Contract 68HERC19D0011
Task Order: # 68HERC20F0025
Task Order Title: Technical Expertise Support on Environmental Protection Agency (EPA) Scientific Issues and Topics

Task 2 Workshop on Triangulation of Evidence in Environmental Epidemiology
Anticipated Workshop Date: FY21 Q4
Report Output: Rapporteur Report

Background Information:

The term 'triangulation' has been used to describe the integration of results from different approaches taken to address a research question[1]. Specifically, if each approach has different intrinsic sources of potential bias or other limitations that are unrelated to each other, comparing and contrasting their results may reduce uncertainties in the overall body of evidence. Triangulation provides a framework to consider and utilize as much information as possible rather than excluding potentially valuable evidence due to perceived limitations or weaknesses. For chemical health assessments, triangulation may be applied at multiple levels – for example, multiple analyses within a single study or experiment, synthesis of results within a single stream of evidence (e.g., within the body of epidemiologic studies), or integration across evidence streams (e.g., toxicological, epidemiologic, and mechanistic) informing causal determinations. Application of triangulation to integrate across evidence streams is an established approach to evidence integration in US EPA risk assessment, as discussed at a prior 2018 NAS workshop sponsored by EPA ("[HYPERLINK "http://dels.nas.edu/Upcoming-Event/Evidence-Integration-Workshop/AUTO-0-96-15-Q"]"). There is a need to develop systematic and transparent approaches for applying triangulation to environmental epidemiologic evidence, especially within and across epidemiologic studies[2].

Triangulation can leverage results from a body of epidemiological evidence that may be influenced to different degrees by different types and amounts of bias[3], which may be identified using a variety of study evaluation approaches. However, methods to utilize triangulation in this context are not well-described; thus clarifying triangulation methods for this application is the primary goal of this workshop.

The overall aims of this workshop are to:

1. Characterize and summarize existing examples of triangulation used as a tool in risk assessment for evidence synthesis, focusing on use for synthesis within and across epidemiologic studies.
2. Solicit input on how triangulation can be implemented, transparently documented, and clearly communicated in science assessments overall

Proposed format:

- Introductory presentations(s) to introduce the concept of triangulation. While the focus is on triangulation within the body of epidemiologic evidence, this session should acknowledge the different levels at which triangulation may be applied (as noted above), and the potential to use external evidence to inform epidemiologic inference (e.g., the selection of genetic polymorphisms to use as instrumental variables may depend heavily on mechanistic studies that inform mode of action for a particular exposure).

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[1] Lawlor DA, Tilling K, Davey Smith G. Triangulation in aetiological epidemiology. International Journal of Epidemiology 2016: 45(6), 1866–1886, https://doi.org/10.1093/ije/dyw314
[2] Pearce N, Vandenbroucke JP, Lawlor DA. Causal Inference in Environmental Epidemiology: Old and New Approaches. Epidemiology 2019:30(3):311-316. doi: 10.1097/EDE.0000000000000987.
[3] Maclure M, Schneeweiss S. Causation of bias: the episcope. Epidemiology 2001: 12(1):114-22. doi: 10.1097/00001648-200101000-00019.

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- Topical presentations (may include follow-up panel discussion)
    - Specific examples of using triangulation for evidence synthesis, in the context of environmental epidemiology if possible:
        - Within an epidemiologic study (e.g., through use of multiple control series)
        - Across a group of epidemiologic studies
    - Use of triangulation for hazard identification and decision making in the risk assessment context.
    - How to identify datasets or subsets of data that can be used for triangulation.
    - Determining potential sources, direction, and magnitude of bias within and across environmental epidemiologic studies, using a variety of study evaluation approaches or tools.
    - Organization and presentation of triangulation results and conclusions (quantitative and qualitative), addressing how triangulation can be implemented, transparently documented, and clearly communicated in science assessments overall, and in causality determinations specifically.
- Poster Session

Anticipated Panel Expertise:

Public health risk assessment expertise with significant experience in environmental epidemiology. Additionally, it is a requirement that multiple experts have demonstrated experience with evaluation of risk of bias (quantitative and qualitative), and evidence integration methods for environmental exposures.

EPA Technical/Subject Mater Experts (SME) Points of Contact:

Krista Christensen, EPA/ORD/CPHEA
Tom Luben, EPA/ORD/CPHEA
Rebecca Nachman, EPA/ORD/CPHEA
Elizabeth Radke-Farabaugh, EPA/ORD/CPHEA