RESEARCH
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Fortified Foods Are Major Contributors to Nutrient Intakes in Diets of US Children and Adolescents☆

Louise A. Berner, PhD; Debra R. Keast, PhD; Regan L. Bailey, PhD, RD; Johanna T. Dwyer, DSc, RD

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ABSTRACT

Background Even in an era of obesity and dietary excess, numerous shortfall micronutrients have been identified in the diets of US children and adolescents. To help tailor strategies for meeting recommendations, it is important to know what foods contribute greatly to micronutrient intakes. Data are lacking on specific contributions made by added nutrients.

Objective Our aims were to examine the impact of fortification on nutrient adequacy and excess among US children and adolescents and to rank food sources of added nutrient intake and compare rankings with those based on total nutrient intake from foods.

Design and statistical analyses Data were from 7,250 respondents 2 to 18 years old in the National Health and Nutrition Examination Survey 2003-2006. Datasets were developed that distinguished nutrient sources: intrinsic nutrients in foods; added nutrients in foods; foods (intrinsic plus added nutrients); and total diet (foods plus supplements). The National Cancer Institute method was used to determine usual intakes of micronutrients by source. The impact of fortification on the percentages of children having intakes less than the Estimated Average Requirement and more than the Upper Tolerable Intake Level was assessed by comparing intakes from intrinsic nutrients to intakes from intrinsic plus added nutrients. Specific food sources of micronutrients were determined as sample-weighted mean intakes of total and added nutrients contributed from 56 food groupings. The percentage of intake from each grouping was determined separately for total and added nutrients.

Results Without added nutrients, a high percentage of all children/adolescents had inadequate intakes of numerous micronutrients, with the greatest inadequacy among older girls. Fortification reduced the percentage less than the Estimated Average Requirement for many, although not all, micronutrients without resulting in excessive intakes. Data demonstrated the powerful influence of fortification on food-source rankings.

Conclusions Knowledge about nutrient intakes and sources can help put dietary advice into a practical context. Continued monitoring of top food sources of nutrients and nutrient contributions from fortification will be important.

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EVEN IN THE CONTEXT OF EPIDEMIC OBESITY AND dietary excess, numerous shortfall micronutrients have been identified in American diets, including some vitamins and minerals of particular concern for children and adolescents.[1] To help tailor strategies for meeting nutrient recommendations, it is valuable to know what specific foods contribute greatly to micronutrient intakes. Important sources of nutrients in American diets are not necessarily foods that are intrinsically nutrient rich; nutrients can also come from dietary supplements or from foods that are frequently consumed and/or fortified.[2,3]

Fortification (this term is used generically throughout this article to refer to any addition of nutrients to foods) is one potential means of addressing micronutrient shortfalls. In fact, micronutrients have been added to fortify foods in the United States for more than half a century, and the practice played a major role in virtually eliminating classical nutrient-deficiency diseases, such as rickets and pellagra.[4] At the present time, some fortification is carried out in accordance with specific requirements of the US Food and Drug Administration, such as standards of identity for enriched grain foods or addition of vitamin A to reduced-fat milk to meet nutritional equivalency of whole milk, and other fortification has been termed *discretionary*[5] because it is done voluntarily

and at the discretion of food manufacturers (although, of course, within technological, regulatory, and other constraints). Despite its historical success, fortification has come under scrutiny because of concerns that it could lead to overconsumption of nutrients.[4,5] However, although fortification has undoubtedly increased vitamin and mineral intakes in the United States,[4,6] data are lacking on the specific contributions made by fortification of foods with micronutrients[5] other than folic acid.[7,8]

To ascertain the effects of fortification on children's dietary quality, it is essential to examine the specific sources of nutrients as well as the overall levels of nutrient intake. Subar and colleagues determined which food sources contributed the highest amounts of nutrients to diets of US children in 1989-1991.[2] Although they concluded that fortified foods, especially ready-to-eat (RTE) cereals, made large contributions to intakes of many nutrients,[2] the amounts contributed by added nutrients contained in fortified foods were not specifically examined. There has been a lack of information about the impact of fortification on nutrient adequacy and excess among children in the United States, and what foods are making the largest contributions to intakes of added nutrients.

Recently, Fulgoni and colleagues[9] quantified nutrient intakes contributed from naturally occurring and added nutrients contained in foods consumed by Americans 2 years of age and older, using data from the National Health and Nutrition Examination Survey (NHANES) 2003-2006. Fortification contributed greatly to intakes of many micronutrients, reducing the percentage of the population having intakes below the Estimated Average Requirement (EAR) without adding appreciably to the percentage having intakes above the Upper Tolerable Intake Level (UL).[9] Fulgoni and colleagues' analysis reported data only for children aged 2 to 18 years as a group,[9] yet food-consumption patterns might differ greatly by age and sex. Therefore, one goal of this report was to quantify the impact of fortification by age and sex subgroups of children.

Another goal of this report was to determine the food sources of added nutrient intake, to rank them, and to compare these rankings of added nutrient sources with rankings based on total (both intrinsic and added) nutrient intake from foods consumed by children and adolescents.

METHODS

Study Population

The 2003-2004 and 2005-2006 What We Eat in America dietary intake components and dietary supplement data from NHANES, a continuous nationally representative population-based survey, were combined for this study. Details of NHANES study design, implementation, datasets, analytic considerations, and other documentation are available online.[10,11] The analytic sample included participants aged 2 to 18 years having complete, reliable 24-hour dietary recall data, and excluded pregnant and/or lactating females. As described in online documentation,[10,11] in-person health examinations, which included a 24-hour dietary recall, were completed at the Mobile Examination Center, and a second 24-hour recall was collected via telephone 3 to 10 days later. Parents/guardians of children aged 2 to 5 years provided the dietary recalls and children aged 6 to 11 years were assisted by an adult. All participants or proxies provided written informed consent and the Research Ethics Review Board at the National Center for Health Statistics approved the survey protocol.[12]

Nutrient Sources in Foods and Nutrient Intakes

The sources of nutrients added by enrichment or fortification were separated from naturally occurring (intrinsic) nutrients in foods eaten by NHANES participants. Enrichment was defined as the addition of thiamin, niacin, riboflavin, folic acid, and iron to refined grain foods/ingredients as determined by US Food and Drug Administration standards of identity for enriched cereal grain products, and fortification included nutrient additions to all other foods (such as breakfast cereals, granola bars, juice drinks, and milk). The underlying databases and strategies used to develop the nutrient sources food composition data are described in detail elsewhere.[9] Briefly, this was a data-based approach that used databases, such as the US Department of Agriculture (USDA) Food and Nutrient Database for Dietary Studies, versions 2.0 and 3.0[13,14]; the USDA Standard Reference datasets, versions 18 and 20[15,16]; and the USDA MyPyramid Equivalent Database, version 2.0.[17] Added nutrients in foods were identified using different strategies, depending on the nutrient and food. For example, added folic acid, vitamin E, and vitamin B-12 data are readily available in the Standard Reference. Besides folic acid, amounts of other nutrients added during grain enrichment (thiamin, riboflavin, niacin, and iron) were determined by calculating the difference between nutrient content of enriched and unenriched versions of grain foods/ingredients in the Standard Reference. A similar approach was taken for foods such as juices, where nutrient composition data were available for comparable fortified and unfortified versions of the food. As another example, amounts of intrinsic nutrients contained in manufactured fortified foods, such as RTE cereals, were first calculated by applying representative nutrient data to food compositional data available from the MyPyramid Equivalent Database, and then added nutrients were calculated as the difference between total nutrient content and estimated intrinsic nutrient content of the food. Additional details of the approaches used have been published previously.[9]

Also, as described previously,[9] nutrient intakes from food sources and dietary supplements were determined using 2 days of 24-hour dietary recall data, along with dietary supplement questionnaire data. Components of the dataset included the intake per day of total nutrients (from both food and dietary supplements), nutrients from food (both intrinsic and added), and nutrients added to food. Sample-weighted mean intake of each nutrient and percentages of total nutrient intake contributed from each source were determined using day 1 recall data because the mean is an unbiased estimate of the group's usual mean nutrient intake.[18]

The appropriate way to estimate nutrient intake inadequacy in a population is to determine the percentage of the group with usual intake below the Estimated Average Requirement (%<EAR), and possible excessive intakes are best estimated as the percentage of the group with usual intake above the Upper Tolerable Level (%>UL).[19] The National Cancer Institute method,[20,21] applied to the 2 days of dietary intake data, was used to determine usual nutrient intakes as described elsewhere.[9] The %<EAR was determined

for all micronutrients except vitamin K and potassium, which have only Adequate Intake values, and %>UL was determined if the UL had been established. Usual intake of retinol and added vitamin E, niacin, folic acid, and magnesium were determined to assess %>UL because the UL for only those nutrient forms were established.[19]

The impact of fortification on usual intakes less than EAR or above the UL was determined by comparing results of analyses of intrinsic vs total food nutrients (intrinsic and added). The additional impact on intakes due to dietary supplements was determined by comparing results of analyses of food vs total nutrients (food and supplements).

Ranked Food Sources of Total and Added Nutrients

To determine food sources of total and added nutrients, it was first necessary to define food groupings of interest. The schemes described by Cook and colleagues[22] and Cotton and colleagues[3] (who identified 113 dietary source groups within nine major food categories) were used as the basis for food classification, although some food groupings were modified or collapsed to form the 56 groups shown in Figure 1. Mixtures of foods were not disaggregated because the interest in this research was to examine food sources of nutrients on an "as reported" basis. Rather, each food in the What We Eat in America/NHANES was assigned to a food grouping based on its main ingredient. Many groups included discrete foods, such as apples, milk, etc. However, if the food group included mixtures, nutrients attributed to that group could be contributed from various components of the food mixture. For example, "pasta dishes" would include foods such as lasagna, in which the main ingredient is pasta; the tomato sauce, cheese, meat, and other ingredients would also contribute to nutrient intakes from the pasta dishes group. Similarly, "white potatoes" can include nutrient contributions from milk or another ingredient in a potato dish, such as mashed potatoes, and "mixtures mainly meat" would include contributions from ingredients such as carrots in beef stew.

Using day 1 food intake data, mean intakes of total and added nutrients contributed from each group of foods were

Grain Products; Mixtures Mostly Grain
- Flour, bran, baking ingredients
- Yeast bread and rolls
- Hot breakfast cereal
- Ready-to-eat cereal
- Granola/cereal bars and toaster pastries
- Rice, cooked grains
- Pasta
- Biscuits, corn bread, pancakes, tortillas
- Crackers, popcorn, pretzels, chips
- Pizza, turnovers
- Sandwiches (eg, hamburgers), bread mixtures
- Rice mixtures
- Pasta dishes (eg, macaroni and cheese)
- Tortilla and taco mixtures

Vegetables
- Potatoes (white)
- Broccoli, spinach, greens
- Carrots, sweet potatoes, winter squash
- Tomatoes, tomato/vegetable juice
- Lettuce
- String beans (green, yellow, wax)
- Corn, peas, lima beans
- Olives, pickles
- Other vegetables
- Mixed vegetables, vegetable mixtures

Fruit
- Fruit
- Fruit juice

Dairy Products
- Milk
- Milk drinks
- Yogurt
- Cheese

Meat, Poultry, Fish
- Beef
- Lamb, veal, game
- Pork, ham, bacon
- Organ meats
- Frankfurters, sausages, luncheon meats
- Poultry
- Fish and shellfish
- Mixtures mainly meat, poultry, fish (eg, beef stew)

Eggs, Legumes, Nuts, and Seeds
- Eggs
- Legumes
- Nuts, seeds (includes butters, pastes)

Fats and Oils
- Margarine and butter
- Salad dressings, mayonnaise
- Other fats and oils

Desserts and Sweets
- Cake, cookies, quick bread, pastry, pie
- Milk desserts
- Candy, sugars, and sugary foods

Beverages
- Fruit drinks and -ades
- Soft drinks, soda (includes diet)
- Coffee and tea
- Other nonalcoholic beverages (eg, energy drinks, sport drinks, water)
- Alcoholic beverages

Other Foods
- Meal replacements/supplements
- Soup, broth, bouillon
- Condiments and sauces
- Whey and artificial sweeteners

Figure 1. Food groupings used when determining food sources of nutrients.

determined. The percentage of intake contributed from each food group was determined as a ratio by dividing the nutrient intake contributed from the specific food group by the nutrient intake from all foods. Percentages of total and added nutrients contributed by food groups were calculated separately, and ranked in descending order. Analyses incorporated NHANES sample weights, so intake estimates are representative of the US population.

Statistical Analyses

Analyses were stratified by age and sex subgroups, including children aged 2 to 8 years (n=2,601; sexes combined), children/adolescents aged 9 to 18 years (n=4,649), males aged 9 to 13 years (n=1,009), females aged 9 to 13 years (n=1,039), males aged 14 to 18 years (n=1,351), and females aged 14 to 18 years (n=1,250). Sample weights were applied in all analyses to adjust for oversampling and survey response.[10,11] SAS software, version 9.2 (2003, SAS Institute) was used for usual intake analyses to determine percentages of the population having intakes less than the EAR and greater than the UL. SUDAAN software version 9.0.3 (2007, RTI) was used to adjust the variance for the complex sample design when determining mean (±standard error) micronutrient intake and the percentage of intake supplied by fortification, as well as food sources of nutrient intakes.

RESULTS

Figure 2 shows the prevalence of inadequate intakes (%<EAR) in the age/sex subgroup (children aged 2 to 8 years) having the lowest levels of inadequacy and in the subgroup (females aged 14 to 18 years) having the highest levels of inadequacy. Table 1 summarizes the estimates of inadequate (%<EAR) or potentially excessive (%>UL) micronutrient intakes for each age/sex subgroup of children, by source of the nutrients. Among all age/sex subgroups, when considering only intrinsic nutrient intake from foods, approximately 25% to 100% had inadequate intakes of numerous nutrients, including vitamins A, D, E, folate, and calcium. Among females aged 14 to 18 years, approximately 23% to 92% also had inadequate intakes of thiamin, riboflavin, niacin, vitamin B-6, vitamin C, phosphorus, magnesium, iron, and zinc; and a large percentage of other subgroups of children aged 9 years and older had inadequate intakes of some of these nutrients as well. When nutrient intakes contributed from fortification were added, the %<EAR for vitamins A, D, B-6, C, the five enrichment nutrients, and zinc shifted sharply lower. However, there was less change in %<EAR for vitamin E, calcium, or other minerals (Figure 2; Table 1). Except for vitamins D and E, there was relatively little additional impact of dietary supplements on %<EAR for most nutrients.

Among most subgroups, the percentages having usual intakes above the UL were very low or zero for most nutrients, even when considering total intakes from food plus supplements (Table 1). There were a few exceptions, but only among children aged 2 to 8 years. Twenty-four percent of them had zinc intakes above the UL, even considering only the zinc intrinsic to food, with the %>UL shifted even higher by fortification and dietary supplements. The percentages above the UL for niacin and folic acid were 8.2% and 9.7%, respectively, when fortification was considered, and much higher (28.4% and 30.3%) when intakes from dietary supplements were included.

Mean daily intake of added nutrients and percentage of the intake of nutrients from food contributed by added nutrients (both fortification and enrichment) are shown in Table 2 (available online at www.andjrnl.org). Nutrient enrichment and fortification contributed half or more of the intakes of vitamin D, thiamin, and folate; 19.9% to 47.1% of the intakes of vitamin A, vitamin C, riboflavin, niacin, B-6, B-12, and iron; 12.1% to 18.4% of the intake of zinc; 4.5% to 6.6% of calcium intake; and only negligible percentages of the other micronutrients.

Tables 3 through 7 show ranked food sources of vitamins A, C, D, folate, and iron, nutrients that were identified in the 2010 Dietary Guideline for Americans reports[1,6] as nutrients of concern among one or more subgroups of children and/or adolescents and for which enrichment and/or fortification contributed at least 10% of the nutrient intake from all foods. (Tables 8 through 13 [available online at www.andjrnl.org] show rankings for all other micronutrients for which enrichment and/or fortification contributed at least 10% of the intake of that nutrient from foods.) Within each table, food sources were listed if they contributed at least 2% of the nutrient intake from all foods; footnotes to the tables list food groupings each contributing at least 1% but <2% of intake. Each of the tables shows ranked food sources of total nutrients (both intrinsic and added) separately from the ranked food sources of added nutrients. The Tables also show rankings for children aged 2 to 8 years and older children/adolescents separately. (Data not shown suggested only small shifts in rankings when comparing age and sex subgroups within the entire group aged 9 to 18 years.) For both the 2- to 8-year-old and 9- to 18-year-old age groups, the major food sources of added nutrients were always among the major food sources of total nutrients, demonstrating that fortification of foods had a powerful influence on how food sources of these nutrients were ranked in American children's consumption patterns. RTE cereal (for all nutrients, Tables 3 through 7 and Tables 8 through 13 [available online at www.andjrnl.org]), milk and milk drinks (for vitamins A and D; Tables 3 and 4), juice and juice drinks (for vitamin C; Table 5), and yeast breads/rolls and other food groups containing enriched-grain ingredients (for thiamin, niacin, riboflavin, folate, and iron, Tables 6 and 7 and Tables 8 through 10 [available online at www.andjrnl.org]) predominated as food sources of both total and added nutrients.

DISCUSSION

The authors are not aware of publications of recent nationally representative data that distinguish or rank food sources of added micronutrients in children's diets, although there are recent publications of sources of total (intrinsic plus added) nutrient intake by children (Keast and colleagues[24]; and data available online showing major food sources of sodium, potassium, and calcium[25]).

For these children and adolescents, fortification added noticeably to intakes of iron and each of the shortfall vitamins identified in 2010 Dietary Guidelines for Americans reports,[1,6] except for vitamin E, and shifted the prevalence of inadequate intakes lower. If it had not been for added nutrients, thiamin, riboflavin, niacin, vitamin B-6, and zinc

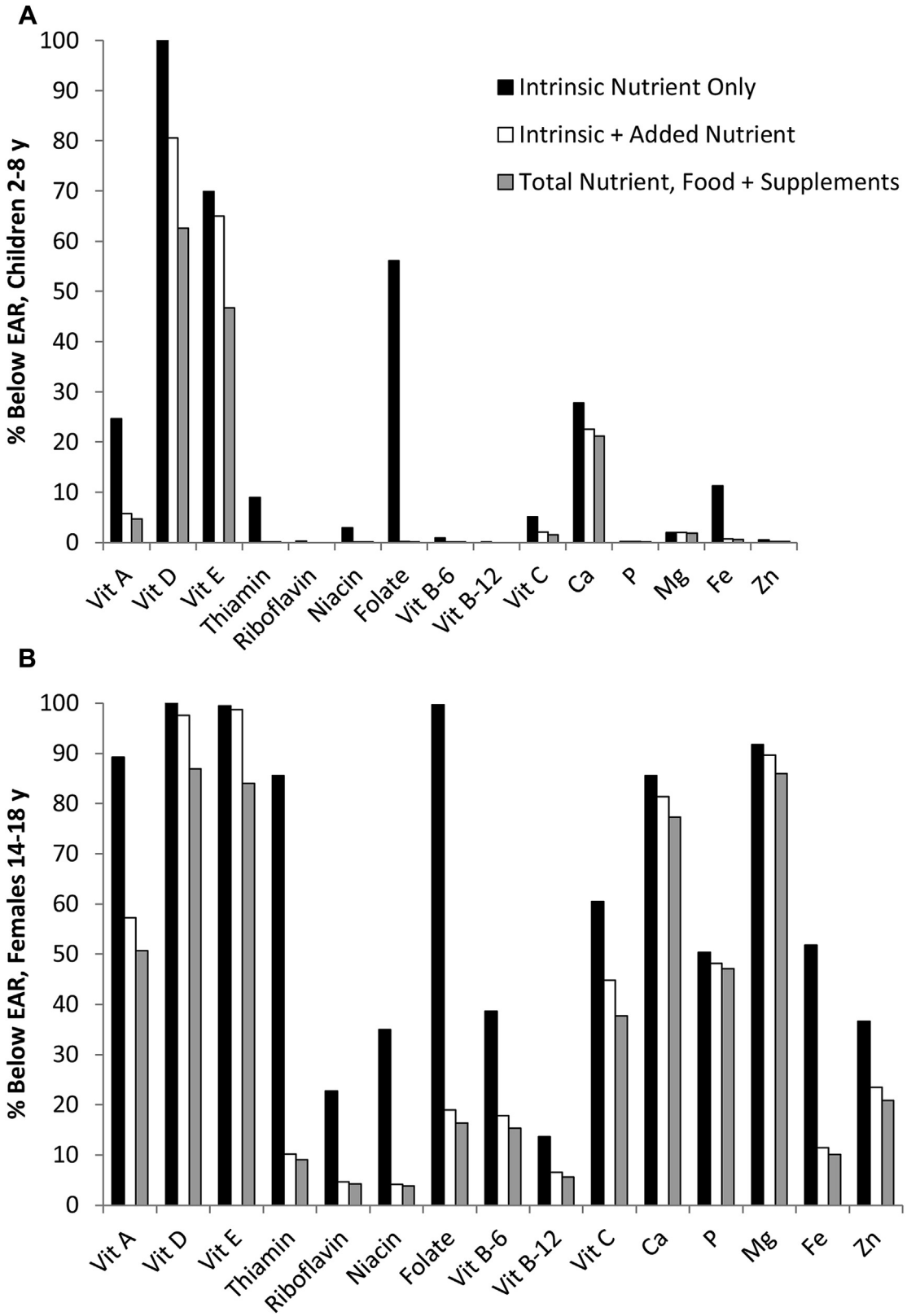

Figure 2. Percentage of the population with usual intake below the Estimated Average Requirement. Subgroups shown had the lowest (A, children aged 2 to 8 years) and highest (B, females aged 14 to 18 years) prevalence of inadequate intakes among the total population aged 2 to 18 years. Data from National Health and Nutrition Examination Survey 2003-2006.

Table 1. Percentage of children having usual micronutrient intakes below the Estimated Average Requirement and above the Upper Tolerable Level, considering only the food's intrinsic nutrients, both intrinsic and added nutrients from food, and nutrients from food plus supplements[ab]

	Children 2 to 8 Years Old (n=2,601)		Males 9 to 13 Years Old (n=1,009)		Females 9 to 13 Years Old (n=1,039)		Males 14 to 18 Years Old (n=1,351)		Females 14 to 18 Years Old (n=1,250)	
Nutrient and source	% <EAR[c]	% ≥UL[d]	% <EAR	% ≥UL	% <EAR	% ≥UL	% <EAR	% ≥UL	% <EAR	% ≥UL
Vitamin A										
Intrinsic only	24.6	0	60.3	0	74.6	0	87.5	0	89.2	0
Intrinsic+added nutrients	5.7	13.4	24.5	<1	30.8	0	56.4	0	57.2	0
Food+supplements	4.7	ND[e]	20.9	ND	26.4	ND	50.7	ND	50.7	ND
Vitamin D										
Intrinsic only	100	0	100	0	100	0	100	0	100	0
Intrinsic+added nutrients	80.6	0	86.1	0	92.0	0	88.2	0	97.6	0
Food+supplements	62.6	0.2	75.8	0.4	77.9	0.4	80.6	0	86.9	0
Vitamin E										
Intrinsic only	69.9	NA[f]	87.1	NA	94.7	NA	96.2	NA	99.5	NA
Intrinsic+added nutrients	65.0	0	85.5	0	90.7	0	94.6	0	98.7	0
Food+supplements	46.7	0.2	71.9	0	72.5	0	83.7	0	84.0	0.2
Thiamin										
Intrinsic only	8.9	—[g]	27.6	—	43.3	—	55.6	—	85.6	—
Intrinsic+added nutrients	0.1	—	0.2	—	1.4	—	1.5	—	10.2	—
Food+supplements	0.1	—	0.2	—	1.2	—	1.2	—	9.0	—
Riboflavin										
Intrinsic only	0.3	—	3.5	—	7.5	—	9.4	—	22.7	—
Intrinsic+added nutrients	0	—	0.3	—	1.0	—	1.2	—	4.7	—
Food+supplements	0	—	0.3	—	0.8	—	1.0	—	4.2	—
Niacin										
Intrinsic only	2.9	NA	4.9	NA	15.6	NA	7.3	NA	35.0	NA
Intrinsic+added nutrients	0.1	8.2	0.1	2.7	0.8	0.4	0.2	0.2	4.1	0
Food+supplements	0.1	28.4	0.1	12.0	0.8	10.9	0.2	4.4	3.8	2.5
Folate										
Intrinsic only	56.1	NA	90.6	NA	94.5	NA	96.3	NA	99.7	NA
Intrinsic+added nutrients	0.2	9.7	1.3	1.1	3.4	0.4	4.0	0.1	19.0	0
Food+supplements	0.1	30.3	0.9	7.6	3.0	6.8	3.6	2.4	16.4	1.2
Vitamin B-6										
Intrinsic only	0.9	0	5.2	0	12.0	0	10.1	0	38.6	0
Intrinsic+added nutrients	0.1	0	1.1	0	4.0	0	2.9	0	17.8	0
Food+supplements	0.1	0.2	1.0	0	3.4	0	2.7	0.4	15.3	0.1
Vitamin B-12										
Intrinsic only	0.1	—	0.3	—	2.0	—	0.7	—	13.7	—
Intrinsic+added nutrients	0	—	0.1	—	0.7	—	0.3	—	6.5	—
Food+supplements	0	—	0.1	—	0.7	—	0.2	—	5.6	—
Vitamin C										
Intrinsic only	5.1	0	30.3	0	29.1	0	52.6	0	60.5	0

(*continued on next page*)

Table 1. Percentage of children having usual micronutrient intakes below the Estimated Average Requirement and above the Upper Tolerable Level, considering only the food's intrinsic nutrients, both intrinsic and added nutrients from food, and nutrients from food plus supplements[ab] (*continued*)

	Children 2 to 8 Years Old (n=2,601)		Males 9 to 13 Years Old (n=1,009)		Females 9 to 13 Years Old (n=1,039)		Males 14 to 18 Years Old (n=1,351)		Females 14 to 18 Years Old (n=1,250)	
Nutrient and source	**% <EAR[c]**	**% ≥UL[d]**	**% <EAR**	**% ≥UL**	**% <EAR**	**% ≥UL**	**% <EAR**	**% ≥UL**	**% <EAR**	**% ≥UL**
Intrinsic+added nutrients	2.0	0	19.6	0	17.6	0	38.7	0	44.8	0
Food+supplements	1.5	1.0	16.5	0.4	14.6	0.1	33.8	0	37.7	0.2
Calcium										
Intrinsic only	27.8	0.1	62.8	0	76.1	0	53.1	0	85.6	0
Intrinsic+added nutrients	22.5	0.3	57.6	0	70.6	0	47.4	0.1	81.4	0
Food+supplements	21.2	0.4	55.4	0.1	68.1	0	45.2	0.2	77.3	0.2
Phosphorus										
Intrinsic only	0.2	0	20.4	0	38.3	0	10.6	0	50.3	0
Intrinsic+added nutrients	0.2	0	19.6	0	37.2	0	9.9	0	48.1	0
Food+supplements	0.1	0	19.2	0	35.9	0	9.8	0	47.1	0
Magnesium										
Intrinsic only	1.9	NA	26.0	NA	42.9	NA	79.3	NA	91.7	NA
Intrinsic+added nutrients	1.9	0.2	24.9	0	40.9	0	75.6	0	89.7	0
Food+supplements	1.8	0.4	23.8	0	38.6	0	73.2	0.2	86.0	0.1
Iron										
Intrinsic only	11.2	0	6.6	0	15.8	0	13.8	0	51.8	0
Intrinsic+added nutrients	0.7	0	0	0.1	0.8	0	0.5	0.1	11.5	0
Food+supplements	0.6	1.2	0	1.6	0.6	0.5	0.5	0.9	10.1	1.5
Zinc										
Intrinsic only	0.5	24.3	6.7	0.2	19.8	0	7.3	0	36.7	0
Intrinsic+added nutrients	0.2	44.9	3.5	1.6	11.8	0.2	4.5	0.1	23.5	0
Food+supplements	0.2	52.7	3.2	7.5	10.6	6.4	4.1	1.9	20.9	0.9
Copper										
Intrinsic only	0.1	6.5	0.5	0	2.5	0	1.8	0	15.6	0
Intrinsic+added nutrients	0	7.3	0.6	0	2.4	0	1.9	0	15.6	0
Food+supplements	0	13.6	0.6	0.1	2.3	0	1.7	0	14.0	0
Selenium										
Intrinsic only	0	7.0	0	0	0.3	0	0	0	2.4	0
Intrinsic+added nutrients	0	7.3	0	0	0.3	0	0.1	0	2.1	0
Food+supplements	0	7.5	0	0	0.2	0	0	0	2.3	0

[a]Data from National Health and Nutrition Examination Survey 2003-2006; usual intake determined using the National Cancer Institute method, with covariates including the recall number, weekday/weekend day, and dietary supplement use (yes/no).
[b]Upper Tolerable Level for vitamin A based only on retinol. Upper Tolerable Level for vitamin E, niacin, folate, and Mg based only on added nutrients (fortification/enrichment and supplements).
[c]EAR=Estimated Average Requirement.
[d]UL=Upper Tolerable Level.
[e]ND=not determined. Data are available separated by users vs nonusers of supplements in Bailey and colleagues.[23]
[f]NA=not applicable because Upper Tolerable Level does not apply to the intrinsic form of the nutrient.
[g]Dashes indicate no Upper Tolerable Level has been established.

Table 3. Top food sources of vitamin A (both intrinsic and added to foods) and top food sources of only added vitamin A in the diets of children, from National Health and Nutrition Examination Survey 2003-2006[ab]

Food Sources of Both Intrinsic and Added Vitamin A				Food Sources of Only Added Vitamin A			
Rank	Rank and food grouping	%	Cumulative %	Rank	Rank and food grouping	%	Cumulative %
children 2 to 8 years old[c] (n=2,601)							
1	Milk	22.6	22.6	1	Ready-to-eat cereal	42.6	42.6
2	Ready-to-eat cereal	17.0	39.6	2	Milk	25.1	67.7
3	Milk drinks	8.2	47.8	3	Milk drinks	11.7	79.4
4	Carrots, sweet potato, winter squash	4.9	52.7	4	Pasta dishes	3.5	82.9
5	Cheese	4.6	57.3	5	Margarine, butter	3.1	86.0
6	Milk desserts	4.1	61.4	6	Bars/toaster pastries	2.8	88.8
7	Pasta dishes	3.7	65.1	7	Cake, cookie, quick bread, pastry, pie	2.3	91.1
8	Mixtures mainly meat	3.6	68.7	8	Fruit drinks/-ades	2.0	93.1
9	Eggs	3.3	72.0				
10	Biscuits, cornbread, pancakes, tortillas	3.0	75.0				
11	Pizza, turnovers	2.7	77.7				
12	Margarine, butter	2.3	80.0				
13	Hot breakfast cereal	2.3	82.3				
14	Cake, cookie, quick bread, pastry, pie	2.0	84.3				
children/adolescents 9 to 18 years old[d] (n=4,649)							
1	Milk	19.6	19.6	1	Ready-to-eat cereal	37.6	37.6
2	Ready-to-eat cereal	13.7	33.3	2	Milk	29.1	66.7
3	Cheese	6.0	39.3	3	Bars/toaster pastries	7.3	74.0
4	Carrots, sweet potato, winter squash	5.8	45.1	4	Milk drinks	5.8	79.8
5	Milk desserts	4.7	49.8	5	Cake, cookie, quick bread, pastry, pie	3.7	83.5
6	Pizza, turnovers	4.6	54.4	6	Margarine, butter	3.3	86.8
7	Milk drinks	4.4	58.8	7	Pasta dishes	2.8	89.6
8	Mixtures mainly meat	3.6	62.4				
9	Pasta dishes	3.2	65.6				
10	Eggs	3.2	68.8				
11	Cake, cookie, quick bread, pastry, pie	3.0	71.8				
12	Biscuits, cornbread, pancakes, tortillas	2.9	74.7				
13	Bars/toaster pastries	2.7	77.4				
14	Margarine, butter	2.3	79.7				

[a]From day 1 dietary recall; sample weights applied.

[b]Table includes data for food groupings contributing ≥2% of intake for the nutrient.

[c]Three additional food groupings contributed at least 1% each to total dietary intake (in descending order: fruit; soup, broth, bouillon; granola/cereal bars, toaster pastries). One additional food grouping contributed at least 1% to added nutrient intake (eggs).

[d]Seven additional food groupings contributed at least 1% each to total dietary intake (in descending order: sandwiches, bread mixtures; tortilla, taco mixtures; other fats and oils; fruit; broccoli, spinach, greens; soup, broth, bouillon; fruit juice). Three additional food groupings contributed at least 1% each to added nutrient intake (in descending order: eggs; meal replacements/supplements; white potatoes).

Table 4. Top food sources of vitamin D (both intrinsic and added to foods) and top food sources of only added vitamin D in the diets of children, from National Health and Nutrition Examination Survey 2003-2006[ab]

Food Sources of Both Intrinsic and Added Vitamin D				Food Sources of Only Added Vitamin D			
	Rank and food grouping	%	Cumulative %	Rank and food grouping		%	Cumulative %
children 2 to 8 years old[c] (n=2,601)							
1	Milk	56.1	56.1	1	Milk	66.7	66.7
2	Milk drinks	15.0	71.1	2	Milk drinks	16.5	83.2
3	Ready-to-eat cereal	8.3	79.4	3	Ready-to-eat cereal	10.5	93.7
4	Eggs	2.7	82.1				
5	Fruit juice	2.6	84.7				
children/adolescents 9 to 18 years old[d] (n=4,649)							
1	Milk	51.8	51.8	1	Milk	67.6	67.6
2	Milk drinks	9.8	61.6	2	Milk drinks	12.2	79.8
3	Ready-to-eat cereal	8.0	69.6	3	Ready-to-eat cereal	11.6	91.4
4	Fruit juice	3.3	72.9				
5	Eggs	3.1	76.0				
6	Mixtures mainly meat	3.1	79.1				
7	Fish, shellfish	2.7	81.8				
8	Frankfurters, sausages, lunch meats	2.1	83.9				

[a]From day 1 dietary recall; sample weights applied.
[b]Table includes data for food groupings contributing ≥2% of intake for the nutrient.
[c]Five additional food groupings contributed at least 1% each to total dietary intake (in descending order: mixtures mainly meat/fish poultry; pasta dishes; frankfurters, sausages, luncheon meats; yogurt; fish/shellfish). Two additional food groupings contributed at least 1% each to added nutrient intake (in descending order: yogurt; pasta dishes).
[d]Five additional food groupings contributed at least 1% each to total dietary intake (in descending order: pasta dishes; pork/ham/bacon; cheese; pizza, turnovers; sandwiches, bread mixtures). Two additional food groupings contributed at least 1% each to added nutrient intake (in descending order: pasta dishes; yogurt).

might also have been considered "shortfall nutrients" in older children, particularly girls. After adding intake from dietary supplements, the %<EAR for most nutrients other than vitamins D and E did not change noticeably. An explanation might be that in 2003-2006, most children consumed fortified foods but only 26% to 42% (depending on age/sex) reported supplement use; the impact of supplements on micronutrient intakes was more notable when examining supplement users separately from the total population.[23]

Fortification was more influential on intakes of vitamins than minerals, but even with the increased intakes from fortification, substantial percentages of most age/sex subgroups had intakes of vitamins A, C, and D that were less than the EAR. In addition, fortification had minimal impact on the %<EAR for several shortfall nutrients, including calcium, potassium, magnesium, phosphorus, and vitamin E. On average, only about 50 mg per day or 5% of the calcium intake from food came from fortification, although this represented an increase from 1989-1991 estimates.[26] As a Food and Nutrition Board committee concluded, one of the guiding principles to justify discretionary fortification is documentation of dietary inadequacy,[5] a criterion that is met for several of the nutrients mentioned. This presents an opportunity for selective fortification with nutrients such as vitamin D and calcium.[27-29] However, it is an ongoing challenge to improve intakes of target populations without potentially exposing others to excessive amounts.[28,30,31] In addition, technical challenges, including taste, mass, or stability issues, present barriers to the addition of some shortfall nutrients; therefore, fortification is not a panacea. A recent editorial in the *Journal of Pediatrics* suggested that an evaluation of fortification strategies, and possible development of new products or formulations, might be helpful in addressing continued low intakes of some micronutrients by children.[32]

The data presented here do not raise concern about fortification contributing to intakes above the UL for most micronutrients, except folic acid, niacin, and zinc, which might possibly be a concern for the youngest subgroup examined, children aged 2 to 8 years. However, the intakes might not be truly of public health concern if the UL established for children are set too low. Questions about the quantification of the UL remain because of lack of evidence of any adverse effects, even though many children have usual intakes above the UL for nutrients such as zinc; because of a lack of data on specific hazard identification relevant to children; and because the extrapolation of adult UL values to children on the basis of body weight is controversial and can be fraught with error.[33,34] In addition, adequate biomarkers

Table 5. Top food sources of vitamin C (both intrinsic and added to foods) and top food sources of only added vitamin C in the diets of children, from National Health and Nutrition Examination Survey 2003-2006[ab]

Food Sources of Both Intrinsic and Added Vitamin C				Food Sources of Only Added Vitamin C			
Rank	Food grouping	%	Cumulative %	Rank	Food grouping	%	Cumulative %
children 2 to 8 years old[c] (n=2,601)							
1	Fruit juice	37.9	37.9	1	Fruit drinks/-ades	57.1	57.1
2	Fruit drinks/-ades	22.4	60.3	2	Fruit juice	21.1	78.2
3	Fruit	12.5	72.8	3	Ready-to-eat cereal	18.3	96.5
4	Ready-to-eat cereal	4.9	77.7				
5	Candy, sugars, and sugary foods	3.8	81.5				
6	White potatoes	2.3	83.8				
7	Broccoli, spinach, greens	2.2	86.0				
children/adolescents 9 to 18 years old[d] (n=4,649)							
1	Fruit juice	32.4	32.4	1	Fruit drinks/-ades	72.1	72.1
2	Fruit drinks/-ades	23.7	56.1	2	Ready-to-eat cereal	19.6	91.7
3	Fruit	11.4	67.5	3	Fruit juice	3.0	94.7
4	Ready-to-eat cereal	3.9	71.4	4	Other nonalcoholic beverages	2.3	97.0
5	White potatoes	3.2	74.6				
6	Other vegetables	2.9	77.5				
7	Candy, sugars, and sugary foods	2.6	80.1				
8	Mixtures mainly meat	2.5	82.6				
9	Pizza, turnovers	2.4	85.0				

[a]From day 1 dietary recall; sample weights applied.
[b]Table includes data for food groupings contributing ≥2% of intake for the nutrient.
[c]Four additional food groupings contributed at least 1% each to total dietary intake (in descending order: other vegetables; milk drinks; pasta dishes; mixtures mainly meat, poultry, fish).
[d]Five additional food groupings contributed at least 1% each to total dietary intake (in descending order: broccoli, spinach, greens; crackers, popcorn, pretzels, chips; pasta dishes; tomatoes, tomato/vegetable juice; condiments and sauces).

of zinc status are not available.[19] More data are needed to support evidence-based recommendations for UL values for children.[33,34]

Consumers are advised to obtain nutrients primarily from nutrient-dense forms of foods, and "dietary supplements or fortification of certain foods may be advantageous in specific situations to increase intake of a specific vitamin or mineral."[6] Despite the large nutrient contributions made by fortified foods, they are not always among the foods targeted by recommendations to increase intakes, and sometimes, as in the case of refined grain foods and juice drinks, reduced intakes might even be recommended. Recently, Reedy and Krebs-Smith examined NHANES data to determine which foods contributed most to children's intakes of energy, solid fat, and added sugar, components targeted for reduction.[35] A direct comparison with their data is not possible because of food grouping differences, but some general comparisons can be made because they also examined food sources of nutrients without disaggregating mixtures. They reported that the top five food sources of energy for the 2- to 18-year-old age group, each supplying 5.6% to 6.8% of total energy intake, were grain desserts, pizza, soda, yeast breads, and chicken.[35] In comparison, Tables 6 and 7 and Tables 8 through 10 (available online at www.andjrnl.org) show that yeast breads/rolls and pizza were also among the top five food sources of total and added thiamin, niacin, riboflavin, folate, and iron. Reedy and Krebs-Smith found that fruit drinks, soda, grain desserts, dairy desserts, and candy were the top five sources of added sugars.[35] Data from this article show that fruit drinks/-ades were major sources of total and added vitamin C (Table 5), and the "cake, cookies, quick bread, pastry, and pies" group was among the top five or six sources of added enrichment nutrients (Tables 6 and 7 and Tables 8 through 10 [available online at www.andjrnl.org]). There is some overlap between major food sources of micronutrients and major sources of components targeted for reduction, and care should be taken so that following dietary advice (to limit macronutrient intake from certain foods, for example) does

Table 6. Top food sources of folate (both intrinsic and added to foods) and top food sources of only added folate in the diets of children, from National Health and Nutrition Examination Survey 2003-2006[ab]

Food Sources of Both Intrinsic and Added Folate				Food Sources of Only Added Folate			
Rank	Food grouping	%	Cumulative %	Rank	Food grouping	%	Cumulative %
children 2 to 8 years old[c] (n=2,601)							
1	Ready-to-eat cereal	30.5	30.5	1	Ready-to-eat cereal	48.2	48.2
2	Yeast bread, rolls	9.7	40.2	2	Yeast bread, rolls	11.2	59.4
3	Pizza, turnovers	6.0	46.2	3	Pasta dishes	7.7	67.1
4	Pasta dishes	6.0	52.2	4	Pizza, turnovers	6.5	73.6
5	Crackers, popcorn, pretzels, chips	4.5	56.7	5	Cake, cookie, quick bread, pastry, pie	4.6	78.2
6	Milk	4.1	60.8	6	Biscuits, cornbread, pancakes, tortillas	3.8	82.0
7	Cake, cookie, quick bread, pastry, pie	3.8	64.6	7	Crackers, popcorn, pretzels, chips	3.8	85.8
8	Fruit juice	3.7	67.8	8	Rice, cooked grains	2.4	88.2
9	Biscuits, cornbread, pancakes, tortillas	3.2	71.0				
10	Fruit	2.3	73.3				
children/adolescents 9 to 18 years old[d] (n=4,649)							
1	Ready-to-eat cereal	22.0	22.0	1	Ready-to-eat cereal	36.1	36.1
2	Yeast bread, rolls	13.3	35.3	2	Yeast bread, rolls	16.3	52.4
3	Pizza, turnovers	9.7	45.0	3	Pizza, turnovers	10.9	63.3
4	Pasta dishes	5.0	50.0	4	Pasta dishes	6.6	69.9
5	Crackers, popcorn, pretzels, chips	4.4	54.4	5	Cake, cookie, quick bread, pastry, pie	5.1	75.0
6	Cake, cookie, quick bread, pastry, pie	4.0	58.4	6	Biscuits, cornbread, pancakes, tortillas	4.4	79.4
7	Sandwiches, bread mixtures	3.5	61.9	7	Sandwiches, bread mixtures	3.7	83.1
8	Biscuits, cornbread, pancakes, tortillas	3.4	65.3	8	Crackers, popcorn, pretzels, chips	3.7	86.8
9	Fruit juice	3.2	68.5	9	Tortilla, taco mixtures	2.6	89.4
10	Milk	2.8	71.3	10	Rice, cooked grains	2.2	91.6
11	Tortilla, taco mixtures	2.8	74.1				
12	Mixtures mainly meat	2.4	76.5				

[a]From day 1 dietary recall; sample weights applied.
[b]Table includes data for food groupings contributing ≥2% of intake for the nutrient.
[c]Ten additional food groupings contributed at least 1% each to added nutrient intake (in descending order: mixtures mainly meat, poultry, fish; white potatoes; soup, broth, bouillon; rice, cooked grains; sandwiches, bread mixtures; legumes; milk drinks; eggs; tortilla, taco mixtures; hot breakfast cereals). Seven additional food groupings contributed at least 1% each to added nutrient intake (in descending order: sandwiches, bread mixtures; mixtures mainly meat, poultry, fish; hot breakfast cereal; soup, broth, bouillon; pasta; tortilla, taco mixtures; rice mixtures).
[d]Eight additional food groupings contributed at least 1% each to total dietary intake (in descending order: white potatoes; legumes; fruit; nuts, seeds, including butters/pastes; rice, cooked grains; granola/cereal bars, toaster pastries; rice mixtures; soup, broth, bouillon). Four additional food groupings contributed at least 1% each to added nutrient intake (in descending order: mixtures mainly meat, poultry, fish; granola/cereal bars, toaster pastries; rice mixtures; soup, broth, bouillon).

Table 7. Top food sources of iron (both intrinsic and added to foods) and top food sources of only added iron in the diets of children, from National Health and Nutrition Examination Survey 2003-2006[ab]

Food Sources of Both Intrinsic and Added Iron				Food Sources of Only Added Iron			
Rank	Food grouping	%	Cumulative %	Rank	Food grouping	%	Cumulative %
children 2 to 8 years old[c] (n=2,601)							
1	Ready-to-eat cereal	28.5	28.5	1	Ready-to-eat cereal	59.0	59.0
2	Yeast bread, rolls	8.5	37.0	2	Yeast bread, rolls	9.5	68.5
3	Pizza, turnovers	5.4	42.4	3	Pizza, turnovers	6.1	74.6
4	Cake, cookie, quick bread, pastry, pie	4.9	47.3	4	Cake, cookie, quick bread, pastry, pie	4.8	79.4
5	Crackers, popcorn, pretzels, chips	4.8	52.1	5	Pasta dishes	3.3	82.7
6	Pasta dishes	4.6	56.7	6	Biscuits, cornbread, pancakes, tortillas	3.2	85.9
7	Fruit juice	3.9	60.6	7	Crackers, popcorn, pretzels, chips	3.1	89.0
8	Biscuits, cornbread, pancakes, tortillas	3.9	64.5				
9	Mixtures mainly meat	2.9	67.4				
10	Poultry	2.1	69.5				
11	Hot breakfast cereal	2.0	71.5				
children/adolescents 9 to 18 years old[d] (n=4,649)							
1	Ready-to-eat cereal	19.2	19.2	1	Ready-to-eat cereal	44.0	44.0
2	Yeast bread, rolls	11.0	30.2	2	Yeast bread, rolls	14.8	58.8
3	Pizza, turnovers	8.8	39.0	3	Pizza, turnovers	11.0	69.8
4	Cake, cookie, quick bread, pastry, pie	5.0	44.0	4	Cake, cookie, quick bread, pastry, pie	5.2	75.0
5	Crackers, popcorn, pretzels, chips	4.7	48.7	5	Biscuits, cornbread, pancakes, tortillas	3.7	78.7
6	Sandwiches, bread mixtures	4.2	52.9	6	Crackers, popcorn, pretzels, chips	3.4	82.1
7	Mixtures mainly meat	4.0	56.9	7	Sandwiches, etc	3.0	85.1
8	Biscuits, cornbread, pancakes, tortillas	3.8	60.7	8	Bars/toaster pastries	2.8	87.9
9	Pasta dishes	3.8	64.5	9	Pasta dishes	2.7	90.6
10	Beef	3.3	67.8	10	Tortilla, taco mixtures	2.3	92.9
11	Tortilla, taco mixtures	3.1	70.9				
12	Soft drinks, soda	2.5	73.4				
13	Fruit juice	2.3	75.7				
14	Poultry	2.1	77.8				

[a]From day 1 dietary recall; sample weights applied.
[b]Table includes data for food groupings contributing ≥2% of intake for the nutrient.
[c]Eleven additional food groupings contributed at least 1% each to total dietary intake (in descending order: milk drinks; sandwiches, bread mixtures; soup, broth, bouillon; white potatoes; beef; frankfurters, sausages, luncheon meats; eggs; fruit; tortilla, taco mixtures; candy, sugars, and sugary foods; legumes). Four additional food groupings contributed at least 1% each to added nutrient intake (in descending order: rice, cooked grains; granola/cereal bars, toaster pastries; sandwiches, bread mixtures; mixtures mainly meat, poultry, fish).
[d]Nine additional food groupings contributed at least 1% each to total dietary intake (in descending order: potatoes; granola/cereal bars, toaster pastries; frankfurters, sausages, luncheon meats; soup, broth, bouillon; eggs; candy, sugars, and sugary foods; legumes; rice mixtures; nuts, seeds including butters/pastes). Four additional food groupings contributed at least 1% each to added nutrient intake (in descending order: rice, cooked grains; mixtures mainly meat, poultry, fish; rice mixtures; meal replacements/supplements).

not have an unintended effect of reducing intake of key micronutrients.

To determine how a dietary recommendation might affect nutrient intake, the Dietary Guidelines Advisory Committee modeled the substitution of whole grains for enriched grain foods.[1] Modeling showed that by replacing all grains with whole grains, without including fortified whole-grain products such as RTE cereals, the dietary pattern would contain inadequate levels of folate and iron, and lower (but still adequate) levels of thiamin, niacin, and riboflavin.[1] These careful scenarios assumed that other recommended components of USDA patterns (such as recommended servings of fruits and vegetables) were in compliance with food guidance. From the public health standpoint, shifts in intake of fortified foods, and any resultant nutrient intake changes, should be monitored. In addition, modified enrichment/fortification strategies might help optimize alignment of food-based and nutrient-based dietary guidance.

Major strengths of these analyses include the ability to separate out added nutrients from nutrients intrinsic to foods, and the use of nationally representative data. Determination of usual intakes using the National Cancer Institute method also strengthened this report because usual intake distributions are essential for estimating inadequacies or excesses of nutrient intake by a population. One limitation was that, because of the lack of direct information about the formulation of RTE cereals, bars, and similar fortified foods, the added nutrient content could not be directly calculated using recipes, as it was for other foods. The strategy used to indirectly calculate the added nutrient content (described in Fulgoni and colleagues[9]) likely added some error to intake estimates. Also, caution should be used in making direct comparisons between food-source rankings in this publication with other published work because of the dependence of rankings on food grouping definitions.[36]

CONCLUSIONS

These data indicate that fortification made a large contribution to nutrient intakes and adequacy for many, but not all, micronutrients in the diets of US children/adolescents without leading to excessive intakes for most vitamins and minerals. Fortification had a notable influence on rankings of food sources of many nutrients. Knowledge about nutrient intakes and sources is important to put dietary advice into a practical context. Continued monitoring of top food sources and nutrient contributions from fortification will be important to inform nutrition policy, particularly in this era when childhood obesity is epidemic.

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AUTHOR INFORMATION

L. A. Berner is a professor, Food Science and Nutrition Department, California Polytechnic State University, San Luis Obispo. D. R. Keast is president, Food & Nutrition Database Research, Inc, Okemos, MI. R. L. Bailey is a nutritional epidemiologist, Office of Dietary Supplements, National Institutes of Health, Bethesda, MD. J. T. Dwyer is a senior nutrition scientist, Office of Dietary Supplements, National Institutes of Health, Bethesda, MD, and a professor, Schools of Medicine and Friedman School of Nutrition Science and Policy, Tufts University, Boston, MA.

Address correspondence to: Louise A. Berner, PhD, Food Science and Nutrition Department, California Polytechnic State University, San Luis Obispo, CA 93407. E-mail: lberner@calpoly.edu

STATEMENT OF POTENTIAL CONFLICT OF INTEREST

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Table 2. Mean intake of added nutrients, and percentage of the intake of nutrients from food supplied in children's diets by added nutrients (both fortification and enrichment), with percentages of the intake of five enrichment nutrients supplied by fortification vs enrichment shown separately[a]

	Children 2 to 8 Years Old (n=2,601)		Males 9 to 13 Years Old (n=1,009)		Females 9 to 13 Years Old (n=1,039)		Males 14 to 18 Years Old (n=1,351)		Females 14 to 18 Years Old (n=1,250)	
Nutrient	**Mean (SE[b])**	**%**	**Mean (SE)**	**%**	**Mean (SE)**	**%**	**Mean (SE)**	**%**	**Mean (SE)**	**%**
Vitamin A (μg RAE[c])	225.1 (10.4)	39.7	223.1 (11.6)	35.8	215.1 (17.8)	39.9	227.0 (12.1)	34.9	161.5 (11.5)	34.0
Vitamin D (μg)	5.08 (0.15)	79.3	4.14 (0.23)	71.9	3.76 (0.32)	71.5	4.41 (0.27)	66.7	2.67 (0.17)	67.1
Vitamin E (mg α-tocopherol)	0.17 (0.05)	3.6	0.18 (0.12)	2.7	0.34 (0.12)	5.6	0.18 (0.06)	2.4	0.10 (0.03)	1.7
Vitamin K (μg)	0.37 (0.10)	0.8	0.17 (0.11)	0.3	1.45 (1.38)	2.6	0.13 (0.06)	0.2	0.34 (0.13)	0.5
Vitamin C (mg)	23.57 (2.01)	26.5	16.06 (1.96)	21.4	16.22 (1.76)	20.2	18.98 (1.64)	18.6	15.02 (1.57)	19.9
Thiamin (mg)	0.74 (0.01)	51.1 F[d] 21.9 E[e] 29.1	0.92 (0.04)	52.2 F 18.2 E 34.0	0.74 (0.03)	49.6 F 15.8 E 33.8	1.08 (0.04)	50.4 F 16.1 E 34.3	0.74 (0.03)	51.4 F 15.5 E 36.0
Riboflavin (mg)	0.61 (0.02)	28.7 F 17.1 E 11.5	0.71 (0.03)	30.6 F 15.9 E 14.7	0.55 (0.02)	27.5 F 13.1 E 14.4	0.84 (0.03)	30.2 F 15.0 E 15.3	0.54 (0.03)	29.9 F 13.7 E 16.2
Niacin (mg)	7.18 (0.21)	39.6 F 22.7 E 16.9	8.88 (0.49)	37.0 F 18.8 E 18.2	6.92 (0.33)	35.6 F 16.8 E 18.8	10.90 (0.31)	35.9 F 18.1 E 17.9	6.57 (0.28)	33.3 F 14.3 E 19.1
Folate (μg)	216.2 (6.4)	61.2 F 30.6 E 30.6	262.9 (14.1)	61.7 F 26.5 E 35.2	205.5 (9.0)	57.3 F 22.1 E 35.2	283.2 (9.3)	57.9 F 21.5 E 36.4	201.3 (8.5)	58.2 F 21.3 E 36.9
Vitamin B-6 (mg)	0.47 (0.03)	29.6	0.50 (0.05)	26.8	0.37 (0.04)	24.0	0.58 (0.03)	24.8	0.32 (0.03)	22.0
Vitamin B-12 (μg)	1.24 (0.08)	25.0	1.18 (0.10)	21.7	0.89 (0.10)	19.6	1.76 (0.19)	23.7	0.81 (0.07)	19.9
Calcium (mg)	65.0 (4.5)	6.6	47.5 (6.9)	4.5	53.3 (6.9)	5.6	59.5 (6.7)	4.8	40.4 (5.5)	4.8
Phosphorus (mg)	25.3 (2.4)	2.2	21.6 (3.9)	1.6	16.4 (3.1)	1.4	24.8 (4.0)	1.5	18.2 (2.4)	1.6
Magnesium (mg)	6.8 (0.7)	3.3	6.3 (1.4)	2.5	5.8 (1.7)	2.6	6.2 (1.0)	2.1	5.0 (0.7)	2.4
Potassium (mg)	13.3 (2.1)	0.6	11.1 (4.2)	0.5	4.4 (2.0)	0.2	7.6 (2.1)	0.3	10.9 (2.2)	0.6
Iron (mg)	6.35 (0.19)	47.1 F 29.4 E 17.7	7.43 (0.34)	44.1 F 23.3 E 20.8	5.7 (0.32)	41.3 F 20.3 E 21.0	8.67 (0.36)	42.8 F 21.0 E 21.8	5.59 (0.27)	41.4 F 19.2 E 22.2
Zinc (mg)	1.79 (0.08)	18.4	1.69 (0.16)	13.5	1.23 (0.13)	12.1	1.59 (0.16)	10.3	1.20 (0.18)	12.2

(*continued on next page*)

Table 2. Mean intake of added nutrients, and percentage of the intake of nutrients from food supplied in children's diets by added nutrients (both fortification and enrichment), with percentages of the intake of five enrichment nutrients supplied by fortification vs enrichment shown separately[a] (*continued*)

	Children 2 to 8 Years Old (n=2,601)		Males 9 to 13 Years Old (n=1,009)		Females 9 to 13 Years Old (n=1,039)		Males 14 to 18 Years Old (n=1,351)		Females 14 to 18 Years Old (n=1,250)	
Nutrient	Mean (SE[b])	%	Mean (SE)	%	Mean (SE)	%	Mean (SE)	%	Mean (SE)	%
Copper (mg)	0.02 (0.00)	1.7	0.02 (0.00)	1.4	0.02 (0.01)	1.4	0.02 (0.01)	1.4	0.01 (0.00)	1.2
Selenium (μg)	0.64 (0.09)	0.8	0.43 (0.15)	0.4	0.46 (0.11)	0.5	0.31 (0.06)	0.2	0.61 (0.15)	0.7

[a]From National Health and Nutrition Examination Survey 2003-2006, day 1 dietary recall; sample weights applied.
[b]SE=standard error.
[c]RAE=retinol activity equivalent.
[d]F=fortification (all nutrient addition other than enrichment as defined here).
[e]E=enrichment (addition of thiamin, riboflavin, niacin, folic acid, and iron to wheat flour, pasta, bread, rice, etc, as determined by standards of identity for enriched grains).

Table 8. Top food sources of thiamin (both intrinsic and added to foods) and top food sources of only added thiamin in the diets of children, from National Health and Nutrition Examination Survey 2003-2006[ab]

Food Sources of Both Intrinsic and Added Thiamin				Food Sources of Only Added Thiamin			
Rank	Food grouping	%	Cumulative %	Rank	Food grouping	%	Cumulative %
children 2 to 8 years old[c] (n=2,601)							
1	Ready-to-eat cereal	20.9	20.9	1	Ready-to-eat cereal	39.8	39.8
2	Yeast bread, rolls	9.5	30.4	2	Yeast bread, rolls	13.8	53.6
3	Milk	8.0	38.4	3	Pasta dishes	8.9	62.5
4	Pizza, turnovers	6.7	45.1	4	Pizza, turnovers	8.8	71.3
5	Pasta dishes	6.0	51.1	5	Cake, cookie, quick bread, pastry, pie	5.2	76.5
6	Biscuits, cornbread, pancakes, tortillas	4.0	55.1	6	Biscuits, cornbread, pancakes, tortillas	4.8	81.3
7	Fruit juice	3.8	58.9	7	Crackers, popcorn, pretzels, chips	3.2	84.5
8	Cake, cookie, quick bread, pastry, pie	3.7	62.6				
9	Pork, ham, bacon	3.7	66.3				
10	Crackers, popcorn, pretzels, chips	3.4	69.7				
11	Milk drinks	2.9	72.6				
12	White potatoes	2.8	75.4				
13	Mixtures mainly meat	2.2	77.6				
children/adolescents 9 to 18 years old[d] (n=4,649)							
1	Ready-to-eat cereal	14.7	14.7	1	Ready-to-eat cereal	27.9	27.9
2	Yeast bread, rolls	12.4	37.1	2	Yeast bread, rolls	19.0	46.9
3	Pizza, turnovers	11.0	48.1	3	Pizza, turnovers	14.2	61.1
4	Milk	5.2	53.3	4	Pasta dishes	7.2	68.3
5	Pasta dishes	4.9	58.2	5	Biscuits, cornbread, pancakes, tortillas	5.1	73.4
6	Pork, ham, bacon	4.8	63.0	6	Cake, cookie, quick bread, pastry, pie	5.1	78.5
7	Biscuits, cornbread, pancakes, tortillas	4.1	67.1	7	Sandwiches, bread mixtures	4.3	82.8
8	Sandwiches, bread mixtures	3.9	71.0	8	Tortilla, taco mixtures	3.2	86.0
9	Cake, cookie, quick bread, pastry, pie	3.9	74.9	9	Bars/toaster pastries	2.4	88.4
10	Mixtures mainly meat	3.0	77.9	10	Crackers, popcorn, pretzels, chips	2.2	90.6
11	White potatoes	3.0	80.9				
12	Crackers, popcorn, pretzels, chips	2.9	83.8				
13	Fruit juice	2.7	86.5				
14	Tortilla, taco mixtures	2.6	89.1				

[a]From day 1 dietary recall; sample weights applied.

[b]Table includes data for food groupings contributing ≥2% of intake for the nutrient.

[c]Seven additional food groupings contributed at least 1% each to total dietary intake (in descending order: fruit; sandwiches, bread mixtures; poultry; frankfurters, sausages, luncheon meats; hot breakfast cereals; tortilla, taco mixtures; granola/cereal bars, toaster pastries). Seven additional food groupings contributed at least 1% each to added nutrient intake (in descending order: sandwiches, bread mixtures; rice, cooked grains; mixtures mainly meat, poultry, fish; granola/cereal bars, toaster pastries; soup, broth, bouillon; pasta; tortilla, taco mixtures; hot breakfast cereal).

[d]Seven additional food groupings contributed at least 1% each to total dietary intake (in descending order: granola/cereal bars, toaster pastries; poultry; frankfurters, sausages, luncheon meats; soup, broth, bouillon; milk drinks; fruit; nuts, seed including butters, pastes). Four additional food groupings contributed at least 1% each to added nutrient intake (in descending order: mixtures mainly meat, poultry, fish; rice, cooked grains; soup, broth, bouillon; rice mixtures).

Table 9. Top food sources of riboflavin (both intrinsic and added to foods) and top food sources of only added riboflavin in the diets of children, from National Health and Nutrition Examination Survey 2003-2006[ab]

Food Sources of Both Intrinsic and Added Riboflavin				Food Sources of Only Added Riboflavin			
Rank	Food grouping	%	Cumulative %	Rank	Food grouping	%	Cumulative %
children 2 to 8 years old[c] (n=2,601)							
1	Milk	25.0	25.0	1	Ready-to-eat cereal	53.7	53.7
2	Ready-to-eat cereal	15.6	40.6	2	Yeast bread, rolls	9.1	62.8
3	Milk drinks	7.3	47.9	3	Pizza, turnovers	7.2	70.0
4	Yeast bread, rolls	4.8	52.7	4	Cake, cookie, quick bread, pastry, pie	5.1	75.1
5	Pizza, turnovers	4.3	57.0	5	Pasta dishes	4.7	79.8
6	Pasta dishes	3.7	60.7	6	Biscuits, cornbread, pancakes, tortillas	4.4	84.2
7	Milk desserts	3.0	63.7	7	Crackers, popcorn, pretzels, chips	2.8	87.0
8	Biscuits, cornbread, pancakes, tortillas	2.9	66.6	8	Milk drinks	2.3	89.3
9	Eggs	2.8	69.4	9	Bars/toaster pastries	2.2	91.5
10	Cheese	2.7	72.1				
11	Crackers, popcorn, pretzels, chips	2.6	74.7				
12	Cake, cookie, quick bread, pastry, pie	2.5	77.2				
13	Poultry	2.4	79.6				
14	Mixtures mainly meat	2.1	81.7				
children/adolescents 9 to 18 years old[d] (n=4,649)							
1	Milk	18.8	18.8	1	Ready-to-eat cereal	40.6	40.6
2	Ready-to-eat cereal	12.2	31.0	2	Yeast bread, rolls	13.2	53.8
3	Pizza, turnovers	7.9	38.9	3	Pizza, turnovers	12.5	66.3
4	Yeast bread, rolls	6.9	45.8	4	Cake, cookie, quick bread, pastry, pie	5.7	72.0
5	Milk drinks	4.2	50.0	5	Biscuits, cornbread, pancakes, tortillas	4.4	76.4
6	Pasta dishes	3.3	53.3	6	Pasta dishes	4.1	80.5
7	Sandwiches, bread mixtures	3.2	56.5	7	Bars/toaster pastries	3.9	84.4
8	Cheese	3.1	59.6	8	Sandwiches, etc.	3.0	87.4
9	Cake, cookie, quick bread, pastry, pie	3.0	62.6	9	Tortilla, taco mixtures	2.3	89.7
10	Biscuits, cornbread, pancakes, tortillas	3.0	65.6	10	Crackers, popcorn, pretzels, chips	2.2	91.9
11	Mixtures mainly meat	2.9	68.5				
12	Crackers, popcorn, pretzels, chips	2.8	71.3				
13	Milk desserts	2.8	74.1				
14	Eggs	2.5	76.6				
15	Poultry	2.3	78.9				

[a]From day 1 dietary recall; sample weights applied.

[b]Table includes data for food groupings contributing ≥2% of intake for the nutrient.

[c]Seven additional food groupings contributed at least 1% each to total dietary intake (in descending order: fruit juice; fruit; yogurt; sandwiches, bread mixtures; frankfurters, sausages, luncheon meats; soup, broth, bouillon; fruit drinks, ades). Two additional food groupings contributed at least 1% each to added nutrient intake (in descending order: sandwiches, bread mixtures; mixtures mainly meat, poultry, fish).

[d]Seven additional food groupings contributed at least 1% each to total dietary intake (in descending order: tortilla, taco mixtures; beef; frankfurters, sausages, luncheon meats; pork, ham, bacon; granola/cereal bars, toaster pastries; fruit juice; soup, broth, bouillon). Two additional food groupings contributed at least 1% each to added nutrient intake (in descending order: other nonalcoholic beverages; mixtures mainly meat, poultry, fish).

Table 10. Top food sources of niacin (both intrinsic and added to foods) and top food sources of only added niacin in the diets of children, from National Health and Nutrition Examination Survey 2003-2006[ab]

Food Sources of Both Intrinsic and Added Niacin				Food Sources of Only Added Niacin			
Rank	Food grouping	%	Cumulative %	Rank	Food grouping	%	Cumulative %
children 2 to 8 years old[c] (n=2,601)							
1	Ready-to-eat cereal	20.9	20.9	1	Ready-to-eat cereal	51.6	51.6
2	Poultry	10.4	31.3	2	Yeast bread, rolls	10.4	62.0
3	Yeast bread, rolls	7.7	39.0	3	Pizza, turnovers	6.9	68.9
4	Mixtures mainly meat	5.4	44.4	4	Pasta dishes	5.1	74.0
5	Pizza, turnovers	5.2	49.6	5	Cake, cookie, quick bread, pastry, pie	4.8	78.8
6	Pasta dishes	5.2	54.8	6	Biscuits, cornbread, pancakes, tortillas	3.6	82.4
7	Crackers, popcorn, pretzels, chips	4.5	59.3	7	Crackers, popcorn, pretzels, chips	2.9	85.3
8	Biscuits, cornbread, pancakes, tortillas	3.4	62.7				
9	White potatoes	2.9	65.6				
10	Cake, cookie, quick bread, pastry, pie	2.8	68.4				
11	Frankfurters, sausages, lunch meats	2.7	71.1				
12	Beef	2.5	73.6				
13	Nuts, seeds	2.5	76.1				
14	Pork, ham, bacon	2.2	78.3				
15	Sandwiches, bread mixtures	2.2	80.5				
16	Soup, broth, bouillon	2.2	82.7				
children/adolescents 9 to 18 years old[d] (n=4,649)							
1	Ready-to-eat cereal	13.5	13.5	1	Ready-to-eat cereal	37.0	37.0
2	Poultry	9.4	22.9	2	Yeast bread, rolls	14.2	51.2
3	Yeast bread, rolls	8.9	31.8	3	Pizza, turnovers	11.3	62.5
4	Mixtures mainly meat	7.7	39.5	4	Other nonalcoholic beverages	6.0	68.5
5	Pizza, turnovers	7.7	47.2	5	Cake, cookie, quick bread, pastry, pie	5.0	73.5
6	Beef	4.9	52.1	6	Pasta dishes	4.1	77.6
7	Sandwiches, bread mixtures	4.9	57.0	7	Biscuits, cornbread, pancakes, tortillas	3.9	81.5
8	Pasta dishes	4.3	61.3	8	Sandwiches, bread mixtures	3.2	84.7
9	Crackers, popcorn, pretzels, chips	4.0	65.3	9	Bars/toaster pastries	3.1	87.8
10	Biscuits, cornbread, pancakes, tortillas	3.0	68.3	10	Tortilla, taco mixtures	2.4	90.2
11	White potatoes	2.9	71.2	11	Crackers, popcorn, pretzels, chips	2.2	92.4
12	Pork, ham, bacon	2.8	74.0				
13	Frankfurters, sausages, lunch meats	2.8	76.8				
14	Cake, cookie, quick bread, pastry, pie	2.6	79.4				
15	Tortilla, taco mixtures	2.5	81.9				
16	Other nonalcoholic beverages	2.4	84.3				
17	Nuts, seeds	2.4	86.7				

[a]From day 1 dietary recall; sample weights applied.

[b]Table includes data for food groupings contributing ≥2% of intake for the nutrient.

[c]Seven additional food groupings contributed at least 1% each to total dietary intake (in descending order: fruit juice; milk; fruit; milk drinks; tortilla, taco mixtures; hot breakfast cereal; granola/cereal bars, toaster pastries). Seven additional food groupings contributed at least 1% each to added nutrient intake (in descending order: granola/cereal bars, toaster pastries; other nonalcoholic beverages; sandwiches, bread mixtures; mixtures mainly meat, poultry, fish; soup, broth, bouillon; rice, cooked grains; tortilla, taco mixtures).

[d]Four additional food groupings contributed at least 1% each to total dietary intake (in descending order: granola/cereal bars, toaster pastries; soup, broth, bouillon; fruit juice; fish/shellfish). Two additional food groupings contributed at least 1% each to added nutrient intake (in descending order: mixtures main meat, poultry, fish; rice, cooked grains).

Table 11. Top food sources of vitamin B-6 (both intrinsic and added to foods) and top food sources of only added vitamin B-6 in the diets of children, from National Health and Nutrition Examination Survey 2003-2006[ab]

Food Sources of Both Intrinsic and Added Vitamin B-6				Food Sources of Only Added Vitamin B-6			
Rank	Food grouping	%	Cumulative %	Rank	Food grouping	%	Cumulative %
children 2 to 8 years old[c] (n=2,601)							
1	Ready-to-eat cereal	26.9	26.9	1	Ready-to-eat cereal	90.5	90.5
2	Milk	6.7	33.6	2	Bars/toaster pastries	3.2	93.7
3	Fruit	5.6	39.2	3	Other nonalcoholic beverages	3.0	96.7
4	White potatoes	5.6	44.8				
5	Fruit juice	5.2	50.0				
6	Poultry	4.7	54.7				
7	Biscuits, cornbread, pancakes, tortillas	3.3	58.0				
8	Mixtures mainly meat	3.3	61.3				
9	Crackers, popcorn, pretzels, chips	3.3	64.6				
10	Milk drinks	3.1	67.7				
11	Pasta dishes	2.8	70.5				
12	Beef	2.2	72.7				
children/adolescents 9 to 18 years old[d] (n=4,649)							
1	Ready-to-eat cereal	19.3	19.3	1	Ready-to-eat cereal	77.7	77.7
2	White potatoes	6.3	25.6	2	Other nonalcoholic beverages	12.3	90.0
3	Mixtures mainly meat	5.7	31.3	3	Bars/toaster pastries	6.0	96.0
4	Poultry	5.5	36.8				
5	Milk	4.7	41.5				
6	Beef	4.7	46.2				
7	Crackers, popcorn, pretzels, chips	4.1	50.3				
8	Fruit juice	3.7	54.0				
9	Other nonalcoholic beverages	3.5	57.5				
10	Pizza, turnovers	3.3	60.8				
11	Sandwiches, bread mixtures	3.2	64.0				
12	Fruit	3.1	67.1				
13	Biscuits, cornbread, pancakes, tortillas	2.8	69.9				
14	Pasta dishes	2.6	72.5				
15	Pork, ham, bacon	2.5	75.0				
16	Yeast bread, rolls	2.2	77.2				
17	Tortilla, taco mixtures	2.2	79.4				
18	Frankfurters, sausages, lunch meats	2.1	81.5				

[a]From day 1 dietary recall; sample weights applied.

[b]Table includes data for food groupings contributing ≥2% of intake for the nutrient.

[c]Twelve additional food groupings contributed at least 1% each to total dietary intake (in descending order: pizza, turnovers; pork/ham/bacon; yeast bread, rolls; frankfurters, sausages, luncheon meats; sandwiches, bread mixtures; granola/cereal bars, toaster pastries; soup, broth, bouillon; nuts, seeds including butters/pastes; other nonalcoholic beverages; eggs; hot breakfast cereal; tortilla, taco mixtures). One additional food grouping contributed at least 1% each to added nutrient intake (milk drinks).

[d]Five additional food groupings contributed at least 1% each to total dietary intake (in descending order: granola/cereal bars, toaster pastries; nuts, seeds including butters/pastes; milk drinks; cake, cookies, quick bread, pastry, pie; eggs). One additional food grouping contributed at least 1% each to added nutrient intake (cake, cookies, quick bread, pie).

Table 12. Top Food Sources of vitamin B-12 (both intrinsic and added to foods) and top food sources of only added vitamin B-12 in the diets of children, from National Health and Nutrition Examination Survey 2003-2006[ab]

Food Sources of Both Intrinsic and Added Vitamin B-12				Food Sources of Only Added Vitamin B-12			
Rank	Food grouping	%	Cumulative %	Rank	Food grouping	%	Cumulative %
children 2 to 8 years old[c] (n=2,601)							
1	Milk	26.5	26.5	1	Ready-to-eat cereal	86.2	86.2
2	Ready-to-eat cereal	21.7	48.2	2	Biscuits, cornbread, pancakes, tortillas	5.6	91.8
3	Milk drinks	6.6	54.8	3	Milk drinks	4.3	96.1
4	Mixtures mainly meat	5.6	60.4				
5	Beef	4.1	64.5				
6	Cheese	3.4	67.9				
7	Frankfurters, sausages, lunch meats	3.2	71.1				
8	Pizza, turnovers	3.2	74.3				
9	Fish, shellfish	3.1	77.4				
10	Pasta dishes	2.8	80.2				
11	Eggs	2.8	83.0				
12	Sandwiches, bread mixtures	2.2	85.2				
13	Milk desserts	2.2	87.4				
children/adolescents 9 to 18 years old[d] (n=4,649)							
1	Milk	19.5	19.5	1	Ready-to-eat cereal	74.5	74.5
2	Ready-to-eat cereal	16.3	35.8	2	Other nonalcoholic beverages	15.5	90.0
3	Beef	9.6	45.4	3	Biscuits, cornbread, pancakes, tortillas	5.8	95.8
4	Mixtures mainly meat	5.5	50.9				
5	Sandwiches, bread mixtures	5.3	56.2				
6	Pizza, turnovers	5.2	61.4				
7	Cheese	4.0	65.4				
8	Frankfurters, sausages, lunch meats	3.7	69.1				
9	Fish, shellfish	3.7	72.8				
10	Other nonalcoholic beverages	3.4	76.2				
11	Milk drinks	3.2	79.4				
12	Eggs	2.4	81.8				
13	Pasta dishes	2.3	84.1				
14	Tortilla, taco mixtures	2.3	86.4				

[a]From day 1 dietary recall; sample weights applied.

[b]Table includes data for food groupings contributing ≥2% of intake for the nutrient.

[c]Five additional food groupings contributed at least 1% each to total dietary intake (in descending order: biscuits, corn bread, pancakes, tortillas; poultry; yogurt; pork, ham, bacon; tortilla, taco mixtures). One additional food grouping contributed at least 1% to added nutrient intake (other nonalcoholic beverages).

[d]Four additional food groupings contributed at least 1% each to total dietary intake (in descending order: milk desserts; pork, ham, bacon; poultry; biscuits, corn bread, pancakes, tortillas). Two additional food groupings contributed at least 1% each to added nutrient intake (in descending order: granola/cereal bars, toaster pastries; cake, cookies, quick bread, pastry, pie).

Table 13. Top food sources of zinc (both intrinsic and added to foods) and top food sources of only added zinc in the diets of children, from National Health and Nutrition Examination Survey 2003-2006[ab]

Food Sources of Both Intrinsic and Added Zinc				Food Sources of Only Added Zinc			
Rank	Food grouping	%	Cumulative %	Rank	Food grouping	%	Cumulative %
children 2 to 8 years old[c] (n=2,601)							
1	Ready-to-eat cereal	18.5	18.5	1	Ready-to-eat cereal	96.8	96.8
2	Milk	12.4	30.9				
3	Beef	5.2	36.1				
4	Pasta dishes	4.7	40.8				
5	Mixtures mainly meat	4.7	45.5				
6	Pizza, turnovers	4.7	50.2				
7	Milk drinks	4.2	54.4				
8	Cheese	4.1	58.5				
9	Poultry	3.7	62.2				
10	Crackers, popcorn, pretzels, chips	3.6	65.8				
11	Frankfurters, sausages, lunch meats	3.2	69.0				
12	Yeast bread, rolls	3.0	72.0				
13	Sandwiches, bread mixtures	2.5	74.5				
children/adolescents 9 to 18 years old[d] (n=4,649)							
1	Ready-to-eat cereal	11.7	11.7	1	Ready-to-eat cereal	95.0	95.0
2	Beef	10.5	22.2				
3	Milk	8.0	30.2				
4	Pizza, turnovers	7.1	37.3				
5	Mixtures mainly meat	7.1	44.4				
6	Sandwiches, bread mixtures	5.2	49.6				
7	Cheese	4.4	54.0				
8	Crackers, popcorn, pretzels, chips	3.9	57.9				
9	Pasta dishes	3.8	61.7				
10	Yeast bread, rolls	3.7	65.4				
11	Tortilla, taco mixtures	3.7	69.1				
12	Poultry	3.6	72.7				
13	Frankfurters, sausages, lunch meats	3.2	75.9				
14	Pork, ham, bacon	2.4	78.3				

[a]From day 1 dietary recall; sample weights applied.

[b]Table includes data for food groupings contributing ≥2% of intake for the nutrient.

[c]Twelve additional food groupings contributed at least 1% each to total dietary intake (in descending order: milk desserts; tortilla, taco mixtures; pork, ham, bacon; cake, cookies, quick bread, pastry, pie; eggs; candy, sugars, and sugary foods; white potatoes; legumes; yogurt; biscuits, cornbread, pancakes, tortillas; nuts, seeds including butters/pastes; soup, broth, bouillon). One additional food grouping contributed at least 1% each to added nutrient intake (granola/cereal bars, toaster pastries).

[d]Nine additional food groupings contributed at least 1% each to total dietary intake (in descending order: milk drinks; cake, cookies, quick bread, pastry, pie; nuts, seeds including butters/pastes; milk desserts; white potatoes; candy, sugars, and sugary foods; eggs; legumes; biscuits, cornbread, pancakes, tortillas). Three additional food groupings contributed at least 1% each to added nutrient intake (in descending order: crackers, popcorn, pretzels, chips; granola/cereal bars, toaster pastries; meal replacements/supplements).