of Medicine
> Ex. 6
> 718 405-8091 (fax)
>
> ---
>
> **From:** Spire, Paul <PSpire@aap.org>
> **Sent:** Tuesday, December 19, 2017 6:15:20 PM
> **To:** Etzel, Ruth; Sophie Balk
> **Subject:** Green Book - Endocrine Disrupting Chemicals chapter - editor review
>
> *CAUTION: This email comes from an external source; the attachments and/or links may compromise our secure environment. Do not open or click on suspicious emails. Please click on the "Phish Alert" button on the top right of the Outlook dashboard to report any suspicious emails.*
>
> Dear Ruth and Sophie,
>
> I am writing to convey the attached "Endocrine Disrupting Chemicals" chapter for editor review. Maida Galvez and Michele La Merrill were the lead authors for this chapter.
>
> Ari Bernstein served as the primary reviewer. The COEH review comments were conveyed to Drs. Galvez and La Merrill embedded in the document as track changes and comments.

Please note that Maida returned a clean draft, which is attached. I have also used Word's "compare documents" feature to create a version that shows Maida and Michelle's last round of edits in track changes, so you can see what they've updated. I've also attached a document labeled "Ari's comments," which shows Ari's comments and the earlier track changes history of this document.

The next step for this chapter will be stakeholder review. We will need to distribute "clean" chapters for review, so at this point we will need to "accept" track changes. I would be happy to do this, or feel free to return a clean chapter to me.

Many thanks,

Paul

From: Galvez, Maida [mailto:maida.galvez@mssm.edu]
Sent: Tuesday, December 19, 2017 4:32 PM
To: Spire, Paul <PSpire@aap.org>
Cc: Etzel, Ruth <etzel.ruth@epa.gov>; Balk, Sophie <sbalk@montefiore.org>; Jennifer Lowry <jlowry@cmh.edu>; 'Michele Andrea La Merrill' <mlamerrill@ucdavis.edu>
Subject: RE: Green Book - Endocrine Disrupting Chemicals chapter - response requested by December 15

Hello all,

Sincere thanks for the COEH's careful review (and your collective patience!).

I addressed all the comments, amended the FAQs and added a ref to BPA analogs as requested.

Please see attached revision.

Cheers,

Maida and Michele

From: Spire, Paul [mailto:PSpire@aap.org]
Sent: Friday, November 17, 2017 5:04 PM
To: Galvez, Maida
Cc: Etzel, Ruth; Balk, Sophie; Jennifer Lowry
Subject: Green Book - Endocrine Disrupting Chemicals chapter - response requested by December 15

Dear Dr. Galvez,

I am writing on behalf of the Green Book editorial team to follow-up on the development of the "Endocrine Disrupting Chemicals" chapter for the *Pediatric Environmental Health, 4th Edition* manual (Green Book).

Attached please find a copy of the draft chapter as it was reviewed by the AAP's Council on Environmental Health (COEH), with comments from the committee embedded in the document

in track changes. We are requesting that you review these comments and adjust the chapter to address these issues. If there are any items that you will not be addressing or that you disagree with, it would be helpful to receive a short explanation of these issues for the committee's consideration.

We also wanted to share one new request and additional guidance that has emerged as this project has progressed:

- Please write 3 - 5 bullet points for your chapter that summarize key issues and take-home messages. (A temple space for this has been added to the chapter.) These are being added at the start of each chapter.
- Please pay special attention to providing citations wherever it would be appropriate to do so, ensuring that all sources are cited and acknowledged.
- If you are using information from another AAP policy statement (or other Academy document), please modify the content so that it is not worded exactly like the existing policy document.
- Please continue to make all adjustments utilizing Word's "Track Changes" feature.

We are hoping to receive all updated chapters within one month, by Friday, December 15.

Thanks again for your ongoing support. If you have any questions or need anything more, please do not hesitate to let me know.

Many thanks,

Paul

Message

From: Etzel, Ruth [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=96A20535ABB54ED4ABF1E40D2AA916D9-ETZEL, RUTH]
Sent: 1/29/2015 1:19:16 PM
To: Reed, Khesha [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=c62327cee1fd4da29a1cc485efe546f7-Reed, Khesha]
Subject: Jackie would like to set up a briefing for our Divisions on glyphosate

Yesterday Jackie M. mentioned that she will be calling you to set up a briefing for the 2 OCHP divisions on glyphosate.

Message

From: Etzel, Ruth [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=96A20535ABB54ED4ABF1E40D2AA916D9-ETZEL, RUTH]
Sent: 12/7/2017 12:50:47 PM
To: Spire, Paul [PSpire@aap.org]
Subject: RE: Green Book - Pesticides - for editor review
Attachments: 39 - Pesticides - editor review RAE 120717.docx

Hi Paul,

Attached is the Pesticides chapter, which I have reviewed. I made several small editorial changes. I think it is ready for stakeholder review.

Best,

Ruth

From: Spire, Paul [mailto:PSpire@aap.org]
Sent: Wednesday, November 22, 2017 6:26 PM
To: Etzel, Ruth <Etzel.Ruth@epa.gov>
Subject: FW: Green Book - Pesticides - for editor review

Hi Ruth.
Re-sending in follow-up to your inquiry about this chapter.
Best,
Paul

From: Spire, Paul
Sent: Monday, October 30, 2017 12:10 PM
To: Etzel, Ruth <etzel.ruth@epa.gov>
Subject: Green Book - Pesticides - for editor review

Dear Ruth,

I am writing to convey the attached "Pesticides" chapter for editor review. Nicholas Newman was the lead author for this chapter.

Alan Woolf served as the primary reviewer. Also attached is a document compiling the COEH's comments, to which Dr. Newman has added responses.

In his email submitting the chapter, Dr. Newman wrote the following:

> Sorry that it took me longer than I thought that it would to get this edited. I responded to the reviewer's comments and I marked my responses in italics in the comments document. I'm not sure about adding information about thallium or fluorides. I reviewed the 2015 Annual Review of the American Association of Poison Control Centers and found only exposures to sulfuryl fluoride (fumigant – most cases in adults) as well as 11 cases of thallium exposure. I removed the reference to fluorides in the introductory section and did not include any information regarding thallium poisoning. I also made some additional corrections through the text (beyond what was suggested – all with changes tracked) and removed all the comments that had new citations as these are all included in the new "references" section.

The next step for this chapter will be stakeholder review. We will need to distribute "clean" chapters for review, so at this point we will need to "accept" track changes. I would be happy to do this, or feel free to return a clean chapter to me.

Many thanks,

Paul

Message

From: Etzel, Ruth [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=96A20535ABB54ED4ABF1E40D2AA916D9-ETZEL, RUTH]
Sent: 4/13/2016 2:35:40 PM
To: Gutierrez, Claudia [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=03e596afea504f91a6c5bb3857a6fea6-Gutierrez, Claudia]
Subject: RE: IPM conferences
Attachments: Puerto Rico Trip Report.docx; ETZEL2016PESTICIDES.USVI.ppt

Hi Claudia,

It was a great honor to join Region 2 for the IPM conferences in St. Croix and Puerto Rico. I am hopeful that our visits will result in more use of IPM on the islands!

Attached is my presentation. I am also attaching a copy of my trip report.

With warm regards,

Ruth

Ruth A. Etzel, MD, PhD
Director
Office of Children's Health Protection
U.S. Environmental Protection Agency
Room 1144 EPA West Building
Washington, DC 20460
Office: 202-564-2188

From: Gutierrez, Claudia
Sent: Wednesday, April 13, 2016 10:09 AM
To: Edward D. Freytag <edfreytag@nola.gov>; jlg23@cornell.edu; Etzel, Ruth <Etzel.Ruth@epa.gov>; Landrigan, Philip <philip.landrigan@mssm.edu>; Sheffield, Perry <perry.sheffield@mssm.edu>
Cc: Fessler, Andrew <Fessler.Andrew@epa.gov>
Subject: IPM conferences

Thank you again for two successful conference. We got great feedback, people were thankful for the opportunity to participate.
These types of events do not go unnoticed on the islands! Thank you!

When you get a moment, can you please send me your presentation? We'd like to post it on the site and mail it to the participants as soon as possible.

Kind regards,
Claudia

Claudia Gutierrez, Senior Advisor, EPA, Office of the Regional Administrator, 290 Broadway, New York, NY, 212-637-5036

HEALTH IMPACTS OF PESTICIDE EXPOSURE in CHILDREN AND ADULTS

Ruth A. Etzel, MD, PhD
Director
Office of Children's Health Protection
U.S. Environmental Protection Agency

Reducing Pesticides in Puerto Rico

April 6, 2016

ED_001703B_00009159_00_afac3948-2c65-54aa-1496-70e7cbcca245

WHAT ARE PESTICIDES?

- Chemicals specifically designed to kill living things
- More than 600 individual pesticide chemicals and many thousands of commercial pesticide products with many different names are on the market
- More than 1 billion lbs. applied each year in USA alone and increasing
- Pesticides can cause acute poisoning and chronic disease. Children and pesticide applicators are at highest risk

<<READ SLIDE.>>

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PESTICIDES – RISKS AND BENEFITS

BENEFITS

- Crop protection
- Food preservation
- Material preservation
- Disease control – dengue Zika and malaria

RISKS

- Toxic to humans
- Long-lasting impacts on environment and ecosystems

Pesticides have numerous beneficial effects. These include crop protection, preservation of food and materials and prevention of vector-borne diseases.
For example pesticides may be used in the prevention of malaria, which kills up to 1 million children per year, and for preventing other vector-borne diseases such as dengue, leishmaniasis and Japanese encephalitis.
Pesticides are toxic by design – they are BIOCIDES, designed to kill, reduce or repel insects, weeds, rodents, fungi or other organisms that can threaten public health and the economy.
Their mode of action is by targeting systems or enzymes in the pests which may be identical or very similar to systems or enzymes in human beings and therefore, they pose risks to human health and the environment.
Pesticides are ubiquitous in the environment and most are synthetic.
There is growing concern about children's exposure to pesticides and their special susceptibility. Children are not little adults, and may have higher exposures and greater vulnerability at both high and low levels of exposure.

Ref:
National Resource Council. Pesticides in the diets of infants and children. National Academy Press, Washington, DC, 1993.

Pesticide Exposures

The following are examples representing a variety of scenarios and exposures that resulted in pesticide poisoning.

ED_001703B_00009159_03_81df50bc-182b-79bb-894f-eb5afe8af4a0

Misuse of bug bombs

- In South Carolina, in November 2009, a 10 month old child died and his 2 year old brother was hospitalized after their mother used seven bug bombs over the period of a month.
- The woman was using the bug bombs to try to rid the home of roaches, which persisted even after seven treatments.

Full Story: In South Carolina, in November 2009, a 10 month child died and his 2 year old brother was hospitalized after their mother used seven bug bombs over the period of a month. The woman was using the bug bombs to try to rid the home of roaches, which persisted even after seven treatments.

The woman called the paramedics after her 10 month old was having difficulty breathing. When the paramedics arrived they transported the whole family to the hospital for treatment for breathing problems. The 10 month old was pronounced dead at the hospital. Upon arrival the 2 year old was placed on a ventilator. The hospital staff reported that the woman was covered in pesticides and had to be decontaminated. Although she was released the following day from the hospital, she was later readmitted for treatment for further breathing problems.

References:

Associated Press (2009, November 3). Bug bombs killed SC baby. The Augusta Chronicle. Retrieved July 16, 2015, from http://chronicle.augusta.com/stories/latest/lat_703021.shtml

Pesticide Drift impacts Hawaii High School

- In 2010, 14 students at a high school in Hawaii were treated for exposure to malathion.
- The malathion was being applied two blocks away, but drifted onto the grounds of the high school.
- 14 of the students were treated for "nausea, irritated throats and eyes, and slight dizziness."
- Two of the students were taken to the hospital for further examination.

Full Story: In 2010, 14 students at a high school in Hawaii were treated for exposure to malathion. The malathion was being applied two blocks away, but drifted onto the grounds of the high school.1 This is not an uncommon event at the school, which has an emergency plan in place for such incidents. They have had to activate this plan at least twice in the past few years.1

All students were evacuated into self-contained air-conditioned buildings after the odor was detected.1 Even with this action, 14 of the students were treated for "nausea, irritated throats and eyes, and slight dizziness."1 In addition, two of the students were taken to the hospital for further examination. 1

References:

Kakesako, G. (2010, September 28). Insecticide odor sickens 14 students and 3 adults. Honolulu Star Advertiser. Retrieved July 7, 2015, from http://www.staradvertiser.com/news/20100928_Insecticide_odor_sickens_14_students_and_3_adults.html?id=103915328

tained air-conditioned buildings after the odor was detected.1

Chlorpyrifos drift onto school bus

- In 2012 in Kern County, California, a school bus carrying 29 7-13 year olds was sprayed with chlorpyrifos by a plane which was spraying nearby fields.
- 14 of children complained of a number of symptoms including itchy skin and eyes, headache, and fatigue.

Full Story: A common source of pesticide exposure is overspray in agricultural areas. In 2012 in Kern County, California, a school bus carrying 29 7-13 year olds was sprayed with chlorpyrifos by a plane which was spraying nearby fields. Of the 29 children aboard the bus, 14 of them complained of a number of symptoms including itchy skin and eyes, headache, and fatigue.1,2 Most of the children were decontaminated at the school and their symptoms dissipated quickly. No long term follow-up was conducted.

The pilot of the crop duster was issued a violation for “failure to use the product pursuant to the label instructions by not ensuring persons would not be contacted directly or through drift.”.1

References:

California Environmental Protection Agency Department of Pesticide Regulation Worker Health and Safety Branch. (2015, January 13). Summary of results from the California Pesticide Illness Surveillance Program. Retrieved from http://www.cdpr.ca.gov/docs/whs/pisp/2012/hs1896.pdf

California Department of Pesticide Regulation. California Pesticide Illness Query. Retrieved July 7, 2015 from: http://apps.cdpr.ca.gov/calpiq/calpiq_detail.cfm

Accidental ingestion of pesticides

- In 2012 in Monterey County, California a grandfather gave his grandchild a sip from a bottle he found in the refrigerator in the child's home.
- The child immediately "screamed and spat the liquid out." Following exposure, the child began coughing and vomiting.
- When the contents of the bottle were tested they found 1,3-dichloropropene and chloropicrin, which they believe may have been left over from a lawn installation.

Full Story: In 2012 in Monterey County, California a pesticide poisoning incident was reported involving a food container full of pesticides. A grandfather gave his grandchild a sip from a bottle he found in the refrigerator in the child's home. The child immediately "screamed and spat the liquid out."1 Following exposure, the child began coughing and vomiting. Fortunately, all symptoms were resolved by the time the child reached a health care facility. When the contents of the bottle were tested they found 1,3-dichloropropene and chloropicrin, which they believe may have been left over from a lawn installation.

References:

California Department of Pesticide Regulation. California Pesticide Illness Query. Retrieved July 7, 2015 from: http://apps.cdpr.ca.gov/calpiq/calpiq_detail.cfm

ACUTE OCCUPATIONAL HAZARDS TO PESTICIDE APPLICATORS

- Acute poisoning while applying pesticides as a result of inhaling aerosols
- Contamination of exterminators during the mixing of concentrated hazardous pesticides
- Skin contact or ingestion of pesticides due to contamination, splashing, or spills
- Accidental inhalation of pesticide spray (caused by a sudden change of wind)
- Accidental swallowing of a liquid pesticide mistakenly thought to be water
- Bursting of overpressurized spraying vessels
- Acute intoxication as a result of release into the atmosphere of hazardous materials

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DEATH IN A PESTICIDE APPLICATOR

- A young Mexican laborer was employed by a California company that processes edible nuts. When insects got into the nuts, it was customary to fumigate under tarps with methyl bromide.
- This young man had been assisting with fumigation
- He became ill rather suddenly at home that evening and died within a few hours
- The cause of death was discovered only after the coroner's office sent specimens to the State Health Department Laboratory, which detected high concentrations of bromide
- A diagnosis was made of methyl bromide poisoning

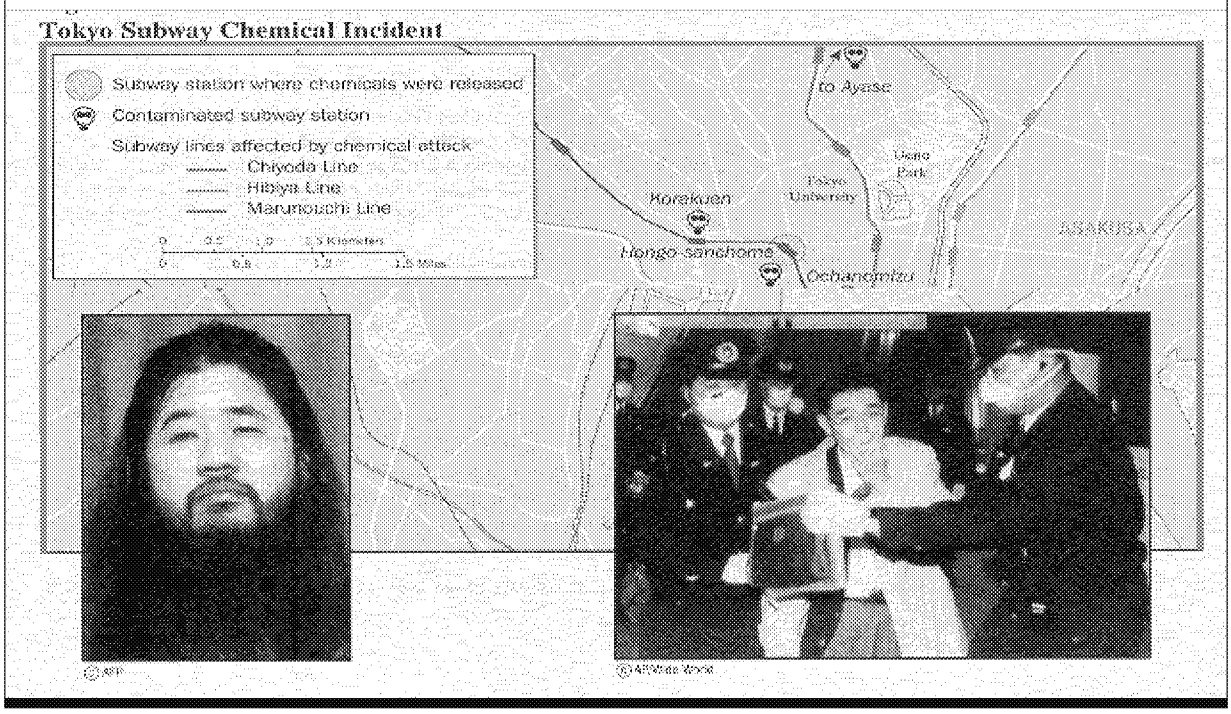
Vacationing family exposed to methyl bromide

- A Delaware family vacationing in the U.S. Virgin Islands in March 2015 was exposed to methyl bromide.
- The methyl bromide was applied by a licensed pest control company in the condo below theirs.
- The teen boys in the family had seizures and were transported to a local hospital where they were intubated to assist with their breathing.

Full Story: A Delaware family vacationing in the U.S. Virgin Islands in March 2015 was exposed to methyl bromide. The methyl bromide was applied by a licensed pest control company, Terminix, in the condo below theirs. Methyl bromide is a restricted use pesticide, and is not approved for indoor use. Within a day or two of the application the family had seizures and were transported to a local hospital where they were all intubated to assist with their breathing.1 They were transferred to hospitals in the United States where the two teenage boys remain. The older teen is conscious but paralyzed from the neck down, as is his father.2 Both parents have been transferred to rehabilitation facilities.2 The Department of Justice is investigating the incident.1
Terminix has agreed to pay $10 million.

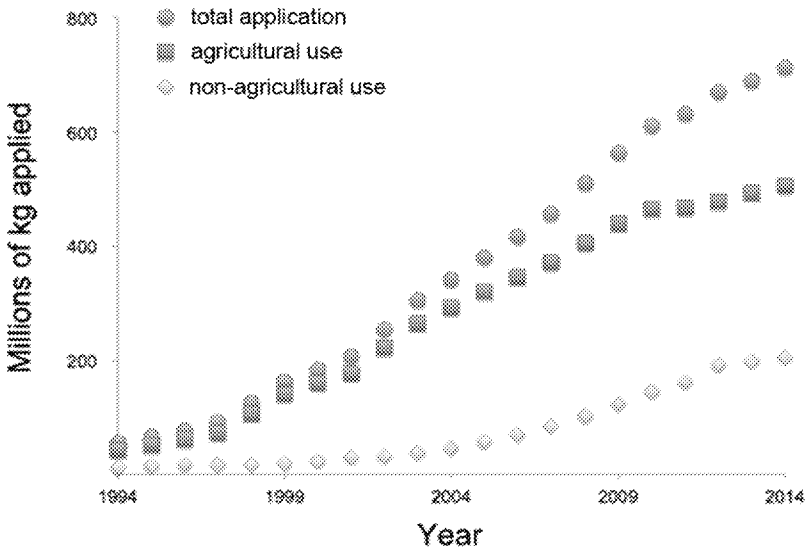
References:
Shapiro, E. (2015, April 6). Poisoned in Paradise: A Look at the Pesticide Methyl Bromide. Retrieved July 14, 2015, from http://abcnews.go.com/Health/poisoned-paradise-pesticide-methyl-bromide/story?id=30119220
Barrish, C. (2015, July 2) Del. Family poisoned in Caribbean in grave condition, governor says. Retrieved July 14, 2015 from http://www.delawareonline.com/story/news/local/2015/07/02/del-family-poisoned-caribbean-paralyzed-governor-says/29625901/
http://www.usatoday.com/story/news/nation-now/2016/03/29/terminix-pay-10m-sickening-delaware-family/82399112/

PESTICIDES ARE INTENDED TO BE TOXIC
War Gases are Potent Pesticides



Pesticides

INCREASING USE OF GLYPHOSATE - ROUNDUP



CHILDREN'S EXPOSURE TO PESTICIDES

A cause of concern

- Multiple chemicals
- Multiple sources of exposure
- Multiple routes of exposure
- Multiple effects

WHO

Pesticides are considered an important environmental threat to children's health in rural areas. This is because:
A large variety of chemicals and mixtures are used as pesticides.
Many pesticides are used at the same time in the same place (agricultural regions).
They are ubiquitous in the environment – and in individual environments (micro-environments) of children – there may be several sources of exposure to the same or a different chemical.
Multiple exposures may occur from the preconception period throughout the child's growth into adolescence and adulthood.

Pesticides may also be heavily used indoors in urban areas, so this is not solely a rural issue.

Pesticides

5/6/2005

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Pesticide poisoning and children

Despite the fact that pesticides must be registered, be approved for a specific use, and have warning labels, there are still numerous poisoning events every year. The cause of the poisonings vary, and include exposure from drifting pesticides from agricultural areas, using the products contrary to their approved use (for example using an outdoor only pesticide indoors), and accidental ingestion.

Children are often the victims of pesticide poisoning incidents. This is likely due to a number of factors. Children are more likely to play on the ground where pesticides may be present, they may not be able to identify a bottle of pesticides, and they spend more time outside than adults.

WE USED TO THINK THAT CHILDREN WERE JUST LITTLE ADULTS

Giotto, National Gallery, Washington DC

~600 years ago, children were still thought of as "little adults"

CHILDREN ARE NOT LITTLE ADULTS

Giotto, National Gallery, Washington DC

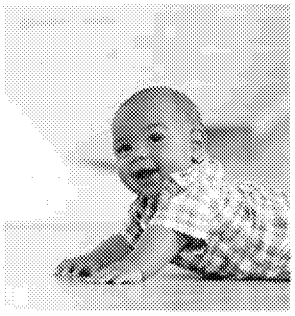
Raphael, National Gallery of Art, Washington, DC

CHILDREN HAVE DIFFERENT RISKS FROM ADULTS

1. Different and unique exposures
2. Dynamic developmental physiology
3. Longer life expectancy
4. Politically powerless

There is now recognition of:

- Special vulnerability of children and developing fetuses to pesticides
- Effects depend upon: toxicity, dose, timing and amount of exposure
- Effects are exacerbated by:
  - Poverty
  - Malnutrition
  - Degraded environments
  - Stressful circumstances



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CHILDREN'S EXPOSURES TO PESTICIDES

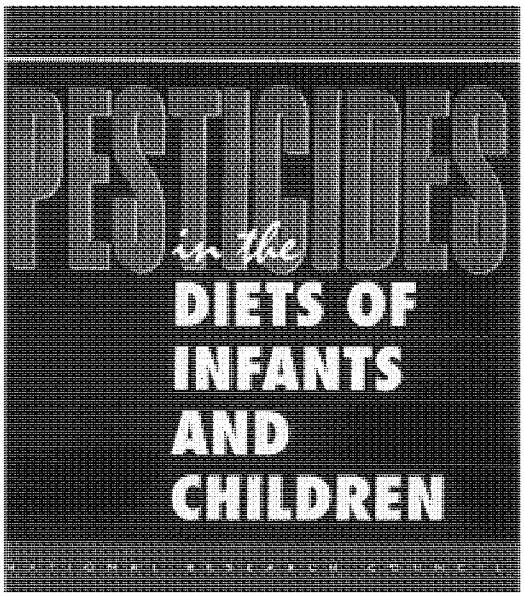
- **Locations:** Homes and schools, playgrounds, parks fields, hospitals and other public places
- **Activities:** Work places, farms, agricultural areas (rural setting)
- **Sources of exposure:** Air, soil, food, water, parents' clothing and shoes, other objects…

Exposure scenarios:

- ACUTE high-level exposure, overt poisoning
- CHRONIC low-level, chronic exposure, delayed efects

Children are exposed in different settings and by a variety of routes.
Pesticides may be unsafely used in the home, by parents who want to protect their children from mosquitoes, cockroaches or rodents. Different pesticides may be stored within the reach of children. They are used in schools and playgrounds (in treated wood) and in green areas (parks and playing fields) to destroy weeds. Hospitals are intended to be places of healing, yet many are using hazardous pesticides).
Living on farms or in agricultural areas, where pesticides are frequently and heavily used, is a high-risk scenario for exposure. Children may also undertake work in the agricultural industry, where they may participate in directly applying pesticides to crops or working in the field immediately after pesticide application.
Potential for "take home" of pesticides on parents'/childs clothing or shoes.
Pesticides may be present in food and water, either as residues from treatment of crops or at higher levels, as a result of contamination.
In some areas, there is a potential for release into the environment during production and formulation of pesticides (in factories).
These are the circumstances under which children may receive acute and high-level exposure leading to poisoning or chronic, low-level exposures linked to more subtle, developmental and other effects. (See next slide)

CHILDREN ARE HIGHLY VULNERABLE TO PESTICIDES

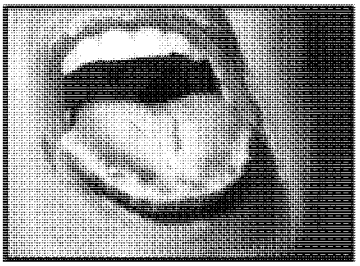


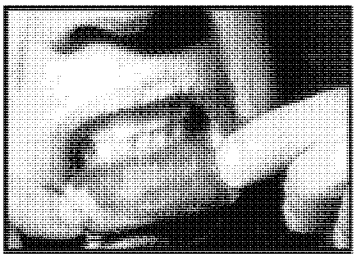
- Greater exposures pound-for-pound than adults. Exploratory behaviors.
- Reduced capacity to detoxify most pesticides.
- Developing organ systems are highly vulnerable
- More years of future life

CHILDREN ARE NOT LITTLE ADULTS

ACUTE PESTICIDE-RELATED ILLNESSES

- Skin and eye irritation
- Upper and lower respiratory tract irritation
- Allergic responses / asthma
- Gastrointestinal symptoms
- Neurological symptoms
- Specific syndromes
  - Cholinergic crisis (organophosphorus pesticides)
  - Bleeding (warfarin-based rodenticides)
  - Caustic lesions and pulmonary fibrosis (herbicide, paraquat)





The signs and symptoms of pesticide poisoning depend upon the pesticide involved and the type and magnitude of exposure.
In general the signs and symptoms are:
dermal and ocular irritation (or allergic response)
upper and lower respiratory tract irritation
allergic responses and asthma
gastrointestinal symptoms: usually vomiting, diarrhoea and abdominal pain
neurological symptoms: excitatory signs in the case of exposure to organochlorines, lethargy and coma; also polyneuritis
specific syndromes:
- cholinergic crisis (organophosphorus pesticides)
- bleeding (warfarin-based rodenticides)
- caustic lesions and pulmonary fibrosis (paraquat)

<<NOTE TO USER: Refer to those pesticides commonly used in the country/area.>>
<<NOTE TO USER: insert local photo.>>
<<READ SLIDE.>>

Refs:
American Academy of Pediatrics Committee on Environmental Health. Pesticides. Chapter 24. In: Etzel RA. ed. Pediatric Environmental Health, 2nd Ed. Elk Grove Village Il. American Academy of Pediatrics, 2003.
CDC. Surveillance for acute insecticide-related illness associated with mosquito-control efforts--nine states, 1999–2002. MMWR Morb Mortal Wkly Rep, 2003, 52:629.
Salameh PR et al. Respiratory symptoms in children and exposure to pesticides. Eur Respir J , 2003, 22:507.
Sanborn MD et al. Identifying and managing adverse effects: 4 Pesticides. CMAJ, 2002, 166:1431.
Pictures: Courtesy of Dr. J. Pronczuk. Lesion caused by paraquat.

ACUTE POISONING BY "ACCIDENTAL" INGESTION

- Storage of leftover pesticide in a medicine or soft drink bottle
- Confusion with pharmaceutical
- Pesticide container reused for storing drinks or food
- Pesticide container present in the child's environment

Bottles containing pharmaceuticals and the pesticide chlorpyriphos
Laborde, CIAT, Montevideo

Acute poisoning results from "accidental" (non-intentional) exposure in toddlers and small children. Ingestion occurs, for example, when:

Pesticides have been stored in a medicine or soft drink bottle.

The pesticide bottle is similar to a bottle used for pharmaceuticals.

Pesticide containers are reused for storing drinks or food.

Pesticide containers are easily accessible in the child's environment.

Photo: Bottles containing pharmaceuticals and the pesticide chlorpyriphos
Courtesy of Laborde, CIAT, Montevideo

Pesticides

PRECONCEPTIONAL PRENATAL EXPOSURE

Pesticide exposure before or during pregnancy has been associated with increased risk of:

- **Infertility**
- **Perinatal death**
- **Spontaneous abortion**
- **Premature birth**
- **Fetal growth retardation**
- **Congenital malformations**
- **Early childhood cancer**

WHO

Exposure of either mother or father to pesticide before conception, or exposure of the mother during pregnancy, has been associated with an increased risk of fetal death, spontaneous abortion and early childhood cancer.
There is increasing evidence that in utero exposure increases the risk of growth retardation: a small-for-gestational age baby, low birth weight, reduced length and small head circumference (see photo).
Significant increases in the risk of congenital anomalies have also been reported. These include: eye defects, limb reduction, urogenital defects, hypospadias, cryptorchidism, orofacial clefts, central nervous system defects and heart defects.

Refs:

Bell EM et al. A case-control study of pesticides and fetal death due to congenital anomalies. Epidemiology, 2001, 12:148.
Berkowitz GS et al. In utero pesticide exposure, maternal paraoxonase activity, and head circumference. Environ Health Perspect, 2004, 112:388.
Eskenazi B et al. Association of in utero organophosphate pesticide exposure and fetal growth and length of gestation in an agricultural population, Environ Health Perspectives, 2004, 112 (10): 1116-1124.
Garcia AM et al. Parental agricultural work and selected congenital malformations. Am J Epidemiol 1999, 149:64.
Heeren GA et al. Agricultural chemical exposures and birth defects in the Eastern Cape Province, South Africa. A case - control study. Environ Health, 2003, 2:11.
Nurminen T. Maternal pesticide exposure and pregnancy outcome. J Occup Environ Med, 1995, 37:935.
Rojas A et al. Malformaciones Congenitas y exposicion a pesticidas. Rev Med Chilena, 2000, 128:399.
Schreinemachers DM. Birth malformations and other adverse perinatal outcomes in four U.S. Wheat-producing states. Environ Health Perspect , 2003, 111 :1259.
Weidner IS et al. Cryptorchidism and hypospadias in sons of gardeners and farmers. Environ Health Perspect, 1998, 106:793.
Whyatt RM et al. Prenatal insecticide exposures birth weight and length among an urban minority cohort. Environ Health Perspect , 2004, 112:1125.

CHRONIC NEUROLOGICAL EFFECTS OF ACUTE PESTICIDE EXPOSURE

- Neurological sequelae of acute poisoning
- Neurological symptoms due to high indoor levels of pesticides
- Subtle changes in memory and attention

It may be difficult to differentiate the effects of prenatal exposure from exposure in early childhood, or sequelae of non-fatal acute poisonings.
Chronic neurobehavioural and neurological effects after acute poisoning with organophosphorus pesticides have been reported in adults.
Memory and concentration problems, unusual fatigue, irritability and depression, visual difficulties and delayed polyneuropathy have been described.
In a well-documented case of chronic organophosphorus pesticide poisoning, the house of an infant with hypertonia, first diagnosed as cerebral palsy, was found to have high levels of chlorpyrifos weeks after a professional application (Wagner, 1994).
Few studies have examined the neurobehavioural effects of postnatal exposure to pesticides.
Subtle changes in short-term memory and attention may be associated with application of organophosphorus pesticides in the home.
There is increasing evidence, particularly from animal models, about neurobehavioural effects of long-term exposure to low levels of pesticides.

Refs:
American Academy of Pediatrics Committee on Environmental Health. Pesticides. Chapter 24. In: Etzel R. ed. Pediatric Environmental Health 2nd Ed Elk Grove Village Il, American Academy of Pediatrics, 2003.
Eskenazi B et al, Exposures of children to organophosphate pesticides and their potential adverse health effects. Environ Health Perspect, 1999, 107(3):409–419.
Keifer M et al. Symptoms and cholinesterase activity among rural residents living near cotton fields in Nicaragua. Occup Environ Med, 1996, 53:726.
Ruckart PZ et al. Long-term neurobehavioral health effects of methyl parathion exposure in children in Mississippi and Ohio. Environ Health Perspect, 2004, 112:46.
Wagner SL et al. Chronic organophosphate exposure associated with transient hypertonia in an infant. Pediatrics, 1994,

94:94.

PESTICIDES AND CHILDHOOD CANCER

Some studies have found an association between postnatal pesticide exposure and an increased risk of pediatric cancer

- **Brain tumors**
- **Acute lymphocytic leukemia**
- **Non-Hodgkin lymphoma**

A number of epidemiologic studies have found a significant association between cancer and domestic exposure to pesticides.
Evidence is increasing, but still limited because of the methodological weaknesses of the research.
Investigations in children living in the rural areas of developed countries have also produced limited evidence.

Refs:
Borkhardt A et al. Congenital leukaemia after heavy abuse of permethrin during pregnancy. Arch Dis Child Fetal Neonatal Ed. 2003, 88:F436.
Daniels JL et al. Residential pesticide exposure and neuroblastoma. Epidemiology, 2001. 12:20.
Leiss JK et al. Home pesticide use and childhood cancer: a case-control study. Am J Public Health, 1995, 85:249.
Ma X et al. Critical windows of exposure to household pesticides and risk of childhood leukaemia. Environ Health Perspect, 2002, 110:955.
Pogoda JM et al. Household pesticides and risk of pediatric brain tumors. Environ Health Perspect, 1997, 105:1214.

ENDOCRINE DISRUPTION

- Low doses of certain pesticides may mimic or block hormones or trigger inappropriate hormone activity
- Endocrine disruption may alter development and reproduction and induce birth defects
- Endocrine disruption has been linked to:
  - Infertility
  - Low sperm count
  - Early puberty
  - Hormone-dependent cancers (testicular, breast, prostate)

Endocrine disruption is not an effect, but a mechanism of toxicity that may have different effects.
Evidence of the effect related to this mode of toxicity in children is still limited.
There is experimental evidence of endocrine disruption. Pesticides may have:
estrogenic effects (DDT, dieldrin, endosulfan, methoxychlor)
anti-androgenic effects (DDT, vinclozilin, procymidone)
anti-thyroid effects (ethylenethiourea (ETU), maneb, zineb metabolites)
anti-progestin effects (DDT).
Synthetic pesticides may interfere with the natural process of development.

Refs:

Baskin LS et al. Hypospadias and endocrine disruption, is there a connection? Environ Health Perspect, 2001, 109:1175.
Damstra T et al. Global assessment on the state of the science of endocrine disrupters. IPCS. UNEP/ILO/WHO, 2002.
Gray LE et al. Effects of environmental antiandrogens on reproductive development in experimental animals. Hum Reprod Update, 2001, 7:248.
Landrigan P et al. Assessing the effects of endocrine disruptors in the National Children´s Study. Environ Health Perspect, 2003, 111:1678.

CHRONIC OCCUPATIONAL HAZARDS TO PESTICIDE APPLICATORS

- Increased risk for chronic neurodegenerative disease – Parkinson Disease
- Increased risk of cancer – leukemia and lymphoma
- Sterility - DBCP
- Increased risk of cancer in applicators' children
  - **Leukemia**
  - **Brain cancer**
  - **Hodgkin and non-Hodgkin lymphomas**
  - **Kidney cancer**

OBSOLETE AND BANNED PESTICIDES

Obsolete and banned pesticides are pesticides that can no longer be used for their intended purpose or any other purpose.

They may include:

- Pesticides stored in empty and contaminated pesticide containers
- Pesticides in heavily contaminated soil
- Buried pesticides
- Pesticides saved after a ban
- Pesticides imported from developing countries

Why are some pesticides obsolete and banned?:

- Use prohibited for health/environmental reasons – too toxic
- Product deteriorated as result of improper or prolonged storage
- Product not suitable for intended use and cannot be used for other purposes, nor can it easily be modified to become usable.

Obsolete, unwanted and banned pesticides are serious environmental hazards. Leaking and corroding metal drums filled with obsolete and dangerous pesticides dot urban and rural landscapes of developing countries around the world. These chemical leftovers have become villains in the agricultural world they were designed to help, affecting not only a nation's agriculture and its environment, but also fundamentally the health of its people and consequently development in general be it in rural areas or under urban conditions.

This global environmental tragedy is a direct result of several decades of mishandling and misuse, but is most dramatic in the developing world where there is no awareness of the inherent danger of pesticides. The unaware therefore draw water from contaminated site for own survival and that of their animals.

Obsolete pesticides may include: <<READ SLIDE>>

Most of the affected countries are under tropical conditions where agricultural and vector pests flourish both in diversity and numbers. Migratory pests such as locusts, grasshoppers, grain eating birds, storage pests, rodents, etc. inflict untold damage to agriculture and bring about hunger or misery when they are at their peak.

Poor nations have been led to believe that the only alternative to combat pests agricultural or otherwise effectively is only by using pesticides. The poor or the unaware never think for a moment that pesticides are poisonous and that they are dangerous to life. Most believe that pesticides are like medicines. They consider that they kill pests selectively and are therefore less harmful to humans, animals and plants. Governments save budgets to purchase pesticides on regular basis. Also constantly plead to donors and organizations for assistance either for direct supply of pesticides or for contributions of financial support for purchasing them. In response, donors and organizations supply pesticides. Recipient countries anxious to minimize pest damages to the minimum or, being less aware of the negative consequences, usually receive pesticides from every possible source and direction. This leads to uncoordinated influx of pesticide donations and trading, subsequently giving rise to excessive supply. While some of the donations are genuine, others take the opportunity to dump unwanted and illegal pesticides on the poor and unsuspecting countries. Pesticides reach individual farmers or household dwellers that value pesticides dearly. They keep them in their houses, with their food and animals. Pesticide vendors take the opportunity to promote pesticides aggressively. It is not uncommon to find pesticides being stored in the open or in heavily populated zones and usually in substandard stores and sold along with

food and drinks, etc. Children are used in advertising sales of pesticides and often get easy access to pesticides. They play with empty pesticide cans and use them for drinking water or milk. Most pesticide cans litter streets or are simply dumped in open municipality dumps for subsequent open burning leading to serious emissions of dioxins affecting child waste pickers (scavengers) working in the informal recycling sector. Obsolete pesticides found in open waste sites may also be used/sold by waste pickers and re-introduce them into the agricultural sector.

Common causes of obsolete pesticides include the following:

Use of the product has been prohibited or severely restricted for health or environmental reasons (e.g. through banning; withdrawal of registration, or policy decision by relevant government agencies)

The product has deteriorated as a result of improper or prolonged storage and can no longer be used according to its label specifications and instructions for use, nor can it easily be reformulated to become usable again.

The product is not suitable for its intended use and cannot be used for other purposes, nor can it easily be modified to become usable.

Other possible reasons for why we have obsolete pesticide include:

Banning of pesticides that are still kept in store.

Aggressive pesticide sales, promotions and distributions by the Chemical Industry.

Difficulties in forecasting outbreaks of pest.

Inappropriate assessment of pesticide requirements.

Insufficient application capacity.

Inappropriate formulations or substandard containers.

Excessive donations: these are usually inappropriate because they are not received when needed most (i.e. late arrival of donations or out of season delivery), or are uncoordinated with similar donations from various sources. Such are tantamount to dumping.

Inadequate storage facilities and lack of staff trained in storage management (i.e. poor stock taking and lack of records).

Ineffective distribution or poor marketing systems for pesticides (government or private sector or both).

Lack of awareness of the inherent dangers of pesticides.

Misuse of pesticide containers (e.g. for a variety of domestic uses, water containers, food storage, use for pot plants, etc.).

Notes from FAO: www.fao.org/WAICENT/FAOINFO/AGRICULT/AGP/AGPP/Pesticid/Disposal/index_en.htm

PREVENTION OF EXPOSURE

What can be done to prevent pesticide exposure and poisoning ?

Take action at local level

WHO

<<READ SLIDE.>>

Because of the potential for long-term damage to critical structures such as the nervous system, immune system and endocrine system, prevention of all acute poisoning events as well as of exposure to low doses during development is a high priority for ensuring children's environmental health. There are many steps that can be taken at the local/practice level, national/government level and international treaty/trade levels to decrease exposure to pesticides and related illnesses.

Picture: WHO, L. De Toledo. Ethiopia

Pesticides

PREVENTION – LOCAL LEVEL

Use pesticides ONLY when the benefits outweigh the risks

- Avoid cosmetic or routine use of pesticides in the home
- Use integrated pest management, non-chemical pest controls

If pesticides are necessary:

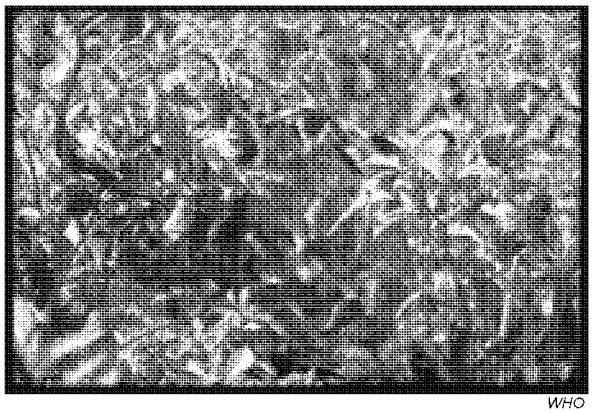
- Store in original containers with child-proof seals, out of reach, in a locked cabinet
- Educate on the safe use of pesticides
  - Follow manufacturer's instructions
  - Use protective equipment
  - Respect re-entry times
  - Pregnant women should not apply pesticides
- Use least hazardous chemicals, least dangerous mode of application

Pesticides should be used only when the benefits outweigh the risks, and non-chemical pest control procedures have failed.
Cosmetic use of pesticides, that is their use to control aesthetically unpleasant plants or non-dangerous insects such as crickets or house millipedes, should be completely avoided.
Integrated pest management (IPM) procedures which include hygiene, sealing of cracks and crevices, screening of doors and windows, and other measures should be the first line of defence for pest management.
If pesticides must be used, they should be stored only in their original containers with manufacturer's labels intact, preferably with child-proof seals, out of the reach of children and in locked cabinets or cupboards.
Users should always follow the safety precautions specified by the manufacturer and observe all safety recommendations including use of gloves, masks, protective clothing and observation of re-entry times (the time when it is safe to return to a treated area).
Pregnant women should not apply pesticides and particular care should be taken to determine appropriate re-entry times for pregnant women, infants and small children. These times may be considerably longer than for less vulnerable individuals.
If chemicals are required, the least hazardous chemical (when there is scientific evidence of less toxicity) should be used with the most contained mode of distribution considered effective. For example, fogs and bombs should not be used. Bait stations are preferable to baseboard sprays or crack and crevice treatment. Granules and bait stations should be used only if they are inaccessible to babies, toddlers and small children (and pets).

Refs:
UNEP Chemicals. Childhood Pesticides Poisoning. Information for Advocacy and Action. May 2004 (www.who.int/ceh/publications/en/pestpoisoning.pdf).
US EPA Webpage for Integrated Pest Management (www.epa.gov/pesticides/food/ipm.htm).

PREVENTION – COMMUNITY LEVEL

- **Integrated pest management**
  - **Homes**
  - **Schools**
  - **Public buildings**
  - **Health centers**
  - **Public parks**
- **Community activities**
  - **Community campaigns**
  - **School activities**
  - **Local awards or contests**
  - **Pesticide-free "zones"**
  - **Support organic farming**



WHO

Many organizations (especially FAO and WHO) promote alternative non-chemical forms of pest-control and there is increasing engagement in non-pesticide dependent agriculture and integrated pest management (IPM).
A variety of local initiatives involving the community can help to create an environment that promotes decreased dependence on pesticides in homes, schools, public areas, health facilities and parks.

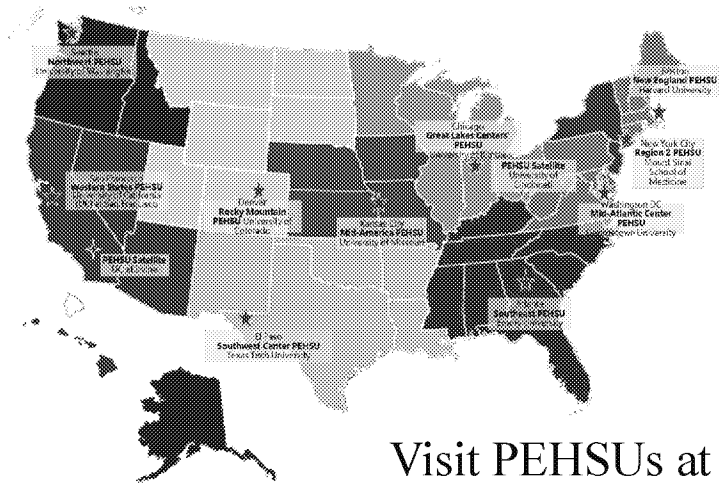
Examples of community activities include:
community campaigns and school activities
local awards or contests
pesticide-free "zones“
support for organic farming

FAO: Food and Agriculture Organization

<<READ SLIDE.>>
Picture: WHO, P. Virot. Plants at the Biofarm, Ethiopia, June 2002.

Pesticide questions: Who to call?

Region 2 Pediatric Environmental Health Specialty Unit



PEHSU
Pediatric Environmental Health Specialty Units

Visit PEHSUs at www.pehsu.net

Contact

Ruth Etzel, MD, PhD, Director
Office of Children's Health Protection
Environmental Protection Agency
HTTP://WWW2.EPA.GOV/CHILDREN
(202) 564-2188

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GRACIAS

Message

From: Etzel, Ruth [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=96A20535ABB54ED4ABF1E40D2AA916D9-ETZEL, RUTH]
Sent: 10/17/2016 4:08:28 PM
To: Wiggins, Lanelle [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=ff03ebbba87143a9b2803faf6551584a-Wiggins, Lanelle]
CC: Reed, Khesha [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=c62327cee1fd4da29a1cc485efe546f7-Reed, Khesha]; Allen, Reginald [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=799c3b0558e14130b17c66b2533548ba-Allen, Regi]
Subject: Transition Papers for OCHP review
Attachments: TSCA Issue Paper_4 October 2016 -dan OCHP edit.docx

Hi Lanelle,

Thanks for the opportunity to comment on the draft transition papers. Attached is a draft of the TSCA issue paper with comments shown in tracked changes mode. We also have the following comments:

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Best,

Ruth

Ruth A. Etzel, MD, PhD
Director
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Message

From: Etzel, Ruth [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=96A20535ABB54ED4ABF1E40D2AA916D9-ETZEL, RUTH]
Sent: 6/30/2015 8:38:09 PM
To: Miller, Gregory [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=0e889cdc40224a5484182092e4824fa7-GMille03]
Subject: RE: Slate.com article on workplace exposures

Thanks for sharing. Please send the second part when available.

From: Miller, Gregory
Sent: Tuesday, June 30, 2015 3:40 PM
To: AO-OCHP-Everyone
Subject: Slate.com article on workplace exposures

"The second part, which will run Wednesday, focuses on the risks unborn children face from their parents' exposures."

http://www.slate.com/articles/business/moneybox/2015/06/osha_regulations_of_silica_and_other_substances_they_re_out_of_date_and.single.html

Working to Death

Tens of thousands of workers suffer and die from toxic chemicals, fumes, and dusts each year. And the government's system to protect them is tragically broken.

By Jamie Smith Hopkins, Maryam Jameel, and Jim Morris

PORT BYRON, New York—Six weeks before Chris Johnson was born in 1974, the U.S. government **issued a warning** about a substance that would nearly kill him 30 years later.

The substance was silica, a component of rock and sand that is the scourge of miners, sandblasters, and other workers who breathe it in. When pulverized into dust, it can cause silicosis—a scarring of the lungs that leads to slow suffocation—as well as lung cancer.

This was no newly discovered hazard. The ancient Greeks and Romans were **mindful of it**. Labor Secretary Frances Perkins launched a **national campaign** against it in the 1930s after the knifelike particles dispatched hundreds of tunnel workers in West Virginia.

The 1974 warning by the National Institute for Occupational Safety and Health said the workplace exposure limit for silica put people in danger. NIOSH urged the Department of Labor's Occupational Safety and Health Administration to cut the limit in half.

OSHA finally did so in 1989, only to see its work undone by a **court decision**. It didn't try again until 2011. In the interim, Johnson became a bricklayer and developed acute silicosis after a five-month job that enshrouded him in dust. He's 40 and, on paper, can expect to survive less than five years.

As Johnson's experience shows, inaction has consequences. Silica—which OSHA says threatens **2.2 million workers, mostly in construction**—is a striking example of the government's failure to properly regulate toxic substances in American workplaces. The silica rule still isn't finished. If it is enacted despite industry protests, it will be only the 37th health standard issued by the agency in its **44-year history**.

It's an ignominious record given the human and economic costs of work-related disease in the United States. According to a widely cited University of California–Davis **study**, an estimated 53,000 people died in 2007 from on-the-job exposures—**outnumbering** those killed in suicides, motor vehicle accidents, falls, or homicides. More than 400,000 others got sick. The price tag: an estimated $58 billion. OSHA puts the **annual toll** at more than 50,000 deaths and 190,000 illnesses.

The government has failed for 40 years to more strictly control silica, exposing countless workers to this lethal substance.

An 18-month investigation by the Center for Public Integrity has found that the epidemic of occupational disease in America isn't merely the product of neglect or misconduct by employers. It's the predictable result of a bifurcated system of hazard regulation—one for the general public and another, far weaker, for workers. Risks of cancer and other illnesses considered acceptable at a workplace wouldn't be tolerated outside of it.

For years the best OSHA has been able to do is set chemical limits so that no more than one extra cancer case would be expected among every 1,000 workers exposed at the legal maximum over their entire careers. The U.S. Environmental Protection Agency's standards for the public are 10 to 1,000 times more protective. The real gap is often worse, a former OSHA official says.

"I can't see any justification for treating people that differently," said Adam M. Finkel, who heads the **Penn Program on Regulation** at the University of Pennsylvania Law School and was director of health standards programs at OSHA from 1995 to 2000.

Bricklayer Chris Johnson contracted acute silicosis triggered by silica dust exposure on the job. The U.S. government has failed for 40 years to more strictly control silica in American workplaces—exposing countless other workers to this lethal substance—and leaving Johnson with a life expectancy of 45 years.

Among the Center's findings:

- Most of OSHA's 470 chemical exposure limits are, by the agency's own admission, grossly outdated and don't protect workers from a variety of ailments. Cancer, for instance: The agency's own analyses of 16 substances estimate that cancer risks associated with legal exposures to workers over their careers are as high as 6 in 10. Analyses of an additional 31 exposure limits by the Center and Finkel found cancer risks above 1 in 10 for nearly half the chemicals.
- The vast majority of the tens of thousands of chemicals made or used in the U.S., including some very common and toxic substances, have no workplace exposure limits. The lung-ravaging food flavoring diacetyl. The widely used herbicide glyphosate, recently named a probable carcinogen by the World Health Organization. The agents in chemotherapy drugs, hazardous to the health care workers preparing and handling them.
- Even apparent success stories—rare cases in which chemical limits were tightened—can be Pyrrhic victories. OSHA's own calculations suggest, for example, that the cancer risk for hexavalent chromium, a metal used in specialty paints and coatings, was as high as 1 in 3 at the limit in effect from 1971 to 2006. At the current, stricter standard, the risk is still as high as 1 in 22, OSHA acknowledges.
- Sampling for chemicals has fallen over the last three decades as workplaces multiplied but OSHA's staff levels stagnated. Even so, OSHA still finds exposures above legal limits, a Center analysis found. One in 6 samples containing hexavalent chromium, taken after the 2006 rule change, topped the limit of 5 micrograms per cubic meter of air. Samples containing lead, a brain-damaging metal that can accumulate on a worker's clothing and hurt the whole family, have exceeded the limit 40 percent of the time since 1984.

- NIOSH last did a nationwide workplace exposure survey more than three decades ago because it has not had the funding to update it. Critical information on both old and emerging chemical hazards across industries is missing, putting regulators and researchers at a disadvantage.

A profound toll

Job-related illness is a slow-motion tragedy few seem to understand or acknowledge. Its victims usually die one by one, out of public view, though disease clusters emerge on occasion.

More than 50 cases of bladder cancer, for example, have been **tied to a small Goodyear chemical plant** in Niagara Falls, New York, far above the expected number in the general population. NIOSH investigators identified the suspect chemical years ago: ortho-toluidine, used to keep tires from cracking. Exposures in the plant weren't extreme; in fact, they were "well below" the legal limit, the **investigators reported**.

Goodyear, which made changes to its factory after the problem came to light, **said in a statement** that all but one of the 54 bladder cancer cases identified through its own screening program involved workers who came to the plant before 1990.

"While the ortho-toluidine exposure levels in the plant have generally been far below the permissible exposure limits, engineering controls were put in place in the 1980s to further reduce levels in the plant," the company said.

Steve Wodka, a lawyer in New Jersey who represented about half the Goodyear victims in claims settled out of court, said he knows of 62 bladder cancer cases from the plant. He calls that cluster "probably the best example of the inadequacy of the system."

Ortho-toluidine is in a family of chemicals—aromatic amines—known since the 1930s to cause bladder cancer, Wodka said. Yet its exposure limit of 5 parts per million, adopted by OSHA in 1971, was fashioned only to protect workers from the chemical's acute effects, not cancer.

"It remains the law of the land today," Wodka said.

The blight of disease contracted on the job isn't confined to factory workers. It consumes hairdressers, grocery store meat wrappers, scientists, and people in a variety of other professions. Many are stricken by middle age.

The panoply of illnesses, from **nerve damage** to **dementia** to virulent **cancers**, takes a profound toll on workers and their families. Careers are lost, finances shredded, marriages tested. In some cases, workers opt for macabre, last-ditch procedures to try to save their lives.

"They basically clean you out like a fish," cancer victim Mike Dennen, who worked in asbestos-contaminated textile factories, said of his 2013 surgery. "They tell you before surgery you can end up without a bladder, you can end up without your intestines."

Federal regulators are overwhelmed by the scope of the problem, **which didn't materialize by chance**. Congress has exacerbated the situation by refusing to fortify the weak 1970 law specifying what OSHA can do. Trade groups have challenged health standards in court while workers have lost their lives. The White House's Office of Management and Budget is a vortex that sucks in proposed agency rules and doesn't spit them out for months—or years.

David Michaels, head of OSHA since 2009, speaks frankly about the results.

"With a few exceptions, OSHA's standards to protect workers from chemical exposures are weak and out of date, or simply nonexistent," he said in a recent interview.

He cited as an example the solvent hexane, which can **wreck the nervous system**. OSHA's exposure limit for the chemical is **500 parts per million**, 10 times the level NIOSH says is safe.

"We know workers get sick at levels below 500 parts per million," Michaels said. "We can't do anything about that."

David Michaels, head of OSHA since 2009, told the Center for Public Integrity that "with a few exceptions, OSHA's standards to protect workers from chemical exposures are weak and out of date, or simply non-existent."
Photo by Jamie Smith Hopkins/Center for Public Integrity

OSHA's exposure limits almost all date to its founding in 1971, he noted, when the agency adopted 1960s-era voluntary numbers **embraced by industry**. Few have been updated since, and only those few became full standards with specific technological and medical requirements.

"The law under which OSHA operates … forces us to go through a very, very complex, onerous process for regulating any individual chemical," Michaels said. "It takes many years and millions of dollars in studies to issue one standard. And that's why we've got only a few dozen standards."

An ancient hazard

Silicosis and other dust-related diseases, the 1974 NIOSH document reported, "have probably existed since man began to dig into the earth's crust." Silica was a cruelly efficient killer of stonecutters in the 17th century; slicing through the workers' lungs during necropsy was "like cutting a mass of sand," a Dutch physician reported in 1672. It silenced 19th-century sandstone masons in England long before they reached old age.

Silica also precipitated America's worst industrial disaster: the deaths of more than 750 workers—many black—who drilled a water-diversion tunnel through silica-rich rock near Gauley Bridge, West Virginia, in the early 1930s. Death estimates reached as high as 2,000, but the full count will never be known. Sick workers were booted out of company housing. Some who died on site were carted off to unmarked graves.

Four decades after that, in December 1974, Christopher Scott Johnson was born in Auburn, New York. His life almost perfectly tracks silica's tortured regulatory history.

The month of Johnson's birth, OSHA published an "advance notice of proposed rulemaking," indicating movement toward a new silica standard. That effort fizzled due to a lack of funds, according to the head of OSHA at the time.

Silica-related death and disease continued. As bad as things were in foundries and other dusty, fixed establishments, where workers legally could be exposed to twice the NIOSH-recommended silica limit, construction was far worse. Employers in that sector could subject workers to five times the recommended limit without breaking the law.

That's still the case.

Johnson landed in the construction category in 1993. He became a bricklayer, also known as a mason, following in the footsteps of two uncles. He crafted sidewalks and floors with bricks and stone, and helped repair and put up buildings.

"I was very happy with my job," he said in an interview at his home in Port Byron, west of Syracuse. "I felt fulfillment."

Johnson said he was oblivious to silica's destructive properties. That didn't matter until he was assigned a job in Rome, New York, in April 2004. Standing on hydraulic lifts, Johnson and his co-workers at a small contracting

firm removed and replaced damaged brick from the façades of three apartment buildings operated by the Rome Housing Authority.

The work, which lasted through September of that year, generated "a tremendous amount of dust," Johnson said. "You're in a basket that's maybe 6 feet wide and 2 or 3 feet deep, so you're pretty much stuck right there."

The workers were given disposable paper masks, known by experts to be ineffective against microscopic silica particles. The one half-face respirator on the job had a broken strap, "so we didn't really use it," Johnson said.

It's not just factory workers. It's hairdressers, grocery store meat wrappers, scientists, and more.

They had tools to suppress the dust: Their diamond-bladed, 14-inch demolition saws came equipped with hose attachments for "wet cutting." But the project manager for the Housing Authority refused to allow the practice, fearing it would "make too much of a mess," according to an **affidavit** given by a former co-worker in a **lawsuit** Johnson later filed against the authority. OSHA rules, moreover, don't require it.

Johnson did "about 90% of the saw cutting and grinding on the job," his former colleague said in the affidavit. "In fact, he was often so covered in dust we nicknamed him 'Dusty.' "

Jim Baldwin, who joined the Housing Authority as executive director years later, said he would have allowed wet cutting "because of the danger caused by the inhalation of the fine dust."

"Not having proper respirators on the job was certainly a factor in the worker's illness," he added by email. "For that I would have shut the job down until that equipment was made available and was being used."

There is no way to know how much silica Johnson inhaled. But the current rule for construction is so weak, even employers that stay within the legal limit can be "sentencing someone to death from lung disease," said **Celeste Monforton**, a lecturer at George Washington University and a former Labor Department analyst and adviser.

By the time the Rome job ended, "something was not right with me," Johnson said. He was short of breath, losing weight rapidly, unable to do simple tasks without exertion. "I had no clue what was going on."

The answer came early in a three-week stay at the University of Rochester's Strong Memorial Hospital in December 2004. Johnson's parents drove him there after his right lung collapsed following a biopsy, and further tests showed he had acute silicosis triggered by mixed dust exposure.

He underwent an unusual procedure called a lavage, in which his lung was flushed of sticky material filling up the air sacs and robbing him of oxygen. He stayed on a ventilator for nine days.

"None of the doctors really even knew if he was going to pull through or not," said his wife, Beverly.

Chris Johnson and his wife, Beverly, in February 2015.

Photo by Maryam Jameel/Center for Public Integrity

The procedure didn't help much. Johnson continued to struggle for air as he rested fitfully at home in early 2005. He was a candidate for a double lung transplant, a prospect he found unappealing once he learned the odds of survival: Less than half of patients would live five years, and less than a quarter would survive 10.

He opted instead for a second lavage at the Cleveland Clinic in May 2005. This one took. By 2006 his lung disease had stabilized, though it hadn't been cured.

Internist and lung specialist Dr. William Beckett treated Johnson in Rochester and was so struck by the severity of the young mason's condition that he co-authored an article about it for a medical journal. In an interview, he noted the banality of the substance that had gummed up Johnson's lungs.

"This is not an unusual material. It's not exotic," Beckett, now affiliated with Harvard Medical School and Mount Auburn Hospital in Cambridge, Massachusetts, said of silica. "It's something that everybody is around, but the people who cut through it or work with it are susceptible to getting disease from it."

Beckett chaired an American Thoracic Society committee that called for a stricter OSHA silica limit in 1997. To his dismay, the old one is still in place.

"There are many, many, I'm sure, young men in the United States who are doing the same kind of job [Johnson did]," he said, "and probably getting the same kinds of exposures."

Forty years of futility

OSHA's 40-years-and-counting quest to keep silica from killing workers is a study in inertia and frustration. The agency tried to tighten exposure limits for silica and 375 other substances in a 1989 rule, but a federal appeals court **struck it down**, saying the analyses OSHA used to justify the rule weren't detailed enough.

It took OSHA nearly two decades to regroup, even though it deemed silica a regulatory priority in **1995** and **2002**. In the meantime, **evidence hardened** that silica could cause **lung cancer** in addition to silicosis.

It's unlikely any group of workers has felt the sting of lax silica controls more than **sandblasters**, who use pressurized guns to shoot sand at corroded surfaces to prepare them for painting. The sand breaks apart as it strikes metal, creating clouds of dust laced with invisible shards of quartz that scar the lungs.

NIOSH, **noting available alternatives** such as nut shells and sawdust, suggested in 1974 that sandblasting with silica be **banned**. Britain and a swath of mainland Europe had **already done so** by that point.

But industry groups in the United States, like the euphemistically named Silica Safety Association, composed of purveyors and beneficiaries of sandblasting, lobbied successfully in the 1970s to fend off a ban, predicting economic hardship.

In February 2011, OSHA finally sent a proposed silica rule to the Office of Management and Budget for vetting. It emerged **921 days later** in 2013. OMB officials will not say why it took so long; 90 days, plus a single 30-day extension, is supposed to be the maximum unless the rulemaking agency asks for more time.

Apart from trimming the silica exposure limit to the NIOSH-recommended number for all workers, the **proposed standard** would require employers to control dust with methods such as water or vacuum systems and provide medical monitoring for highly exposed workers. OSHA predicted it would save nearly 700 lives and prevent 1,600 new cases of silicosis per year.

The Labor Department held **14 days** of hearings in Washington, D.C., in the spring of 2014. Among the witnesses was construction worker Santiago Hernandez, who'd come to the United States five years earlier from Tlaxcala, Mexico, expecting to find safer conditions.

Instead, he said in **written testimony**, "things are actually much worse here than in Mexico. ... The protections you receive here are useless. Employers give you a little paper mask that, when you finish, is just as dirty and dusty on the inside as on the outside."

Dale McNabb, a tile setter from Warren, Michigan, **spoke** of developing "breathing problems at night" in his 20s. "By the time I was 30 I felt it more. I could hear my labored breathing and wheezing, and it shocked me."

In 2008, when he was 42, he volunteered to use a grinder to remove thinset—a mortar made of cement and sand—from a wall over the course of several weeks. "At the end of the project I was feeling pretty bad," McNabb testified. Tests showed "shadowing in my pleural membrane so severe that the membrane was almost opaque, and there were several lesions on my lungs.

"When I get exposed to dust now—and not just silica dust, any dust—it feels like I have a plastic bag around my head and someone's trying to pull it shut on me," McNabb said. He got a job as a shuttle bus driver, then in financial services, and is thankful he can work. But the stress that followed his health crisis left a lasting mark. "In the end, silica exposure cost me my job, my health and also my marriage."

Industry witnesses also shared doleful stories—what would happen to companies if they had to comply with the proposed rule.

The American Foundry Society, **disputing** OSHA's cost estimates, said the standard would eat up 10 percent of the industry's revenue and "threaten the viability of foundries across the country."

The American Chemistry Council, the chemical industry's main trade group, **said** the silicosis death rate has dropped more than 90 percent since 1968. Neil King, a lawyer for the council, blamed newer cases on

exposures "that occurred decades ago" and more recent exposures that far exceeded the current limit—something that happens regularly, he said.

And the U.S. Chamber of Commerce, which represents more than 3 million businesses, suggested that OSHA ought to take more time on an effort already four decades old.

"We have serious concerns about this rulemaking being rushed," said Henry Chajet, a lawyer who **spoke** for the chamber.

Industry groups have kept up the pressure as the rule has inched toward final form.
That **includes** pointed **comments** from the chamber, a lobbying powerhouse **that spent $124 million** to press for its members' interests in 2014—more than the next four top-ranked groups combined.

About 30 people march outside the U.S. Chamber of Commerce on June 5 to protest the chamber's opposition to a stricter silica standard. Marc Freedman, the trade group's executive director for labor law policy, watched from the steps and chuckled. "It's lame," Freedman told a Center reporter. "Why do they think the chamber is the reason this [standard] hasn't happened?"

Photo by Maryam Jameel/Center for Public Integrity

OSHA's **economic analysis** projected that while affected businesses would spend an estimated $664 million annually to comply with the proposal—about **$1,242 for the average workplace**—the net benefits would range from about $2.9 billion to $4.7 billion a year, values OSHA applied to avoided disease.

In a congressionally requested **1995 review** of past OSHA actions, the since-**dismantled** Office of Technology Assessment found that the agency tended to overestimate the cost its health rules would impose on industry—often in a big way.

Nonetheless, in March the Construction Industry Safety Coalition, composed of 25 trade groups, said its **own study** concluded that a new silica standard would cost construction companies nearly $5 billion a year—10 times what OSHA had calculated for that industry. It could be "the most expensive OSHA standard ever for the construction industry," the coalition **warned**.

OSHA is undeterred, Michaels told the Center. "President Obama has made it very clear he is committed to getting the silica standard out while he's president." A final rule is expected by the end of 2016, a Labor Department spokeswoman said.

But the Senate Appropriations Committee last week approved an **appropriations bill rider** that would require more study before the rule could be issued, which would put the proposal at the mercy of the next president. And even if the rule is enacted, that may not be the final word. Industry almost always challenges OSHA standards in court, which can delay or overturn them.

Reports from public health officials, meanwhile, show that silica remains a workplace menace.

Congress has exacerbated the situation by refusing to fortify the weak 1970 law specifying what OSHA can do.

In 2012, NIOSH researchers said they collected 116 air samples at sites in five states where shale deposits were tapped with the oil and gas extraction technique known as hydraulic fracturing, or fracking. Vast quantities of high-silica sand are used to hold open fissures underground, allowing the product to flow into wells; the NIOSH team **found** that nearly half the samples were above the current OSHA exposure limit, creating an "inhalation health hazard."

Almost 80 percent were above the NIOSH-recommended limit—the number OSHA wants to enact.

Another group of NIOSH researchers **reported in June** that silicosis deaths, after decreasing for years, are rising again. Silicosis was listed as the underlying or contributing cause of death for 88 people in the U.S. in 2011, **down from 164** a decade earlier, but such deaths rose to 103 in 2012 and 111 in 2013.

Those who died during the three-year period included a dozen people younger than 45. Researchers called this "concerning," saying it suggested that intense exposures, of the sort that sickened Chris Johnson, were occurring. Their data didn't reflect other illnesses linked to silica, such as lung cancer, chronic obstructive pulmonary disease, and kidney disease.

The five-decade plunge in silicosis deaths cited by trade groups reflects a shift from manufacturing to service jobs, NIOSH said in a statement to the Center.

"That does not mean that the risk for developing silica-related diseases … is acceptable in those that still work in dusty trades," the agency said.

"Scott's not here"

Last summer, encouraged by his tolerable if imperfect state of health, Johnson tried to get back into masonry. The experiment lasted a few weeks.

"I just couldn't do it anymore," he said. "And then I did try to do a factory job, and that didn't work."

A stepfather to three boys, Johnson lifts weights, runs on a treadmill, and busies himself with household projects. Six feet tall and 250 pounds, he betrays no outward sign of infirmity. Having settled his lawsuit against the Rome Housing Authority, he's in decent financial shape and is determined to exceed his predicted life span of 45 years.

Still, Johnson said, "I'm affected a lot by my lungs now. I'm constantly getting sick." A cold that would sideline the average person for a day or two immobilizes him for weeks. "It puts me right down to where I have no energy," he said.

But Johnson is grateful to be alive. He's already had more time than some workers struck with silicosis.

Bricklayer Scott Whipps, shown here with his dog Maddy, died of silicosis at 38 in 2006.

Photo courtesy of Judy Schoon

Scott Allen Whipps—like Johnson, a mason—died at 38 in 2006, four years after being diagnosed with the disease. His final months were agonizing.

"He coughed nonstop," said his mother, Judy Schoon of Fergus Falls, Minnesota. "He coughed up blood. He coughed so much that he'd vomit."

Schoon and her husband, Jim, Whipps' stepfather, witnessed it all firsthand. They'd taken in Whipps during those last months, and his bedroom was next to theirs.

"The goal was always a lung transplant, but he could never get the infection out of his body, so he couldn't be considered for one," Judy Schoon said.

One of his lungs turned gangrenous, and shortly after surgery, his condition deteriorated until his hold on life was "very tenuous," according to a doctor's report. Whipps would wake up screaming in the hospital for his mother. Doctors tried another surgery to save him, to no avail. He died an hour and a half after medical personnel unhooked him from life support, his family telling him to go where the pain would not follow.

It's been nine years. Judy Schoon still hasn't processed her son's early death. Losing a child, she said, is "unnatural."

"I wake up sometimes," Schoon said, "and think, 'Oh—Scott's not here.' "

This story was **published** *by the* **Center for Public Integrity**, *a nonprofit, nonpartisan investigative news organization in Washington.* **It part of** a **series** examining the epidemic of work-related disease in America. The second part, which will run Wednesday, focuses on the risks unborn children face from their parents' exposures. For more on its investigation, follow the Center for Public Integrity on **Twitter** and join the conversation on its **Worker Safety Facebook group**.

Jamie Smith Hopkins is a reporter for the Center for Public Integrity's environmental health and labor desk.

Maryam Jameel is a reporter for the Center for Public Integrity's environmental health and labor desk.

Jim Morris is the managing editor of the Center for Public Integrity's environmental health and labor desk.

Message

From: Etzel, Ruth [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=96A20535ABB54ED4ABF1E40D2AA916D9-ETZEL, RUTH]
Sent: 10/11/2017 5:23:04 PM
To: Paul Spire [PSpire@aap.org]
Subject: Emerging Technologies chapter
Attachments: 52 - Emerging Technologies - editor review SJB 073017RAE082417.docx

Hi Paul,

Both Sophie and I have reviewed this chapter. It is now ready for stakeholder review.

Best,

Ruth

Ruth A. Etzel, MD, PhD
Director
Office of Children's Health Protection
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460
Phone: 202-564-2188

Message

From: Berger, Martha [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=58F5EF445E4D4DC694A2D4FB35951B9A-MBERGER]
Sent: 7/5/2018 2:51:37 PM
To: AO-OCHP-Everyone [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=222d03d48d634481af638d4892296469-AO-OCHP-Everyone]; Bartels, Kimberly [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=5aa1ae6ec9ee4c8dae63a1cde0867d5d-Larson, Kimberly]
Subject: Fwd: Children's environmental health newsletter - May June 2018

Fyi

Martha

Martha Berger
Office of Children's Health Protection
US Environmental Protection Agency
Ex. 6

Begin forwarded message:

From: heca <heca@WHO.INT>
Date: July 5, 2018 at 5:53:05 AM EDT
To: <HECANET@LISTSERV.WHO.INT>
Subject: Children's environmental health newsletter - May June 2018
Reply-To: HECANET <HECANET@LISTSERV.WHO.INT>

You're receiving this newsletter because you have subscribed to the Healthy Environments for Children Alliar

Children's Environmental Health International Initiat

This is an international mailing list provided by WHO and UNEP
dedicated to promoting healthy environments for children

May/June 2018

WHO GLOBAL AMBIENT AIR QUALITY DATABASE (UPDATE 2018)

More than 80% of people living in urban areas that monitor air pollution are exposed to air quality levels that exceed the World Health Organization (WHO) limits. While all regions of the world are affected, populations in low-income cities are the most impacted.

According to the latest air quality database, 97% of cities in low- and middle-income countries with more than 100 000 inhabitants do not meet WHO air quality guidelines. However, in high-income countries, that percentage decreases to 49%.

CHILDREN'S ENVIRONMENTA

Press Releases

One in three UK children live in to
UNICEF research
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million of all children aged five an

In the past two years, the database – now covering more than 4000 cities in 108 countries – has nearly doubled, with more cities measuring air pollution levels and recognizing the associated health impacts.

As urban air quality declines, the risk of stroke, heart disease, lung cancer, and chronic and acute respiratory diseases, including asthma, increases for the people who live in them.

Ambient (outdoor) air quality database 2018

Press release (English)
Press release (French)

BreatheLife video - How air pollution impacts your body

Infographics

TRANSLATIONS OF WHO CHILDREN'S ENVIRONMENTAL HEALTH PUBLICATIONS

'Inheriting a sustainable world: Atlas on children's health and the environment' and 'Don't pollute my future! The impact of the environment on children's health' are now available for download in French and Spanish from the WHO website. 'State of the science of endocrine disrupting chemicals – 2012' is now available in Chinese.

Inheriting a sustainable world? Atlas on children's health and the environment (Available in English, French and Spanish)

Don't pollute my future! The impact of the environment on children's health (Available in English, French and Spanish)

State of the science of endocrine disrupting chemicals - 2012
(Available in Chinese).

WORLD HEALTH ASSEMBLY

The 71st World Health Assembly was held from 21-26 May in Geneva. Public Health, Environmental and Social Determinants of Health topics were discussed and events which took place at the World Health Assembly included:

– Health, environment and climate change A71/10
– Road map for an enhanced global response to the adverse effects of air pollution A71/10 Add.1
– Human health and biodiversity A71/11

Technical briefings on Health, environment and climate change were held, as well as side events on Health in All Policies; Air pollution; and Water, Sanitation and Hygiene.

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WHO (11/6/2018)

World Environment Day: beat plast
World Environment Day is markec
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towards a cleaner, healthier plane
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risks, and especially air pollution. V

WHO launches Global Action Plan
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More active people for a healthier v
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have fewer opportunities to be acti

WMO and WHO tackle health impa
climate change
In the face of growing health impac
change and air pollution, the Wo
(WMO) and World Health Organiza
up joint action to tackle environm
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JOURNAL ARTICLES

Chemicals

Maternal Peripartum Serum DDT/E and Urinary Pyrethroid Metabolite Concentrations and Child Infections at 2 Years in the VHEMBE Birth Cohort

Indoor residual spraying (IRS) of insecticides, conducted in low- and middle-income countries to control malaria, may result in high exposure to dichlorodiphenyltrichloroethane (DDT), its breakdown product dichlorodiphenyldichloroethylene (DDE), or pyrethroids. Animal studies suggest in utero exposure to these chemicals may increase childhood infection frequency. Authors investigated associations between maternal DDT/E and pyrethroid metabolite concentration and child infection associations in an IRS setting in which susceptibility factors are common and infections are leading causes of child morbidity and mortality. *In utero* IRS insecticide exposure may increase childhood infection rates. This was particularly apparent among children from poorer households or whose mothers had low energy intake during pregnancy.

Environmental Health Perspectives

Prenatal Exposure to Perfluoroalkyl Substances and IQ Scores at Age 5; a Study in the Danish National Birth Cohort

Perfluoroalkyl substances (PFASs) are widespread persistent organic compounds that have been suggested to affect neurodevelopment. Authors aimed to evaluate whether prenatal exposure to PFASs is associated with IQ in children. Overall, this study did not find consistent evidence to suggest prenatal exposure to PFASs to be associated with child IQ scores at 5 y of age in the DNBC. Some of the sex-specific observations warrant further investigation. Additional studies should examine offspring IQ at older ages and assess other functional cognitive and neuropsychiatric measures in addition to intelligence. Postnatal exposures to PFASs and mixture effects for PFASs and PFASs with other environmental pollutants should also be considered in future research.

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Glyphosate exposure in pregnancy and shortened gestational length: a prospective Indiana birth cohort study

Glyphosate (GLY) is the most heavily used herbicide worldwide but the extent of exposure in human pregnancy remains unknown. Ninety three percent of the pregnant women had GLY levels above the limit of detection (0.1 ng/mL). Mean urinary GLY was 3.40 ng/mL (range 0.5–7.20 ng/mL). Higher GLY levels were found in women who lived in rural areas ($p = 0.02$), and in those who consumed > 24 oz. of caffeinated beverages per day ($p = 0.004$). Authors observed no correlations with fetal growth indicators such as birth weight percentile and head circumference. However, higher GLY urine levels were significantly correlated with shortened gestational lengths ($r = -0.28$, $p = 0.02$). This is the first study of GLY exposure in US pregnant women using urine specimens as a direct measure of exposure.

Environmental Health

Exploring the endocrine activity of air pollutants associated with unconventional oil and gas extraction

Environment during the World Hea
(31/5/2018)

WHO plan to eliminate industrially
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WHO today released REPLACE
elimination of industrially-produced
food supply. Eliminating trans fats
saving lives: WHO estimates that e
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Industrially-produced trans fats are
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WHO (14/5/2018)

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WHO WPRO (2/5/2018)

Report sounds alarm on soil polluti

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Environmental Health

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Exposure to triclosan, an endocrine disrupting chemical, may affect thyroid hormone homeostasis and adversely affect neurodevelopment. Using a longitudinal pregnancy and birth cohort, authors investigated associations between triclosan exposures during different time windows, and cognitive test scores at 8 y of age in 198 children from the HOME Study. Full-Scale IQ was not significantly associated with urinary triclosan concentrations during gestation or childhood but was significantly associated with a 10-fold increase in maternal urinary triclosan concentration at delivery [−4.5 points (95% CI: −7.0, −2.0)]. Perceptual Reasoning Index (PRI) scores were significantly decreased in association with urinary triclosan concentrations at delivery and at 2 y of age. Associations between repeated triclosan concentrations and cognitive test scores significantly varied among exposure at different time periods for Full-Scale IQ, PRI, Verbal Comprehension Index, and Working Memory (triclosan–visit interaction $p \leq 0.04$). Urinary triclosan concentrations at delivery, but not during mid to late pregnancy and childhood, were associated with significantly lower children's cognitive test scores at 8 y of age in this cohort of U.S.
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Environmental Health Perspectives

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mining and the intensification of ag
soil contamination across the plane
seen soil used as a sink for ever gr
waste, says *Soil Pollution: A Hidde*
the food we eat, the water we drink
health of our ecosystems," said FA
Maria Helena Semedo at the start
potential of soils to cope with pollut
soil pollution should be a top priorit
(2/5/2018)

In the Media

'Our kids need proper water': Famil
in drinking water
Some of Australia's poorest comm
high in uranium, and residents
ignoring the problem. Many of us t
thought — high-quality drinking wa
regions across the country. But
Laramba, north of Alice Springs, d
double the recommended levels o
for a decade. ABC News (19/6/201

Pollutionwatch: Air contamination c
Beijing is slowly shedding its image
In 2013, it ranked as the 40th wors
the World Health Organisation gl
thanks in part to a crackdown on p
Air pollution in the 62 Chinese citie
by an average of 30% between 201
problems are often blamed on the
but the problems probably date ba
(24/5/2018)

Hamburg becomes first German cit
Hamburg is to become the first Ger
to improve air quality, setting a ter
the country. The ban will affect abo
thirds of the diesel vehicles registe
city. Authorities in the northern por
older vehicles would be barred fror
May. "Driving limits for older diesel
as planned" thanks to a decision
government said. The Guardian (2

Mysterious rise in banned ozor
scientists
A sharp and mysterious rise in emi
chemical has been detected by s

Water, Sanitation and Hygiene

Rationale for Environmental Hygiene towards global protection of fetuses and young children from adverse lifestyle factors
In this study authors aim at strengthening the management of exposure to individual health hazards during pregnancy and lactation, with protective measures in a global strategy of Environmental Hygiene. They hypothesize that such a strategy could reduce both the individual effects of harmful agents in complex mixtures and the possible interactions among them. A panel of experts should develop and endorse implementable measures towards a protective behavior. Their application is meant to be preferably as a package of measures in order to maximize protection and minimize interactions in causing adverse effects. Testing our hypothesis requires biomonitoring studies and longitudinal evaluation of health endpoints in the offspring. Favorable effects would legitimate further action towards equal opportunity access to improved environmental health. Environmental Hygiene is proposed as a global strategy aiming at effective protection of pregnant women, unborn children and infants against lifelong consequences of exposure to combinations of adverse lifestyle factors.
Environmental Health

E-waste

Impact of informal electronic waste recycling on metal concentrations in soils and dusts
Electronic and electrical equipment contains over 1000 different substances, including metals. During informal e-waste recycling some of these substances such as metals, are released into the environment causing environmental pollution. This study assessed the impact of different informal e-waste recycling activities (burning, dismantling, and repairing) on metal concentrations in top soils and various dust. Metal concentrations at e-waste recycling sites were compared to the concentrations at control sites in three study locations in Nigeria (Lagos, Ibadan, and Aba). In the three study locations, mean metal concentrations at the e-waste recycling sites exceeded the concentrations at the control sites and the Nigerian standard guideline values by 100 s to 1000 s times. Burning sites showed the highest pollution level, followed by dismantling sites, then repair sites. This study provides scientific evidence for an urgent need to develop effective strategies to strengthen enforcement of existing e-waste regulations in Nigeria.
Environ Res

UPCOMING EVENTS

WHO's First Global Conference on Air Pollution and Health
30 October - 1 November 2018, Geneva, Switzerland

International Childhood Cancer Cohort Consortium (I4C) Annual Meeting
13-14 Nov 2018, Tokyo, Japan

Excellence in Pediatrics Conference
6-8 December 2018, Prague, Czechia

being banned around the world.
stopped, the recovery of the ozone
from damaging UV radiation, coul
source of the new emissions has
finding a more precise location re
chemicals were used in making foa
aerosols and as refrigerants. But th
Montreal protocol after the disc
Antarctica in the 1980s. Since 2007
reported production of CFC-11, th
CFCs. The Guardian (16/5/2018)

London bans junk food ads on pub
London plans to ban junk food
transport network to tackle child ob
in Europe, Mayor Sadiq Kahn said
children aged 10 and 11 in Lor
according to research compiled
obesity in London is a ticking timeb
If we don't take bold steps against
young people as well as placing
pressurized health service," Kahr
(11/5/2018)

Thirdhand smoke is widespread a
evidence shows
First came doctors' warnings
discoveries about the danger of sec
number of scientists are raising the
residual chemicals left on indoo
Mounting research has shown suc
can be absorbed through the skin, i
even years after the smoke has d
(9/5/2018)

Children living in green neighbour
asthma
Since the pioneering work of arch
who found that patients with a vie
more quickly from surgery, researc
natural environment is associate
benefits. We have focused our wo
published today, shows that
neighbourhoods are less likely to c
equally effective, however. If a chilc
of plants, they were even less lik
landscapes with low plant divers
conifers, on the other hand, were
greenness is good, but more biodi
The Conversation (8/5/2018)

Asthma in children could become v
Asthma attacks in children, who liv
a playground, is often severe, su
exposure to traffic-related pollutio

EVENTS

IDSE Italy: a campaign on Climate and Health at the "National Conference on Climate, Air Pollution and Health" in Tarant

On 15 and 16 May 2018, a two-day national Conference on Climate Change, Air Pollution and Health was held in Taranto, Italy. The conference has been promoted by the National Federation of Medical Orders, the International Society of Doctors for the Environment Italy, the Order of Doctors of Taranto, and organized in collaboration with the Ministry of Health, with the technical support of the World Health Organization and the Municipality of Taranto. Among the outcomes of the conference was the launch of a national campaign on Climate, Air Pollution and Health which aims at building a new strategy to train physicians on the correlation between health, environment and climate change. Health professionals can play a fundamental role in reporting on environmental-related health issues and in raising the awareness the population.

EDUCATION AND TRAINING

AAP Environmental Health ECHO

The Pediatric Environmental Health Specialty Units (PEHSUs) lead the AAP Environmental Health ECHO. The purpose of the Environmental Health ECHO is to increase clinician knowledge, comfort and competence in preventing or identifying, diagnosing, and treating environmentally-related health conditions in children and reproductive-age adults. This program uses the ECHO (Extension for Community Healthcare Outcomes) model, a tele-mentoring platform that leverages video conference technology to connect a team of specialists with primary care providers in local communities. This program meets biweekly for a brief lecture followed by a de-identified patient case presentation and discussion. Topics will include lead, mold, indoor and outdoor air quality, food safety, and more! This program differs from a traditional webinar in that all attendees actively participate and learn from each other.

WHO Children's environmental Health training modules translated into Japanese

Three modules from the WHO Training Package for Health Care Providers "Why children?", "Children are not little adults" and "unsound management of chemicals" are now available in Japanese.

asthma in children. According to a
Israel Deaconess Medical Center,
field's length of major roadways ha
paediatric asthma compared to chil
away. It has been long known that
an asthma attack among childre
suffering from asthma. However,
about the role of long-term expos
impact. Hindustan Times (2/5/2018

Air pollution inequality widens betw

Pollution inequality between the w
according to the latest global
Organisation (WHO) which shows
developing nations – die every ye
Overall, nine in 10 people on th
dangerous, air, says the WHO repo
comprehensive collection of globa
contamination vary widely depend
financial resources. The Guardian

Fracking chemicals "imbalance" the

Chemicals commonly found in grou
wells appear to impair the proper fu
according to a lab study released to
in the journal Toxicological Scien
between fracking chemicals and
suggests that baby girls born to mo
fight diseases later in life as well as
free pregnancy. Environmental Hea

For Farmworkers' Kids, Country Air
Asthma

Most people think of asthma as a c
rural kids are just as likely to have
people who grow our food are espe
the University of Washington and th
Clinic are working on a new app
Uncontrolled asthma often has to d
conditions. And farm worker fam
pollutants that can trigger asthma
wildfires and agricultural burning,
OPB (25/4/2018)

Links to past issues and how to subscribe

This document is not a formal publication of the United Nations Environment Programme and the World Health Organiza
featured documents are not necessarily the views of the organizations.

Have news for us?

If you would like to submit information to future HECANET issues, email us at heca@who.int with the subject line "IN

Collated and distributed with the cooperation of the
Children's Health and the Environment Program, The University of Queensland, Brisbane, Austra

Message

From: Bernardi, Cassandra [CBernardi@aap.org]
Sent: 7/5/2018 2:41:33 PM
To: pehsu@pehsu.net
Subject: FW: Children's environmental health newsletter - May June 2018

Please see below for the latest newsletter from the Healthy Environments for Children Alliance.

From: HECANET <HECANET@LISTSERV.WHO.INT> **On Behalf Of** heca
Sent: Thursday, July 5, 2018 4:53 AM
To: HECANET@LISTSERV.WHO.INT
Subject: Children's environmental health newsletter - May June 2018

You're receiving this newsletter because you have subscribed to the Healthy Environments for Children Alliance

Children's Environmental Health International Initiatives

This is an international mailing list provided by WHO and UNEP
dedicated to promoting healthy environments for children

May/June 2018

WHO GLOBAL AMBIENT AIR QUALITY DATABASE (UPDATE 2018)

More than 80% of people living in urban areas that monitor air pollution are exposed to air quality levels that exceed the World Health Organization (WHO) limits. While all regions of the world are affected, populations in low-income cities are the most impacted.

According to the latest air quality database, 97% of cities in low- and middle-income countries with more than 100 000 inhabitants do not meet WHO air quality guidelines. However, in high-income countries, that percentage decreases to 49%.

In the past two years, the database – now covering more than 4000 cities in 108 countries – has nearly doubled, with more cities measuring air pollution levels and recognizing the associated health impacts.

As urban air quality declines, the risk of stroke, heart disease, lung cancer, and chronic and acute respiratory diseases, including asthma, increases for the people who live in them.

Ambient (outdoor) air quality database 2018

Press release (English)
Press release (French)

BreatheLife video - How air pollution impacts your body

CHILDREN'S ENVIRONMENTAL HEA

Press Releases

One in three UK children live in toxic air
UNICEF research
Young children and babies in the UK are
impacted by deadly levels of the most har
according to new analysis by UNICEF UK.
that one in three children in the UK (4.5 r
areas with unsafe levels of particulate po
million of all children aged five and youn
under one living in the most toxic air zor
Unicef UK is calling for the Governmer
measures that target the worst-polluted a
from toxic air in places they live, learn and p

WHO certifies Paraguay malaria-free
The World Health Organization (WHO) too
having eliminated malaria, the first count
granted this status since Cuba in 1973. "It
today to certify that Paraguay is officially
Tedros Adhanom Ghebreyesus, WHO
recorded statement. "Success stories like
possible. If malaria can be eliminated ir
eliminated in all countries." In 2016, WH

Infographics

TRANSLATIONS OF WHO CHILDREN'S ENVIRONMENTAL HEALTH PUBLICATIONS

'Inheriting a sustainable world: Atlas on children's health and the environment' and 'Don't pollute my future! The impact of the environment on children's health' are now available for download in French and Spanish from the WHO website. 'State of the science of endocrine disrupting chemicals – 2012' is now available in Chinese.

Inheriting a sustainable world? Atlas on children's health and the environment (Available in English, French and Spanish)

Don't pollute my future! The impact of the environment on children's health (Available in English, French and Spanish)

State of the science of endocrine disrupting chemicals - 2012 (Available in Chinese).

WORLD HEALTH ASSEMBLY

The 71st World Health Assembly was held from 21-26 May in Geneva. Public Health, Environmental and Social Determinants of Health topics were discussed and events which took place at the World Health Assembly included:

– Health, environment and climate change A71/10
– Road map for an enhanced global response to the adverse effects of air pollution A71/10 Add.1
– Human health and biodiversity A71/11

Technical briefings on Health, environment and climate change were held, as well as side events on Health in All Policies; Air pollution; and Water, Sanitation and Hygiene.

JOURNAL ARTICLES

Chemicals

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In the Media

'Our kids need proper water': Families plea
in drinking water

Some of Australia's poorest communities
high in uranium, and residents have a
ignoring the problem. Many of us turn on
thought — high-quality drinking water is su
regions across the country. But in the
Laramba, north of Alice Springs, drinking
double the recommended levels of uraniu
for a decade. ABC News (19/6/2018)

Pollutionwatch: Air contamination drops by

Beijing is slowly shedding its image as the
In 2013, it ranked as the 40th worst city fo
the World Health Organisation global da
thanks in part to a crackdown on polluters
Air pollution in the 62 Chinese cities track
by an average of 30% between 2013 and 2
problems are often blamed on the country
but the problems probably date back to t
(24/5/2018)

Hamburg becomes first German city to ba

Hamburg is to become the first German cit
to improve air quality, setting a template f
the country. The ban will affect about 214,
thirds of the diesel vehicles registered in G
city. Authorities in the northern port city s
older vehicles would be barred from two of
May. "Driving limits for older diesel vehicles
as planned" thanks to a decision by a t
government said. The Guardian (23/5/201

Mysterious rise in banned ozone-destr
scientists

A sharp and mysterious rise in emissions o
chemical has been detected by scientist
being banned around the world. Unless
stopped, the recovery of the ozone layer, w
from damaging UV radiation, could be de
source of the new emissions has been t
finding a more precise location requires f
chemicals were used in making foams for
aerosols and as refrigerants. But they were
Montreal protocol after the discovery o
Antarctica in the 1980s. Since 2007, there
reported production of CFC-11, the seco
CFCs. The Guardian (16/5/2018)

London bans junk food ads on public trans

to improved environmental health. Environmental Hygiene is proposed as a global strategy aiming at effective protection of pregnant women, unborn children and infants against lifelong consequences of exposure to combinations of adverse lifestyle factors.
Environmental Health

E-waste

Impact of informal electronic waste recycling on metal concentrations in soils and dusts
Electronic and electrical equipment contains over 1000 different substances, including metals. During informal e-waste recycling some of these substances such as metals, are released into the environment causing environmental pollution. This study assessed the impact of different informal e-waste recycling activities (burning, dismantling, and repairing) on metal concentrations in top soils and various dust. Metal concentrations at e-waste recycling sites were compared to the concentrations at control sites in three study locations in Nigeria (Lagos, Ibadan, and Aba). In the three study locations, mean metal concentrations at the e-waste recycling sites exceeded the concentrations at the control sites and the Nigerian standard guideline values by 100 s to 1000 s times. Burning sites showed the highest pollution level, followed by dismantling sites, then repair sites. This study provides scientific evidence for an urgent need to develop effective strategies to strengthen enforcement of existing e-waste regulations in Nigeria.
Environ Res

UPCOMING EVENTS

WHO's First Global Conference on Air Pollution and Health
30 October - 1 November 2018, Geneva, Switzerland

International Childhood Cancer Cohort Consortium (I4C) Annual Meeting
13-14 Nov 2018, Tokyo, Japan

Excellence in Pediatrics Conference
6-8 December 2018, Prague, Czechia

EVENTS

IDSE Italy: a campaign on Climate and Health at the "National Conference on Climate, Air Pollution and Health" in Tarant
On 15 and 16 May 2018, a two-day national Conference on Climate Change, Air Pollution and Health was held in Taranto, Italy. The conference has been promoted by the National Federation of Medical Orders, the International Society of Doctors for the Environment Italy, the Order of Doctors of Taranto, and organized in collaboration with the Ministry of Health, with the technical support of the World Health Organization and the Municipality of Taranto. Among the outcomes of the conference was the launch of a national campaign on Climate, Air Pollution and Health which aims at building a new strategy to train physicians on the correlation between health, environment and climate

London plans to ban junk food advertis
transport network to tackle child obesity, w
in Europe, Mayor Sadiq Kahn said on Fric
children aged 10 and 11 in London ar
according to research compiled for Bri
obesity in London is a ticking timebomb ar
If we don't take bold steps against it we a
young people as well as placing a hug
pressurized health service," Kahn said
(11/5/2018)

Thirdhand smoke is widespread and may
evidence shows
First came doctors' warnings about
discoveries about the danger of secondhar
number of scientists are raising the alarm a
residual chemicals left on indoor surfa
Mounting research has shown such poter
can be absorbed through the skin, ingested
even years after the smoke has dissipate
(9/5/2018)

Children living in green neighbourhoods a
asthma
Since the pioneering work of architecture
who found that patients with a view of a
more quickly from surgery, research has sh
natural environment is associated with
benefits. We have focused our work on as
published today, shows that children
neighbourhoods are less likely to develop
equally effective, however. If a child was ex
of plants, they were even less likely to g
landscapes with low plant diversity, su
conifers, on the other hand, were a risk
greenness is good, but more biodiverse g
The Conversation (8/5/2018)

Asthma in children could become worse if
Asthma attacks in children, who live near a
a playground, is often severe, suggests
exposure to traffic-related pollution and
asthma in children. According to a researc
Israel Deaconess Medical Center, childre
field's length of major roadways had nearl
paediatric asthma compared to children wh
away. It has been long known that smog a
an asthma attack among children and
suffering from asthma. However, researc
about the role of long-term exposure to
impact. Hindustan Times (2/5/2018)

Air pollution inequality widens between ric
Pollution inequality between the world's ri
according to the latest global data f

change. Health professionals can play a fundamental role in reporting on environmental-related health issues and in raising the awareness the population.

EDUCATION AND TRAINING

AAP Environmental Health ECHO
The Pediatric Environmental Health Specialty Units (PEHSUs) lead the AAP Environmental Health ECHO. The purpose of the Environmental Health ECHO is to increase clinician knowledge, comfort and competence in preventing or identifying, diagnosing, and treating environmentally-related health conditions in children and reproductive-age adults. This program uses the ECHO (Extension for Community Healthcare Outcomes) model, a tele-mentoring platform that leverages video conference technology to connect a team of specialists with primary care providers in local communities. This program meets biweekly for a brief lecture followed by a de-identified patient case presentation and discussion. Topics will include lead, mold, indoor and outdoor air quality, food safety, and more! This program differs from a traditional webinar in that all attendees actively participate and learn from each other.

WHO Children's environmental Health training modules translated into Japanese
Three modules from the WHO Training Package for Health Care Providers "Why children?", "Children are not little adults" and "unsound management of chemicals" are now available in Japanese.

Organisation (WHO) which shows that 7 r
developing nations – die every year fron
Overall, nine in 10 people on the plar
dangerous, air, says the WHO report, whic
comprehensive collection of global air qu
contamination vary widely depending on
financial resources. The Guardian (1/5/201

Fracking chemicals "imbalance" the immu
Chemicals commonly found in groundwate
wells appear to impair the proper functionir
according to a lab study released today. Tl
in the journal Toxicological Sciences, is
between fracking chemicals and immun
suggests that baby girls born to mothers ne
fight diseases later in life as well as they co
free pregnancy. Environmental Health Nev

For Farmworkers' Kids, Country Air Means
Asthma
Most people think of asthma as a city kid p
rural kids are just as likely to have asthma
people who grow our food are especially vu
the University of Washington and the Yaki
Clinic are working on a new approach
Uncontrolled asthma often has to do with p
conditions. And farm worker families a
pollutants that can trigger asthma: dust,
wildfires and agricultural burning, and am
OPB (25/4/2018)

Links to past issues and how to subscribe

This document is not a formal publication of the United Nations Environment Programme and the World Health Organization and
featured documents are not necessarily the views of the organizations.

Have news for us?
If you would like to submit information to future HECANET issues, email us at heca@who.int with the subject line "INFORMA

Collated and distributed with the cooperation of the
Children's Health and the Environment Program, The University of Queensland, Brisbane, Australia

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pehsu+unsubscribe@pehsu.net.

Message

From: Spire, Paul [PSpire@aap.org]
Sent: 9/25/2018 3:45:44 PM
To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; 'Sophie Balk' [sbalk@montefiore.org]
Subject: Green Book 2nd Proofs - 53 - Emerging Technologies
Attachments: 53_PEH_ch53_0959-0968.gm.edit1.pdf; 53_1st proof with feedback_PEH_ch53_000-000.gm.revrae080818 sjb090618.pdf

Hi Ruth and Sophie.

I am writing to provide the attached 2nd proof for your review. Also attached for reference is the response that we submitted to the 1st proof. Please be reminded that this round is intended to ensure that the previously requested changes have been properly incorporated.

Many thanks,

Paul

Message

From: Environmental Law360 [news-q2@law360.com]
Sent: 7/16/2018 7:45:18 AM
To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]
Subject:[SPAM-Sender] Bid To Expand States' NEPA Review Power Is A Mixed Bag

ENVIRONMENTAL

Monday, July 16, 2018

TOP NEWS

Analysis

Bid To Expand States' NEPA Review Power Is A Mixed Bag

While the Trump administration's proposal to expand National Environmental Policy Act authority to states likely won't draw much excitement from states with shrinking budgets and limited staff, industry observers say, the proposal will allow many others to speed up critical transportation infrastructure projects. Read more »

DOI Tells 4th Circ. To Reject Atlantic Coast Pipeline Block

Environmental groups on Friday continued dueling with the National Park Service over a bid to delay the Atlantic Coast Pipeline, pushing back against the government's contention an injunction blocking construction would overstep the Fourth Circuit's jurisdiction. Read more »

Enviros Ask 5th Circ. To Declare Effluent Rule Delay Illegal

A coalition of eight environmental groups on Thursday urged the Fifth Circuit to hold that the U.S. Environmental Protection Agency lacked the authority to postpone an Obama-era rule that set limits on how much toxic metal can be discharged with power plants' wastewater. Read more »

Tribes Talking With New Potential Owner For Power Plant

The Navajo Nation and the Hopi Tribe have said they have been in talks with two companies to possibly take over the ownership and operation of the Navajo Generating Station, a massive 2,250-megawatt coal-fired power plant. Read more »

POLICY & REGULATION

House Pushes Through Fed. Water Facility Title Transfer Bill

A piece of bipartisan legislation aimed at making it easier for nonfederal entities like Native American tribes and local utilities to acquire title transfers for federal water facilities has passed through the U.S. House of Representatives, according to congressional leaders. Read more »

LITIGATION

Enviros Seek Quick Win In Suit Over Enbridge Spill Plan OK

Listen to our new podcast here

LAW FIRMS

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DLA Piper
Dickinson Wright
Earthjustice
Eckert Seamans
Epstein Becker Green
Farella Braun
Gibson Dunn
Goodwin
Greenberg Traurig
Hogan Lovells

The National Wildlife Federation on Thursday continued to urge a Michigan federal judge to hand it a quick win on its claims that the U.S. Department of Transportation unlawfully approved Enbridge Energy's oil spill response plans for a Wisconsin-to-Ontario pipeline without properly reviewing whether those plans squared with federal environmental statutes. Read more »

Miner Says Romania Illegally Squeezed It For More Money

Canadian miner Gabriel Resources Ltd. has filed a more detailed $4.4 billion international arbitration claim against Romania, alleging the country blocked its Rosia Montană gold and silver project in a bid to shake the company down for more money. Read more »

Enviros Look To Nix Permit For Refinery Near National Park

A trio of environmental groups launched a lawsuit in North Dakota state court Thursday challenging a decision by the state's Department of Health to award an air pollution control permit to Meridian Energy Group Inc. for a proposed oil refinery near Theodore Roosevelt National Park. Read more »

EPA 'Amazingly Wrong' On Roundup Cancer Risk, Jury Hears

The U.S. Environmental Protection Agency was "amazingly wrong" when it found that glyphosate, the active ingredient in Monsanto's Roundup weed killer, was not a likely carcinogen, a former National Institutes of Health scientist told a California jury Friday during a landmark trial over claims the herbicide caused a retired groundskeeper's lymphoma. Read more »

EXPERT ANALYSIS

Investment Tax Credit Guidance Means Sunny Days For Solar

Notice 2018-59, issued last month by the Internal Revenue Service, confirms that standards and safe harbors previously defined in guidance issued for wind energy projects can be used in the context of solar energy projects. Solar energy sponsors can now act with greater certainty in making solar investments, say Jon Nelsen, Michael Didriksen and Peter Farrell of Baker Botts LLP. Read more »

A Path To New York's Energy Storage Goal

New York state's recently issued Energy Storage Roadmap identifies the actions and initiatives that can help New York meet its energy storage goal of 1,500 megawatts by 2025. Danielle Mettler-LaFeir of Barclay Damon LLP looks at the road map's recommendations and the opportunities they create. Read more »

Asbestos Transparency Laws Can Stop Double Recovery

Some asbestos plaintiffs have obtained full recovery from viable defendants and simultaneously, or later, recovered more money for the same injury from asbestos bankruptcy trusts established by those same entities. Recognizing this problem, more and more states are turning to asbestos transparency laws as a solution, say Scott Hunsaker and Karl Borgsmiller of Tucker Ellis LLP. Read more »

Series

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Law professor Nathalie Martin's new book, "Lawyering From the Inside Out: Learning Professional Development Through Mindfulness and Emotional Intelligence," can be of value to any lawyer aiming to achieve greater productivity, relieve the stress of the legal profession and focus on goals, says U.S. District Chief Judge Denise Page Hood of the Eastern District of Michigan. Read more »

Opinion

It's Not All About The Benjamins, Baby (Lawyer)

Notwithstanding the latest salary war among prominent law firms, I urge my middle-aged and older colleagues to help the recent graduates we know focus on the long term. Even if the salary is the same, there is a big difference between an institutional firm and the relatively younger firms matching BigLaw, says J.B. Heaton, a University of Chicago business law fellow and former partner at Bartlit Beck. Read more »

LEGAL INDUSTRY

Global 20: Linklaters

From playing a key role in Takeda's $62 billion takeover of Shire PLC to its work on a $4 billion infrastructure deal in Africa, U.K.-based Linklaters LLP blazed new trails around the globe over the past year and earned a spot on Law360's Global 20 list. Read more »

Exclusive

ABA Cuts Chief's Salary Amid Layoffs, Falling Membership

The American Bar Association reduced its executive director's pay from $1.25 million in 2015 to $1.17 million in 2016, documents made public Friday show, but Law360 has learned that a bigger pay cut for the executive is in the works as the organization grapples with declining membership and dues revenue, as well as layoffs. Read more »

Convicted Husband Of Ex-Linklaters Atty To Pay SEC $120K

The husband of a former Linklaters LLP associate who pled guilty to trading on insider information gleaned from his wife must disgorge nearly $120,000 to the U.S. Securities and Exchange Commission in a related civil suit, a New York federal judge ruled Thursday. Read more »

Analysis

A Justice Kavanaugh Would Be Unleashed From Precedent

On the D.C. Circuit, Judge Brett Kavanaugh has been forced to comply with precedents he doesn't agree with. That would change if he's confirmed to the Supreme Court. Read more »

Another Red-State Senate Dem Opposes Judge Kavanaugh

Another red-state Democrat, Michigan's Sen. Debbie Stabenow, announced her opposition to D.C. Circuit Judge Brett Kavanaugh's nomination to the U.S. Supreme Court Friday, adding to a growing group of Democrats who have said they will vote no on President Donald Trump's choice to replace retiring Justice Anthony Kennedy. Read more »

Perkins Coie Atty Tapped For 9th Circ. In New Round Of Noms

Just days after announcing his latest Supreme Court pick, President Donald Trump on Friday unveiled six new judicial nominees for federal courts around the country, including Seattle-based Perkins Coie LLP

Hobby Lobby Stores
Johnson & Johnson
Mattress Firm Holding Corp.
Monsanto Co.
NBCUniversal Inc.
National Parks Conservation Association
National Wildlife Federation
New York City Bar Association
New York Times Co.
Physicians for Social Responsibility
Planned Parenthood Federation
SAS Institute
Shire PLC
Sierra Club
SoftBank Group Corp.
Southern Environmental Law Center
Stillwater Mining Company
Time Warner Inc.
Tix Corporation
Vodafone Group PLC
Washington Nationals

GOVERNMENT AGENCIES

Bureau of Reclamation
California Environmental Protection Agency
Consumer Financial Protection Bureau
European Union
Executive Office of the President
Federal Communications Commission
Federal Energy Regulatory Commission
Federal Highway Administration
Federal Transit Administration
Fish and Wildlife Service
Hopi Tribe
Internal Revenue Service
National Institutes of Health
National Labor Relations Board
National Park Service
National Telecommunications and Information Administration
Navajo Nation
New York Power Authority

partner Eric Miller for the Ninth Circuit over the objections of a home-state senator. Read more »

Feature

GC Cheat Sheet: The Hottest Corporate News Of The Week

A report revealed that female general counsel collect 78 cents for every dollar earned by men at the same level, the European Union proposed an expanded equivalence for its financial services and internal memos showed the American Bar Association faces an uncertain future if it continues on its current track of losing revenues. These are some of the stories in corporate legal news you may have missed in the past week. Read more »

In Case You Missed It: Hottest Firms And Stories On Law360

For those who missed out, here's a look back at the law firms, stories and expert analyses that generated the most buzz on Law360 last week. Read more »

Podcast

Law360's Pro Say: Who Is Brett Kavanaugh?

The political battle lines are already forming in Washington, D.C., over President Donald Trump's nomination of Judge Brett Kavanaugh to replace Justice Anthony Kennedy on the U.S. Supreme Court. But who is the man himself? This week on Law360's Pro Say podcast we attempt to answer that, from Kavanaugh's resume to his biggest rulings, his writing style and his judicial philosophy. Read more »

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U.S. Environmental Protection Agency

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Message

From: Maaike Jansen [jansen@un.org]
Sent: 3/5/2019 2:57:02 PM
Subject: FW: Children's Environmental Health Newsletter - February - March 2019

with apologies for cross-postings

From: HECANET <HECANET@LISTSERV.WHO.INT> **On Behalf Of** heca
Sent: Tuesday, 05 March, 2019 5:02 AM
To: HECANET@LISTSERV.WHO.INT
Subject: Children's Environmental Health Newsletter - February - March 2019

You're receiving this newsletter because you have subscribed to the Healthy Environments for Children Alliance

Children's Environmental Health International Initiatives

This is an international mailing list provided by WHO and UNEP

dedicated to promoting healthy environments for children

Jan/Feb 2019

TEN THREATS TO GLOBAL HEALTH IN 2019

The world is facing multiple health challenges. These range from outbreaks of vaccine-preventable diseases such as measles and diphtheria, increasing reports of drug-resistant pathogens and growing rates of obesity and physical inactivity, to the health impacts of air pollution and climate change and multiple humanitarian crises.

The Report outlines the top ten issues that will demand attention from WHO and its health partners in 2019. To address these and other threats, 2019 sees the start of WHO's new five-year strategic plan – the 13th General Programme of Work 2019–2023. This plan focuses on a triple billion target: ensuring one billion more people benefit from access to universal health coverage, one billion more people are protected from health emergencies and one billion

CHILDREN'S ENVIRONMENTAL HEA

Press Releases

WHO in collaboration with the Ministry of
and early childhood development in Inpati
programs in South Sudan

Severe acute malnutrition (SAM) is one
illness and death among under-five ch
In 2019, nearly 260 000 young children
severe acute malnutrition and, at leas
expected to develop medical complicat

more people enjoy better health and wellbeing. Reaching this goal will require addressing the threats to health from a variety of angles.

JOURNAL ARTICLES

Air Pollution

Acute effects of air pollutants on spontaneous pregnancy loss: a case-crossover study

This study aimed to investigate the relationship between acute exposure to air pollutants and spontaneous pregnancy loss. Authors found that a 10-ppb increase in 7-day average levels of nitrogen dioxide was associated with a 16% increase in the odds of spontaneous pregnancy loss (odds ratio [OR] = 1.16; 95% confidence interval [CI] 1.01-1.33; P=.04). A 10-μg/m^3 increase in 3-day and 7-day averages of fine particulate matter were associated with increased risk of spontaneous pregnancy loss, but the associations did not reach statistical significance ($OR_{3\text{-day average}}$ = 1.09; 95% CI 0.99-1.20; P=.05) ($OR_{7\text{-day average}}$ = 1.11; 95% CI 0.99-1.24; P=.06). Authors found no evidence of increased risk for any other metrics of nitrogen dioxide or fine particulate matter or any metric for ozone. This study found that short-term exposure to elevated levels of air pollutants was associated with higher risk for spontaneous pregnancy loss.

Fertility and Sterility

Air pollution in the week prior to delivery and preterm birth in 24 Canadian cities: a time to event analysis

Numerous studies have examined the association between air pollution and preterm birth (< 37 weeks gestation) but findings have been inconsistent. Pooled estimates across 24 cities indicated that an IQR increase in ozone (O3, 13.3 ppb) 0–3 days prior to delivery was associated with a hazard ratio of 1.036 (95% CI 1.005, 1.067) for preterm birth, adjusting for infant sex, maternal age, marital status and country of birth, neighbourhood socioeconomic status (SES) and visible minority, temperature, year and season of birth, and a natural spline function of day of year. There was some evidence of effect modification by gestational age and season. Associations with carbon monoxide, nitrogen dioxide, particulate matter, and sulphur dioxide were inconsistent. Authors observed associations between daily O3 in the week before delivery and preterm birth in an analysis of approximately 1 million births in 24 Canadian cities between 1999 and 2008. This analysis is one of a limited number which have examined these short

intellectual potential and inhibit physic
increased risk of lifelong disability. To ir
and reduce the impact of acute
implementing an integrated health/nut
and hygiene (WASH)/protection stra
Emergency Nutrition program. This str
on stabilization centers in areas with
acute malnutrition in South Sudan. Ove
five with SAM and medical complicatior
admitted in SC will benefit from these
next six months. WHO AFRO (8/2/201

NTDs: WHO launches toolkit to optimize w
hygiene interventions

The World Health Organization (WHO)
toolkit to help improve delivery of water,
(WASH) services to underserved pc
many neglected tropical diseases (NTD
2015 global strategy the toolkit, WAS
together: a 'how to guide' for NTD pr
providing step-by-step guidance to
managers, volunteers and implementin
engage and work collaboratively w
"Targeted water and sanitation interver
in tackling the many neglected tropic
Maria Neira, Director, WHO Departn
Environmental and Social Determina
(31/1/2019)

Intercountry meeting to fight malnutrition ir

The WHO Regional Office for the Ea
holding an intercountry consultative me
points from 22 to 24 January 2019, ir
Food and Agriculture Organization c
UNICEF and the World Food Pro
including representatives from Membe
stakeholders, will address the issue
Region. Malnutrition, in its various for
health problem in WHO's Eastern M
More than 20 million children under th
by poor nutrition. Half of all women, mo
and 15% of children in the Region are
Some countries, especially those affect
to experience high levels of food insecu
micronutrient deficiencies. WHO EMRC

term associations employing Cox proportional hazards models to account for the different exposure durations of preterm vs. term births.

Environmental Health

Let the "A" in WASH Stand for Air: Integrating Research and Interventions to Improve Household Air Pollution (HAP) and Water, Sanitation and Hygiene (WaSH) in Low-Income Settings

The authors argue that bringing these two areas together would improve the effectiveness and efficiency of interventions to reduce the massive disease burden associated with HAP and poor WaSH, including pneumonia and diarrhea, the leading killers of young children in low-income countries. HAP and WaSH face similar challenges in designing, implementing, and securing the sustained and exclusive use of scalable interventions such as clean fuel and water. Research can advance greater coordination of these areas by demonstrating their interactions and wider impacts on well-being as well as the potential for programmatic synergies. Integrated solutions to clean households and communities can benefit from the contribution in multiple disciplines, including economics and policy analysis; business and finance; engineering and technology; lab sciences, environmental health, and biomedical sciences; and behavioral and implementation sciences.

Environmental Health Perspectives

Chemicals

Organophosphate Pesticide Metabolite Concentrations in Urine during Pregnancy and Offspring Nonverbal IQ at Age 6 Years

Susceptibility to organophosphate (OP) pesticide neurotoxicity may be greatest during the prenatal period; however, previous studies have produced mixed findings concerning in utero OP pesticide exposure and child cognition. The objective of this study was to determine whether maternal urinary concentrations of OP pesticide metabolites are inversely associated with child nonverbal IQ at 6 y of age and to examine potential effect measure modification by the PON1 gene. Overall, associations between child nonverbal IQ and maternal DAP concentrations were small and imprecise, and these associations were inconsistent across urine sampling periods. However, for a 10-fold difference in total DAP concentration for the >25weeks of gestation samples, adjusted child nonverbal IQ was 3.9 points lower (95% CI: −7.5, −0.3). Heterogeneity in the DAP–IQ association by PON1 gene allele status was not observed (n=474). Consistent evidence of an association between higher maternal urinary DAP concentrations and lower child IQ scores at 6 y of age was not observed.

New WHO Asia-Pacific centre for environm
Seoul

A new World Health Organization (WH
for Environment and Health in the Wes
open this year in Seoul, Republic of Ko
open the Centre was signed today by V
for the Western Pacific Shin Yo
Environment of the Republic of Kore
Mayor of Seoul Park Won-soon. T
healthier and safer environments and
resilience to climate and environment
Western Pacific Region. "Environment
change are among the greatest threats
With the establishment of the WHO
Environment and Health in the Western
be able to step up our support to cou
better protect people's health. Having t
offer mutual benefits to WHO and the
and City of Seoul," said Shin You
(15/1/2019)

Drink salty water or go thirsty – Climate ch
school children

The students at Kingani school in th
Bagamoyo used to have two choices
school: get sick or remain thirsty. Risin
drought and reduced or erratic rainfall
so salty it would cause headaches, stom
To make matters worse, the water that
time fetching from watering holes was
disease. Ismat Hassan, who came from
es Salaam to study and board at Kinga
from drinking the well water, typhoid fr
from watering holes, and pain and exha
to drink neither. UNEP (14/2/2019)

New UN report reveals that hunger in Afric

Hunger in Africa continues to rise after
threatening the continent's hunger era
the Malabo Goals 2025 and the 2030
Development, particularly the Sustaina
2 (SDG2). New data presented in the jo
Regional Overview of Food Security

Environmental Health Perspectives

Exposure to Perfluoroalkyl Substances during Fetal Life and Pubertal Development in Boys and Girls from the Danish National Birth Cohort

It remains unsettled whether prenatal exposure to perfluoroalkyl substances (PFASs) affects human reproductive health through potential endocrine disruption. Authors aimed to explore the associations between prenatal exposure to several PFASs and various aspects of pubertal development in boys and girls. Overall, prenatal exposure to PFOS, perfluorohexane sulfonate (PFHxS), perfluoroheptane sulfonate (PFHpS), perfluorononanoic acid (PFNA), and perfluorodecanoic acid (PDFA) (girls) and PFHxS and PFHpS (boys) was associated with lower mean age at puberty marker onset. PFDA and PFNA exposure was associated with higher mean age at onset of puberty in boys. Nonmonotonic associations in girls (PFOS, PFHpS, PFDA) and boys (PFDA, PFNA) were observed, showing larger mean age differences for the combined puberty indicator in the middle tertile [girls: PFOS: −3.73 mo, 95% confidence interval (CI): −6.59, −0.87; PFHpS: −4.92 mo, 95% CI: −11.68, 1.85; PFDA: −3.60 mo, 95% CI: −9.03, 1.83; and boys: PFNA: 4.45 mo, 95% CI: −1.30, 10.21; PFDA: 4.59 mo, 95% CI: −0.93, 10.11] than in the highest tertile with the lowest as reference.

Environmental Health Perspectives

Prenatal Exposure to Select Phthalates and Phenols and Associations with Fetal and Placental Weight among Male Births in the EDEN Cohort (France)

The placenta performs crucial physiological functions to ensure normal fetal development. Few epidemiological studies investigated placental weight sensitivity to phthalates and phenols. The authors' goal was to explore whether maternal exposure to select phthalates and phenols is associated with changes in placental weight at birth and in placental–to–birth weight ratio (PFR). The multipollutant ENET model for placental weight retained four biomarkers: triclosan and monocarboxy-isononyl phthalate (MCNP), which were negatively associated with placental weight, and benzophenone-3 and the sum of parabens, which were positively associated with this outcome. The ENET model for PFR retained two phthalate metabolites [MCNP and monocarboxy-isooctyl phthalate (MCOP)], which were negatively associated with this outcome. The positive association between the sum of parabens and placental weight was consistent with results of a previous study among 49 male births.

Environmental Health Perspectives

today, indicates that 237 million people
are suffering from chronic undernutriti
made in the past years. The joint report
for Africa of the Food and Agricultur
United Nations (FAO) and the Unit
Commission for Africa (ECA) was lau
Ababa at an event presided by FAO's D
Climate and Natural Resources, Maria
(13/2/2019)

International push to improve food safety

Greater international cooperation is ne
food from causing ill health and hampe
sustainable development, world lea
opening session of the First Inter
Conference, in Addis Ababa, organize
(AU), the Food and Agriculture Orga
Nations (FAO), the World Health Organ
World Trade Organization (WTO). A
International Forum on Food Safety
focus on interlinkages between food
scheduled to be hosted by WTO in Ge
two meetings are expected to galvani
actions in the key areas that are strateg
safety. FAO (12/2/2019)

Rwanda's ambitious plan for clean and eff

The Government of Rwanda has releas
sustainably cooling foods and life-s
keeping homes and other indoor spa
weather. Such moves are essential
access to cooling while ensuring that h
the sector does not exacerbate clim
electricity. When it comes to cooling,
refrigerators and air conditioners. W
products is key, the Government o
holistically when it comes to meetin
noting that continuing on a business as
a huge rise in electricity use and a sh
gas emissions and pollution that its
cannot afford. UNEP (11/2/2019)

Statistical Methodology in Studies of Prenatal Exposure to Mixtures of Endocrine-Disrupting Chemicals: A Review of Existing Approaches and New Alternatives

This study aimed to review the statistical methods used in these studies, to identify additional applicable methods, and to determine the strengths and weaknesses of each method for addressing the salient statistical and epidemiological challenges. Authors identified 74 studies and analyzed the methods used to estimate mixture health effects, identify important mixture components, account for nonmonotonicity in exposure–response relationships, assess interactions, and identify windows of exposure susceptibility. Authors identified both frequentist and Bayesian methods that are robust to multicollinearity, performing shrinkage, variable selection, dimension reduction, statistical learning, or smoothing, including methods that were not used by the studies included in our review. Compelling motivation exists for analyzing EDCs as mixtures, yet many studies make simplifying assumptions about EDC additivity, relative potency, and linearity, or overlook the potential for bias due to asymmetries in chemical persistence.

Environmental Health Perspectives

Very low-level prenatal mercury exposure and behaviors in children: the HOME Study

Mercury is toxic to the developing brain, but the lowest concentration associated with the development of behavior problems is unclear. The purpose of this study was to examine the association between very low-level mercury exposure during fetal development and behavior problems in children. The median prenatal total blood mercury concentrations was 0.67 µg/L. Overall, authors did not find statistically significant associations between mean prenatal mercury concentrations and behavior problems scores, but a 2-fold increase in mercury concentrations at 16-weeks gestation was associated with 0.83 point (95% CI: 0.05, 1.62) higher BASC-2 anxiety scores. Maternal and cord blood mercury concentrations at delivery were associated with parent-reported anxiety at 8 years. Authors found limited evidence of an association between very-low level prenatal mercury exposure and behaviors in children, with an exception of anxiety.

Environmental Health

Maternal urinary 2-hydroxynaphthalene and birth outcomes in Taiyuan, China

Naphthalene is the simplest polycyclic aromatic hydrocarbon (PAH). It is easily emitted into the atmosphere, posing a significant risk to human health. However, limited studies have described the impact of naphthalene exposure on birth outcomes. In this study,

Progress on food security and nutrition s
Central Asia

More than 14 million adults, and some 4.7
and Central Asia suffer from severe food i
the Food Insecurity Experience Scale
Agriculture Organization of the United N
released today. The Regional Overview
Nutrition: Europe and Central Asia 201
country data on dietary energy supply,
nutrition indicators, such as stunting
overweight and obesity, and the effects of t
FAO estimates that some 2.1 percent of the
of nearly one billion was exposed to sever
2017 based on FIES data. FAO (11/12/201

In the Media

UN agency plan tackles 'hidden cost' o
safer, mercury-free mining

As gold production exposes millions
children globally to toxic levels of merc
$180-million Global Environment F
Opportunities for the Long-term Devel
and small-scale gold mining (ASGM
programme will improve conditions fo
countries while slashing harmful me
widespread use of mercury in the art
sector affects the environment and
developing countries" said Philippe Sch
Development Organization's (UNIDO)
Programme Development and Techn
News (18/2/2019)

Toxic black snow covers Siberian coalmini

Residents of a coalmining region in Sib
videos online showing entire streets and
black snow that critics say highlight
catastrophe. In one video, filmed in Ki
Kuzbass region, a woman drives past r
snow stretching to the horizon, covering a
the courtyards of residential buildings. Th
were described as "post-apocalyptic" b
Guardian (15/02/2019)

authors investigated the association between the maternal urinary metabolites of naphthalene, 2-hydroxynaphthalene (2-OH NAP), and birth outcomes. General linear models showed that prenatal urinary 2-OH NAP was associated with lower birth weight (BW) (− 4.38% for the high vs. low exposure group of 2-OH NAP; p for trend = 0.049) and higher cephalization index (CI) (4.30% for the high vs. low exposure group of 2-OH NAP; p for trend = 0.038). These associations were linear and significant when 2-OH NAP was modeled as a continuous variable in restricted cubic spline models (P linear = 0.0293 for 2-OH NAP and BW; P linear = 0.0326 for 2-OH NAP and CI). Multiple linear regression data indicated that each 1 ln-unit increase in 2-OH NAP was significantly associated with a 2.09 g/cm increase in the CI.

Environmental Health

E-waste

Heavy metals in human urine, foods and drinking water from an e-waste dismantling area: Identification of exposure sources and metal-induced health risk

Electronic waste or e-waste dismantling activities are known to release metals. However, the human exposure pathways of metals, and their association with oxidative stress in e-waste dismantling areas (EDAs) remain unclear. In this study, the results revealed elevated geometric mean concentrations in vegetables (Cd 0.096 and Pb 0.35 μg/g fw), rice (Cd 0.15, Pb 0.20, and 12.3 μg/g fw), hen eggs (Cd 0.006 and Pb 0.071 μg/g fw), and human urine (Cd 2.12, Pb 4.98, Cu 22.2, and Sb 0.20 ng/mL). Our calculations indicate that rice consumption source accounted for the overwhelming proportion of daily intakes (DIs) of Cd (61-64%), Cu (85-89%), and Zn (75-80%) in children and adults living in EDA; vegetables were the primary contributors to the DIs of Cd (30-32%); and rice (20-29%), vegetables (28-38%), and dust ingestion (26-45%) were all important exposure sources of Pb. Risk assessment predicted that DIs of Cd, Pb, Cu, and Zn via food consumption poses health risks to local residents of EDAs, and the urinary concentrations of analyzed metals were significantly (Pearson correlation coefficient: r = 0.324-0.710; p < 0.01) associated with elevated 8-OHdG, a biomarker of oxidative stress in humans.

Ecotoxicol Environ Saf

Weedkiller 'raises risk of non-Hodgkin lym

A broad new scientific analysis of the ca
glyphosate herbicides, the most widely use
the world, has found that people with high
pesticides have a 41% increased risk of de
called non-Hodgkin lymphoma. The
compelling link" between exposures to glyp
and increased risk for non-Hodgkin lymp
concluded, though they said the specific
should be interpreted with caution. The find
contradict the US Environmental Prot
assurances of safety over the weed killer a
several countries consider limiting the u
products in farming. The Guardian (14/2/2

Air pollution well above legal thresholds in

The concentration of particulate matter wit
10 (PM10), and respectively 2.5 micro
measures the quality of the air in a city, fre
nine times the maximum levels accepted u
capital city Bucharest, according to th
company Philips, which placed 15 measur
and Ploiesti, Wall-street.ro reported. As a g
the air tends to be worse during the cold da
air quality monitoring network in Romania
October 1, 2018. It continuously mon
emissions PM 10, PM2.5, and PM1. Roma

A toxic crisis in America's coal country

In the shadow of some of America's most
where companies use huge amounts of ex
off mountains, isolated communities sa
poisoned. Now, they must decide if they
industry they have relied upon for generati

The Fluorine Detectives

A few times every year, Christopher Higgin
Colorado, receives a special delivery in th
Higgins finds several vials, each holding up
collected from boreholes near U.S. militar
unremarkable, but it is contaminated wi
called fluorochemicals, which have bee
concern around the world. This class of c

Maternal urinary metabolites of PAHs and its association with adverse birth outcomes in an intensive e-waste recycling area

Polycyclic aromatic hydrocarbons (PAHs) are well-known carcinogenic and endocrine disrupting chemicals that have been concerned over the past few decades. Authors aimed to determine the hydroxylated PAH (OHPAH) metabolite concentrations in maternal urine collected from the e-waste-contaminated area of Guiyu and the reference area of Haojiang, China, and to evaluate their health effects on birth outcomes. The median ΣOHPAH concentration was 6.87 μg/g creatinine from Guiyu, and 3.90 μg/g creatinine from Haojiang. 2-OHNap and 1-OHPyr were the predominant metabolites. Residence in Guiyu and recycling in houses were associated with elevated 2-OHNap and 1-OHPyr. Standardized mean difference revealed that compared to low PAH metabolite levels in the first quartile, high PAH metabolite levels in the fourth quartile especially for 1-OHPyr, ΣOHPAHs and sometimes hydroxylphenanthrene compounds, presented a reduced size in birth outcomes (overall SMD: -0.09; 95% CI: -0.15, -0.03), including head circumference, BMI and Apgar 1 score, and increased size in height.

Environmental Pollution

New Publications

Pediatric Environmental Heath – 4th Edition

The American Academy of Pediatrics (AAP) announces the publication of the fourth edition of Pediatric Environmental Health. This manual is a comprehensive guide for pediatric clinicians to the identification, prevention, and treatment of environmental health problems in children. It has been produced by the AAP Council on Environmental Health and edited by Ruth A. Etzel, MD, PhD, and Associate Editor Sophie J. Balk, MD.

Social determinants and non-communicable diseases: time for integrated action

In high-income countries, life expectancy and healthy life expectancy are linked in a graded way with measures of socioeconomic disadvantage. The major contributors to the social gradient in health outcomes are non-communicable diseases (NCDs). Increasingly, in middle-income countries, evidence shows that NCDs follow the same gradient of higher risk in people of lower socioeconomic status. The example of obesity suggests that as low-income countries develop, NCDs will follow the social gradient seen in middle and high-income

worrying concentrations in rivers, soils an
from Europe to Australia. Some of the olde
studied and banned, but new, mystery typ
time. Higgins's team, at the Colorado Sc
several environmental-chemistry labs be
Department of Defense to work out the che
they are one of the most complex groups c
says. Scientific American (13/2/2019)

Europe's most deprived areas 'hit hardest

Europe's poorest, least educated and m
bearing the brunt of the air pollution cris
official stocktake of its kind. Nearly half of
neighbourhoods exceeded EU nitrogen dio
compared with 2% of its wealthiest area
exposed to long-term air pollution in the G
more likely to be readmitted to hospital, wh
mortality rates. Similar findings were repo
Malta, the Netherlands, Wales and Wall
mining analysis from the European Enviror
Guardian (4/2/2019)

Toxic smog forces Bangkok to close hundr

Toxic smog forced Bangkok authorities to
order to shut nearly 450 schools on W
struggled to manage a pollution crisis tha
concern. The Thai capital has been shro
weeks, forcing residents to don masks ar
criticism of the uneven response by the gov
for the lingering pall include exhaust
construction, the burning of crop stubble, ar
getting trapped in the city. The Guardian (3

Toxic air is harming our children with every

All day, every day, even while they sleep, t
in South Asia are being seriously harmed
leading the world in this respect—and not
pollution now kills an estimated 130,000
single year. It is a staggering fact that twel
Asia are breathing air that is six times
international limits set by the World Health
that South Asia has three-quarters of the g
of breathing harmful air is not visible to th
Quality Index measures how toxic the air is
is "good", 50-100 is "moderate", 100-150 i

countries. Control of NCDs requires integrated action across all major areas of society that influence health. Yet system-wide efforts to improve the social determinants of health, such as early childhood education and parenting skills, education and lifelong learning, working and employment conditions, poverty reduction and ensuring a healthy standard of living, housing and the environment, and prevention of ill health, are yet to take root in many parts of the world.

BMJ

EDUCATION AND TRAINING

1st webinar of the series, Creating & Using Knowledge to Protect Children's Environmental Health

Join CEHN and CEH Movement Partners for the 1st webinar of the series, Creating & Using Knowledge to Protect Children's Environmental Health. In this webinar, you will learn about important children's environmental health research underway and how research findings are being shared with and acted upon.

March 6 2019, 1:00 - 2:30 pm ET.

For more details about this webinar visit the 2019 Education Series and Register for the webinar.

WHO Children's environmental Health training modules translated into Japanese

Three modules from the WHO Training Package for Health Care Providers "Why children?", "Children are not little adults" and "unsound management of chemicals" are now available in Japanese.

groups" (including children), 151-200 is "un
unhealthy", and 301-500 is "hazardous". T

Hanoi chokes as air pollution increases to

The Air Quality Index at various air monit
capital showed dangerously high levels o
instance, it was at 240 at Pham Van Dor
District. The index touched 238 on Hang
201 on Tan Mai Street. A number abo
anyone, while anything between 201 an
according to the US Environment Protec
concentration of the particulate matter P
raised health alarms. The PM2.5 concentra
was 400 micrograms per cubic metre on
while on My Dinh Street was 300. The W
safety limit is 25 micrograms per cubic
(29/1/2019)

Environment and health at increasing ri
of 'e-waste'

To highlight the rising challenge po
discarded electronics worldwide, sev
together to launch the report at the Wo
Davos, Switzerland, on Thursday, in
solutions to a behemoth-sized proble
world sicker and adding to environme
joint report, entitled, "A New Circular V
Time for a Global Reboot", calls for a
based on the "circular economy"
regenerative system can minimize was
UN News (24/1/2019)

Climate change threatens public health
provide care

The reality of climate change — and th
could not be clearer. As health care p
that climate change harms those we
recognize that it compromises our abili
more carbon dioxide and other greenh
our atmosphere, the more difficult it
example, in late 2017, Hurricane Maria
in Puerto Rico that produces small-vo
bags. As a result, hospitals around
Harvard teaching hospitals, struggled t

essential IV fluids and medications wel
Globe (18/12/2019).

Links to past issues and how to subscribe

This document is not a formal publication of the United Nations Environment Programme and the World Health Organization and featured documents are not necessarily the views of the organizations.

Have news for us?

If you would like to submit information to future HECANET issues, email us at heca@who.int with the subject line "INFORMA

Collated and distributed with the cooperation of the

Children's Health and the Environment Program, The University of Queensland, Brisbane, Australia

Message

From: Bernardi, Cassandra [CBernardi@aap.org]
Sent: 3/5/2019 2:01:30 PM
To: pehsu@pehsu.net
Subject: FW: Children's Environmental Health Newsletter - February - March 2019

Good morning,

Please see below for the latest issue of the HECA newsletter.

Best,

Cassie Bernardi, MPH
Manager, PEHSU East
American Academy of Pediatrics
345 Park Blvd
Itasca, IL 60143
P: Ex. 6

From: HECANET <HECANET@LISTSERV.WHO.INT> **On Behalf Of** heca
Sent: Tuesday, March 5, 2019 4:02 AM
To: HECANET@LISTSERV.WHO.INT
Subject: Children's Environmental Health Newsletter - February - March 2019

You're receiving this newsletter because you have subscribed to the Healthy Environments for Children Alliance

Children's Environmental Health International Initiatives

This is an international mailing list provided by WHO and UNEP

dedicated to promoting healthy environments for children

Jan/Feb 2019

TEN THREATS TO GLOBAL HEALTH IN 2019

The world is facing multiple health challenges. These range from outbreaks of vaccine-preventable diseases such as measles and diphtheria, increasing reports of drug-resistant pathogens and growing rates of obesity and physical inactivity, to the health impacts of air pollution and climate change and multiple humanitarian crises.

The Report outlines the top ten issues that will demand attention from WHO and its health partners in 2019. To address these and other threats, 2019 sees the start of WHO's new five-year strategic plan – the 13th General Programme of Work 2019–2023. This plan focuses on a triple billion target: ensuring one billion more people benefit from access to universal health coverage, one billion more people are protected from health emergencies and one billion more people enjoy better health and wellbeing. Reaching this goal will require addressing the threats to health from a variety of angles.

JOURNAL ARTICLES

Air Pollution

Acute effects of air pollutants on spontaneous pregnancy loss: a case-crossover study

This study aimed to investigate the relationship between acute exposure to air pollutants and spontaneous pregnancy loss. Authors found that a 10-ppb increase in 7-day average levels of nitrogen dioxide was associated with a 16% increase in the odds of spontaneous pregnancy loss (odds ratio [OR] = 1.16; 95% confidence interval [CI] 1.01-1.33; P=.04). A 10-μg/m^3 increase in 3-day and 7-day averages of fine particulate matter were associated with increased risk of spontaneous pregnancy loss, but the associations did not reach statistical significance ($OR_{3\text{-day average}}$ = 1.09; 95% CI 0.99-1.20; P=.05) ($OR_{7\text{-day average}}$ = 1.11; 95% CI 0.99-1.24; P=.06). Authors found no evidence of increased risk for any other metrics of nitrogen dioxide or fine particulate matter or any metric for ozone. This study found that short-term exposure to elevated levels of air pollutants was associated with higher risk for spontaneous pregnancy loss.

Fertility and Sterility

CHILDREN'S ENVIRONMENTAL HEA

Press Releases

WHO in collaboration with the Ministry of
and early childhood development in Inpati
programs in South Sudan

Severe acute malnutrition (SAM) is one
illness and death among under-five ch
In 2019, nearly 260 000 young children
severe acute malnutrition and, at leas
expected to develop medical complicat
intellectual potential and inhibit physic
increased risk of lifelong disability. To ir
and reduce the impact of acute
implementing an integrated health/nut
and hygiene (WASH)/protection stra
Emergency Nutrition program. This str
on stabilization centers in areas with
acute malnutrition in South Sudan. Ove
five with SAM and medical complicatior
admitted in SC will benefit from these
next six months. WHO AFRO (8/2/201

NTDs: WHO launches toolkit to optimize w
hygiene interventions

The World Health Organization (WHO)
toolkit to help improve delivery of water,
(WASH) services to underserved pc
many neglected tropical diseases (NTD
2015 global strategy the toolkit, WAS
together: a 'how to guide' for NTD pr
providing step-by-step guidance to
managers, volunteers and implementin
engage and work collaboratively w
"Targeted water and sanitation interver
in tackling the many neglected tropic
Maria Neira, Director, WHO Departn
Environmental and Social Determina
(31/1/2019)

Air pollution in the week prior to delivery and preterm birth in 24 Canadian cities: a time to event analysis

Numerous studies have examined the association between air pollution and preterm birth (< 37 weeks gestation) but findings have been inconsistent. Pooled estimates across 24 cities indicated that an IQR increase in ozone (O3, 13.3 ppb) 0–3 days prior to delivery was associated with a hazard ratio of 1.036 (95% CI 1.005, 1.067) for preterm birth, adjusting for infant sex, maternal age, marital status and country of birth, neighbourhood socioeconomic status (SES) and visible minority, temperature, year and season of birth, and a natural spline function of day of year. There was some evidence of effect modification by gestational age and season. Associations with carbon monoxide, nitrogen dioxide, particulate matter, and sulphur dioxide were inconsistent. Authors observed associations between daily O3 in the week before delivery and preterm birth in an analysis of approximately 1 million births in 24 Canadian cities between 1999 and 2008. This analysis is one of a limited number which have examined these short term associations employing Cox proportional hazards models to account for the different exposure durations of preterm vs. term births.

Environmental Health

Let the "A" in WASH Stand for Air: Integrating Research and Interventions to Improve Household Air Pollution (HAP) and Water, Sanitation and Hygiene (WaSH) in Low-Income Settings

The authors argue that bringing these two areas together would improve the effectiveness and efficiency of interventions to reduce the massive disease burden associated with HAP and poor WaSH, including pneumonia and diarrhea, the leading killers of young children in low-income countries. HAP and WaSH face similar challenges in designing, implementing, and securing the sustained and exclusive use of scalable interventions such as clean fuel and water. Research can advance greater coordination of these areas by demonstrating their interactions and wider impacts on well-being as well as the potential for programmatic synergies. Integrated solutions to clean households and communities can benefit from the contribution in multiple disciplines, including economics and policy analysis; business and finance; engineering and technology; lab sciences, environmental health, and biomedical sciences; and behavioral and implementation sciences.

Environmental Health Perspectives

Chemicals

Intercountry meeting to fight malnutrition ir

The WHO Regional Office for the Ea holding an intercountry consultative me points from 22 to 24 January 2019, ir Food and Agriculture Organization c UNICEF and the World Food Pro including representatives from Membe stakeholders, will address the issue Region. Malnutrition, in its various for health problem in WHO's Eastern M More than 20 million children under th by poor nutrition. Half of all women, mo and 15% of children in the Region are Some countries, especially those affect to experience high levels of food insecu micronutrient deficiencies. WHO EMRC

New WHO Asia-Pacific centre for environm Seoul

A new World Health Organization (WH for Environment and Health in the Wes open this year in Seoul, Republic of Ko open the Centre was signed today by V for the Western Pacific Shin Yo Environment of the Republic of Kore Mayor of Seoul Park Won-soon. T healthier and safer environments and resilience to climate and environment Western Pacific Region. "Environment change are among the greatest threats With the establishment of the WHO Environment and Health in the Western be able to step up our support to cou better protect people's health. Having t offer mutual benefits to WHO and the and City of Seoul," said Shin You (15/1/2019)

Drink salty water or go thirsty – Climate ch school children

The students at Kingani school in th Bagamoyo used to have two choices school: get sick or remain thirsty. Risin drought and reduced or erratic rainfall r so salty it would cause headaches, stor

Organophosphate Pesticide Metabolite Concentrations in Urine during Pregnancy and Offspring Nonverbal IQ at Age 6 Years

Susceptibility to organophosphate (OP) pesticide neurotoxicity may be greatest during the prenatal period; however, previous studies have produced mixed findings concerning in utero OP pesticide exposure and child cognition. The objective of this study was to determine whether maternal urinary concentrations of OP pesticide metabolites are inversely associated with child nonverbal IQ at 6 y of age and to examine potential effect measure modification by the PON1 gene. Overall, associations between child nonverbal IQ and maternal DAP concentrations were small and imprecise, and these associations were inconsistent across urine sampling periods. However, for a 10-fold difference in total DAP concentration for the >25weeks of gestation samples, adjusted child nonverbal IQ was 3.9 points lower (95% CI: −7.5, −0.3). Heterogeneity in the DAP–IQ association by PON1 gene allele status was not observed (n=474). Consistent evidence of an association between higher maternal urinary DAP concentrations and lower child IQ scores at 6 y of age was not observed.

Environmental Health Perspectives

Exposure to Perfluoroalkyl Substances during Fetal Life and Pubertal Development in Boys and Girls from the Danish National Birth Cohort

It remains unsettled whether prenatal exposure to perfluoroalkyl substances (PFASs) affects human reproductive health through potential endocrine disruption. Authors aimed to explore the associations between prenatal exposure to several PFASs and various aspects of pubertal development in boys and girls. Overall, prenatal exposure to PFOS, perfluorohexane sulfonate (PFHxS), perfluoroheptane sulfonate (PFHpS), perfluorononanoic acid (PFNA), and perfluorodecanoic acid (PDFA) (girls) and PFHxS and PFHpS (boys) was associated with lower mean age at puberty marker onset. PFDA and PFNA exposure was associated with higher mean age at onset of puberty in boys. Nonmonotonic associations in girls (PFOS, PFHpS, PFDA) and boys (PFDA, PFNA) were observed, showing larger mean age differences for the combined puberty indicator in the middle tertile [girls: PFOS: −3.73 mo, 95% confidence interval (CI): −6.59, −0.87; PFHpS: −4.92 mo, 95% CI: −11.68, 1.85; PFDA: −3.60 mo, 95% CI: −9.03, 1.83; and boys: PFNA: 4.45 mo, 95% CI: −1.30, 10.21; PFDA: 4.59 mo, 95% CI: −0.93, 10.11] than in the highest tertile with the lowest as reference.

Environmental Health Perspectives

Prenatal Exposure to Select Phthalates and Phenols and Associations with Fetal and Placental Weight among Male Births in the EDEN Cohort (France)

To make matters worse, the water that
time fetching from watering holes was
disease. Ismat Hassan, who came from
es Salaam to study and board at Kinga
from drinking the well water, typhoid fr
from watering holes, and pain and exha
to drink neither. UNEP (14/2/2019)

New UN report reveals that hunger in Afric

Hunger in Africa continues to rise after
threatening the continent's hunger era
the Malabo Goals 2025 and the 2030 A
Development, particularly the Sustaina
2 (SDG2). New data presented in the jo
Regional Overview of Food Security a
today, indicates that 237 million people
are suffering from chronic undernutriti
made in the past years. The joint report
for Africa of the Food and Agricultur
United Nations (FAO) and the Unit
Commission for Africa (ECA) was lau
Ababa at an event presided by FAO's D
Climate and Natural Resources, Maria
(13/2/2019)

International push to improve food safety

Greater international cooperation is ne
food from causing ill health and hamp
sustainable development, world lea
opening session of the First Inter
Conference, in Addis Ababa, organize
(AU), the Food and Agriculture Orga
Nations (FAO), the World Health Organ
World Trade Organization (WTO). A
International Forum on Food Safety
focus on interlinkages between food
scheduled to be hosted by WTO in Ge
two meetings are expected to galvani
actions in the key areas that are strateg
safety. FAO (12/2/2019)

Rwanda's ambitious plan for clean and eff

The placenta performs crucial physiological functions to ensure normal fetal development. Few epidemiological studies investigated placental weight sensitivity to phthalates and phenols. The authors' goal was to explore whether maternal exposure to select phthalates and phenols is associated with changes in placental weight at birth and in placental–to–birth weight ratio (PFR). The multipollutant ENET model for placental weight retained four biomarkers: triclosan and monocarboxy-isononyl phthalate (MCNP), which were negatively associated with placental weight, and benzophenone-3 and the sum of parabens, which were positively associated with this outcome. The ENET model for PFR retained two phthalate metabolites [MCNP and monocarboxy-isooctyl phthalate (MCOP)], which were negatively associated with this outcome. The positive association between the sum of parabens and placental weight was consistent with results of a previous study among 49 male births.

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Environmental Health Perspectives

Very low-level prenatal mercury exposure and behaviors in children: the HOME Study

Mercury is toxic to the developing brain, but the lowest concentration associated with the development of behavior problems is unclear. The purpose of this study was to examine the association between very low-level mercury exposure during fetal development and behavior problems in children. The median prenatal total blood mercury concentrations was 0.67 µg/L. Overall, authors did not find statistically significant associations between mean prenatal mercury concentrations and behavior

The Government of Rwanda has releas
sustainably cooling foods and life-s
keeping homes and other indoor spa
weather. Such moves are essential
access to cooling while ensuring that h
the sector does not exacerbate clim
electricity. When it comes to cooling,
refrigerators and air conditioners. W
products is key, the Government o
holistically when it comes to meetin
noting that continuing on a business a
a huge rise in electricity use and a sh
gas emissions and pollution that its
cannot afford. UNEP (11/2/2019)

Progress on food security and nutrition
Central Asia

More than 14 million adults, and some 4.7
and Central Asia suffer from severe food
the Food Insecurity Experience Scale
Agriculture Organization of the United
released today. The Regional Overvie
Nutrition: Europe and Central Asia 201
country data on dietary energy supply,
nutrition indicators, such as stunting
overweight and obesity, and the effects of
FAO estimates that some 2.1 percent of th
of nearly one billion was exposed to sever
2017 based on FIES data. FAO (11/12/20

In the Media

UN agency plan tackles 'hidden cost'
safer, mercury-free mining

As gold production exposes millions
children globally to toxic levels of mer
$180-million Global Environment
Opportunities for the Long-term Devel
and small-scale gold mining (ASGM
programme will improve conditions f
countries while slashing harmful me
widespread use of mercury in the ar
sector affects the environment and
developing countries" said Philippe Sc

problems scores, but a 2-fold increase in mercury concentrations at 16-weeks gestation was associated with 0.83 point (95% CI: 0.05, 1.62) higher BASC-2 anxiety scores. Maternal and cord blood mercury concentrations at delivery were associated with parent-reported anxiety at 8 years. Authors found limited evidence of an association between very-low level prenatal mercury exposure and behaviors in children, with an exception of anxiety.

Environmental Health

Maternal urinary 2-hydroxynaphthalene and birth outcomes in Taiyuan, China

Naphthalene is the simplest polycyclic aromatic hydrocarbon (PAH). It is easily emitted into the atmosphere, posing a significant risk to human health. However, limited studies have described the impact of naphthalene exposure on birth outcomes. In this study, authors investigated the association between the maternal urinary metabolites of naphthalene, 2-hydroxynaphthalene (2-OH NAP), and birth outcomes. General linear models showed that prenatal urinary 2-OH NAP was associated with lower birth weight (BW) (− 4.38% for the high vs. low exposure group of 2-OH NAP; p for trend = 0.049) and higher cephalization index (CI) (4.30% for the high vs. low exposure group of 2-OH NAP; p for trend = 0.038). These associations were linear and significant when 2-OH NAP was modeled as a continuous variable in restricted cubic spline models (P linear = 0.0293 for 2-OH NAP and BW; P linear = 0.0326 for 2-OH NAP and CI). Multiple linear regression data indicated that each 1 ln-unit increase in 2-OH NAP was significantly associated with a 2.09 g/cm increase in the CI.

Environmental Health

E-waste

Heavy metals in human urine, foods and drinking water from an e-waste dismantling area: Identification of exposure sources and metal-induced health risk

Electronic waste or e-waste dismantling activities are known to release metals. However, the human exposure pathways of metals, and their association with oxidative stress in e-waste dismantling areas (EDAs) remain unclear. In this study, the results revealed elevated geometric mean concentrations in vegetables (Cd 0.096 and Pb 0.35 μg/g fw), rice (Cd 0.15, Pb 0.20, and 12.3 μg/g fw), hen eggs (Cd 0.006 and Pb 0.071 μg/g fw), and

Development Organization's (UNIDO)
Programme Development and Techr
News (18/2/2019)

Toxic black snow covers Siberian coalmini

Residents of a coalmining region in Sib
videos online showing entire streets and
black snow that critics say highlight
catastrophe. In one video, filmed in Ki
Kuzbass region, a woman drives past r
snow stretching to the horizon, covering a
the courtyards of residential buildings. Th
were described as "post-apocalyptic" b
Guardian (15/02/2019)

Weedkiller 'raises risk of non-Hodgkin lym

A broad new scientific analysis of the ca
glyphosate herbicides, the most widely use
the world, has found that people with high
pesticides have a 41% increased risk of de
called non-Hodgkin lymphoma. The
compelling link" between exposures to glyp
and increased risk for non-Hodgkin lymp
concluded, though they said the specific
should be interpreted with caution. The find
contradict the US Environmental Prot
assurances of safety over the weed killer a
several countries consider limiting the u
products in farming. The Guardian (14/2/2

Air pollution well above legal thresholds in

The concentration of particulate matter wit
10 (PM10), and respectively 2.5 micro
measures the quality of the air in a city, fre
nine times the maximum levels accepted u
capital city Bucharest, according to th
company Philips, which placed 15 measur
and Ploiesti, Wall-street.ro reported. As a g
the air tends to be worse during the cold da
air quality monitoring network in Romania
October 1, 2018. It continuously mor
emissions PM 10, PM2.5, and PM1. Roma

human urine (Cd 2.12, Pb 4.98, Cu 22.2, and Sb 0.20 ng/mL). Our calculations indicate that rice consumption source accounted for the overwhelming proportion of daily intakes (DIs) of Cd (61-64%), Cu (85-89%), and Zn (75-80%) in children and adults living in EDA; vegetables were the primary contributors to the DIs of Cd (30-32%); and rice (20-29%), vegetables (28-38%), and dust ingestion (26-45%) were all important exposure sources of Pb. Risk assessment predicted that DIs of Cd, Pb, Cu, and Zn via food consumption poses health risks to local residents of EDAs, and the urinary concentrations of analyzed metals were significantly (Pearson correlation coefficient: $r = 0.324\text{-}0.710$; $p < 0.01$) associated with elevated 8-OHdG, a biomarker of oxidative stress in humans.

Ecotoxicol Environ Saf

Maternal urinary metabolites of PAHs and its association with adverse birth outcomes in an intensive e-waste recycling area

Polycyclic aromatic hydrocarbons (PAHs) are well-known carcinogenic and endocrine disrupting chemicals that have been concerned over the past few decades. Authors aimed to determine the hydroxylated PAH (OHPAH) metabolite concentrations in maternal urine collected from the e-waste-contaminated area of Guiyu and the reference area of Haojiang, China, and to evaluate their health effects on birth outcomes. The median ΣOHPAH concentration was 6.87 μg/g creatinine from Guiyu, and 3.90 μg/g creatinine from Haojiang. 2-OHNap and 1-OHPyr were the predominant metabolites. Residence in Guiyu and recycling in houses were associated with elevated 2-OHNap and 1-OHPyr. Standardized mean difference revealed that compared to low PAH metabolite levels in the first quartile, high PAH metabolite levels in the fourth quartile especially for 1-OHPyr, ΣOHPAHs and sometimes hydroxylphenanthrene compounds, presented a reduced size in birth outcomes (overall SMD: -0.09; 95% CI: -0.15, -0.03), including head circumference, BMI and Apgar 1 score, and increased size in height.

Environmental Pollution

New Publications

Pediatric Environmental Heath – 4th Edition

The American Academy of Pediatrics (AAP) announces the publication of the fourth edition of Pediatric Environmental

A toxic crisis in America's coal country

In the shadow of some of America's most
where companies use huge amounts of ex
off mountains, isolated communities sa
poisoned. Now, they must decide if they
industry they have relied upon for generati

The Fluorine Detectives

A few times every year, Christopher Higgin
Colorado, receives a special delivery in th
Higgins finds several vials, each holding up
collected from boreholes near U.S. militar
unremarkable, but it is contaminated wi
called fluorochemicals, which have bee
concern around the world. This class of c
worrying concentrations in rivers, soils an
from Europe to Australia. Some of the olde
studied and banned, but new, mystery typ
time. Higgins's team, at the Colorado Sc
several environmental-chemistry labs be
Department of Defense to work out the che
they are one of the most complex groups o
says. Scientific American (13/2/2019)

Europe's most deprived areas 'hit hardest

Europe's poorest, least educated and m
bearing the brunt of the air pollution cris
official stocktake of its kind. Nearly half of
neighbourhoods exceeded EU nitrogen dio
compared with 2% of its wealthiest area
exposed to long-term air pollution in the G
more likely to be readmitted to hospital, wh
mortality rates. Similar findings were repor
Malta, the Netherlands, Wales and Wall
mining analysis from the European Enviro
Guardian (4/2/2019)

Toxic smog forces Bangkok to close hundr

Toxic smog forced Bangkok authorities to
order to shut nearly 450 schools on W
struggled to manage a pollution crisis tha
concern. The Thai capital has been shro
weeks, forcing residents to don masks an
criticism of the uneven response by the gov
for the lingering pall include exhaust

Health. This manual is a comprehensive guide for pediatric clinicians to the identification, prevention, and treatment of environmental health problems in children. It has been produced by the AAP Council on Environmental Health and edited by Ruth A. Etzel, MD, PhD, and Associate Editor Sophie J. Balk, MD.

Social determinants and non-communicable diseases: time for integrated action

In high-income countries, life expectancy and healthy life expectancy are linked in a graded way with measures of socioeconomic disadvantage. The major contributors to the social gradient in health outcomes are non-communicable diseases (NCDs). Increasingly, in middle-income countries, evidence shows that NCDs follow the same gradient of higher risk in people of lower socioeconomic status. The example of obesity suggests that as low-income countries develop, NCDs will follow the social gradient seen in middle and high-income countries. Control of NCDs requires integrated action across all major areas of society that influence health. Yet system-wide efforts to improve the social determinants of health, such as early childhood education and parenting skills, education and lifelong learning, working and employment conditions, poverty reduction and ensuring a healthy standard of living, housing and the environment, and prevention of ill health, are yet to take root in many parts of the world.

BMJ

EDUCATION AND TRAINING

1st webinar of the series, Creating & Using Knowledge to Protect Children's Environmental Health

Join CEHN and CEH Movement Partners for the 1st webinar of the series, Creating & Using Knowledge to Protect Children's Environmental Health. In this webinar, you will learn about important children's environmental health research underway and how research findings are being shared with and acted upon.

March 6 2019, 1:00 - 2:30 pm ET.

For more details about this webinar visit the 2019 Education Series and Register for the webinar.

construction, the burning of crop stubble, a
getting trapped in the city. The Guardian (

Toxic air is harming our children with ever

All day, every day, even while they sleep, t
in South Asia are being seriously harmed
leading the world in this respect—and not
pollution now kills an estimated 130,000
single year. It is a staggering fact that twel
Asia are breathing air that is six times
international limits set by the World Health
that South Asia has three-quarters of the g
of breathing harmful air is not visible to th
Quality Index measures how toxic the air is
is "good", 50-100 is "moderate", 100-150 i
groups" (including children), 151-200 is "un
unhealthy", and 301-500 is "hazardous". T

Hanoi chokes as air pollution increases to

The Air Quality Index at various air monit
capital showed dangerously high levels o
instance, it was at 240 at Pham Van Dor
District. The index touched 238 on Hang
201 on Tan Mai Street. A number abo
anyone, while anything between 201 an
according to the US Environment Protec
concentration of the particulate matter P
raised health alarms. The PM2.5 concentra
was 400 micrograms per cubic metre on
while on My Dinh Street was 300. The W
safety limit is 25 micrograms per cubic
(29/1/2019)

Environment and health at increasing ri
of 'e-waste'

To highlight the rising challenge po
discarded electronics worldwide, sev
together to launch the report at the Wo
Davos, Switzerland, on Thursday, in
solutions to a behemoth-sized proble
world sicker and adding to environme
joint report, entitled, "A New Circular
Time for a Global Reboot", calls for a
based on the "circular economy"

WHO Children's environmental Health training modules translated into Japanese

Three modules from the WHO Training Package for Health Care Providers "Why children?", "Children are not little adults" and "unsound management of chemicals" are now available in Japanese.

regenerative system can minimize was
UN News (24/1/2019)

Climate change threatens public health
provide care

The reality of climate change — and th
could not be clearer. As health care p
that climate change harms those we
recognize that it compromises our abili
more carbon dioxide and other greenh
our atmosphere, the more difficult it
example, in late 2017, Hurricane Maria
in Puerto Rico that produces small-vo
bags. As a result, hospitals around
Harvard teaching hospitals, struggled t
essential IV fluids and medications wel
Globe (18/12/2019).

Links to past issues and how to subscribe

This document is not a formal publication of the United Nations Environment Programme and the World Health Organization and
featured documents are not necessarily the views of the organizations.

Have news for us?

If you would like to submit information to future HECANET issues, email us at heca@who.int with the subject line "INFORMA

Collated and distributed with the cooperation of the

Children's Health and the Environment Program, The University of Queensland, Brisbane, Australia

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You received this message because you are subscribed to the Google Groups "pehsu" group.

To unsubscribe from this group and stop receiving emails from it, send an email to pehsu+unsubscribe@pehsu.net.

Message

From: Spire, Paul [PSpire@aap.org]
Sent: 9/21/2018 8:37:19 PM
To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; 'Sophie Balk' [sbalk@montefiore.org]
Subject: Green Book 2nd Proofs - 29 - Endocrine Disrupting Chemicals
Attachments: 29_PEH_ch29_0511-0520.gm.edit1.pdf; 29_1st proof with feedback_PEH_ch29_000-000.gm.revrae071718 sjb073118rae080118.pdf

Hi Ruth and Sophie.

I am writing to provide the attached 2nd proof for your review. Also attached for reference is the response that we submitted to the 1st proof. Please be reminded that this round is intended to ensure that the previously requested changes have been properly incorporated.

Many thanks,

Paul

Message

From: Malashock, Daniel [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=86AD680AB41A4FA6A0FC113C1222FCB0-MALASHOCK,]
Sent: 11/29/2018 2:52:03 PM
To: AO-OCHP-Everyone [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=222d03d48d634481af638d4892296469-AO-OCHP-Everyone]
Subject: FW: Monday 12/10 - The Global Glyphosate Study: a paradigm shift (EOH Seminar)
Attachments: Mandrioli, Daniele - 12.10.18 (poster).pdf

FYI – if you're interested in attending please use the link below to RSVP.

From: Daniel Malashock <malashock@gwmail.gwu.edu>
Sent: Wednesday, November 28, 2018 8:10 PM
To: Malashock, Daniel <malashock.daniel@epa.gov>
Subject: Fwd: Monday 12/10 - The Global Glyphosate Study: a paradigm shift (EOH Seminar)

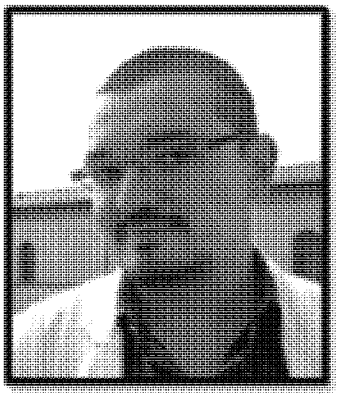
---------- Forwarded message ---------
From: **Department of Environmental and Occupational Health** <eohdept@email.gwu.edu>
Date: Wed, Nov 28, 2018 at 3:51 PM
Subject: Monday 12/10 - The Global Glyphosate Study: a paradigm shift (EOH Seminar)
To:

Milken Institute School of Public Health

THE GEORGE WASHINGTON UNIVERSITY

DEPARTMENT OF ENVIRONMENTAL AND OCCUPATIONAL HEALTH

2018 Research Seminar Series



The Global Glyphosate Study: a paradigm shift

Daniele Mandrioli, MD
Associate Director of the Cesare Maltoni Cancer Research Center, Ramazzini Institute, Bologna, Italy

New funding strategies, innovative bioassay designs and evidence-based methods have been developed by the Cesare Maltoni Cancer Research Center (CMCRC) in order to face the challenges of modern toxicology. The Ramazzini Institute (RI) recently published the first results of the pilot phase of the Global Glyphosate Study showing that glyphosate-based herbicides (GBHs) altered certain important biological parameters, mainly relating to sexual development, genotoxicity and the alteration of the intestinal microbiome. The RI, with the support of other independent Institutes and Universities in Europe and the United States, has now launched a crowdfunding campaign to support the long-term phase of the Global Glyphosate Study.

Date: Monday, December 10, 2018
Time: 12:30 pm -1:30 pm
Location: 4th Floor Conference Room, 950 New Hampshire Ave. NW, Washington, DC 20052
WebEx: *http://go.gwu.edu/EOHseminars* *Phone: +1-855-282-6330* *Access Code: 735 334 490*
All are welcome - A light lunch will be provided - RSVPs strongly encouraged.

RSVP Here

Event Contact: eohdept@gwu.edu or 202.994.1734

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Department of Environmental & Occupational Health
Milken Institute School of Public Health | The George Washington University

950 New Hampshire Ave NW, Floor 4, Washington, DC 20052

t 202-994-1734

Milken Institute School of Public Health

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The Global Glyphosate Study: a paradigm shift

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Event Contact: eohdept@gwu.edu or 202.994.1734

Message

From: Dai, Mona [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=04B65457E78F48ADB6250E4ED9AB06C7-DAI, MONA]
Sent: 6/7/2018 12:42:37 PM
To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]
Subject: FW: David Gee Slides
Attachments: Faroes Biases May 2018.pdf

Hi Ruth,

Here are the slides from David Gee's talk. I'm not sure if Maggie has already mentioned this to you (or if David talked to you directly), but he said he was really interested in coming to the US to give a talk. I think Maggie has his contact information to get in touch in case that's something OCHP is interested in.

Thanks!
Mona

From: Trevino, Lindsey S [mailto:Lindsey.Trevino@bcm.edu]
Sent: Wednesday, June 6, 2018 7:01 PM
To: Dai, Mona <dai.mona@epa.gov>
Subject: Re: David Gee Slides

Hi Mona,

I apologize for the delayed response. I am traveling again and have not been good keeping track of email. I have attached his slides as a PDF file (the original presentation was really large). Please feel free to pass along to the others if they ask (I don't have their contact email with me right now). Once again, it was great meeting you!

Lindsey

From: "Dai, Mona" <dai.mona@epa.gov>
Date: Wednesday, June 6, 2018 at 4:35 PM
To: Lindsey Trevino <Lindsey.Trevino@bcm.edu>
Subject: David Gee Slides

*****CAUTION:*** This email is not from a BCM Source. Only click links or open attachments you know are safe.**

Hi Lindsey!

I hope you had a safe and smooth flight back to the US! It was great meeting you at the PPTOX conference. Would you still be willing to share David Gee's slides with me? I would love to be able to review them.

Thanks,
Mona

Some Biases in evaluating Causality & in taking Precautionary Action

David Gee, (Ret) EEA, Senior Adviser, Science, Policy, Emerging Issues.
Visiting Fellow, Institute of Environment, Health & Societies, Brunel University, London
Fellow Collegium Ramazzini
Founding member, European Network of Scientists for Social & Environmental Responsibility

ED_001703C_00000591_000_70573450-a460-aeb0-c000-0090b7200e00

A motivating maxim……..

“Philosophers have hitherto interpreted the world: the point however is to change it”

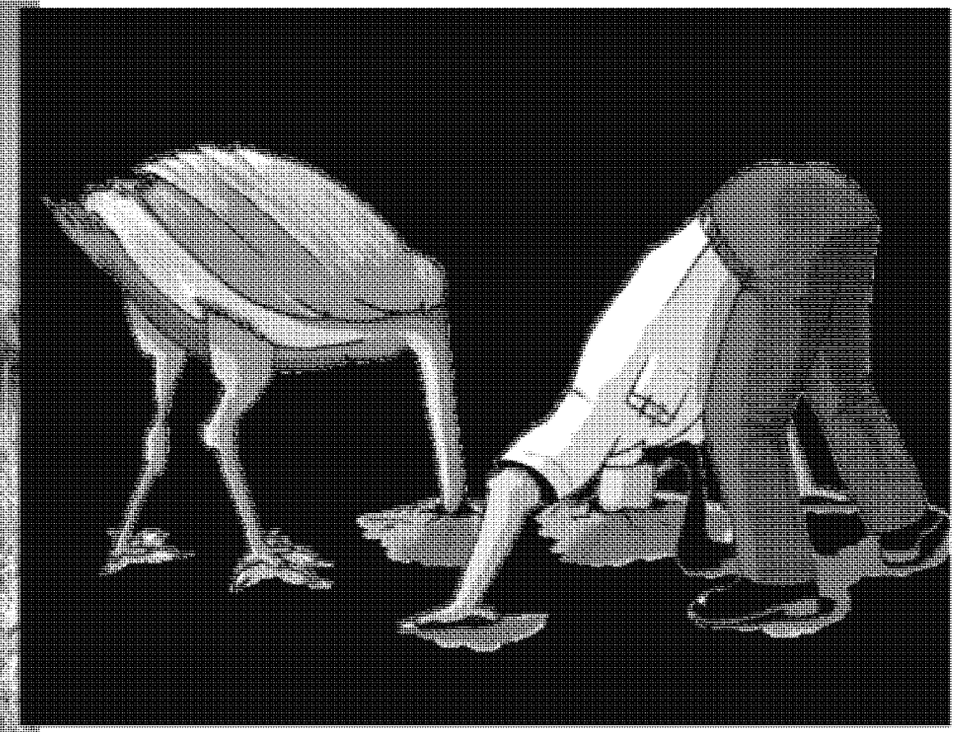
Inscription on Marx’s grave, Highgate cemetery, London.

ED_001703C_00000591_001_c5494be3-3265-411a-e2ed-727eacec2bd2

On Knowing & Acting…….

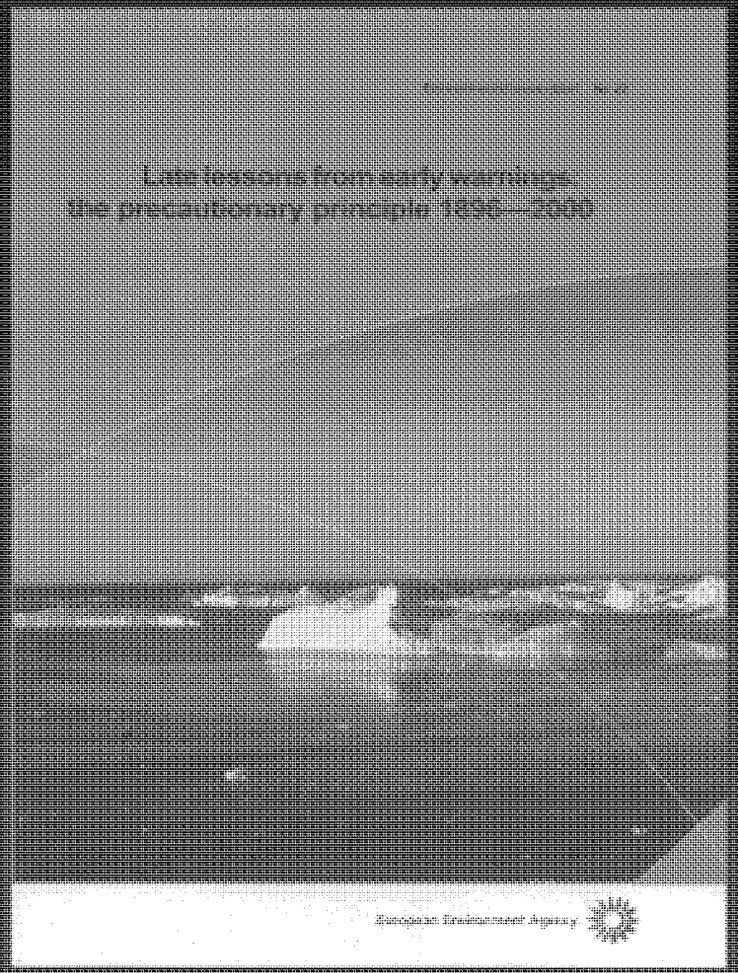
"Knowing is not enough : we must apply . Willing is not enough : we must do"

Goethe

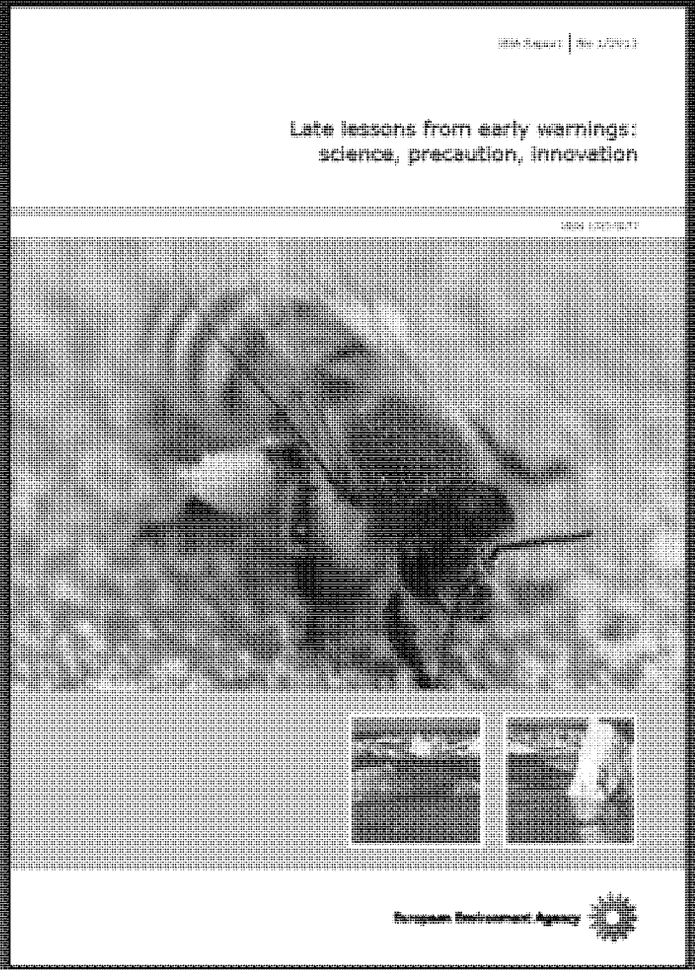


Homo sapiens (tragicus? stupidus?) as slow learners: Two volumes

2001



2013



European Environment Agency

34 case studies in the "Late Lessons" reports…

'Environmental chemicals'

- **Beryllium**
- **PCBs**
- CFCs
- TBT antifoulants
- **Mercury**
- Environmental Tobacco
- **Perchlorethylene**
- **Booster biocides**
- **DBCP**
- **DDT**
- **Vinyl chloride**
- **Bisphenol A**

Ecosystems

- **Ecosystems resilience**
- Great Lakes pollution
- Fish stock collapse
- Acid rain
- **Bee decline, France**
- **Invasive alien species**
- **Floods**
- **Climate change**

Transport fuel additives

- Benzene
- MBTE
- Lead

'Micro technologies'

- **Nano**
- **GMOs & Agro-ecology**

Animal feed additives

- BSE, 'mad cow disease'
- Beef hormones
- Antibiotics

- Asbestos

Pharmaceuticals

- **Contraceptive pill**
- DES

Radiations

- X-rays
- **Mobile phones**
- **Nuclear accidents**

European Environment Agency

….and 8 “horizontal “ chapters..

- the “12 late lessons” from vol 1…

..and in vol 2:

- **the precautionary principle;**
- **false positives;**
- **precautionary science; (Grandjean)**
- **costs of inaction; (Mikel Skou Andersen)**
- **protection of early warning scientists; (Carl Cranor)**
- **why businesses ignore early warnings;**
- **Conclusions.**
- **2 Annexes on summaries**
- **& updates of 8 vol 1 case studies.**

..and 8 updates on vol 1 case studies

- Fish /aquaculture (Norwegian salmon case)
- Benzene
- Asbestos
- PCBs
- CFCs & Ozone layer
- DES
- Antimicrobials as growth promotors
- MTBE
- Hormones as Growth promoters

The early warning on Leaded petrol at the one day "trial" of leaded petrol, May 1925

"the development of lead poisoning will come on so insidiously *..that* ***leaded petrol will be in nearly universal use..***

...before the public and the government awakens to the situation."

Yendell Henderson, Yale Professor of Physiology

"Lead makes the mind give way: lead in petrol"
Needleman & Gee, Late Lessons, EEA 2013

Early Warning scientists personally harassed for their "*inconvenient truths*"

- **Snow** on Cholera
- **Selikoff** on asbestos
- **Hendersen, Byers, Patterson, Needleman** on leaded petrol
- **Henry Lai**, **Hardell on** RF radiation
- **Putzei, Chapella** on GMOs
- **Dr Hosakawa, Grandjean** on Mercury
- **Schneiderman** on Climate Change
- others from Bees research
- Onur Hamzaoglu on industrial pollution in Turkey
- **Dr Stockman in Ibsen's *"An Enemy of the People"***

Pal Weihe?

"Being in a minority of one did not make you mad" G Orwell, "*1984*"

(See case study chapters; & "**Justice for early warners & late victims**", Cranor, in "Late Lessons" EEA , 2013)

"Attack the Messenger": *"The Lancet"* on John Snow, 1855

"It is the misfortune of Medicine..that it is continually exposed to discomfiture, through the perverse, crotchety, or treasonable behavior of certain of its own disciples....

..crude opinions and hobbyistic dogmas of men whose perceptions are dimmed by the gloom of the den in which they think and move".

Editorial ,Lancet, June 23,1855.

ED_001703C_00000591_010_2602e8f7-25ec-abfe-7e3f-08ebe9f0294b

The Henrik Ibsen Award for Early Warning Scientists, 2019…?

Pal Weihe as first recipient?

8 generic insights from the "Late Lessons" case studies.....

1. Acknowledge complexity, variability, uncertainty, & ignorance
2. **Research eventually shows that** Exposures **expand over time..**
3. **..and the** Nature of Harm **expands over time..**
4. Harm **is caused at** lower & lower levels of exposure
5. Regulations/economic instruments **(mainly)** stimulate innovation
6 **The** costs of regulations **are usually** over –estimated
7. **The** benefits of regulations **usually** under-estimated & they often expand over time.

8. Biases play a key role

- in the evaluation of causality and
- in **mainly** preventing timely action to prevent/minimise harm

ISSAC NEWTON on scientific ignorance *("nescience")*

"to myself I seem to have been only like a boy playing on the seashore, and diverting myself now and then finding a smoother pebble or a prettier shell than ordinary..

whilst the great ocean of "truth" lay all undiscovered before me."

More Humility and less Hubris in the Sciences of ecosystems and human health?

1. Acknowledge complexity, variability, uncertainty, & ignorance (*"nescience"*)

- "the **causal links** between stressors and harm are **more complex** than was previously thought"
- "much harm (from cancers and climate change to the decline in bees and in children's IQ) is caused by **co-causal factors acting independently, or together**"
- **"Timing of exposure** can determine "the poison"
- **"Low dose effects** can be greater than high doses" (radiations, BPA, lead)
- **"Varying susceptibilities** from age, sex, immune state, stress, genes, epigentics…
- **"there are usually continuums from "effects" to "adverse" effects.."**
- **"But sometimes Thresholds & tipping points…"**
- **"Systems level effects are** not predictable from individual level analysis (eg bee colonies);
- More **transparency about complexities, variabilities, uncertainties & ignorance needed** in **risk assessments.**

From "simple" science to complex systems science…

- From nature ***or*** nurture to **nature *and* nurture** (**Leaded petrol** & IQ of children)
- From **toxicology to endocrinology (BPA; oestradiol in contraceptive pill)**
- From **linear dose/response to non linear DR (Radiations; BPA)**
- From smooth transitions in biological/ecological systems to abrupt **"tipping points"(Climate change; Fish stocks, Ecosystems)**
- From "dose makes the poison" to **"timing of dose makes poison"(DES;TBT)**
- **From single to multi-causality**

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Expect inconsistency from biological/ecological complexity & variability

"Consistency in nature does not require that all, or even a majority of studies find the same effect.

If all studies of lead showed the same relationship between variables, one would be startled, perhaps justifiably suspicious"

Needlemann (1995) "Making Models of Real World events: the use and abuse of inference, Neurotoxicology and Teratology, vol 17, no. 3.

Expect *inconsistency* from complexity & variability in ecology..

"the complexity of environmental factors and of bee colonies means that the same conditions can never be reproduced.

A particular combination of such factors arising in a field experiment ***cannot be considered representative of "average" environmental conditions*** *to which honey bees could be exposed"*

Maxim L ,van der Sluijs, "Systemic insecticides and honeybees" in Late Lessons, EEA, 2013.

2. Research eventually shows that Exposures expand over time…..

- Asbestos/DBCP/Be/tobacco: from **producers** to **users & bystanders** eg insulators, plantation workers, passive smokers
- **& Domestic:** asbestos in wives from washing overalls; children of asbestos workers; smokers families
- **& Environmental:** near asbestos & lead mines and factories; teachers from asbestos; DBCP in water; tobacco; PCBs;
- **& Consumers:** Asbestos; PCBs; BPA; nano;
- **& Next generations:** Asbestos, radiations, Mercury, DES, climate changes
- **& Target to non target species:** Goucho & Bees; Polar bears & fish from PCBs; oysters from TBT; fish from the Pill

3. the Nature of Harm expands over time….

- **Asbestos**: 1929 asbestosis; 1954 lung cancer; 1959 mesothelioma, 2012 throat & other cancers
- **Tobacco**: 1951 lung cancer; 2012 many cancers, foetal harm; heart disease
- **PCBs**: 1960s bird reproduction;2012s neurological harm in children; soil contamination
- **Lead**: 1979 brain damage in children; 2012 heart disease in adults
- **Minamata:** 1950 brain damage & neurological; 1960s birth defects 1990s childrens IQ & behavioural
- **DES**: 1970 vaginal cancer; 1980s reproductive problems; 2012 breast cancer; sons repro harm.

4. Harm is caused at lower & lower levels of exposure…

- Asbestos
- Lead
- PCBs
- Mercury
- TBT
- Radiations
- BPA….etc

….often with, eventually, no known threshold…

eg Lead (EFSA, 2012).

** "safe" limits always come down…….with very few exceptions eg Glyphosate (check?)*

The role of Biases in delaying timely action on Hazards:

- During evidence creation & evaluation
- At the "case for action" (Bradford Hill) stage.

"We are not alone": biases in the Financial Industry

"The Financial Conduct Authority has discovered that some of its suspicions about the risk of bias (in bringing companies to public share buying) are well founded"

(This has been well known "for decades"!)

The Guardian, Mar 2, 2017

9 Types of Biases in Epidemiology; Toxicology; Risk Assessment; Evidence Evaluation

- 21 Technical/methodological
- 17 Cognitive
- 5 Motivational
- Intellectual
- Funding & Economic
- “Group think”
- Rivalries-personal
- Rivalries-Institutional
- Choices & Judgements in evaluating overall evidence

Technical/Methodological Biases….

"the extent to which flaws in the design and execution of a collection of studies could bias the estimate of effect for each outcome under study"

IOM (Institute of Medicine): **Finding What Works in Health Care: Standards for Systematic Reviews**. In. Edited by Press NA. Washington, DC; 2011.

7 Types of Technical/Methodological Biases in Animal & Human studies….

- Selection (in exposure randomization; study group allocation)
- Confounding (& modifying variables)
- Performance (similar experimental conditions; protocol adherence; statistical analyses)
- Attrition/exclusion (of outcome data)
- Measurement/***detection*** (mis-measurement of exposures, outcomes or confounders; ***latency***),
- ***Reporting*** (selective reporting; *"perils of the precis")*
- ***Communication of results*** *("hedging")*

See "Systematic Review and Evidence Integration for Literature based Environmental Health Science Assessments", *Rooney et al, EHP 2014*

Detection Biases from Long Latencies between exposure & disease..

- There was little evidence for lung cancer in smokers & asbestos workers **until 25 years from first exposures**;

- It was 40+ years before Brian cancer in Japanese Bomb victims emerged…..

- Current evidence of brain cancer from RF/mobile phones is only in those with >10 yrs exposure…

Detection Bias from Latency and technological change…….

Technological change in an industry/product means that:

"its safe today" can be confidently asserted

despite strong evidence of **today's harm** from **"yesterday's" exposures**…….

…the **"no threshold" assumption for carcinogens, and "low dose" effects,** can help undermine this assertion…

Example of this "Latency Trap": Asbestos, 1906

- *"One hears…..that considerable trouble is **now** taken to prevent the inhalation of the asbestos dust so **that the disease is not so likely to occur as heretofore".***

  (*Dr Murray, evidence to UK Government Inquiry into Industrial Diseases, 1906).*

Asbestosis was therefore not classified as an industrial disease by the Committee…until decades later.

Reporting Bias from RF/Head Tumour studies: an EU 2007 evaluation:

"the perils of the precis?"

The Abstract, p4:

"Since 2001 extensive research has been conducted..

*no health effect has been **consistently** demonstrated at exposure limits below the limits of ICNIRP"...*

The dilution of text conclusions..

“Conclusions”, P28:

“For longer term use (over 10 years) data are sparse...

....any conclusion therefore is uncertain and tentative”.

*“in particular **for acoustic neuroma..there is weak evidence of an association..***

EU SCENIHR, 2007 on Mobile Phones & Cancer. *See “ Mobile phones & Brain Tumour Risk” Hardell, Carlberg,Gee, Late Lessons, EEA, 2013*

Communication Biases in Science: "hedging"

"In light of current evidence on lead many past reports were unnecessarily hedged and underestimated the impact of lead exposure on brain development".

Hedging is a.. means of projecting due caution and modesty when concluding from a study"

*"**prudent and responsible inference"** is needed…*

rather than "convincing evidence"

Grandjean, PPTOX/BCPT, 2008

From "Causal constipation" to *"prudent and responsible inference"?*

"Both of us…in decades worth of population health science writing that has, at times, sidestepped the issue of whether a condition, factor,or circumstance…was..a "cause".

Sometimes nudged by coauthors, editors, reviewers..and our own timidity".

"Moving beyond the cause constraint: a public Health of Consequence", Sandrea Galea & Roger Vaughan, ALPH, v 108, May 2018

21 Methodological Biases in Environmental Health Sciences and their Main Directions of Error...

SCIENTIFIC STUDIES	SOME METHODOLOGICAL FEATURES	MAIN[1] DIRECTIONS OF ERROR:
Experimental	•**High doses**	**False positive (negative if low dose effects)**
Studies	•Short (in biological terms) **range of doses**	False negative
(Animal)	•**Low genetic variability**	False negative
	•**Few exposures to mixtures**	False negative
	•**Few Foetal-lifetime exposures**	False negative
	•**High fertility strains**	False negative (Developmental/reproductive endpoints)

[1] Some features can go either way (e.g.inapproriate controls) but most of the features mainly err in the direction shown in the table

(Gee, Bailar, Grandjean,2004; Grandjean,2013, Gee, 2014)

Observational Studies (Wildlife & Humans)	**•Confounders**	**False positive/negative**
	•Inappropriate controls	**False positive/negative**
	•Non-differential exposure misclassification	False negative
	•Insensitive outcome measures	False negative
	•Inadequate follow-up	False negative
	•Short latency	False negative
	•Lost cases	False negative
	•Simple models that do not reflect complexity	False negative
	•Multi-causality	False negative
Experimental And Observational Studies	**•Publication bias**	**False positive**
	•Reporting bias	False negative
	•Scientific cultural pressure to avoid false positives	False negative
	•Low statistical power (small studies)	False negative
	•5 % probability level to minimise chances of false positives	False negative
	•Funding bias	False negative

Avoiding False positives produces robust science …
…..but unsound public policy…?

17-19 False Negatives ensures **robust** science……

….but at the expense of **delayed action** on potential hazards….

And don't we need *"precautionary science"(*Grandjean)

9 Cognitive Biases: *"easy to correct"*

- "Gamblers fallacy"
- Insensitivity to sample size
- Base rate fallacy

+ 6 others

"Cognitive & Motivational biases in Decision and Risk Analysis",
Monibeller G., von Winterfeldt, D, Risk Analysis, v 35, n 7, 2015

12 Cognitive Biases: *" Difficult to correct"*

- Anchoring
- Availability
- Equalising
- Myopia
- Over confidence

+ 7 others

Risk Analysis, 2015

Myopia: "Scientific Inertia" in chemicals Research

- An analysis of 78 environmental and health journals 1899-2009 revealed a major focus on:
- PCBs, sulphur dioxide, benzene, asbestos, TBT, MBTE, DES.
- Of the nearly 15,000 articles published on these substances some 40% had been published since 2000.

See chapter on "Precautionary Science", Grandjean, Late Lessons from Early Warnings, 2013.

Scientific Inertia…….

- **Only 352 articles researched 8 of the emerging, large production chemicals identified as priorities by the US EPA, eg 1,3-Dichlorobenzene.**

- **There were no articles on five other priority chemicals.**

Myopia: Research: how much on developing products v protection (anticipating hazards)?

EU Public Research 1994-2013	"Products"	"Protection"
Nanotechnology (2002-2013)	5 billion	112 million **(2%)**
Biotechnology(1994-2013)	7.5billion	273 million **(4%)**
Information Communications Technology/EMF(2007-2013)	19 billion	18 million **(0.09%)**

5 Motivational Biases: *"difficult to detect and to correct"*

- Confirmation bias -desire to confirm one's belief

- Affect bias : a predisposition to or against an outcome/option

- Un/Desireability of consequences/options, events:
- Optimism bias (technology will solve it)
- "wilful blindness"

(Minimise via use of multiple experts, stakeholders, protocols,& partial probabilities)

Risk Analysis, 2016

Intellectual Bias: the Beef Hormones case at World Trade Organisation.

*"The European Communities alleges that "**that Drs. Boisseau and Boobis,**..as "co-authors" of the JECFA reports, "cannot be considered to be independent and impartial in these circumstances, because this would amount to asking them to review and criticise reports that are their own doing".*

Upheld at WTO Appellate Body

Source: p27, para 65 World Trade Organization, WT/DS320/AB/R, "United States-Continued Suspension of Obligations in the EC-Hormones Dispute", (16 October 2008)

Intellectual Bias: Observing & *Understanding* causality can be decades apart……

A *sufficiency of evidence for action* need not include

evidence of mechanisms of action……

……as these data can take decades to collect and be agreed upon by experts in the field eg Cholera; Tobacco; DES

Knowledge of "Mechanisms of Action" (MA) is a scientific luxury.....

- MA can take **decades to agree** eg cholera, smoking, DES pill, BSE
- **If present, MA provide robust evidence *for* causality.**
- **If MA are absent, this not robust evidence *against* causality**.
- **If MA are absent then expect both negative animal evidence and uncertainty** about which exposure metrics are relevant.

Eg thalidomide was negative in rodents but positive in guinea pigs; and betanapthylamine was negative in rodents but positive in dogs.

"Group Think" & "Anchoring" Biases: IPPC advice to lead climate change authors……

Be aware of:

*"the tendency for **a group to converge on an expressed view** and become over confident in it.*

*Views and estimates can also become **anchored on previous versions, or values**, to a greater extent than is justified".*

Guidance Note on Uncertainty to its 4th Assessment authors, Intergovernmental Panel on Climate Change, 2005 & 2010

Rivalries : between Scientists

- From different scientific disciplines eg toxicolgy & endocrinology
- From Prior beliefs
- From Paradigms preferred
- From Personal Prejudices
- From Passions eg jeolosy (Newton & Leibnitz; Doll & Fisher & Alice Stewart)
- From research Funding fights…..

(See « Rivals: Conflict as the Fuel of Science », M. White, Vintage, 2002

«A Tale of Two Scientists», Gale Greene, 2017

On Paradigms & Prejudices: Hook v Newton re theory of light & colour

Hook's view that light was a wave led him to dismiss Newton's theory that it was a particle:

but without giving it much attention: he boasted of having only spent 3 hours reviewing it…

Newton was outraged and withdrew it, only publishing 30 years later..

(«Rivals», p 29)

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The Power of Prevailing Scientific Paradigms….

"A new scientific truth does not triumph by convincing its opponents and making them see the light but rather because ***its opponents eventually die****, and a new generation grows up that is familiar with it"*

(Max Planck, Nobel physicist, 1949)

Personal Biases: citizens & policymakers

"Reasoning often starts with established conclusions and works back to find "facts".

Its not lack of knowledge or understanding-but "motivational reasoning" …. which confirms your own bias and writing off inconvenient truths"

From evidence based policymaking to policy based evidence making..

"Seeing Reason: human brains skew facts", D jones , New Scientist, Dec 3rd 2016

Personal biases: *"Seeing Reason 2016"*

- Conspiracies are most attractive to people who feel they are losing out
- Rejecting facts is associated with low esteem
- *"When I read about the dangers of alcohol I gave up.....reading"*
- "Fact checking helps-but not much on controversial issues
- On many issues (immigration, fracking) "scientific curiosity" (not "scientific literacy") helps liberals & conservatives to converge around what the facts say.
- "Cognitive dualism" exists : holding two contradictory beliefs

"Seeing Reason: human brains skew facts", D jones , New Scientist, Dec 3rd 2016

Funding & Economic Biases

See the Vatican and its seeking of scientists who would contradict Galileo! ("Rivals",M White)

And histories of Asbestos, Lead, some Pharma, Tobacco, BPA, & Mobile phones, climate change..

where source of funding strongly predicts nature of the results

(R. Doll, leading UK Epidemiologist who first established lung causes, asbestos & Tobacco, was later paid £1000 a day by Monsanto for decades…….not discovered till after his death…Gale, *"A tale of two scientists",* in *"Corporate ties that Bind",* 2017)

"No Hazard" and Funding Bias in Occupational & Environmental Research

13.5% negative (No hazard) findings among studies without financial COI,

28.3% negative studies with any financial COI but none of the authors were employed with the funding organizations, and

58.8% negative studies with any financial COI and one or more of the authors were employed with the funding organizations.

Financial Conflicts of Interest and Study Results in Environmental and Occupational Health Research Lee Friedman, Michael Friedman, JOEM Volume 58, Number 3, March 2016

Funding and Intellectual biases: GMOs

*"Scientists with **industry funding** and/or those trained in **molecular biology** were very likely to have a **positive attitude** to GM crops and to hold that they **do not represent any unique risks**…*

*..while publicly-funded scientists working independently of GM crop developer companies and/or those trained in ecology were more likely to hold a "**moderately negative**" attitude to GM crop safety and to **emphasize the uncertainty and ignorance involved**".*

Institutional changes to minimise disciplinary & funding biases?

"The strong effects of (scientific) training and funding might justify certain institutional changes concerning how we organize science and how we make public decisions when new technologies are to be evaluated."

Kvakkestad, V., et al. (2007). *"Scientists' perspectives on the deliberate release of GM crops".* Environmental Values 16(1): 79–104.

Funding Bias in sugar sweetened beverages (SSB) & weight gain.

- Reviews without any reported Funding Conflict of Interest :

  83% concluded that SSB consumption could be a potential risk factor for weight gain.

- Reviews with some Funding CoI:

  83% concluded that the scientific evidence was insufficient to link SSB consumption and weight gain.

Financial Conflicts of Interest and Reporting Bias Regarding the Association between Sugar-Sweetened Beverages and Weight Gain: A Systematic Review of Systematic Reviews, 2013. Maira Bes-Rastrollo et al PLOS Medicine 2013.

Funding Bias in Asbestos Science

In a letter of July 12, 2014, over one hundred scientists and thirty organisations wrote:

"We call on "Current Opinion in Pulmonary Medicine" to withdraw Bernstein's article due to its bias, Its scientifically flawed data, its selective literature review and its misrepresentation of facts".

Heath Risks of Chrysotile Asbestos , Bernstein D.M. Current Opinion in Pulmonary Medicine:

July 2014 - Volume 20 - Issue 4 - p 366–370

Weasely words on Asbestos funding "conflicts of interest"?

Current Opinion in Pulmonary Medicine has now published the following correction:

The health risk of chrysotile asbestos: Erratum

"During the editing process of the recent article by Bernstein, the conflicts of interest statement was wrongly amended from
'No conflicts of interest relevant to this article' to

'There are no conflicts of interest.'

The publisher apologises for this error".

Funding Bias acknowledged in "Litigation driven Asbestos Science"

"Since publication of these 4 articles (on asbestos ,2008) we have had a request to add the following information to the Declaration of Interest:

*The articles listed above report on work that **Georgia-Pacific commissioned** to address issues that have arisen in that **litigation**.*

***I, Stewart E. Holm, representing Georgia-Pacific, am an author on all four papers. The other authors are consulting experts retained by or on behalf of Georgia-Pacific** to conduct the research and prepare the articles. Dr. Donaldson has been listed as potential testifying **expert witness by Georgia-Pacific**, and Dr. Bernstein has testified as an **expert witness for Georgia-Pacific.**"*

Inhalation Toxicology, 2011, 1,

"Dr Bernstein would like to take this opportunity to clarify that he works as a scientific consultant to the chrysotile asbestos industry and gives presentations worldwide on the science of chrysotile asbestos.

In the last three years he has received payment for his consultancy services from: Honeywell, International Chrysotile Association and Zimbabwe National Chrysotile Taskforce".

Funding bias & "Institutional delay" in Climate Change

An analysis of the financial resource mobilization of 91 organisations in the climate change counter-movement (CCCM) in the United States, 2003 to 2010, found that:

- The overwhelming majority of the philanthropic support came from conservative foundations.
- there is evidence of a trend toward concealing the sources of CCCM funding through the use of donor directed philanthropies.

Brulle, R.J. "Institutionalizing delay: foundation funding and the creation of U.S. climate change counter-movement organizations" Climatic Change (2014) 122: 681

Funding Bias in Back Pain Research

"We demonstrated a significant association between source of funding, study outcome, and LOE in spinal research.

A large proportion of industry funded research was shown to report favorable outcome".

Spine J. 2014 Feb 1;14(2):308-14. **Does source of funding and conflict of interest influence the outcome and quality of spinal research?**

Amiri AR, Kanesalingam K, Cro S, Casey AT

Conflicts of Interest in Evaluating Painkiller Research

A Journal Sentinel/MedPage Today *investigation found that nine of the 19 experts on the IOM panel that produced that report had* ***connections to companies*** *that manufacture narcotic painkillers at the time or in the three years prior to their work on the report.*

The IOM did not disclose any of these financial conflicts of interest when the report was published"

The Institute of Medicine report, 'Relieving Pain in America, A Blueprint for Transforming Prevention, Care, Education, and Research.'

MedpageToday June 25, 2014

Economic Interests strongly influence Cost Benefit Analysis results : and in the predictable direction

- Transport **infrastructure**: construction costs and times are ***routinely under-estimated*** c 20-50%
- **Costs of regulating health/environment hazards**: ***over-estimated*** (30-2300%)
- **Benefits** of health/environment measures, when studied, are from a narrow range & usually ***under-estimated***;
- **Secondary benefits** often ***ignored***
- **Innovation/**dynamic effects are **often ignored** yet help cause large cost /emissions reductions

Economic Bias & "Manufacturing Scientific Doubt"

"Doubt is our product since it is the best means of competing with the 'body of fact' that exists in the mind of the general public."

From an executive at Brown & Williamson, Tobacco Company, 1969.

See EEA chapters on Beryllium,tobacco, leaded petrol, climate change etc. And Michaels 2009: Oreskes,2010 on manufacturing doubt & funding biases

Economic Bias & Pesticides Research

"OPERA Research Center is a front group for the pesticide industry in the bee debate".

"OPERA has strong links with the pesticide industry and functions as one of their lobby front groups in Brussels……

the director of OPERA sits on the pesticides panel of EFSA".

Corporate Europe Observatory and European Beekeeping Coordination (Beelife), December 2013

Economic Bias : Corporate pressure on regulatory agencies, 2013

"We ask you to formally confirm that you will rectify the press release by 11 o'clock. Otherwise you will appreciate that we will consider our legal options."

Major Company X to major EU Regulatory Agency

Press release not changed:

"We would appreciate further explanations from you" (the Director) before *"deciding on the legal options available to it and the identity of specific defendants in any possible court action".*

Something light

Cornered

by Mike Baldwin

"What's important is that we learn from what we must never admit happened."

Rivalries: between Scientific Institutions

- Royal Commission on Environmental Pollution v Advisory Committee on Pesticides re spray drift UK 2005/6
- IARC v EFSA/ECHA re Glyphosate 2017
- Within WHO re EMF

Biases in Evidence Evaluation

*"Most scientific committees are **designed primarily to construct biased and self protecting consensuses** resistant to challenge"*

Discuss....

"Truth, belief, and consensus", D Cross, J. Biological Physics & Chemistry, Feb 2015.

Different Conclusions from "Same" Knowledge Evaluated

Classification of TCE risk assessment reports in 1995/6

(from Ruden 2001)

- - - **Negative**	+ - - **Positive animal**	+ - + **Positive aninal, negative human, plausible risk**	+ + + **Positive animal & human, plausible risk**
1996 ACGIH	1996 HSIA, Online, Industry	1996 OECD/EU UK, Int.Org.	1995 IARC
			1996 Deutsche Forschungsgemeinschaft, DFG, Germany
			1996 MAK Germany Occ. Agency

"7 Sources of Divergent Evaluations of the "same" evidence

1. Institutional/Cultural factors eg Committee mandate; membership; & Questions addressed
2 Knowledges accepted for review
3 Weights given to knowledges reviewed
4 "Rules" by which knowledges assessed become evidence asserted.
5 Approaches to evaluating Uncertainties, Understandings, Confidences, & Likelihoods about the knowledge base and cause/effect links; and
6 Group "rules" for conclusions about Strengths of Evidence for ***Causality*** and (the different) Strengths of/nature of ***Action Recommendations***
7 Reporting & Communicating Biases

EEA Workshop on 4 case studies, unpublished, 2008

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Institutional Bias inn Selecting the RA Committee: BSE

"Really, the key is the setting up of the Committee: who is on it and the nature of the investigations"

(MAFF official, BSE transcript, 1998, 29 June,p79-81)

"the opposition to the involvement of the Public Health Laboratory Service in BSE policy was anxiety that this would be tantamount to admitting the possibility of a human health risk".

- (Welsh Chief MO,Phillips BSE Inquiry,2000, V 11. para 4.28)

(See BSE chapter in « Late Lessons from Early Warnings:the Precautionary Principle 1898-2000 », EEA, 2001).

Bees & Gaucho pesticide: the search for the single cause..?

"The Risk Assessment ***does not allow us to demonstrate*** *that maize seed dressing with Gaucho can be* ***solely*** *responsible, at* ***national*** *level..*

for ***all colony losses, behavioural troubles, honey bee mortalities, or general decline in honey production"***

French Commission for Toxic Products , 2002.

.....or embrace multi-causality…. ?

*"Gaucho…is **of concern** (on maize)*

*as **one** of the **explanatory elements for the weakening of the bee populations observed** despite the ban of Gaucho in sunflowers."*

Multifactor study of the Honeybee Colonies Decline, French Scientific & Technical Committee, 2003, see Late Lessons, Bees chapter

IARC v BfR & EFSA on Carcinogenicity of Glyphosate, 2015

- 2015: the World Health Organization's cancer agency IARC
- concluded that glyphosate was a *"probable human carcinogen"*

- 2015 German BfR : a classification for carcinogenicity is "not warranted" for glyphosate.

- 2015 EFSA: *"glyphosate is unlikely to pose a carcinogenic hazard to humans" based on German BfR RA*

Whence the Differences between IARC & EFSA Evaluations on Glyphosate?

See:

"Differences in the carcinogenic evaluation of glyphosate between IARC and EFSA"

Chris Portier & 94 other scientists, JECH, Mar 2016

International Workshop on Divergent Evaluations of the "same" evidence

- RSM Nov 5/6 2018 (or Jan 2019)
- Organised by Gee (Brunel) Holgate (Southampton), Ruden(Stockholm)
- *No funding yet!!*
- 4 case studies of different evaluations

- Glyphosate: IARC v EFSA
- Mobile Phones & Head tumours: Hardell v EU SCENIHR
- Aerotoxic Syndrome: Howard v BAA
- BPA: France v EFSA

Bias at the German Institute for Risk Assessment?

- The German toxicologist Dr Peter Clausing has accused the German Federal Institute for Risk Assessment (BfR) and the European Food Safety Authority (EFSA) of committing scientific fraud by twisting scientific facts and distorting the truth, with the aim of concluding that glyphosate is not a carcinogen.
- EFSA and BfR thereby accepted and reinforced the conclusion proposed by the Monsanto-led Glyphosate Task Force (GTF).

(Clausing made this accusation in front of five judges at the Monsanto Tribunal, held in The Hague from 14–16 October)

"Conflicts of interest" in GMO Risk Assessment at EFSA, 2010

In 2010, 12 out of 21 experts of the GMO Panel were found to have a conflict of interest

In 2011 the European Ombudsman ruled that EFSA failed…to carry out *"a sufficiently thorough assessment of the potential conflict of interest"*

"Conflicts of interest in members of EFSA's management board and expert panels" were among the issues that prompted the European Parliament to postpone approving the agency's 2010 Budget.

WHO EMF Monograph Contributors; some Conflicts of Interest?

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“Revolving Doors”…. between regulators and Corporations they regulate

“Dr Helen Thompson, a key government scientist whose research was used by ministers to argue against a ban on pesticides thought to harm bees is to join Syngenta, the chemical giant which manufactures one of the insecticides”.

Thompson led a field project intended to test the effect of neonicotinoids on bumblebees. However, the study was criticised as flawed after the near ubiquitous use of the insecticides led to the contamination of colonies meant to be pesticide-free controls”.

Guardian 26th July 2013.

#NoTTIP #NoCETA

#NoISDS #StopCETA

Risk estimates that are *"pleasing to the powerful"*

".. he had a knack for producing radiation risk estimates pleasing to the powerful.

Doll produced a report for UK Prime Minister that concluded, "The present and foreseeable hazards from external radiation due to fall-out from the test explosions of nuclear weapons . . . are negligible"—

thereby giving the okay to the H-bomb trials that took place in the Pacific in 1957 and 1958.

His complacency was not shared by the more than 9,000 scientists who signed Linus Pauling's petition warning that weapons testing would produce millions of cancers and birth defects, a petition that helped bring about the 1963 moratorium on above ground testing.

"A Tale of Two Scientists", G. Greene, in "Corporate ties that bind", 2017.

The Bradford Hill "criteria" for causality are asymmetrical…..

If present, can be sound basis *for* causal inference ..

If absent cannot be sound basis for concluding *no* causal inference…….

..as Bradford Hill pointed out….

Now the "criteria" are much more asymmetrical than in 1965 given what we now know about multi-causality & complexity

"Environment & Disease: association or causation?" (Bradford Hill, 1965)

“The Case for Action”

“All scientific work is incomplete..

...that does not confer on us the freedom to ignore the knowledge we already have or to postpone the action that it appears to demand at the given time”

“Environment & Disease: association or causation?” (Bradford Hill, 1965)

Sufficient evidence "for action" ?

"….we must surely ask what is involved in our decision...

*…it almost inevitably leads us to introduce **differential standards** before we convict."*

Bradford Hill. 1965

Bradford Hill on different Strengths of Evidence for case specific Action..

- *"relatively slight evidence"* for pregnancy pill ban
- *"fair evidence"* for reduced/eliminated exposure to probable carcinogenic oil at work
- *"Very strong evidence"* for public restrictions on smoking, burning fossil fuels, or fatty diets.

Bradford Hill, The Environment & Disease: Association or Causation?", Proc Roy. Soc Med ,1965, 58, 295-300.

Some Strengths of Scientific Evidence…

- **Beyond all reasonable doubt** (scientific causality & criminal law)
- **Reasonable certainty** (Int.Panel Climate Change , 2007)
- **Balance of probabilities/evidence** (IPCC,2001; civil law)
- **Strong possibility** (IARC on ELF ,2002; on RF 2011)
- **Reasonable grounds for concern**(EU Communication on PP)
- **Scientific suspicion of risk** (Swedish Chemicals Law,1975
- **"Pertinent information"** (WTO SPS justifying member state actions to protect health'

……which are appropriate for different purposes, depending on the costs of being wrong in acting/not acting

ED_001703C_00000591_088_a5000a65-f649-6bec-7ea8-5829b51efd19

The “appropriate “ strength of evidence for precautionary action is an Ethical choice, not a Scientific issue

*Who benefits, and who loses, from **being wrong** in acting, or not acting, early enough to prevent harm?*

- **Short term, specific, economic interests**?
- Or the **longer term health & wellbeing of people and their environments?**

Systematic Reviews can increase confidence in evidence evaluation…

By using transparent and reproducible methods of evidence evaluation that acknowledge uncertainties, variabilities and ignorance…….

Navigation Guide; OHAT Guide; SYRINA for EDCs….

SYRINA: A solution to the UNEP/WHO request on methods for evaluating evidence on EDCs

Marlene Ågerstrand

Department of Environmental Science and Analytical Chemistry (ACES),
Stockholm University

marlene.agerstrand@aces.su.se

ED_001703C_00000591_091_1277dfde-020b-ea98-ea41-2376f4be7e63

Traditional chemical risk assessment

Identify one or a few key (eco)toxicity studies.

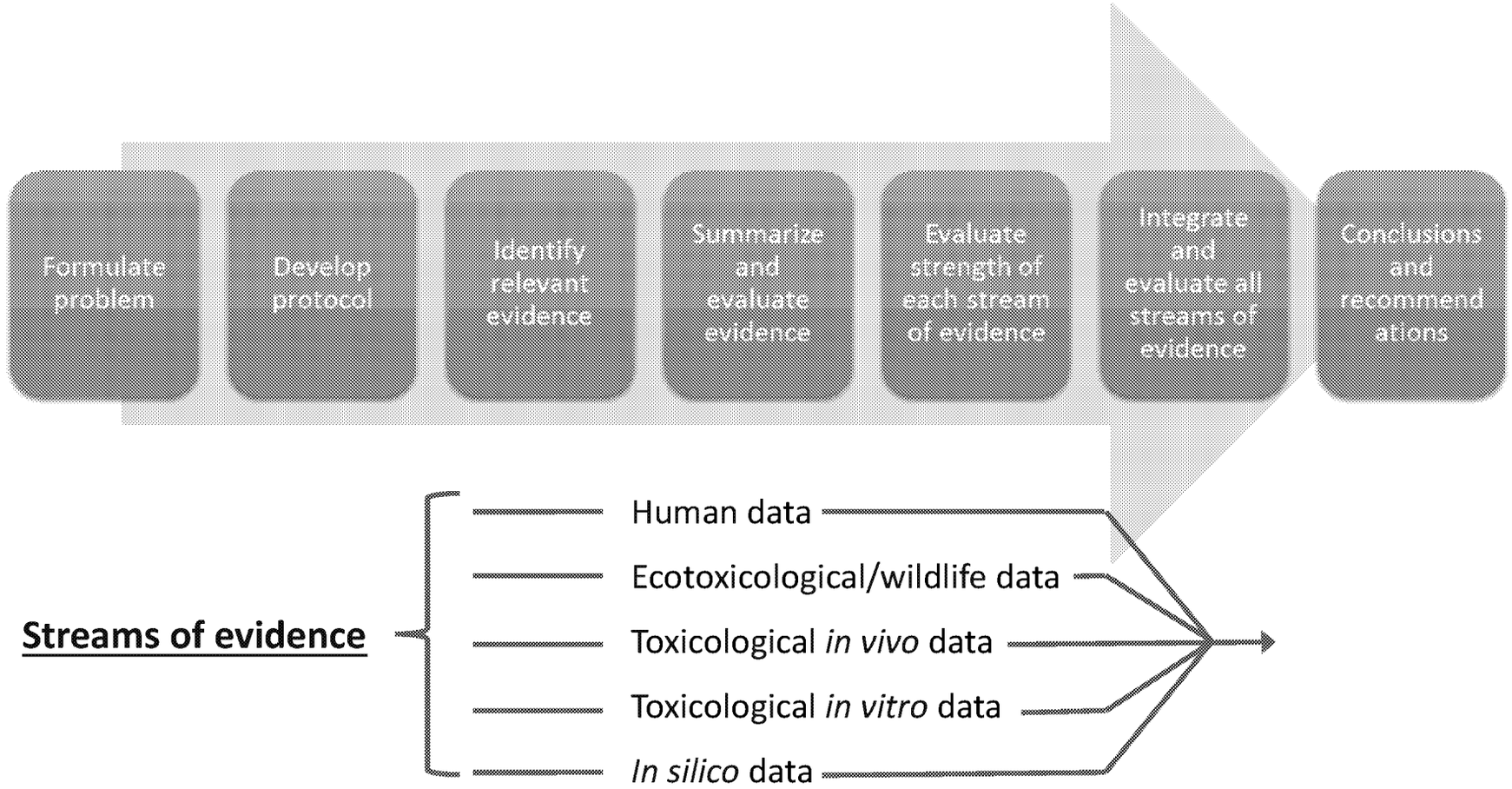
Preferably *in vivo* studies conducted according to standardized guidelines and Good Laboratory Practices (GLP).

Systematic Review and Weight of Evidence evaluation

Make use of all available data: *in silico*, *in vitro*, *in vivo*, epidemiological studies.

Include non-standard and non-GLP studies.

A framework for the systematic review and integrated assessment of endocrine disruption



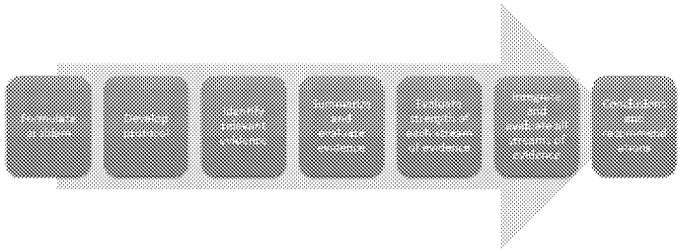
Evaluating Evidence on EDCs: 3 step Conclusions in SYRINA

*1. "We have weak / moderate / strong evidence that exposure to compound X is associated with **adverse outcome** Y in humans and/or in animals."*

*2. "We have weak / moderate / strong evidence that compound X is associated with Y **endocrine disrupting activity** in experimental animal studies."*

3. "The **link between endocrine disrupting activity and outcome is plausible**

The process – in brief



- **Step 7**: Conclusions and recommendations

Strength of Evidence: Endocrine Disrupting Activity				
Strong	Probable EDC	Probable EDC	Known EDC	Known EDC
Moderate	Possible EDC	Possible EDC	Probable EDC	Known EDC
Weak	Not classifiable	Not classifiable	Possible EDC	Probable EDC
No data	Not classifiable	Not classifiable	Possible EDC	Probable EDC
	No data	**Weak**	**Moderate**	**Strong**
	Strength of Evidence: Association Between Exposure and Health Outcome			

"Chemical A is a suspected EDC that can cause Y in people."

On reducing & managing Biases.

- More public funding of science (taxes on harmful agents)

- Private funding of research via independent 3rd parties

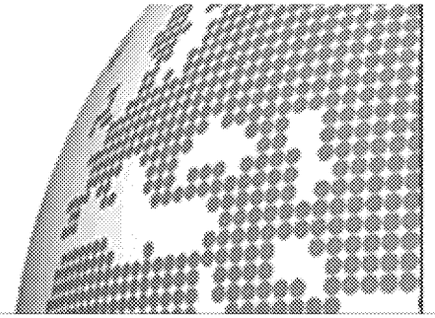
- Awareness of Biases in science and risk assessment.

Transparency about Biases & Conflicts of Interest

- Enforced Guidelines from Journals & Professional bodies.
- More/better Systematic Reviews eg Navigation Guide; SYRINA.

On reducing CoI…….

Policy on entities from whom financial contributions, contracts, and grants WILL and WILL NOT be sought/accepted, and how these will be disclosed (2016)



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Publisher's Conflicts of Interest policies….

- Full disclosure about a relationship that could constitute a conflict–even if the person doesn't believe it affects their judgment–should be reported to the institution's ethics group and to the journal editor

- According to the U.S. Office of Research Integrity, having a conflict of interest is not in itself unethical, and there are some that are unavoidable.
- Full transparency is always the best course of action, and, if in doubt, disclose.

Elsvier 2015

Brunel University London

A case for creating a new Nobel Prize in Transdisciplinary Science

David Gee

Genevieve Dewez

Susan Jobling

Institute of Environment, Health and Societies

ED_001703C_00000591_099_02b10fe8-861f-10f0-0ab1-4f575b733b9d

Thank you

geedavid90@gmail.com

All Late Lessons chapters from both vols available from EEA website as PDFs

Plus Kindle for vol 2

Message

From: Spire, Paul [PSpire@aap.org]
Sent: 9/20/2018 3:31:20 PM
To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Sophie Balk [sbalk@montefiore.org]
Subject: Green Book 2nd Proofs - 40 - Pesticides
Attachments: 40_PEH_ch40_0687-0728.gm.edit1.pdf; 40_1st proof with feedback_PEH_ch40_000-000.gm.revrae081618 sjb082718.pdf

Hi Ruth and Sophie.

I am writing to provide the attached 2nd proof for your review. Also attached for reference is the response that we submitted to the 1st proof. Please be reminded that this round is intended to ensure that the previously requested changes have been properly incorporated.

Many thanks,

Paul

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To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]
Subject: [SPAM-Sender] House Judiciary Panel Approves Expedited Permitting Bill

Friday, September 7, 2018

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TOP NEWS

House Judiciary Panel Approves Expedited Permitting Bill

The House Judiciary Committee voted on Thursday in favor of a Republican-sponsored bill aimed at speeding up the permitting process for projects that require review by federal agencies, a move that proponents said would create jobs and that Democrats slammed for allegedly undermining important oversight. Read full article »

FERC Chair Denies WH Collaboration On Coal, Nuke Bailout

Federal Energy Regulatory Commission Chairman Kevin McIntyre has denied the agency is working with the White House on a controversial plan to bail out coal and nuclear power plants, as recently suggested by his chief of staff, and defended FERC's independence, according to a letter released Thursday by congressional Democratic leaders. Read full article »

State AGs Join Fight Over DOI Flip On Migratory Bird Kills

Democratic attorneys general from eight states sued the U.S. Department of the Interior in New York federal court seeking to undo its decision not to criminally prosecute individuals and companies for accidentally killing or injuring migratory birds, joining environmental groups that have already challenged the policy about-face. Read full article »

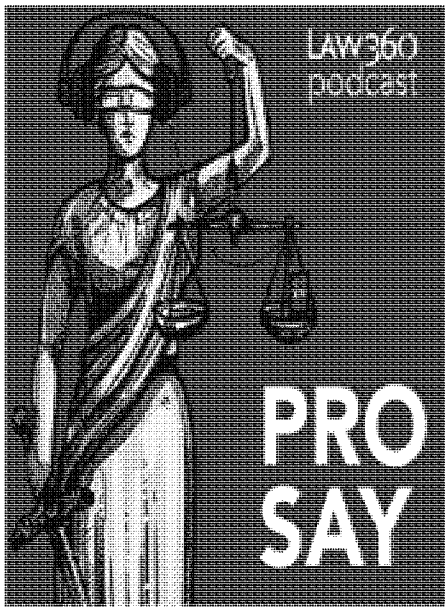
Arkema Wants Harvey Chemical Suit Paused For Criminal Trial

Arkema Inc. and its CEO asked a Texas federal court to temporarily halt a civil case brought by first responders and residents who claimed they were harmed by the release of chemicals during Hurricane Harvey, saying that it should not proceed at the same time as a similar criminal case. Read full article »

ENFORCEMENT

PennDOT Settles Stormwater Case With Reduction Programs

The Pennsylvania Department of Transportation will pay a $100,000 fine, roll out stricter controls over construction site runoff and build stormwater



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reduction projects as part of a settlement with the U.S. Environmental Protection Agency announced on Wednesday. Read full article »

LITIGATION

3rd Circ. Partially Grants NJ Permits In Pipeline Fight

A Third Circuit panel on Wednesday upheld federal permits for Transco's $116 million pipeline upgrade in New Jersey, but said the state was wrong to think federal law preempted its power to hold adjudicatory hearings on the state's own permits, which must now be held. Read full article »

Monsanto Can't Round Up Chemical Docs From Advocacy Org

A New York judge handed a defeat to agrichemical giant Monsanto Co. on Thursday in its fight for documents from an advocacy group that has called for a halt on the use of glyphosate, the key ingredient in Monsanto's Roundup weed killer, with the judge saying the subpoena risked "chilling" free speech and political activity. Read full article »

Ex-DNC Chair Ducks Visa Scheme Suit By Chinese Investors

A Virginia federal judge on Wednesday tossed claims of fraud made against Terry McAuliffe, former head of the Democratic National Committee, by a group of Chinese investors, finding that the investors had not provided enough detail in their allegations saying they were swindled out of green cards. Read full article »

DEALS

Canadian Energy Co. Invests $80M In Japanese Solar Plant

Canada-based Grasshopper Solar Corp., a global developer and manager of solar assets, said on Thursday that it has invested $80 million in Japanese civil engineering and construction firm Setouchi Koken's Iizuka Solar Plant located in Fukuoka, Japan. Read full article »

EXPERT ANALYSIS

What The Arkema Indictment Means For Chemical Cos.

Last month, a Texas grand jury indicted Arkema Inc., its CEO and a plant manager for allowing a release of air contaminants during Hurricane Harvey. The indictment is legally significant because it represents a criminal prosecution for a safety incident that involved no fatalities or catastrophic environmental harm, say Benjamin Patton and Mary Balaster of Reed Smith LLP. Read full article »

LEGAL INDUSTRY

New Emails Reveal Kavanaugh As Opinionated Bush Lawyer

In previously confidential records released Thursday, D.C. Circuit Judge Brett Kavanaugh called an affirmative action program a "naked racial set-aside," discussed whether Roe v. Wade is "settled law" and corresponded with a Republican Hill staffer later accused of misappropriating Democratic material while he was a White House lawyer in the early 2000s. Read full article »

Kavanaugh Defends Bush Record, Words On Executive Power

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Fox Rothschild
Genova Burns
Gerard Fox Law
Gibson Dunn
Gray Cary
Holland & Knight
Hollingsworth LLP
Husch Blackwell
Jung & Sisco
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Lockridge Grindal
Morrison & Foerster
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Perkins Coie
Potter Minton
Reed Smith
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D.C. Circuit Judge Brett Kavanaugh found himself defending his statements on executive power and involvement in controversial Bush administration judicial nominees and policies Thursday, as he closed out his testimony for his U.S. Supreme Court nomination hearing. Read full article »

White Men Have Leg Up In Legal Industry, Attys Say

A survey of almost 3,000 in-house and law firm attorneys has found that the legal industry suffers from an "endemic" gender and racial bias that favors white men in a number of different ways, including when it comes to hiring, promotions, assignments and compensation. Read full article »

Series

NYC Brick & Mortar: Trend Breakers

While various law firms in New York have over the past two years taken less space per lawyer and set up shop with smaller partner and associate offices, some firms have bucked those trends. This is the final article in a four-part series that looks at how law firms in New York are addressing the question of brick-and-mortar space. Read full article »

Senate Confirms 8 Trump District Court Nominees

The Senate voted to confirm eight nominees to federal district courts Thursday afternoon, pushing the number of district judges confirmed under President Donald Trump to 41. Read full article »

Law360's Weekly Verdict: Legal Lions & Lambs

Litigation boutique Campbell Campbell Edwards & Conroy PC stepped up to take the top legal lions spot this week, winning a favorable ruling for Johnson & Johnson in personal injury litigation over its antipsychotic drug Risperdal, while a trio of law firms representing Apple landed on the lambs list after a judge denied the technology giant's request for a new trial, leaving in place a $502 million patent verdict against it. Read full article »

Ex-Raiders, Buccaneers Atty Named XFL General Counsel

The relaunching XFL football league announced Thursday it has signed a former counsel for a pair of NFL teams as its general counsel. Read full article »

JOBS

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Twitter Inc.

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Whitbread PLC

World Wrestling Entertainment, Inc.

Xerox Corporation

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Occupational Safety and Health Administration

Pennsylvania Department of Transportation

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U.S. Chemical Safety and Hazard Investigation Board

U.S. Department of Energy

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To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; 'Sophie Balk' [sbalk@montefiore.org]
Subject: Green Book 2nd Proofs - 17 - Drinking Water
Attachments: 17_PEH_ch17_0277-0302.gm.edit1.pdf; 17_1st proof with feedback_PEH_ch17_000-000.gm.revrae081418 sjb090118rae090118.pdf

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Paul

Message

From: no-reply@vrmailer3.com [no-reply@vrmailer3.com]
on behalf of info@healthyschools.org [info@healthyschools.org]
Sent: 8/24/2018 4:07:32 PM
To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]
Subject: NewsSlice: September is National Preparedness Month

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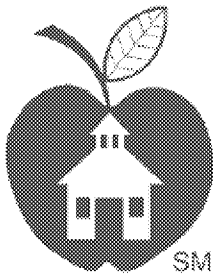

NewsSlice

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Forward to a Friend

August 24, 2018 - *Bi-weekly on Fridays during July and August*

September is National Preparedness Month

Disaster News:

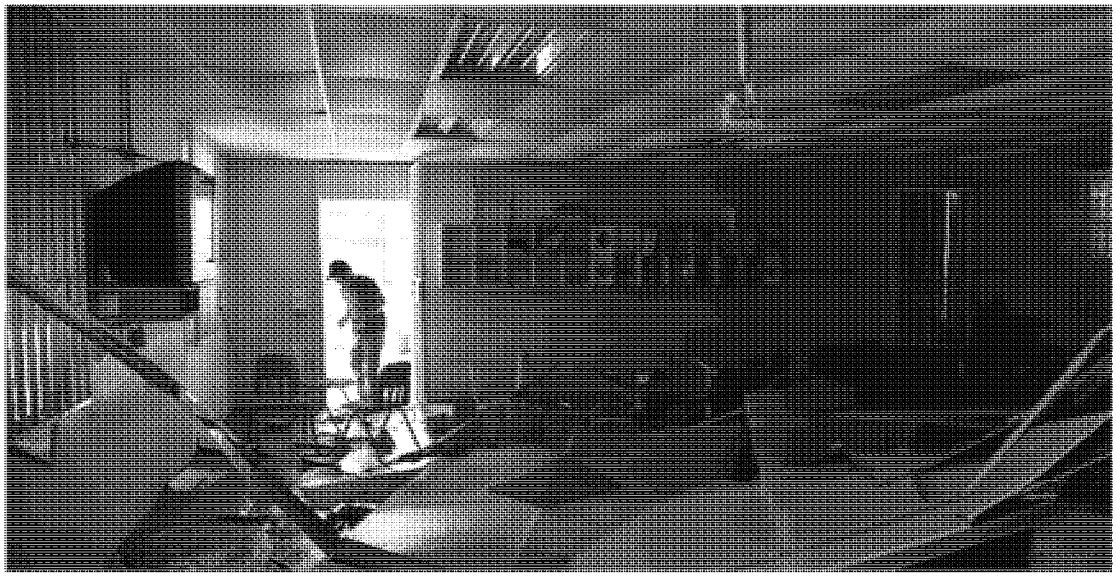
Many U.S. Schools Still Not Fully Prepared for Disasters

NATIONAL - Many U.S. public school districts lack comprehensive plans for responding to natural disasters, infectious disease outbreaks and other emergencies despite a federal initiative for all schools to address these needs by 2020, researchers say. Overall, roughly four out of five school districts have plans for helping students and staff with special needs during an emergency situation, the study by the U.S. Centers for Disease Control and Prevention (CDC) found. Almost four of five school districts are prepared to provide mental health services to students, faculty and staff in the wake of a disaster. (Reuters)

School hallway post Hurricane Sandy - New York State - Windham-Ashland Jewett school (Times Union)

What I Learned Researching the Deadliest School Disaster in American History

OPINION - School tragedies have become agonizingly commonplace, but the school disaster that claimed the most lives in American history has been widely forgotten. On a sunny Friday afternoon in March of 1937, the students at the recently completed New London School in East Texas waited impatiently to be dismissed. Fifty PTA mothers watched a dance program put on by the younger children; older students were giving reports, taking tests or talking excitedly about the sports competition taking place over the weekend. (Time)



School in Puerto Rico after Hurricane Maria
(Photo courtesy Hector Retamal/AFP/Getty Images)

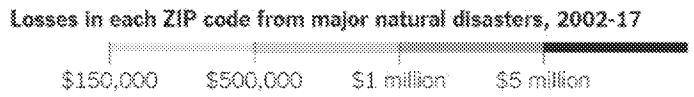
Educators: Delaying School Year 'An Option' if Smoke Doesn't Clear, Most Expected to Operate On-Time

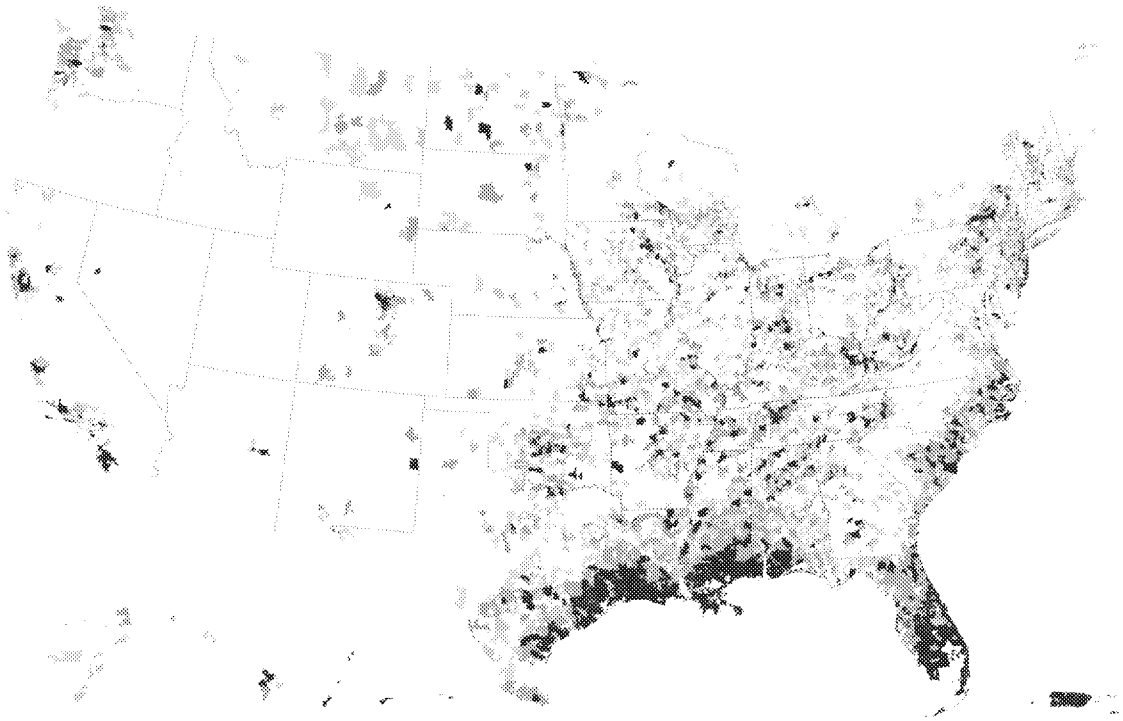
WASHINGTON STATE - Lingering smoke from wildfires have brought bad air quality to Washington state. The Washington State Department of Health has a set of recommendations for school districts dealing with sub-par air quality, but its ultimately up to the school on what to do. According to DOH, its recommended that staff allow students with asthma, respiratory infection or heart disease to stay indoors. When the air is hazardous, the department recommends that students stay indoors, keep activity levels light and either cancel sporting events or move them to an area with "good" air quality. (iFIBER One News)

New York Times Interactive Map:

The Places in the U.S. Where Disaster Strikes Again and Again

NATIONAL - In the last 16 years, parts of Louisiana have been struck by six hurricanes. Areas near San Diego were devastated by three particularly vicious wildfire seasons. And a town in eastern Kentucky has been pummeled by at least nine storms severe enough to warrant federal assistance. These places are part of a small fraction of the United States that has sustained most of the damage from major natural disasters, forming a pattern of destruction concentrated in specific areas. About 90 percent of the total losses across the United States occurred in ZIP codes that contain less than 20 percent of the national population, according to an analysis of data from the Small Business Administration. (New York Times)





Note: All the maps in this article show losses verified by the Small Business Administration for disasters in which a presidential disaster declaration was issued. The values of the losses are expressed in 2017 dollars. (The New York Times)

Useful PEHSU Guides for Disasters:

Hurricanes and Flooding
Disaster Preparedness For Children
Health Risks of Wildfires for Children

***HS Network's Guide for Parents*:**

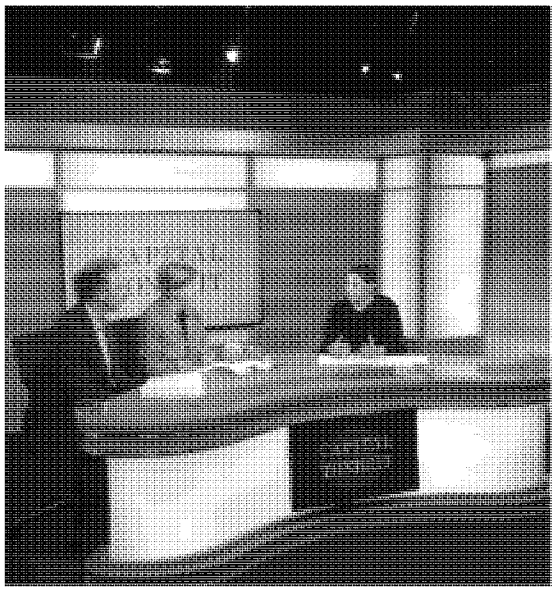
"In Their Own Words: 9/11 Parents Help Other Parents & Schools with Lessons Learned" – advice from experienced parents

---

BACK TO SCHOOL 2018 UPDATES

- Watch Albany, NY Capital Tonight on Spectrum News!
To see HSNetwork executive director, Claire Barnett, and Russ Haven from NYPIRG, interviewed about the national Back to School Day and *Toolkit*: lead in school water, need for $1 per child or $65m/year funding at USEPA for kids and schools, how to find safer school supplies, and more!

Click the picture to watch!



Update USPIRG Toxins in School Supplies Report - ***featured in 2018 Back to School Toolkit***

US Senator Schumer is Calling on the Federal Government to Investigate Toxins in School Supplies

NATIONAL - Countless parents across New York are purchasing new school supplies for students. But Senator Chuck Schumer (D-NY) is calling on the government to regulate toxic chemicals in school supplies. Multiple reports by non-profits and consumer advocacy groups have raised concerns that popular back-to-school supplies contained dangerous levels of toxic chemicals. (Schumer.Senate.Gov)

New York State Bans Smoking in Facilities That Offer Childcare

NEW YORK - On Monday, New York Governor Andrew Cuomo signed this ban that applies to both state-run and private facilities that are licensed or registered to provide child care services. It applies at all times- even when children are not present. This is a strong effort to cut down on second and third-hand smoke for the sake of all children's health. (TimesUnion)

Weed-Killing Chemical Linked to Cancer Found in Children's Cereal
NATIONAL - A new report found glyphosate, a weed-killing chemical that some health authorities link to cancer, in a number of popular breakfast foods and cereals marketed to children. The study by the non-profit Environmental Working Group (EWG) discovered trace amounts of the most widely used herbicide in the country in oats, granolas and snack bars. Thirty-one out of 45 tested products had levels higher than what some scientists consider safe for children. Products with excessive levels of the herbicide included Quaker Old Fashioned Oats, Cheerios, Quaker Dinosaur Egg Instant Oats, Great Value Instant Oats, and Back to Nature Classic Granola. (CBS)

PFAS Found in Drinking Water for 1.5M in Michigan
MICHIGAN - Testing data disclosed by the Department of Environmental Quality shows that more

than 1.5 million people in Michigan have unwittingly been drinking municipal water with some level of contamination by toxic chemicals called PFAS.(MI Live)

Momentum Builds to End the Largest Mercury Use in U.S.A. - Dental Amalgam
CHICAGO - A coalition of 50 environmental, public health, and children's rights groups called for an end to the controversial filling material – dental amalgam – in American children, and for a two-year general phase-out in its use in the United States. Supporters include many major national nonprofit groups, including Sierra Club, Greenpeace, Health Care Without Harm, Clean Water Action, Consumers for Dental Choice, and Learning Disabilities Association of America. The paper, known as the Chicago Declaration, was unveiled at a news conference held at the University of Illinois at Chicago and chaired by Charlie Brown, president of the World Alliance for Mercury-Free Dentistry. Brown noted, "Starting July 1, the European Union bans amalgam for children under 15; the U.S. needs to act too." (PR Newswire)

Mississippi 12-Year-Old has Asthma Attack at School, Dies
MISSISSIPPI - Officials say a 12-year-old boy had an asthma attack at a Mississippi middle school and died Perry County School District Superintendent Gregory Dearman tells WDAM-TV that the sixth-grader died Wednesday. Dearman says the boy had an asthma attack in the gym at Perry Central Middle School. Authorities have not released the boy's identity, though County Coroner Heather Meeler has said he was 12 years old. (US News & World Report)

Have an upcoming event to include? Let us know, info@healthyschools.org

Archived Webinars / Presentations

Collaborative for High Performance Schools (CHPS), "From Research to Action: Evidence-Based Design for Healthy School Buildings", May 3, 2018, (register free to watch)

Lead in Drinking Water with Dr. Jerome Paulson

Towards Healthy Schools: Reducing Risks to Children with Claire Barnett

Rights of Children with Disabilities in Public Charter Schools: U.S Department of Education Office of Special Education and Rehabilitative Services Webinar

U.S. Environmental Protection Agency's Indoor Air Quality Master Class Webinar Series
Healthy Schools Network note- view the webinars and earn certificates

Upcoming Events

Connecting Health and Learning through ESSA: Opportunities for School Nurses
Webinar: August 27, 2018 - 4:00 p.m - 5:00 p.m. Eastern Time
Join the Alliance for a Healthier Generation and the National Association of School Nurses to learn about the opportunities ESSA provides school nurses as they collaborate with school staff, students, families and community partners to take action to reduce chronic absenteeism.

Volunteer Opportunity:
National Voter Registration Day 2018
Tuesday, September 25th
Organized by Nonprofit VOTE for the first time in 2012, National Voter Registration Day has become a nation-wide effort of thousands of organizations to ensure our families, friends, neighbors, and communities are registered to vote. To get involved, plan a voter registration drive in your community, give employees time off to vote, or share registration information on social media. Nonprofit VOTE and Independent Sector have both assembled excellent resources on how you can be successful (and nonprtisan) in your voter registration efforts.

All In for IAQ Preventive Maintenance: Key Strategies for Training Staff and Communicating Success
US EPA Webinar: Thursday, September 27, 2018 - 1:00 p.m – 2:30 p.m. EDT
Attend this webinar to learn how to—
Train staff to integrate preventive maintenance and indoor air quality (IAQ) management strategies to save money and protect health.
Ensure your school's IAQ preventive maintenance program runs efficiently.
Communicate effectively to raise awareness of the importance of IAQ preventive maintenance and increase buy-in and support.
Replicate the best practices of school district mentors to implement communications and team training strategies as part of a sustainable IAQ preventive maintenance program.

Children's Environmental Health Day 2018
Thursday, October 11th
The Children's Environmental Health Network established CEH Day in 2016 as a day of raising awareness about children's environmental health issues, a day of taking action to stand up for children, and a day of community and connection. As a means to foster the children's environmental health movement and a strong network of advocates, CEHN has spearheaded the establishment of Children's Environmental Health Day (CEH Day), we invite you to join us in the Movement to Take Action for Children!

APHA's 2018 Annual Meeting and Expo
San Diego Convention Center, 111 W Harbor Dr. San Diego, CA 92101
November 10 - 14
Theme: "Creating the Healthiest Nation: Health Equity Now**"**

APHA's Annual Meeting and Expo is the largest annual gathering of public health professionals. More than 12,000 people attend, and thousands of new abstracts are presented each year, making APHA 2018 the most influential meeting in public health. Prepare for the meeting by learning specific information for presenters and attendees.
See the program at a glance. HS Network, with the Learning Disabilities Association and the Children's Environmental Health Network, will present a panel on Eliminating Lead in Schools and Child Care on Monday afternoon, Nov. 12, at 3 PM.

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CC: Sophie Balk [SBALK@montefiore.org]
Subject: Chapter 17 - Drinking Water
Attachments: 17_PEH_ch17_000-000.gm.revrae081418 sjb090118.pdf

Ruth,
Please see attached with minor edits.

Re Table on page 18, I removed a word to make better sense of the sentence. Please let me know if you agree.

Reference 14 still looks incomplete since it does not contain page numbers.

Thanks

Sophie J Balk MD
Attending Pediatrician
Children's Hospital at Montefiore
Professor of Pediatrics
Albert Einstein College of Medicine
Ex. 6
718 405-8091 (fax)

Message

From: Environmental Law360 [news-q2@law360.com]
Sent: 8/24/2018 7:41:57 AM
To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]
Subject: [SPAM-Sender] Monsanto Faces 8,000 Glyphosate Suits, Bayer CEO Says

ENVIRONMENTAL

Friday, August 24, 2018

TOP NEWS

Monsanto Faces 8,000 Glyphosate Suits, Bayer CEO Says

The head of Bayer AG on Thursday said that there are now 8,000 lawsuits against its recently acquired Monsanto over glyphosate-based weed killers, the focus of a recent trial that ended in $289 million jury award to a school groundskeeper who claimed they caused his cancer. Read full article »

Canada's High Court Nixes Bid To Halt Hot-Button Pipeline

The Supreme Court of Canada on Thursday rejected a British Columbia city's effort to block construction of Kinder Morgan's Trans Mountain Pipeline project, which was recently purchased by the Canadian government for CA$4.5 billion ($3.4 billion). Read full article »

Green Groups Ask High Court to Review Border Wall Decision

Conservation groups on Thursday asked the U.S. Supreme Court to strike down parts of an immigration law that they say has allowed President Donald Trump's administration to improperly evade environmental reviews of its controversial plans to build more walls along the nation's border with Mexico. Read full article »

States Urge Nationwide Injunction For EPA, Corps Water Rule

Louisiana, Mississippi and Texas on Wednesday asked a Texas federal judge to impose a nationwide injunction on the implementation of an Obama-era water rule that the Trump administration is in the process of rolling back. Read full article »

4th Circ. Won't Halt $5B Pipeline Pending Permit Review

The Fourth Circuit on Thursday rejected a bid by environmental groups to temporarily halt the construction of the $5 billion Atlantic Coast Pipeline while the court hears an appeal of the U.S. Army Corps of Engineers' approval of a project permit, saying there is no evidence the pipeline's construction will run afoul of certain timeliness conditions. Read full article »

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Rail Car Cleaning Co., Owners Charged After Worker Deaths

A Nebraska railroad car cleaning company and its two owners were indicted on charges that they flouted worker safety standards — resulting in two employee deaths — and attempted to hide their failures from Occupational Safety and Health Administration inspection, the U.S. Department of Justice announced Thursday. Read full article »

LITIGATION

Pa. Court Won't Broadly Ax Notification Rules For Frackers

A Pennsylvania state court on Thursday refused to throw out controversial new rules on hydraulic fracturing that an industry group claimed created an improper pre-permitting regime that exceeded environmental regulators' statutory authority, but scaled back instances of when the rules would apply. Read full article »

Fla. Counties Can't Block $1.15B Rail Line, DOT Argues

The U.S. Department of Transportation and the Federal Railroad Administration told a D.C. federal court Wednesday to dump a suit by two Florida counties seeking to block the second phase of a passenger rail line connecting Miami to Orlando, arguing the DOT was within its rights to grant a $1.15 billion bond to fund the project. Read full article »

Pa. Justices Won't Hear Conrail's Cleanup Coverage Appeal

The Pennsylvania Supreme Court on Wednesday declined to take up Consolidated Rail Corp.'s petition for review of an appeals court ruling, leaving intact a decision that cleared Continental Insurance Co. and Stonewall Insurance Co. from covering Conrail's environmental cleanup costs. Read full article »

Coast Guard Sued Over Enbridge Pipeline In Great Lakes

Two environmental groups hit the U.S. Coast Guard with a complaint in Michigan federal court Wednesday, saying Enbridge Energy's pipeline through the Straits of Mackinac should be shut down because the service isn't adequately prepared for an oil spill in the Great Lakes. Read full article »

TerraForm Global Wants Option To Terminate $57M Settlement

TerraForm Global Inc., a yieldco of renewable energy giant SunEdison Inc., on Wednesday asked a New York federal court for the option to terminate a $57 million settlement reached with investors for allegedly misrepresenting SunEdison's financial health in its initial public offering documents, saying too many investors have opted out. Read full article »

Deny Enviros Quick Win In Alaska Land Swap Suit: DOI

The U.S. Department of the Interior has urged an Alaska federal court not to grant a quick win to a coalition of environmental groups challenging the agency's approval of a land swap deal that would facilitate the construction of a road across a national wildlife refuge. Read full article »

EXPERT ANALYSIS

Calif. Gas Storage Rules Impose New Burdens On Operators

In June, the California Conservation Commission adopted strict new regulations addressing the safety of underground natural gas storage

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Duke Energy Corporation
Dynegy Inc.
Enbridge
F-Squared Investment Management LLC
GlaxoSmithKline
Halliburton Company
JAMS Inc.
Ketchum Inc.
Kinder Morgan Inc.
Linn Energy, LLC

facilities. Compliance with the rules' highly detailed data requirements may be a daunting process for natural gas operators in the state, say William Rice and James Bowe Jr. of King & Spalding LLP. Read full article »

Brexit: Bracing For A No-Deal Scenario

Once considered the "cliff edge," the possibility of the United Kingdom exiting from the European Union without agreeing on a trade deal has moved from unthinkable to increasingly likely. Both sides are ramping up preparations for a no-deal scenario, which would have significant implications for businesses in all sectors, say attorneys with Baker McKenzie LLP. Read full article »

LEGAL INDUSTRY

Feature

GCs See Potential In Shaking Up Arbitration Fee Norms

The American Arbitration Association's recent introduction of an alternative fee arrangement option is a progressive step in making costs more predictable and simplifying budgeting for eligible cases, but it will take time to truly glean whether the move increases interest in the forum, according to general counsel and other legal professionals. Read full article »

Atty Reffing Napoli Bern Split Denies Quinn Emanuel Bias

The referee appointed to oversee a dispute in New York state court over the defunct firm Napoli Bern Ripka Shkolnik LLP, which was known for representing 9/11 workers, declined to step aside Wednesday, finding that his previous representation of Quinn Emanuel Urquhart & Sullivan LLP, the firm recently retained by Paul K. Napoli, does not make him partial. Read full article »

Ex-Shkreli Atty Taps Williams Heavy Hitter For Appeal

Former Katten Muchin Rosenman LLP attorney Evan Greebel has retained appellate lawyer Kannon Shanmugam of Williams & Connolly LLP to represent him in his appeal of his conviction for aiding "pharma bro" Martin Shkreli in defrauding drugmaker Retrophin Inc., Shanmugam announced Thursday. Read full article »

ConocoPhillips Names Baker Botts Atty As New GC

Houston-based energy giant ConocoPhillips has appointed a Baker Botts LLP corporate partner as its next general counsel, the company confirmed to Law360 on Thursday. Read full article »

Ex-W.Va. Supreme Court Justice Pleads Guilty To Wire Fraud

A recently retired West Virginia Supreme Court of Appeals justice pled guilty Thursday to a federal wire fraud charge connected to his personal use of a state-owned vehicle and gas credit card, according to the U.S. Attorney's Office for the Southern District of West Virginia. Read full article »

No Mention Of Kavanaugh In Unsealed Starr Leak Report

The White House gloated Thursday after U.S. Supreme Court nominee D.C. Circuit Judge Brett Kavanaugh was not mentioned in a report unsealed by the National Archives investigating alleged leaks by Independent Counsel Ken Starr's office during the Clinton-Lewinsky scandal in the late 1990s. Read full article »

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U.S. Coast Guard
U.S. Department of Homeland Security
U.S. Department of Justice
U.S. Department of Labor
U.S. Department of Transportation

Kavanaugh Sits Down With GOP Holdout Murkowski

After a high-stakes meeting with D.C. Circuit Judge Brett Kavanaugh on Thursday, Sen. Lisa Murkowski, R-Alaska, kept mum on whether she will support his nomination to the U.S. Supreme Court. Read full article »

ACLU Wins Pause Of Speech Limits For Court Support Staff

A D.C. federal judge has granted a request by the American Civil Liberties Union for a preliminary injunction against rules blocking the federal court system's administrative employees from expressing support for political parties or donating to political campaigns — a move the ACLU says does not bode well for the government in the case. Read full article »

Law360's Weekly Verdict: Legal Lions & Lambs

Two solo practitioners won big on Wednesday, securing a $53 million jury verdict for their client in a breach of fiduciary duty suit and landing on this week's legal lions list, while Barnes & Thornburg and Bowman and Brooke were among this week's legal lambs after a jury slammed their client Toyota with a nine-figure personal injury verdict. Read full article »

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Message

From: Kristie Trousdale [kristiet@cehn.org]
Sent: 8/15/2018 1:10:38 PM
To: 'Leyla McCurdy' [redacted] Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]; Berger, Martha [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=58f5ef445e4d4dc694a2d4fb35951b9a-Mberger]; [redacted]
Subject: RE: Jennifer Lowry was on CBS This Morning re: glyphosate in cereal

Good morning, Leyla,

Thanks for sharing this!

Kristie

From: Leyla McCurdy [mailto: [redacted]
Sent: Wednesday, August 15, 2018 9:02 AM
To: Ruth Etzel (etzel.ruth@epa.gov) <etzel.ruth@epa.gov>; Martha Berger (berger.martha@epa.gov) <berger.martha@epa.gov>; [redacted] kristiet@cehn.org
Subject: Jennifer Lowry was on CBS This Morning re: glyphosate in cereal

Good Morning,
I just found out that Jennifer Lowry was on CBS This Morning regarding glyphosate in cereal.
Here's the online article " Weed-killing chemical linked to cancer found in some children's breakfast foods
https://www.cbsnews.com/news/glyphosate-roundup-chemical-found-in-childrens-breakfast-foods/
I am looking forward to talking to you at 1:00 pm – CEH Committee call.
Best.
Leyla

Message

From: Malashock, Daniel [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=86AD680AB41A4FA6A0FC113C1222FCB0-MALASHOCK,]
Sent: 8/15/2018 1:01:39 PM
To: AO-OCHP-Everyone [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=222d03d48d634481af638d4892296469-AO-OCHP-Everyone]
Subject: Unsafe levels of glyphosate weed killer chemical in oat products, report says - CNN

FYI – CNN article regarding glyphosate in oat products. It was based on the below EWG report.
https://www.cnn.com/2018/08/15/health/glyphosate-oat-products-ewg-study/index.html
https://www.ewg.org/childrenshealth/glyphosateincereal

LCDR Daniel Malashock, MS, REHS
U.S. Public Health Service
Environmental Health Scientist
Regulatory Support and Science Policy Division
Office of Children's Health Protection
U.S. Environmental Protection Agency
Office: (202) 566-2976
Email: Malashock.Daniel@epa.gov

Message

From: Spire, Paul [PSpire@aap.org]
Sent: 8/14/2018 10:53:01 PM
To: Etzel, Ruth [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=96a20535abb54ed4abf1e40d2aa916d9-Etzel, Ruth]
Subject: 8 additional page proofs with Gayle's comment for review
Attachments: 34_PEH_ch34_000-000.gm.rev.pdf; 35_PEH_ch35_000-000.gm.rev.pdf; 40_PEH_ch40_000-000.gm.rev.pdf; 44_PEH_ch44_000-000.gm.rev1.pdf; 59_PEH_ch59_000-000.gm.rev.pdf; 49_PEH_ch49_000-000.gm.rev.pdf; 55_PEH_ch55_000-000.gm.rev.pdf; 64_PEH_ch64_000-000.gm.rev.pdf

Hi Ruth.

I am writing to convey 8 additional page proofs with Gayle's comments for your review.

Many thanks,

Paul

Message

From: Euling, Susan [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=CB0873315ED244FA852DF546E1191E4C-EULING, SUSAN]
Sent: 8/9/2018 10:14:10 PM
To: AO-OCHP-Everyone [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=222d03d48d634481af638d4892296469-AO-OCHP-Everyone]
Subject: FW: Save the Date! UCSF Chemical Industry Documents Library events on Sept 13

FYI:

From: UCSF Program on Reproductive Health and the Environment [mailto:PRHE@LISTSRV.UCSF.EDU] **On Behalf Of** Sausser, Ann M
Sent: Wednesday, August 08, 2018 6:58 PM
To: PRHE@LISTSRV.UCSF.EDU
Subject: Save the Date! UCSF Chemical Industry Documents Library events on Sept 13

Save the Date!

On September 13, 2018, the UCSF Environmental Health Initiative, in collaboration with the UCSF Program on Reproductive Health and the Environment and the UCSF Industry Documents Library, will host two timely and important events on the science and stories contained within three new collections of chemical industry documents being added to the library. Please see below for details, including links to register for each event.

"Failing for Forty Years: What the Poison Papers Tell Us About the EPA and How to Reform It"

Dr. Jonathan Latham, Director of the Bioscience Resource Project and donor of the Poison Papers to the UCSF Chemical Industry Documents library, will talk about the importance of the 20,000-document collection and how they expose problems with both the internal culture of the EPA and its legal framework that are often fraught with industry influences that prevent precautionary decision-making, even when the science clearly points to danger.

Lecture from 10:00-11:00am at Byers Auditorium in Genentech Hall, UCSF Mission Bay, 600 16th Street.
Brunch reception to follow in Genentech Hall Atrium from 11am-12pm.
Please click here to register.

"Unsealing the Science: What the Public can Learn from Internal Chemical Industry Documents"

A panel discussion with the donors of three new UCSF chemical industry documents collections - the Glyphosate and Agrochemical Collection (Gary Ruskin, US Right to Know), the Poison Papers (Jonathan Latham, Bioscience Resource Project), and the Benzene Collection (Raphael Metzger, principal of the Metzger Law Group) will explore what the documents mean for public health and the perils they faced in making these documents public. Professor Stanton Glantz, who began the library with the first collection of internal tobacco industry documents, will introduce the panel and explain how the documents have been used to inform litigation, documentaries, and public policy decisions. The panel will be moderated by Dr. Tracey Woodruff, Professor and Director of the UCSF Program on Reproductive Health and the Environment and Co-Director of the UCSF Environmental Health Initiative, which has supported the development of the Chemical Industry Documents library.

Panel discussion from 3:30-5:30 at Cole Hall Auditorium, UCSF Parnassus Campus, 513 Parnassus Avenue.
Please click here to register.

Message

From: Dzubow, Rebecca [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=403CA1721F3D43D38DE9189A93A95B76-DZUBOW, REBECCA]
Sent: 8/27/2018 5:53:05 PM
To: AO-OCHP-Everyone [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=222d03d48d634481af638d4892296469-AO-OCHP-Everyone]
Subject: Pesticide Studies Won E.P.A.'s Trust, Until Trump's Team Scorned 'Secret Science'

Pesticide Studies Won E.P.A.'s Trust, Until Trump's Team Scorned 'Secret Science'

Backed by agrochemical companies, the current administration and Congress are moving to curb the role of human health studies in regulation.

By Danny Hakim and Eric Lipton

- Aug. 24, 2018

SALINAS, Calif. — José Camacho once worked the fields here in the Salinas Valley, known as "the Salad Bowl of the World" for its abundance of lettuce and vegetables. His wife still does.

But back in 2000, Mr. Camacho, who is 63, got an unusual phone call. He was asked if he wanted to work for a new project studying the effects of pesticides on the children of farm workers.

"This seemed really crazy," he recalled saying at the time, since he barely spoke English. "A research study?"

The project, run by scientists from the University of California, Berkeley, and funded in part by the Environmental Protection Agency, is still going all these years later. Known as Chamacos, Spanish for "children," it has linked pesticides sprayed on fruit and vegetable crops with respiratory complications, developmental disorders and lower I.Q.s among children of farm workers. State and federal regulators have cited its findings to help justify proposed restrictions on everything from insecticides to flame-retardant chemicals.
But the Trump administration wants to restrict how human studies like Chamacos are used in rule-making. A government proposal this year, called Strengthening Transparency in Regulatory Science, could stop them from being used to justify regulating pesticides, lead and pollutants like soot, and undermine foundational research behind national air-quality rules. The E.P.A., which has funded these kinds of studies, is now labeling many of them "secret science."

Studying disease trends in specific groups of people — a branch of medicine known as epidemiology — started to gain currency at the E.P.A. in recent years. These studies can be difficult because they require adjusting for all the various substances people are exposed to beyond pesticides. But researchers had amassed years of data from a wave of compelling chemical studies begun in the 1990s, giving regulators a new body of research to incorporate into their decision-making.

Under the Obama administration, the E.P.A., which had long favored tests on rats and other laboratory animals in its pesticide regulation, began considering epidemiological studies more seriously. The agency leaned on this type of research in proposing to ban an insecticide called chlorpyrifos in late 2016, and has been repeatedly prodded to take action on the chemical by federal courts.

But weeks after Donald J. Trump was elected president, CropLife America, the main agrochemical trade group, petitioned the E.P.A. to "halt regulatory decisions that are highly influenced and/or determined by the results of epidemiological studies" unless universities were forced to share more of their data.

Industry leaders aggressively challenged such studies in high-level meetings and emails with E.P.A. leaders, according to thousands of pages of documents obtained through Freedom of Information Act requests. One trade group invited a top E.P.A. official to meet with its Washington lobbyist last year, complaining that "carefully controlled" animal studies were giving way to "conclusions reflected in epidemiological papers." Gary W. Van Sickle, executive director of the California Specialty Crops Council, wrote to the agency last September that "there have been serious flaws with E.P.A.'s conclusion to use these data."

The council, representing growers of crops as diverse as carrots, garlic, pears and peppers, cited "inappropriate use of the epidemiology."

The E.P.A., whose new leadership is seeded with industry veterans, has responded. In a mid-July assessment of atrazine, a widely used weed killer long banned in Europe, the agency reviewed and dismissed 12 recent epidemiological studies linking the herbicide to such ailments as childhood leukemia and Parkinson's disease. It echoed the conclusions of research funded by Syngenta, atrazine's manufacturer, finding the chemical unlikely to cause cancer.

Before scandals forced Scott Pruitt out last month as head of the E.P.A., he proposed the transparency regulation. It would ban many epidemiological studies, and other outside research, unless more data behind the studies was made public. In doing so, he revived a strategy advanced for years by congressional Republicans and corporate interests like tobacco companies.

"The era of secret science at E.P.A. is coming to an end," Mr. Pruitt proclaimed at the time. The agency's new acting administrator, Andrew R. Wheeler, says he's moving forward with the proposal, as the agency re-evaluates a class of widely used insecticides, called organophosphates, that have been the subject of numerous epidemiological studies like Chamacos.

Nancy B. Beck, a chemical industry veteran who is the E.P.A.'s deputy assistant administrator, said there was no attempt to thwart epidemiology, adding that the agency was committed to "the best available science in the most transparent manner."

But academics and state health officials say universities are being pressured to release data that would ultimately divulge the identities of study participants, a strategy once used by tobacco companies seeking to undermine research on the dangers of smoking. While participant data is shared with regulators in drug trials, academics fear that the E.P.A.'s proposal would additionally require divulging confidential personal information, potentially violating privacy regulations for federally funded research.

"It is a naked attempt to use a false claim that something nefarious is going on with these studies in an effort to allow industry to challenge conclusions that are not in their favor," said James Kelly, a manager of environmental surveillance at the Minnesota Department of Health.

A Wave of Studies, an Uneasy Industry

An advertisement in a Nebraska student newspaper was looking for people who wanted to "earn extra money." Thirty-six college student volunteers and others from the community who responded were paid $460 to drink gelatin capsules filled with the pesticide chlorpyrifos, at up to 300 times levels the E.P.A. considered safe, without a full discussion of the risks.

Sponsored by Dow Chemical, this study, conducted in 1998, was one of the last of its kind. That year, the E.P.A. banned the use of studies exposing people to pesticides, and it continues to severely restrict them.

Epidemiology, which has been used to examine everything from the effects of climate change to childhood obesity, offered a way to continue studying disease trends, amid new legal requirements to examine how pesticides particularly affect infants and children. And it could do so by tracking people during their normal lives instead of treating them as if they were lab rats. Chamacos and other studies began almost immediately, although it took decades to collect sufficient data and study how participants changed over time.

One study by Columbia University researchers linked an insecticide to developmental delays in toddlers. Another, by scientists at the University of California, Los Angeles, connected pesticides to Parkinson's disease. Academics at the University of Rochester found that pesticides lower sperm counts in men, while researchers from the Harvard School of Public Health found lower fertility in women.
By 2015, there was a growing body of research, often funded in part by the E.P.A. The agency decided that year to consult epidemiology more seriously in its evaluation of glyphosate, the world's most popular weed killer and the active ingredient in Monsanto's Roundup.

"This is a watershed event in our Program, and one which I feel particularly proud to be a part (go epi!!)," Carol Christensen, then an E.P.A. epidemiologist, wrote in a 2015 email to a colleague — using "epi" as shorthand for epidemiology. "In the 35 year history of our program, this will be the FIRST time epi studies are actively considered in the decision making."

Yet even then, there was friction over what to make of studies aiming to determine whether glyphosate causes cancer.
One E.P.A. division, the Office of Research and Development, closely examined epidemiological research and came to believe either that glyphosate was likely to cause cancer or that there was at least some evidence suggesting a problem. But another division, the Office of Pesticide Programs, was dismissive of epidemiological studies and determined that glyphosate was not a carcinogen, a view that prevailed at the E.P.A., according to interviews, emails and an internal memo obtained by The New York Times. Those involved in the agency's debates on epidemiology spoke on the condition of anonymity because the discussions weren't public.

Monsanto said in a statement that "we cannot speak to the internal E.P.A. discussions" but emphasized the agency's ultimate finding that glyphosate was not likely to cause cancer.

The cancer question received renewed attention this month when a California jury awarded $289 million to a groundskeeper who alleged that the chemical had sickened him. In his closing argument, the plaintiff's attorney, R. Brent Wisner, called epidemiology one of "the three pillars of cancer science" that the case relied on.

At the E.P.A., the debate swung in favor of epidemiology. While such studies are often complex and can be of varying quality, the agency was reluctant in the past to give them as much weight as lab experiments on animals. But by the Obama administration's final months, the agency moved for the first time to ban a pesticide largely because of epidemiological research.
The pesticide, chlorpyrifos, was the same one ingested years earlier by unwitting Nebraskans. It is applied to crops like apples, oranges and strawberries to combat insects like spider mites and sap-sucking bugs.

In California alone, chlorpyrifos was sprayed on 640,000 acres in 2016, according to state data. And research from Salinas, and the Chamacos study, became a central element in the E.P.A.'s recommendation.

"There is a breadth of information available on the potential adverse neurodevelopmental effects in infants and children as a result of prenatal exposure to chlorpyrifos," the agency concluded in 2016, also citing epidemiological research from Columbia University and the Icahn School of Medicine at Mount Sinai.

The pesticide industry's reaction was loud and intense.

Monsanto, in emails with the E.P.A., was dismissive of critical epidemiological research related to Roundup, writing that "such studies are well known to be prone to a number of biases."

Dow Chemical said in reports submitted to the E.P.A. that "the evidence from these studies is insufficient" and called chlorpyrifos a "proven first-line of defense" against new pest outbreaks.
A month after taking over the E.P.A., Mr. Pruitt acted. He disregarded agency scientists and rejected the proposed chlorpyrifos ban, later callingfor "a new day, a new future, for a common-sense approach to environmental protection."

View From the Field

Ana Lilia Sanchez, 50, has worked in the fields in Salinas more than half her life, and one of her daughters has been a Chamacos study participant.

Ms. Sanchez has learned to watch for drifting droplets or the whir of a helicopter spraying overhead.

"Sometimes when we feel it, or we hear it, we start talking about it," she said recently, sitting with her 5-month-old granddaughter at her home on a Salinas cul-de-sac. "Why wouldn't they tell us, you know, to get out of here, to not come today?" she asked. "Women, they cover themselves, but men are working in short sleeves, so they are more exposed."

Insecticides like chlorpyrifos are organophosphates, from the same chemical family as nerve agents like sarin and Novichok, the Russian-developed compound linked to recent attacks in Britain. While the safety of insecticides is extensively tested, long-term health impacts, or even how far pesticides drift, are the subject of continuing disagreement.

Ms. Sanchez showers after work, before touching her granddaughter.

"I also put my clothes aside," she said. "We separate the clothes we use when we're working, both my husband and I, and wash them separately so they're not contaminated."

While some human studies examine potential harm from pesticide residue found on fruits and vegetables, the Chamacos project is more personal, following hundreds of children in the heart of where American food is grown. California has the nation's largest agricultural industry and uses more than 200 million pounds of pesticides annually.

For locals, pesticides are part of life. "It's a big difference from when I was working," Mr. Camacho said, while standing in a strawberry field framed on three sides by distant hills. Men and women were bent over nearby, pulling weeds. "My supervisor would say: 'That's not dangerous. Just keep working.' There was no information."

Chamacos is built on an unsettling premise: What happens to children of pregnant mothers certain to have pesticides in their bloodstreams? The E.P.A. and other government agencies have spent millions of dollars funding Chamacos.

Half the Chamacos children have been tracked since before birth. Researchers have collected 350,000 samples of blood, urine, breast milk and even household dust and spent nearly two decades studying maturing children. They perform neurodevelopmental and physical assessments and study factors like diet and school performance. After nearly two decades, the study's data appears in more than 160 academic papers.

During a visit to the Chamacos office in Salinas, Brenda Eskenazi, the director of the project and a professor of epidemiology at Berkeley, was testing out brain monitoring equipment, wearing what looked like a black swim cap strewn with knobs and wiring. She has long been fascinated with cognitive development, going back to when she saw a Woodstock reveler — one having a bad acid trip — dive into pavement.

"Why did he do that?" Ms. Eskenazi remembers wondering at the time. "What was he thinking? What's going on in that brain?"

"Any science is imperfect," she said, but stressed that "well-controlled epidemiologic studies" were essential for understanding "how things affect human health." She added, "Otherwise you're just making huge assumptions that a rodent is the same as a human."

A Bitter Debate

The day after Mr. Pruitt made his March 2017 decision to reject a ban on chlorpyrifos, he hosted top executives from one of the nation's largest farming and pesticide trade organizations for a closed-door conversation.

Near the top of the meeting agenda was "Epidemiology Study Policy" in the aftermath of the "chlorpyrifos matter," according to internal records.

"There are no guideposts, if you will, for what is a legitimate, useful epidemiology study and what is not," Jay Vroom, CropLife America's president, said in an interview, explaining what he had told agency officials at this and other meetings.

In a subsequent letter to the E.P.A., a CropLife America lobbyist said the agency was relying on a "shortsighted approach," and the group submitted formal proposals to curb the embrace of epidemiology the E.P.A. undertook under the Obama administration.

Mr. Pruitt responded with his proposal, made this past spring, to ban epidemiological and other studies that did not make study details public, including at least some information on study participants.

Academics have resisted previous requests to review their data, notably at Columbia University. In a 2016 letter to the agency, a university official wrote that it could not provide "extensive individual level data to E.P.A. in a way that ensures the confidentiality" of "our research subjects."

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David Michaels, an epidemiologist at George Washington University's School of Public Health and head of the Occupational Safety and Health Administration during the Obama administration, said Mr. Pruitt's plan was not about transparency but about discrediting studies that made pesticides look bad.

"The underlying justification for this 'transparency' proposal is a caricature of how science really works," Mr. Michaels said at a recent hearing. "The cynical approach proposed by E.P.A. can be best described as 'weaponized transparency.'"

It is no coincidence, he said, that the term "secret science" was also used in the 1970s when the tobacco industry was trying to forestall critical research about smoking.

Researchers have had wins. This month, a federal appeals court ordered the E.P.A. to ban chlorpyrifos, citing findings from human studies. The Trump administration is mulling whether to appeal.

But epidemiologists are unsettled. In mid-July, after nearly two decades of work on Chamacos, the E.P.A. emailed Ms. Eskenazi requesting "the original data" from her research, citing "uncertainty around neurodevelopmental effects associated" with pesticides she has studied. The agency made a similar request to Columbia.

Ms. Eskenazi, worried about her study participants' privacy, alerted university lawyers. She is now concerned that the E.P.A. may try to undermine her study's repeated findings that some pesticides may be harming children.

"I knew this was going to come sooner or later," she said. "And here it is."
Danny Hakim reported from Salinas, and Eric Lipton from Washington.

https://www.nytimes.com/2018/08/24/business/epa-pesticides-studies-epidemiology.html

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