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Revision of the Total Diet Study food list and diets

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The list of foods selected for the Total Diet Study program has been updated to reflect current food consumption patterns.

The Food and Drug Administration's (FDA's) Total Diet Study is an annual program which involves the purchase of selected foods in grocery stores across the United States and analysis of those foods as composite groups for essential minerals, toxic elements, radionuclides, industrial chemicals, and pesticides (1-3). The Total Diet Study is a means to monitor, on a yearly basis, the nutrient and contaminant content of the United States food supply and to observe trends in the consumption of those substances over time. The Total Diet Study allows FDA to assess the dietary exposure of selected age-sex groups to harmful constituents and to essential minerals. Information from this study helps to identify potential public health issues that may warrant changes in agricultural or manufacturing practices or in regulatory policies concerning food additives or nutrient fortification.

The food list and diets used in the Total Diet Study through April 1982 were based on data from the 1965 U.S. Department of Agriculture (USDA) Household Food Consumption Survey. Each year foods were collected from 30 sites in the United States and sent to the FDA Field Office Laboratory in Kansas City, where they were prepared for consumption, composited into 11 or 12 food groups, and then analyzed for contaminants and essential minerals. The foods represented a subset of the total food supply. The mineral and contaminant content of the food subset was extrapolated on a food commodity basis to the total diet to allow for estimation of the daily mineral and contaminant intakes of three age-sex groups (6-month-old infants, 2-year-old toddlers, and teen-age males).

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The following changes have been made for the revised Total Diet Study, beginning in April 1982:

- The food list and diets were updated to reflect the present food supply and current food consumption habits.
- The number of age-sex groups was increased to expand the coverage of the United States population.
- Foods were analyzed individually, rather than in commodity groups, to obtain information on the contribution of specific foods to the daily intake of minerals and contaminants.

This article describes the basis for the selection of the food subset and diets for the revised Total Diet Study Program.

Objective

The objective of the dietary revision was to develop representative United States diets, using approximately 200 foods, for eight age-sex groups (infants, young children, male and female teen-agers, male and female adults, and male and female older persons). The diets were to be based on data from the 1977-78 USDA Nationwide Food Consumption Survey (NFCS) and the Second National Health and Nutrition Examination Survey (NHANES II), carried out by the National Center for Health Statistics (NCHS) in 1976-80. Average daily intakes of the selected foods were to be determined for each age-sex group. The total daily food intake of each group was to approximate 90% or more of the weight of the foods usually consumed.

Procedure

The food subset of the revised Total Diet Study consists of the individual foods that have been selected from the food composition data bases of the NFCS and the NHANES II.

Most foods in this subset represent aggregations of similar items which were grouped on the basis of food type and nutrient content. The item in each group consumed in the largest amount was allowed to represent the group in the Total Diet Study subset. For example, apple pie represents not only all the various types of apple pies (homemade, bakery, fast-food, frozen, deep dish, apple with raisin, apple with cheese, and so forth) but all fruit pies, strudels, crisps, turnovers, and pastry with fruit. White bread represents bread that contains white flour as

the major ingredient, bread crumbs, bread dressings, and bread stuffings. The homemade beef and vegetable stew entry represents mixed dishes which contain meat with potato or other starchy vegetable plus other vegetables in a gravy or sauce. A fast-food quarter-pound hamburger with garnish represents all meat and egg sandwiches, and a fast-food chocolate milkshake represents all types of malts, milkshakes, and eggnogs.

The methods of preservation and preparation indicated for the selected foods are those most commonly used. The formulas used to aggregate mixed dish items and the specific aggregations of the entire NFCS and NHANES II food composition data bases are available in Pennington (4).

Aggregation of the foods in the NFCS and NHANES II food composition data bases and selection of the food consumed in largest quantity have identified the most representative foods while accounting for similar items or items prepared in different ways or with somewhat different ingredients. The weights contributed by foods in an aggregated group to the total diet were ascribed to the representative food in the Total Diet Study subset. Aggregation overestimates weight proportions of the specific foods on the list, but it allows for representative total daily gram intakes, caloric intakes, and nutrient intakes.

The use of this aggregated food subset is highly advantageous to FDA for estimates of nutrient and contaminant intakes because 100% of the weight and caloric value of average diets is represented by a small number of foods. This makes analysis of the foods in a single laboratory under identical conditions feasible. Without aggregation, it would take from 500 to 550 foods to constitute 90% of the weight of the diet; 900 foods to constitute 95%; and 3,000 foods to constitute 99%. (See Table 1.) The desired number of 200 foods (based on the analytical limitations of the FDA Kansas City Field Office Laboratory), without aggregation, would represent only 78.5% of the diet. The Total Diet Study requires determination of 11 essential minerals and more than 120 contaminants from approximately 200 foods collected in four locations (approximately 800 foods per year). Increasing the number of foods much beyond 200 would be cost- and labor-prohibitive for FDA. It would also require the services of several laboratories, which could introduce variables that would affect the results.

Aggregation to develop the food list

Table 2 indicates some characteristics of the NFCS and NHANES II, both of which included statistically representative samples of the United States population. With the entire population sample of each study used, the following were determined for each food in the two data bases: frequency of consumption, total amount consumed, average amount consumed per person per day, and percentage of the total food intake. This evaluation allowed for ordering of the foods in each data base by frequency of consumption, amount consumed, and weight of the total diet.

The 3,727 foods of the NFCS data base and the 2,614 foods of the NHANES II data base were aggregated separately. The two data bases were aggregated in a similar manner, but the differences in the data bases (the foods listed, degree of description and differentiation, methods of preparation and preservation, brand names and generic foods, and so forth) prevented absolutely identical treatment. The two aggregated lists compared well

Table 1. Number of foods necessary to achieve a given weight percent of the Total Diet (from NFCS data)

no. of foods*	weight % of total diet accounted for by this no. of foods
50	57.56
100	68.38
150	74.32
200	78.50
250	81.56
300	83.94
350	85.94
400	87.46
450	88.96
500	89.98
550	90.98
600	91.84
650	92.57
700	93.29
750	93.85
800	94.36
850	94.82
900	95.23
950	95.62
1,000	95.95
1,500	97.53
2,000	98.44
2,500	98.87
3,000	99.04
3,500	99.09

*The National Food Consumption Survey (NFCS) data base for the basic survey contains 3,727 foods.

Table 2. Characteristics of the NFCS 1977-78 and the NHANES II

characteristics	NFCS	NHANES II
supporting organization	USDA	NCHS
duration of study	1977-78	1976-80
number of participants	30,223	20,325
number of daily diets	86,028	20,325
dietary methodologies	24-hour recall and 2-day food diaries	24-hour recall
location of 24-hour recall	participant's home	mobile trailer examination site*
aids to participants for serving size estimates	measuring cups and spoons; ruler; measuring of some sample portions in kitchen	food models; measuring sticks and blocks
age of participants	1 mo.-97 yr.	6 mo.-74 yr.
number of foods in data base	3,727†	2,614
food descriptions	mostly generic foods except for some candies and ready-to-eat cereals	many brand-name products

*The 24-hour recall was part of a physical and nutritional examination.

†Individuals in the Basic Survey of the National Food Consumption Survey (NFCS) consumed 3,727 different foods.

with respect to the items listed and the rank ordering of the foods. The various types of milks, fruits, vegetables, grains, desserts, and beverages were in about the same order of percent weight for the two surveys, although the exact percentages differed. The two lists were then combined, with some additional aggregation, to form a working Total Diet Study food list.

The ages of the eight age-sex groups were selected to represent an adequate number of sample persons from both the NFCS and the NHANES II. The data from each survey were again evaluated to determine for each food in the two data bases for each of the eight groups: frequency of consumption, total amount consumed, average amount consumed per person per day, and percent of the total diet. The data from the two surveys (each survey tre separately) were aggregated for the eight groups as had been done previously for the entire sample. these aggregations, the percent weights for each fo the Total Diet Study food list for the eight age-sex gr were calculated according to NFCS consumption an cording to NHANES II consumption.

Some adjustments (a few additions and deletions) made to the food list at this point because of the eff using specific age-sex groups (rather than the population) on the foods consumed. The Total Die list (Table 3) was finalized at this point. The list con 234 foods, of which 33 are commercially prepared or junior foods.

Table 3. Total diet study food list with gram quantities for specified age-sex groups

food	6-11 mo.	2 yr.	14-16 yr. F	14-16 yr. M	25-30 yr. F	25-30 yr. M	60-65 yr. F	60-65 yr. M
	← gm./day							
001 whole milk, fluid	254.846	249.285	227.379	371.862	104.484	167.877	88.013	127.026
002 low-fat milk, 2% fat, fluid	106.631	68.725	61.233	100.502	52.991	73.843	34.700	50.14
003 chocolate milk, fluid, low-fat milk	1.725	10.673	36.801	61.054	10.384	14.336	3.736	15.07
004 skim milk, fluid	33.939	19.483	17.564	19.649	15.010	13.283	20.670	19.97
005 buttermilk, fluid	0.209	0.488	0.000	0.656	1.136	1.613	5.698	8.69
006 yogurt, plain, low-fat	0.646	1.095	1.064	0.430	2.508	1.792	1.340	0.54
007 milkshake, chocolate, fast-food type	0.451	1.286	5.625	9.097	3.125	4.349	0.328	1.08
008 evaporated milk, canned	6.196	1.874	0.710	0.433	0.428	0.968	1.342	3.01
009 yogurt, sweetened, strawberry, pre-stirred	1.325	1.749	1.043	0.649	3.096	2.932	2.203	0.24
010 cheese, American, processed	1.382	5.463	4.789	7.787	6.448	8.910	3.709	6.05
011 cottage cheese, creamed, 4% milkfat	2.098	1.470	2.209	1.707	4.698	2.749	7.064	6.43
012 cheese, Cheddar, (sharp/mild)*	0.194	1.815	3.326	3.185	5.482	10.746	3.930	4.83
013 beef, ground, regular hamburger, cooked in patty shape	2.282	10.973	19.693	32.515	16.609	18.098	12.211	17.48
014 beef chuck roast, oven roasted	0.613	4.754	9.226	15.290	11.004	18.845	10.835	19.97
015 beef, round steak, stewed in water	0.953	0.549	1.210	1.701	1.487	2.688	1.085	1.99
016 beef (loin/sirloin) steak, pan cooked with added fat†	0.018	4.073	9.937	16.648	15.427	49.476	11.970	21.76
017 pork, ham, cured, not canned, oven cooked	0.302	2.785	7.277	9.809	6.883	11.968	6.575	12.16
018 pork chop, pan cooked with added fat	0.686	3.987	5.582	8.330	5.858	11.826	4.554	7.02
019 pork sausage, (link/bulk), oven cooked	0.578	2.232	2.140	4.243	2.920	7.816	2.858	5.76
020 pork, bacon, oven cooked	0.220	1.675	1.706	3.085	2.077	3.373	2.674	4.57
021 pork roast, loin, oven cooked	0.292	1.599	4.375	3.532	2.786	4.560	3.394	6.16
022 lamb chop, pan cooked with added fat	0.577	0.318	0.256	0.182	1.374	1.077	0.874	0.88
023 veal cutlet, breaded, pan cooked with added fat	0.000	0.212	0.452	0.387	1.345	0.839	0.951	1.35
024 chicken, drumsticks and breasts, breaded and fried with added fat, homemade	1.084	5.882	9.495	12.234	8.994	12.475	7.344	9.25
025 chicken, oven roasted	1.257	4.802	7.195	8.435	9.719	10.509	11.017	11.07
026 turkey breast, oven roasted	0.246	1.070	3.532	3.881	1.472	5.743	2.164	3.73
027 liver (beef/calf), pan fried with added fat	0.506	0.729	0.840	1.325	3.738	2.798	2.927	4.38
028 frankfurters, (beef/beef and pork), boiled	2.104	8.583	6.437	8.761	5.232	8.591	3.753	5.35
029 bologna	0.996	5.243	5.724	11.125	5.407	11.674	4.282	8.18
030 salami, lunch meat type, regular, not hard	0.017	0.442	1.006	0.852	0.593	2.220	4.078	1.55
031 (cod/haddock) fillet, (fresh/frozen), oven cooked	0.853	2.261	4.678	5.802	6.233	9.986	8.363	11.23
032 tuna, canned in oil, drained	0.300	1.471	3.356	2.650	4.253	4.457	3.731	3.11
033 shrimp (fresh/frozen), breaded and fried with added fat, homemade	0.000	0.124	0.760	1.197	2.655	3.472	1.974	1.84
034 fish sticks, commercial, frozen, oven cooked	0.259	1.156	1.707	1.716	1.742	2.141	1.089	1.05
035 eggs, scrambled with added milk and fat	6.374	13.088	7.855	12.073	9.783	15.047	10.085	12.57
036 eggs, fried with added fat	2.627	6.129	4.549	10.020	6.036	11.499	6.566	16.51
037 eggs, soft boiled	2.955	2.891	2.456	2.706	4.751	4.408	7.017	9.35
038 pinto beans, boiled from dried	1.004	3.850	5.761	9.248	7.826	10.640	4.689	7.37
039 pork and beans, canned	1.024	4.593	5.536	11.167	5.509	10.234	4.963	7.90

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Table 3. Total diet study food list with gram quantities for specified age-sex groups (continued)

food	6-11 mo.	2 yr.	14-16 yr. F	14-16 yr. M	25-30 yr. F	25-30 yr. M	60-65 yr. F	60-65 yr. M
	gm./day							
040 cowpeas (blackeyed peas), boiled from dried	0.153	1.094	1.374	2.628	1.669	3.356	2.265	3.118
041 lima beans, mature, boiled from dried	0.024	0.467	0.543	0.764	0.409	0.823	1.137	1.547
042 lima beans, immature, frozen, boiled	0.215	0.595	0.575	0.614	1.282	1.431	1.834	2.069
043 navy beans, boiled from dried	0.024	0.584	0.954	2.702	0.710	2.283	1.362	1.390
044 red beans, boiled from dried	0.449	0.816	2.087	1.681	1.396	2.554	1.325	1.446
045 peas, green, canned	1.260	3.192	2.944	5.541	5.319	5.894	5.547	8.166
046 peas, green, frozen, boiled	0.954	0.666	0.877	1.397	1.671	1.399	2.224	1.631
047 peanut butter, creamy, commercial in jar	0.496	2.911	2.170	4.683	1.214	2.529	1.194	1.823
048 peanuts, dry roasted in jar, salted	0.000	0.239	0.317	0.885	0.731	1.633	0.541	1.269
049 pecans, packaged, unsalted	0.006	0.247	0.410	0.505	0.964	0.781	0.500	0.955
050 rice, white, enriched, cooked	4.334	12.931	16.732	19.504	15.895	22.943	12.466	14.296
051 oatmeal, cooked	12.252	12.159	3.226	5.854	4.380	2.021	10.039	13.570
052 farina, enriched, cooked	6.070	3.514	2.380	3.746	1.921	2.530	3.660	4.981
053 corn grits (hominy grits), enriched, cooked	3.691	5.117	4.215	6.430	3.130	3.744	4.818	6.311
054 corn, (fresh/frozen), boiled	0.375	4.013	5.246	8.037	5.875	7.277	5.733	7.277
055 corn, canned	0.416	3.295	4.588	7.222	2.460	5.029	1.341	2.257
056 corn, cream style, canned	0.680	1.697	4.106	1.836	1.615	2.194	1.435	3.398
057 popcorn, popped in oil	0.150	0.697	1.187	1.500	1.690	1.432	0.125	0.253
058 white bread, enriched	6.303	26.837	38.751	55.678	34.424	36.720	34.988	50.873
059 rolls, white, soft, enriched	0.770	4.104	13.240	21.495	10.055	20.287	6.029	9.050
060 cornbread, southern style, homemade	0.877	3.259	4.432	6.876	3.869	8.850	8.313	11.927
061 biscuits, baking powder, enriched, refrigerated type, baked	0.620	2.582	3.668	4.856	3.063	5.031	4.080	7.806
062 whole wheat bread	0.653	2.706	2.156	3.377	4.178	7.782	5.490	6.587
063 tortilla, flour	0.403	1.288	2.221	3.557	2.306	3.945	0.400	0.999
064 rye bread	0.082	0.372	0.686	0.773	1.711	2.666	3.183	3.683
065 muffins (blueberry/plain)	0.039	0.687	0.914	0.724	0.947	0.945	1.014	0.838
066 saltine crackers	2.874	3.354	2.521	3.022	3.482	3.912	3.559	4.059
067 corn chips	0.106	1.376	2.894	2.354	0.809	2.358	0.208	0.510
068 pancakes made from mix with addition of egg, milk, and oil	1.075	5.833	5.726	8.012	4.482	6.976	3.618	6.296
069 noodles, egg, enriched, cooked	0.791	1.409	1.747	3.427	1.859	2.499	1.210	2.326
070 macaroni, enriched, cooked	1.232	3.258	5.027	8.442	5.312	6.299	2.641	3.584
071 corn flakes	0.577	2.648	3.235	6.181	1.348	1.419	1.793	2.908
072 fruit flavored, presweetened cereal	0.166	2.739	1.461	3.330	0.260	1.944	0.067	0.068
073 Shredded Wheat cereal	0.099	1.642	1.300	3.126	1.515	2.757	2.086	2.837
074 Raisin Bran cereal	0.047	1.158	1.060	2.971	1.231	1.311	2.301	4.348
075 crisped rice cereal	0.418	1.749	0.991	2.196	0.776	0.941	1.054	0.858
076 granola, with raisins	0.204	0.285	0.216	0.294	0.587	1.641	0.753	0.460
077 oat ring, unsweetened cereal	0.428	2.001	1.282	3.989	0.467	0.928	0.345	0.291
078 apple, red with peel, raw	0.947	16.715	12.363	18.680	13.985	12.115	15.750	15.516
079 orange, raw, (navel/Valencia)	1.642	7.341	7.082	9.638	7.974	9.264	8.855	9.454
080 banana, raw	5.781	10.858	5.195	8.101	5.849	6.716	12.719	13.510
081 watermelon, raw	0.252	2.469	5.919	3.156	3.867	3.530	7.265	4.757
082 peach, canned in heavy syrup	11.666	4.572	3.436	4.418	2.402	4.757	6.679	8.458
083 peach, raw	1.558	2.964	3.935	2.268	3.834	3.494	6.924	7.053
084 applesauce, canned, sweetened	9.057	5.687	3.701	4.870	2.441	2.595	4.795	5.490
085 pear, raw	1.111	2.431	1.498	3.010	2.140	2.383	3.780	3.039
086 strawberries, raw	0.498	1.209	1.553	1.255	1.882	1.231	4.389	4.739
087 fruit cocktail, canned in heavy syrup	0.390	1.960	2.792	3.724	3.917	3.020	5.509	4.942
088 grapes (purple/green), raw	0.030	1.616	1.123	1.173	1.196	0.645	1.057	1.317
089 cantaloupe, raw	0.623	0.701	3.344	1.778	3.138	2.822	8.510	6.901
090 pear, canned in heavy syrup	3.875	0.913	0.783	2.589	0.794	1.471	2.743	3.114
091 plums, purple, raw	0.311	0.564	1.193	0.542	0.734	0.945	1.851	1.666
092 grapefruit, raw	0.000	0.843	2.977	1.474	6.201	4.277	17.766	10.209
093 pineapple, canned in juice pack	0.302	0.724	0.914	0.694	1.396	0.885	2.234	1.598
094 cherries, sweet, raw	0.190	0.235	0.225	0.474	0.592	0.476	0.785	0.754

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Table 3. Total diet study food list with gram quantities for specified age-sex groups (continued)

food	6-11 mo.	2 yr.	14-16 yr. F	14-16 yr. M	25-30 yr. F	25-30 yr. M	60-65 yr. F	60-65 yr. M
	gm./day							
095 raisins, dried	0.167	1.158	0.291	0.322	0.257	0.359	0.455	[illegible]
096 prunes, dried, uncooked	0.064	0.094	0.069	0.017	0.091	0.106	1.014	[illegible]
097 avocado, raw	0.017	0.112	0.522	0.055	1.311	1.055	0.915	[illegible]
098 orange juice, frozen, reconstituted	18.115	59.370	42.121	60.734	50.531	58.954	54.006	[illegible]
099 apple juice, canned, unsweetened	17.094	17.594	5.378	4.090	6.454	3.280	3.263	[illegible]
100 grapefruit juice, frozen, reconstituted	0.769	1.119	2.067	3.067	6.776	3.504	8.902	[illegible]
101 grape juice, canned	2.885	8.784	2.925	3.962	4.547	4.419	3.943	[illegible]
102 pineapple juice, canned	1.037	2.308	0.382	1.283	1.236	1.802	1.174	[illegible]
103 prune juice, bottled	0.000	0.296	0.032	0.078	0.164	0.185	2.258	[illegible]
104 orange drink with added vitamin C, canned	9.447	24.954	19.014	20.484	15.826	17.046	8.335	[illegible]
105 lemonade, frozen, reconstituted	0.207	4.641	9.203	11.547	8.890	10.707	6.983	[illegible]
106 spinach, canned	0.049	0.348	0.385	0.666	0.831	0.875	0.724	[illegible]
107 spinach, (fresh/frozen), boiled	0.197	0.586	1.590	1.937	2.485	2.405	3.017	[illegible]
108 collards, (fresh/frozen), boiled	0.401	0.506	0.720	1.553	0.903	1.349	2.748	[illegible]
109 lettuce, raw	0.125	2.619	13.496	12.247	23.540	23.381	20.885	[illegible]
110 cabbage, boiled from raw	0.238	0.667	1.803	1.765	3.036	2.603	4.162	[illegible]
111 coleslaw with dressing, homemade	0.001	0.347	1.962	1.983	2.422	2.887	2.674	[illegible]
112 sauerkraut, canned	0.030	0.064	0.269	0.757	0.656	1.553	0.915	[illegible]
113 broccoli, (fresh/frozen), boiled	0.359	1.254	1.485	0.908	3.954	2.795	2.452	[illegible]
114 celery, raw	0.030	0.173	0.546	0.335	0.818	0.621	1.367	[illegible]
115 asparagus, (fresh/frozen), boiled	0.045	0.171	0.119	0.265	0.805	0.757	1.327	[illegible]
116 cauliflower, (fresh/frozen), boiled	0.000	0.387	0.404	0.303	0.831	0.712	1.380	[illegible]
117 tomato, raw	0.558	3.944	9.500	9.782	16.244	17.193	22.594	[illegible]
118 tomato juice, canned	0.131	1.005	0.888	1.632	3.651	4.785	5.558	[illegible]
119 tomato sauce, canned	0.154	1.777	1.824	2.948	2.439	2.918	1.420	[illegible]
120 tomatoes, canned	0.000	0.152	0.154	0.335	0.886	0.373	1.619	[illegible]
121 beans, snap green, (fresh/frozen), boiled	0.347	0.905	1.209	2.757	2.348	3.036	3.507	[illegible]
122 beans, snap green, canned	1.585	3.234	4.654	6.618	5.252	5.705	6.803	[illegible]
123 cucumber, raw, pared	0.144	0.761	1.730	0.960	3.422	2.710	4.062	[illegible]
124 squash, summer, (fresh/frozen), boiled	0.059	0.403	0.561	0.829	2.245	1.428	3.827	[illegible]
125 sweet pepper, green, raw	0.007	0.065	0.276	0.652	0.981	1.373	0.895	[illegible]
126 squash, winter (Hubbard/acorn), (raw/frozen), boiled	0.653	0.226	0.489	0.027	0.987	1.422	1.983	[illegible]
127 carrots, raw	1.226	2.400	2.647	2.964	3.799	3.023	3.993	[illegible]
128 onion, raw	0.083	0.221	1.362	1.755	2.374	3.373	2.342	[illegible]
129 vegetables, mixed, canned	1.064	1.182	2.732	3.533	5.958	5.623	6.815	[illegible]
130 mushrooms, canned	0.000	0.124	0.543	0.308	1.359	1.337	0.496	[illegible]
131 beets, canned	0.019	0.337	0.733	0.413	0.887	1.201	1.748	[illegible]
132 radish, raw	0.000	0.037	0.273	0.136	0.294	0.422	0.602	[illegible]
133 onion rings, breaded and fried, frozen, commercial, heated	0.050	0.097	0.687	1.870	0.520	0.927	0.145	[illegible]
134 French fries, frozen, commercial, heated	2.475	13.565	19.954	31.212	15.701	32.750	6.018	[illegible]
135 mashed potatoes with margarine and milk, prepared from instant	7.389	9.879	15.004	24.526	11.610	18.835	10.405	[illegible]
136 boiled potato without peel	2.623	6.562	9.495	8.235	8.353	11.727	15.604	[illegible]
137 baked potato with peel	0.601	3.178	5.420	4.823	7.203	8.167	7.219	[illegible]
138 potato chips, commercial	0.166	2.057	4.191	6.352	2.194	4.037	0.449	[illegible]
139 scalloped potatoes, homemade	1.023	2.049	4.145	5.871	5.164	7.424	5.358	[illegible]
140 sweet potato, baked in skin	0.367	0.453	0.994	0.808	1.103	1.270	2.573	[illegible]
141 sweet potato, candied, homemade	0.095	0.355	0.322	0.947	0.562	1.008	0.609	[illegible]
142 spaghetti with meat sauce, homemade	4.786	16.410	17.477	33.570	15.501	23.917	8.956	[illegible]
143 beef and vegetable stew, homemade	2.838	5.798	8.888	10.896	8.074	11.315	10.901	[illegible]
144 pizza, cheese, frozen, commercial, heated	0.484	3.198	12.445	39.978	9.207	13.518	2.003	[illegible]
145 chili con carne, beef and beans, canned	0.938	2.226	7.895	14.307	5.341	14.369	4.730	[illegible]
146 macaroni and cheese, prepared from box mix	3.545	7.481	8.449	12.025	7.400	8.699	5.106	[illegible]
147 quarter-pound hamburger sandwich on white roll with garnish, fast-food type	0.559	4.574	13.695	18.750	10.409	22.215	3.380	[illegible]
148 meatloaf, beef, homemade	1.193	3.983	6.496	10.369	5.595	12.288	4.342	[illegible]
149 spaghetti in tomato sauce, canned	2.259	4.689	13.222	5.390	4.141	4.216	1.875	[illegible]
150 chicken noodle casserole, homemade	0.288	1.213	1.741	4.159	2.355	5.249	2.153	[illegible]

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Table 3. Total diet study food list with gram quantities for specified age-sex groups (continued)

	food	6-11 mo.	2 yr.	14-16 yr. F	14-16 yr. M	25-30 yr. F	25-30 yr. M	60-65 yr. F	60-65 yr. M
		gm./day							
151	lasagne, homemade	0.261	1.137	2.554	4.407	3.044	5.143	1.523	1.947
152	potpie, frozen, commercial, chicken, oven heated	0.142	1.761	1.412	2.117	1.344	2.088	1.494	1.392
153	pork chow mein, homemade	0.321	0.809	2.073	3.119	3.824	4.513	2.920	2.904
154	frozen dinner, fried chicken, mashed potatoes, cornbread and/or vegetable, heated	0.065	1.692	1.329	0.883	1.399	1.223	1.262	1.946
155	chicken noodle soup, canned, reconstituted with water	6.835	17.808	12.612	7.082	7.092	7.511	8.275	14.202
156	tomato soup, canned, reconstituted with whole milk	3.052	5.757	6.000	5.489	10.854	11.112	11.707	11.620
157	vegetable beef soup, canned, reconstituted with water	5.792	16.196	12.113	13.232	5.870	15.099	21.839	20.536
158	beef bouillon, canned, reconstituted with water	0.274	1.049	0.777	1.182	8.013	3.102	3.754	4.178
159	gravy, brown, from mix	1.891	3.513	6.163	7.360	3.692	7.941	4.141	8.536
160	white sauce, medium, homemade	0.346	0.467	0.525	1.430	0.979	1.710	0.734	1.837
161	pickles, dill, bottled	0.004	0.578	1.551	1.249	1.309	1.728	1.006	1.102
162	margarine made with partially hydrogenated vegetable oil, stick type	0.888	2.690	2.765	4.719	3.691	4.647	4.575	5.681
163	salad dressing, Italian, bottled	0.055	0.938	3.132	3.191	5.588	5.745	3.434	3.848
164	butter, stick type	0.367	1.214	1.691	2.447	2.445	3.276	2.297	3.290
165	vegetable oil, corn, bottled	0.167	0.545	0.803	1.020	1.362	1.509	0.900	1.214
166	mayonnaise, bottled	0.046	0.498	1.385	1.424	1.314	2.729	1.111	1.555
167	cream, half and half, fluid	0.015	0.541	1.082	0.953	1.763	2.920	3.045	4.284
168	cream substitute, powdered	0.280	0.264	0.183	0.128	0.962	1.418	1.641	2.322
169	sugar, white, granulated	0.913	3.198	4.442	4.788	5.448	8.383	5.186	7.865
170	syrup, pancake, bottled	0.561	2.454	3.630	5.963	2.213	3.571	1.488	3.099
171	jelly, grape, bottled	0.556	2.563	2.866	4.648	2.211	3.406	2.703	4.208
172	honey, bottled	0.334	0.347	0.618	0.544	0.489	0.873	0.665	0.824
173	catsup, bottled	0.102	1.311	2.367	4.472	1.662	4.263	0.794	0.815
174	ice cream, chocolate	1.490	9.579	15.685	23.044	9.359	13.499	11.303	17.755
175	pudding, chocolate, instant, made with whole milk	1.280	3.487	3.412	6.592	2.672	3.843	4.700	5.183
176	ice cream sandwich	0.054	1.164	1.921	2.524	0.661	0.556	0.369	0.584
177	ice milk, vanilla	0.116	1.724	2.869	5.575	1.899	2.047	2.922	2.456
178	chocolate cake with chocolate icing, (ready-to-eat/frozen)	0.170	2.326	6.731	8.534	3.342	5.913	1.984	3.469
179	yellow cake prepared from mix with white icing prepared from mix	0.634	3.170	8.433	12.127	5.589	8.979	6.893	8.256
180	coffeecake, (ready-to-eat/frozen)	0.052	0.291	1.245	0.919	0.744	1.396	1.199	1.490
181	doughnuts, cake type, plain, (ready-to-eat/frozen)	0.516	2.365	4.018	6.659	3.691	5.683	2.307	4.727
182	(Danish pastry/sweet roll), (ready-to-eat/frozen)	0.119	0.547	2.085	5.172	2.030	3.650	2.521	3.159
183	cookies, chocolate chip	2.604	7.635	5.869	8.076	3.751	4.723	3.084	4.576
184	cookies, sandwich type, chocolate with white cream filling	0.844	3.121	1.795	3.959	1.648	2.715	1.052	2.432
185	apple pie, frozen, heated	0.224	1.693	5.905	8.357	4.896	7.359	6.282	8.715
186	pumpkin pie, frozen, heated	0.440	1.002	3.027	3.239	3.303	5.598	4.807	5.200
187	candy, plain milk chocolate	0.220	2.651	5.700	5.788	2.797	4.090	1.995	1.900
188	candy, caramels	0.075	1.879	2.852	2.433	1.633	4.059	1.124	1.185
189	chocolate powder, sweetened, to mix with hot or cold milk	0.095	0.573	0.659	1.120	0.966	0.738	0.358	0.849
190	gelatin dessert, prepared, strawberry	3.724	5.016	6.095	6.038	3.343	3.448	7.201	8.427
191	carbonated soda, sweetened, cola type, canned	3.949	43.668	142.650	165.605	132.839	214.529	31.040	48.220
192	carbonated soda, sweetened, lemon-lime, canned	4.512	19.409	65.308	92.710	41.622	77.529	19.247	22.092
193	soft drink from powder, cherry flavor, presweetened	18.834	78.505	48.422	69.258	32.490	19.281	8.702	14.215
194	carbonated soda, low calorie, cola, sweetened with saccharine, canned	0.505	6.818	23.566	15.941	54.196	23.162	27.549	15.123

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Table 3. Total diet study food list with gram quantities for specified age-sex groups (continued)

	food	6-11 mo.	2 yr.	14-16 yr. F	14-16 yr. M	25-30 yr. F	25-30 yr. M	60-65 yr. F	60-65 yr.
		←				gm./day			
195	coffee beverage, from instant	0.274	2.162	24.432	26.237	283.427	354.204	372.058	476
196	coffee beverage, from instant, decaffeinated	0.030	0.340	3.194	1.635	17.254	20.943	75.943	62
197	tea beverage, hot, made with tea bag	8.690	31.637	78.957	86.874	163.333	143.786	153.837	97
198	beer, canned	0.024	0.057	0.071	16.119	34.591	299.202	9.291	98
199	wine, table, 12.2% alcohol	0.000	0.000	0.335	0.721	11.925	11.289	5.164	
200	whisky, 80-proof	0.000	0.000	0.088	0.304	4.936	8.518	3.894	
201	water	150.000	321.000	432.000	548.000	399.000	512.000	546.000	581
202	milk-based infant formula with iron, canned, ready-to-serve	47.728	0.682						
203	milk-based infant formula without iron, canned, ready-to-serve	81.931	1.900						
204	infant mixed cereal, prepared from dry with whole milk	51.842	0.147						
205	beef, (st./jr.‡)	6.294	0.089						
206	pork, (st./jr.)	1.489	0.030						
207	(chicken/turkey),* (st./jr.)	5.128	0.000						
208	high meat (chicken/turkey) and vegetables, (st./jr.)	6.200	0.225						
209	high meat beef and vegetables, (st./jr.)	9.236	0.207						
210	high meat ham and vegetables, (st./jr.)	3.303	0.000						
211	vegetables with beef, (st./jr.)	12.717	0.147						
212	vegetables with (turkey/chicken), (st./jr.)	5.412	0.054						
213	vegetables with (bacon/ham), (st./jr.)	8.112	0.114						
214	chicken and noodles, (st./jr.)	9.458	0.000						
215	tomatoes, beef and macaroni, (st./jr.)	3.958	0.000						
216	turkey and rice, (st./jr.)	4.200	0.000						
217	oatmeal with applesauce and bananas, (st./jr.)	16.077	0.316						
218	carrots, (st./jr.)	7.101	0.000						
219	green beans, (st./jr.)	6.124	0.202						
220	(mixed vegetables/garden vegetables), (st./jr.)	5.532	0.060						
221	(sweet potatoes/yellow squash), (st./jr.)	8.286	0.128						
222	corn, creamed, (st./jr.)	2.659	0.000						
223	peas, (st./jr.)	3.212	0.024						
224	spinach, creamed, (st./jr.)	1.588	0.000						
225	(applesauce/applesauce with other fruit), (st./jr.)	21.957	0.240						
226	peaches, (st./jr.)	19.434	0.147						
227	(pear/pear and pineapple), (st./jr.)	11.293	0.172						
228	bananas and pineapple with tapioca, (st./jr.)	14.303	0.257						
229	(prunes/plums) with tapioca, (st./jr.)	4.479	0.356						
230	(apple/apple cherry/apple grape) juice, strained	18.324	0.940						
231	(orange/orange pineapple) juice, strained	8.220	0.604						
232	(pudding/custard), any flavor, (st./jr.)	8.326	0.015						
233	fruit dessert with tapioca, any fruit, (st./jr.)	4.392	0.402						
234	(dutch apple/apple betty), (st./jr.)	8.041	0.060						
	TOTAL DAILY INTAKE	1,263	1,503	1,954	2,677	2,173	3,075	2,259	2,69

*For food items in parentheses, the first item is selected if available. If it is not available, the second item is selected.
†Hydrogenated vegetable fat is used for fried foods and foods cooked with added fat.
‡Strained or junior foods in jars.

Preparation instructions for the foods were developed (4). Recipes were standardized for foods requiring the addition of two or more ingredients and were adjusted to yield 5 lb. of prepared foods (as requested by the FDA Kansas City Field Office Laboratory) (4). A shopping list was prepared from the food list and the recipe ingredients (4).

Diets for the age-sex groups

The information on percent weight for each of the 234 foods as derived from the NFCS and NHANES II for each age-sex group was converted to a gram amount based on the total daily intake of food for each age-sex group. The NFCS and NHANES II aggregated diets were very similar with respect to both weight percents and gram intakes of the 234 foods for the eight age-sex groups. Table 3 shows the daily gram intakes for the 234 foods for the eight groups as averaged from aggregated NFCS and NHANES II data. These are the values used in the revised Total Diet Study for estimating daily intakes of contaminants and minerals. The values for daily water intake were derived from information in the NFCS questionnaire because water was not listed in either data base. The total daily intake of food for each of the eight groups as averaged from the two surveys is listed at the end of Table 3.

Discussion

The revised diets differ from the previous diets in several ways. The revised diets are for eight age-sex groups, five more than had been used before. Previously, maximum exposure to contaminants was evaluated using a high-calorie diet (3,900 kcal per day) for a teen-age male, although infant and toddler diets were representative of average intakes. The caloric content of the eight new diets represents average intakes for each group. Previously, the teen-age male diet was based on household data (a one-week household inventory of food in the house and foods purchased during the week), and the infant and toddler diets were based on individual 24-hour dietary recalls from the Spring quarter of 1965. The revised diets are all based on individual data (24-hour dietary recalls and food records) and reflect seasonal variations in food consumption.

Previously, there were four regional diets for teen-age males, infants, and toddlers. It was not possible to discern regional differences in contaminants or nutrients were due to the concentrations of these substances in foods or due to the quantities of the foods present in the composites. Regional distinction has been abandoned in the revised Total Diet Study for two reasons. First, the increasing complexity of the food distribution system prevents a clear definition of a "regional food," and, second, resource limitations prevent an adequate number of collections in each region to achieve statistical significance in regional comparisons of data.

All foods on the revised list are ready for consumption, while the previous diet included some ingredient items (baking powder, vinegar, salt, and all-purpose flour) and some unprepared grain items (pancake mix and uncooked macaroni, oatmeal, and rice). Combination foods (mixed dishes), fast-food items, nuts, and alcoholic beverages were not previously listed but are included in the new diets.

Discretionary salt (although present previously) is not included in the revised list because there is no estimation of average salt use during cooking or at the table, and the variation among individuals is considered to be quite large. The commercially prepared foods contain the salt added by industry; foods to be prepared according to package directions have salt added if specified; and salt is included in the homemade items in the quantities used in standard recipes. Only the salt added by personal preference during cooking and at the table is omitted. Therefore, the sodium content of the diets is low to average.

All of the foods on the revised list have some counterpart on the previous list so that it is possible to link Total Diet Study data from previous years for trend analysis. The contaminant and mineral values derived from analysis of individual foods in the revised diet may be applied to the foods which make up the old composites so that changes in mineral and contaminant content of foods due to changes in food concentration and/or changes in food consumption may be estimated.

Summary

The foods and diets of FDA's Total Diet Study have been revised according to current food consumption patterns. A representative subset of 234 foods, selected from aggregated NFCS and NHANES II data, is collected and analyzed by the Kansas City Field Office Laboratory for 11 essential minerals and more than 120 chemical contaminants. The daily intake by weight of these 234 foods has been extrapolated to represent 100% of the usual diet for eight age-sex groups. These extrapolated food intakes will be used to assess daily contaminant and mineral intakes. The revised food list and diets will be used until the results of another national food consumption survey show the necessity to further revise the diets for the Total Diet Study Program.

REFERENCES

(1) Food and Drug Administration, Public Health Service, U.S. Department of Health and Human Services: Total Diet Studies FY73, FY74; Total Diet Studies-Adult FY75, FY76, FY77, FY78, FY79. (FY80, FY81-82 are undergoing Agency clearance); Total Diet Studies-Infants and Toddlers FY75, FY76, FY77, FY78, FY79. (FY80, FY81-82 are undergoing Agency clearance).

(2) Food and Drug Administration, Public Health Service, U.S. Department of Health and Human Services: Selected Minerals in Foods Survey FY74; Selected Minerals in Foods Survey-Adult, Infants and Toddlers FY75, FY76, FY77 (FY78/79 and FY80/81-82 are undergoing Agency clearance).

(3) Food and Drug Administration, Public Health Service, U.S. Department of Health and Human Services: Radionuclides in Foods Program FY73, FY74, FY75/76 (FY77/78 and FY79/80 are internal Agency documents).

(4) Pennington, J.A.T.: Revision of the Total Diet Study Food List and Diets. PB 82 192154. Springfield, VA: National Technical Information Service, 1982.