

Current Research

Sources of Energy and Nutrients in the Diets of Infants and Toddlers

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Editor's note: Tables 11-25 that accompany this article are available online at www.adajournal.org.

ABSTRACT

Objective To identify major sources of energy and 24 nutrients and dietary constituents in the diets of US infants and toddlers and to describe shifts in major nutrient sources as children age.

Design Data from 24-hour recalls collected in the 2002 Feeding Infants and Toddlers Study were analyzed to determine the percentage contribution of foods and supplements to total intakes of energy, nutrients, and other dietary constituents. A total of 3,586 unique foods and dietary supplements were reported. Reported foods and supplements were classified into 71 groups based on similarities in nutrient content and use. Nine-hundred seventy-nine food mixtures were disaggregated into their ingredients and ingredients were classified into one of the 71 groups using the same decision rules that guided classification of foods analyzed at the whole food level.

Subjects/setting A national random sample of 3,022 US infants and toddlers 4 to 24 months of age.

Statistical analyses performed The population proportion formula was used to determine the percentage contribution of each of the 71 groups to total intakes. This was done by summing the weighted amount of a given nutrient provided by a given group for all individuals in the sample and dividing by the total weighted amount of that nutrient consumed by all individuals from all foods and sup-

plements. Groups that provided at least 1% of the nutrient in question were rank-ordered. Separate tabulations were prepared for three age groups (4-5 months, 6-11 months, and 12-24 months).

Results Infant formula, breast milk, and milk are major contributors of energy and most nutrients in the diets of infants and toddlers. Among toddlers, juices and fruit-flavored drinks are the second and third most important sources of energy. Fortified foods make substantial contributions to intakes of many essential nutrients, and these contributions increase as children age. For example, among toddlers, fortified grain-based foods make substantial contributions to intakes of vitamin A, iron, and folate, relative to foods that are naturally rich in these nutrients. Supplements also make substantial contributions to intakes of vitamins and selected minerals, particularly among toddlers.

Conclusions In assessing dietary intakes of infants and toddlers, dietetics professionals need to carefully consider contributions of fortified foods and supplements. Dietetics professionals should educate caregivers of infants and toddlers about the importance of foods (rather than just nutrients) in promoting health and about the importance of early feeding practices in the development of lifelong eating habits. Caregivers should be encouraged to avoid relying on fortified foods and supplements to meet nutrient needs and educated about the potential risk of excessive intakes. Caregivers of toddlers and infants over 4 to 6 months of age who are consuming solid foods should be encouraged to feed a wide variety of fruits, vegetables, and whole grains, as well as foods naturally rich in iron. *J Am Diet Assoc. 2006;106:S28-S42.*

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The relative contribution of specific foods and food groups to total nutrient intakes has been studied since the early 1980s, when Bachter and Nichols introduced the concept of characterizing foods as "important" rather than "rich" sources of nutrients (1). The relative importance of a food, as a source of a particular nutrient, is influenced by both the concentration of the nutrient in the food and the frequency of its consumption. As Subar and colleagues (2) point out, yeast breads are a relatively poor source of calcium, but they made an important contribution (nearly 9%) to overall calcium intakes reported in the 1989-1991 Continuing Survey of Food Intakes by Individuals (CSFII) because they were consumed so frequently. Conversely, even though very few people consumed liver and organ meats, these foods, which are concentrated sources of vitamin A, contributed about 5% to overall vitamin A intake (2). Information about the relative contributions of various foods and food

groups can be useful to dietetics professionals, physicians, health educators, policy makers, and the food industry for gaining a more complete understanding of the foods that are driving energy and nutrient intakes of specific population groups. Such data have also been useful to epidemiologists and other nutrition researchers in studying diet-disease relationships and in developing food frequency questionnaires and other dietary assessment instruments.

Over the years, a number of researchers have assessed food sources of energy and/or one or more nutrients or dietary constituents for the US population overall and/or for various subgroups of adults (3-24). By comparison, relatively few such studies have focused on children (2,25-34). Moreover, with one exception, published research includes only children 2 years of age and older. To our knowledge, the only published report that included children younger than 2 is an analysis of data from the Hispanic Health and Nutrition Examination Survey (30). That study focused on low-income Hispanic children 1 to 5 years of age, but did not analyze data by year of age. This article is intended to fill this information gap by reporting the sources of energy and 24 nutrients and dietary constituents among US infants and toddlers. The analysis uses data from the 2002 Feeding Infants and Toddlers Study (FITS), which collected dietary intake data on a stratified, random sample of infants and toddlers 4 to 24 months of age. A unique feature of our analysis is that it includes contributions of dietary supplements. All of the studies referenced in the preceding discussion assessed food sources of nutrients only, and did not consider contributions of dietary supplements. Thus, our data provide information on sources of nutrients based on total intake (food+supplements). Inclusion of data on supplements provides insights about the relative importance of vitamin and mineral supplements in the nutrient intakes of infants and toddlers. A complete description of supplement use among infants and toddlers is provided in the article by Briefel and colleagues (35), also published in this supplement.

METHODS

Sample Design and Subjects

The 2002 FITS was sponsored by Gerber Products Company to update our knowledge of the food and nutrient intakes of infants and toddlers in the United States (36). FITS included a stratified random sample of infants between 4 and 24 months of age. The sample was drawn from Experian's New Parent Database, February to May, 2002, Experian (Lincoln, NE) because it was judged to provide the greatest coverage of infants and toddlers. Infants and toddlers were sampled in six age groups: 4 to 6 months, 7 to 8 months, 9 to 11 months, 12 to 14 months, 15 to 18 months, and 19 to 24 months. Infants 4 to 6 and 9 to 11 months of age were oversampled because these two age groups typically experience significant transitions in infant feeding patterns and practices (from liquid diets to the addition of complementary foods, and from complementary foods to the addition of table foods, respectively). Sample weights were developed to adjust for oversampling, nonresponse, and undercoverage of some subgroups of children not included in the sample frame. A

detailed overview of the FITS study design and sample is available elsewhere (36,37).

In this article (and others in this supplement), we have modified the reporting categories for the two youngest age groups, relative to the age groups that have been used in previous reports of FITS data (38-45). This change was made in response to recent clarifications about the intended age groups for infants in the Dietary Reference Intakes (DRIs) (46-51). The life stage groups used in the DRIs define infancy as the period from birth through 12 months of age and "divide [it] into two 6-month intervals." Thus, although some text and tables in the DRI reports refer to 0 to 6 months and 7 to 12 months, the actual intent is 0 through 5 months (0-5.99)—the first 6 months of life—and 6 through 11 months (6.0-11.99)—the second 6 months of life (Janice Rice Okita, PhD, RD, senior program officer, Food and Nutrition Board, Institute of Medicine, personal communication, June 7, 2005). For this reason, this article limits the youngest age group to infants 4 and 5 months old and includes infants 6 months of age in the second age group (6-11 months). The sample includes 3,022 infants, in the following age groups: 4 to 5 months (n=624), 6 to 11 months (n=1,395), and 12 to 24 months (n=1,003).

Data Collection Methods

FITS data were collected by Mathematica Policy Research, Inc (Princeton, NJ). All data collection instruments and procedures were reviewed and approved by Mathematica Policy Research, Inc's institutional review board compliance officer and quality assurance system. Parents or primary caregivers of sampled infants and toddlers completed a single 24-hour dietary recall. A random subsample of 703 respondents completed a second 24-hour dietary recall 3 to 10 days after the first recall, on a different day of the week. The second recall was collected to support estimates of usual nutrient intakes and comparisons to the DRIs (35,38) and was not used in the analyses presented in this article. All recalls were completed between March and July 2002. Trained interviewers conducted the 24-hour recalls over the telephone using the Nutrition Data System for Research (version 4.03, 2001, University of Minnesota Nutrition Coordinating Center, Minneapolis). An information packet was mailed to respondents a week to 10 days prior to the interview. The packet included a detailed two-dimensional booklet for use in reporting portion sizes. The booklet was designed specifically for FITS and was pilot-tested with mothers of infants and toddlers.

Data on use of dietary supplements were collected as part of the 24-hour recall. After dietary interviewers had collected information about all foods and beverages consumed, they asked caregivers whether the child had taken any supplements ("Did ___ take any vitamin, mineral, or other dietary or herbal supplement yesterday?"). Respondents were asked to consider both prescribed and over-the-counter supplements. When supplements had been consumed, interviewers encouraged respondents to get the bottle(s) and use the label(s) to provide information on supplement type and dosage. Interviewers entered information following Nutrition Data System for Research prompts. Supplement information could be recorded by brand name or as a generic type of supplement

selected from a menu list. (Approximately 70% of respondents reported supplements by brand name.) Additional information on the collection and analysis of data on dietary supplements is provided elsewhere (35).

Breastfed infants and toddlers were included in the study. Recall data for infants and toddlers who were exclusively breastfed assume intakes of 780 mL per day and 600 mL per day, respectively, for infants less than 7 months and infants 7 months and older. For infants and toddlers who were receiving both breast milk and formula, the volume of formula was subtracted from these totals to estimate the amount of breast milk consumed. The method used to impute breast milk intake was based on assumptions used in establishing calcium DRIs (46) and has been used by other researchers (52). Additional details about collection, processing, and quality control of 24-hour recall data are available elsewhere (36,37).

Analytic Methods

Our analysis was designed to be as similar as possible to the methods initially developed by Krebs-Smith and colleagues (13) and later expanded by Subar and colleagues (2,9). These methods have been used in analyzing food sources of nutrients in both the 1989-1991 (2,9) and 1994-1996 (4) rounds of the CSFII. The most important feature of this analytic approach is the disaggregation of many food mixtures into their constituent ingredients. This permits a more precise assessment of the relative contributions of specific foods. For example, if pizza were included in a "grain mixtures" group rather than broken down into its components, the contribution of grains to calcium intake would be overestimated and the contribution of cheese would be underestimated.

The analysis is based on the single 24-hour recall completed for all sampled infants and toddlers. A food classification scheme, consisting of 71 groups (Figure), was created based on the scheme developed by Subar and colleagues (2,9) for analyses of 1989-1991 CSFII data and used most recently by Cotton and colleagues (4) in analyzing 1994-1996 CSFII data for adults. Some food groups considered separately in the CSFII analyses were collapsed for the FITS analysis because of low frequency. Other food groups considered in the CSFII scheme were omitted because they were not reported in the FITS sample. Finally, dietary supplements as well as foods unique to infants and toddlers (eg, infant formulas, baby food desserts, and baby food dinners) were added. We elected to make baby food dinners their own food group rather than disaggregate them so we could track their contribution to nutrient intakes. Findings from a previous FITS analysis revealed that caregivers of infants under 9 months were more likely to feed baby food dinners than to feed plain meats (39). In addition, soy milk was included in the milk group based on food use; for infants and toddlers who consume it, soy milk takes the place of cow's milk.

In the remainder of this article, the term *food group* is used to refer to all 71 groups shown in the Figure, including the two supplement groups. Of the 3,586 unique foods and supplements reported, 2,607 (73%) were assigned to one of the 71 groups. These included all dietary supplements, single-ingredient foods such as milk, fruit, unseasoned meats and vegetables, and some multiple-ingredient

foods that are considered single foods in dietary guidance systems, such as MyPyramid (53), or are considered single items by consumers. Examples include bread, pancakes and waffles, baked desserts, ice cream, ready-to-eat cereals, condiments, sauces, gravies, salad dressings, and fruited yogurt. The remaining 979 foods (27%) were food mixtures that were disaggregated into their ingredients using component-level (ie, recipe) files included in the Nutrition Data System for Research database. The nutrient data included in these files have been adjusted for gains or losses associated with preparation and cooking and, for each nutrient, the sum of all ingredients is equivalent to the total for the food mixture. Foods that were disaggregated include sandwiches, salads, soups, casseroles, pasta-based dishes, pizza, seasoned vegetables, french fries, and most meats prepared with added fat and/or breading. Ingredients from these disaggregated foods were assigned to appropriate food groups. We were unable to disaggregate 36 unique food mixtures (3.5% of all food mixtures flagged for disaggregation) because a component file was not available. This occurred for commercially prebreaded chicken and fish, some commercial meat substitutes, and some flavored milks. These foods were assigned to food groups based on major ingredients.

Vitamin A and folate were estimated in units consistent with the DRIs. The version of the Nutrition Data System for Research database used in the analysis included dietary folate equivalents. Vitamin A in retinol activity equivalents was estimated from Nutrition Data System for Research values for retinol and carotenoids using the following formula (54):

$$\text{retinol activity equivalents} = \mu\text{g retinol} + \frac{1}{2}(\mu\text{g beta-carotene equivalents}/6)$$

Statistical Analyses

Statistical Analysis Software (version 8.2, 2001, SAS Institute, Inc, Cary, NC) was used to create data files and to assign all foods, ingredients, and supplements to one of the 71 groups. After all group assignments were made, population proportions were calculated to estimate the contribution of each group to intakes of energy and 24 nutrients and dietary constituents. This was done by summing the weighted amount of a given nutrient provided by a given food group for all individuals in the sample and dividing by the total weighted amount of that nutrient consumed by all individuals from all foods and supplements. These analyses were completed using SUDAAN (version 9.0, 2004, Research Triangle Institute, Research Triangle Park, NC) to correctly incorporate sample weights and design effects for the complex survey. Separate analyses were completed for infants 4 to 5 months old, infants 6 to 11 months old, and toddlers 12 to 24 months old. Intakes of infants 4 to 5 months were analyzed separately because their largely formula/breast milk-based diet is substantially different from the diet of older infants.

RESULTS

Tables 1 to 10 provide information for energy and nine major nutrients: protein; fats (total, saturated fat, and

| | | |
|--|---|--|
| <p>Milk and milk products Breast milk Infant formula Milk^a Cheese^b Yogurt</p> <p>Meat/poultry/fish/meat alternates Beef Hot dogs/cold cuts (other than ham)/sausages/bacon Lamb Pork/ham Veal Game Organ meats Chicken/turkey Fish/shellfish Eggs^c Dried beans and peas/soy/tofu/meat substitutes Peanut butter/nuts/seeds Baby food dinners</p> <p>Grains and grain products Infant cereal (dry) Bread/rolls/biscuits/bagels/tortillas/English muffins Noninfant cereals (ready-to-eat/hot) Pancakes/waffles/french toast Crackers/pretzels/rice cakes Cereal/granola bars Pasta/noodles Rice Other grains/grain products^d Flour/baking ingredients^e</p> | <p>Vegetables Broccoli Carrots Corn Green beans Mixed/garden vegetables Peas Potatoes (white) Spinach/greens Sweet potatoes/yams Tomatoes/tomato sauce Winter squash Other vegetables^f</p> <p>Fruits (sweetened/unsweetened) Apples/applesauce Apricots Bananas Berries Citrus fruits Fruit cocktail/mixed fruits Peaches/nectarines/plums Pears Grapes Melons Dried fruits (except apricots) Other fruits^g 100% juice</p> | <p>Desserts and sweets Baby food desserts Cakes/pies/pastries/doughnuts/muffins/quickbreads Cookies Ice cream/frozen yogurt/sherbet/pudding Other desserts Sugar/syrups/jams/jellies/other sweeteners Sweetened beverages Candy</p> <p>Other Salad dressings/mayonnaise Gravies/sauces Butter/oil/margarine/other fats^h Condimentsⁱ Chips/other salty snacks Consomme/broth/bouillon Other foods^j Other beverages^k</p> <p>Supplements Vitamin and mineral supplements Other supplements^l</p> |
| <p>^aIncludes cow's milk/soy milk/and goat's milk. ^bExcludes cream cheese. ^cIncludes only eggs reported separately and eggs included in disaggregated food mixtures. ^dIncludes buckwheat groats/barley/couscous/quinoa/bran/wheat germ/bread crumbs. ^eIncludes flour/cornstarch/yeast/baking powder/cornmeal included in disaggregated food mixtures. ^fIncludes onions/cabbage/artichoke/asparagus/beets/cauliflower/celery/eggplant/peppers/mushrooms/okra/pea pods/zucchini/summer squash/water chestnuts/lettuce (other than Romaine)/cucumbers/kohlrabi/leeks/parsnips/seaweed/kelp. ^gIncludes avocado/pineapple/cherries/kiwi/mango/papaya/prunes. ^hIncludes lard/animal fats and regular/low-fat/fat-free versions of cream cheese/sour cream/cream/cream substitutes/half-and-half. ⁱIncludes mustard/catsup/olives/pickles/pickle relish/pimento/vinegar/bacon bits/horseradish/condiment sauces (cocktail/steak/chili/enchilada/barbeque/sweet and sour/soy/taco/teriyaki/miso/tartar/hoisin/hot pepper/Worcestershire). ^jIncludes salt from disaggregated food mixtures/herbs and spices/monosodium glutamate/starch/plain gelatin/artificial sweeteners/pectin/cocoa powder. ^kIncludes unsweetened tea and coffee and alcoholic beverages. ^lPrimarily electrolyte replacement beverages; also includes one fiber supplement and one antacid tablet.</p> | | |

Figure. Food group classifications. Food classification scheme was adapted from the one developed by Subar and colleagues (2,9). Food groups are based on 3,586 individual foods and include those consumed individually or as part of food mixtures that were disaggregated (spaghetti and other pasta-based dishes/pizzas/soups/casseroles/salads/vegetables with added fats (including french fries)/most meat/poultry/fish with added breading and/or fat/sandwiches).

cholesterol); carbohydrates; dietary fiber; and vitamins A, C, and E. Tables 11-25 are presented online only (available at www.adajournal.org) and provide information for 15 other nutrients (eg, vitamins K and D, six of the B-vitamins, calcium, iron, zinc, and other minerals/electrolytes). In each table, separate panels for 4 to 5 month-olds, 6- to 11-month-olds, and 12- to 24-month-olds list food groups in descending order of importance based on

contribution to total intakes. In each panel, lists are limited to food groups that contributed at least 1% of total intake. As noted, dietary supplements are included in the analysis. The relative importance of specific food groups is the same as it would be if supplements were not included. Point estimates for food (only) sources of nutrients can be computed from the data presented in Tables 1 to 25 by using the following formula:

Table 1. Sources of energy among US infants and toddlers 4 to 24 months of age from the 2002 Feeding Infants and Toddlers Study

| 4 to 5 Months | | | 6 to 11 Months | | | 12 to 24 Months | | |
|---------------|----------------|------------|----------------|--------------------------------------|------------|-----------------|--|------------|
| Rank | Food group | % of Total | Rank | Food group | % of Total | Rank | Food group | % of Total |
| 1 | Infant formula | 56.1 | 1 | Infant formula | 43.1 | 1 | Milk (cow's/goat's/soy) | 23.6 |
| 2 | Breast milk | 32.1 | 2 | Breast milk | 10.7 | 2 | 100% juice | 6.4 |
| 3 | Infant cereal | 5.3 | 3 | Infant cereal | 6.5 | 3 | Sweetened beverages | 4.7 |
| 4 | 100% juice | 1.5 | 4 | 100% juice | 4.4 | 4 | Cheese | 4.3 |
| | | | 5 | Milk (cow's/goat's/soy) | 3.4 | 5 | Bread/rolls/biscuits/bagels/tortilla | 4.1 |
| | | | 6 | Baby food dinners | 3.2 | 6 | Chicken/turkey | 3.7 |
| | | | 7 | Bananas | 2.7 | 7 | Butter/oil/margarine/other fats | 3.6 |
| | | | 8 | Cookies | 1.8 | 8 | Noninfant cereals | 3.3 |
| | | | 9 | Apples/applesauce | 1.7 | 9 | Cookies | 3.2 |
| | | | 10 | Baby food desserts | 1.6 | 10 | Hot dogs/cold cuts/sausages/bacon | 2.6 |
| | | | 11 | Bread/rolls/biscuits/bagels/tortilla | 1.2 | 11 | Pasta | 2.6 |
| | | | 12 | Crackers/pretzels/rice cakes | 1.2 | 12 | Crackers/pretzels/rice cakes | 2.5 |
| | | | 13 | Noninfant cereals | 1.2 | 13 | Flour/baking ingredients | 2.4 |
| | | | 14 | Pears | 1.2 | 14 | Bananas | 2.1 |
| | | | 15 | Cheese | 1.1 | 15 | Beef | 2.0 |
| | | | | | | 16 | Infant formula | 1.9 |
| | | | | | | 17 | White potatoes | 1.9 |
| | | | | | | 18 | Cakes/pies/other baked goods | 1.7 |
| | | | | | | 19 | Breast milk | 1.6 |
| | | | | | | 20 | Yogurt | 1.5 |
| | | | | | | 21 | Eggs | 1.5 |
| | | | | | | 22 | Pancakes/waffles/french toast | 1.5 |
| | | | | | | 23 | Chips/other salty snacks | 1.3 |
| | | | | | | 24 | Ice cream/frozen yogurt/pudding | 1.2 |
| | | | | | | 25 | Sugar/syrups/jams/jellies/other sweeteners | 1.1 |
| | | | | | | 26 | Rice | 1.1 |

Table 2. Sources of protein among US infants and toddlers 4 to 24 months of age from the 2002 Feeding Infants and Toddlers Study

| 4 to 5 Months | | | 6 to 11 Months | | | 12 to 24 Months | | |
|---------------|----------------|------------|----------------|--------------------------------------|------------|-----------------|--------------------------------------|------------|
| Rank | Food group | % of Total | Rank | Food group | % of Total | Rank | Food group | % of Total |
| 1 | Infant formula | 64.6 | 1 | Infant formula | 39.9 | 1 | Milk (cow's/goat's/soy) | 35.8 |
| 2 | Breast milk | 23.7 | 2 | Milk (cow's/goat's/soy) | 7.9 | 2 | Chicken/turkey | 11.2 |
| 3 | Infant cereal | 6.2 | 3 | Infant cereal | 6.8 | 3 | Cheese | 8.2 |
| | | | 4 | Breast milk | 6.5 | 4 | Beef | 5.1 |
| | | | 5 | Baby food dinners | 5.5 | 5 | Bread/rolls/biscuits/bagels/tortilla | 3.3 |
| | | | 6 | Chicken/turkey | 4.6 | 6 | Eggs | 3.2 |
| | | | 7 | Cheese | 3.1 | 7 | Hot dogs/cold cuts/sausages/bacon | 2.8 |
| | | | 8 | Beef | 1.9 | 8 | Pasta | 2.3 |
| | | | 9 | Yogurt | 1.8 | 9 | Flour/baking ingredients | 2.2 |
| | | | 10 | Bread/rolls/biscuits/bagels/tortilla | 1.6 | 10 | Noninfant cereals | 2.2 |
| | | | 11 | Noninfant cereals | 1.4 | 11 | Pork/ham | 2.0 |
| | | | 12 | Bananas | 1.3 | 12 | Yogurt | 1.8 |
| | | | 13 | Pasta | 1.2 | 13 | Fish/shellfish | 1.8 |
| | | | 14 | Peas | 1.1 | 14 | Crackers/pretzels/rice cakes | 1.3 |
| | | | 15 | Eggs | 1.1 | 15 | Infant formula | 1.2 |
| | | | 16 | Pork/ham | 1.0 | 16 | Pancakes/waffles/french toast | 1.1 |
| | | | | | | 17 | 100% juice | 1.0 |
| | | | | | | 18 | Cookies | 1.0 |

Table 3. Sources of total fat among US infants and toddlers 4 to 24 months of age from the 2002 Feeding Infants and Toddlers Study

| 4 to 5 Months | | | 6 to 11 Months | | | 12 to 24 Months | | |
|---------------|----------------|------------|----------------|---------------------------------|------------|-----------------|--------------------------------------|------------|
| Rank | Food group | % of Total | Rank | Food group | % of Total | Rank | Food group | % of Total |
| 1 | Infant formula | 58.4 | 1 | Infant formula | 57.5 | 1 | Milk (cow's/goat's/soy) | 32.0 |
| 2 | Breast milk | 39.5 | 2 | Breast milk | 17.1 | 2 | Butter/oil/margarine/other fats | 11.1 |
| 3 | Infant cereal | 1.2 | 3 | Milk (cow's/goat's/soy) | 4.4 | 3 | Cheese | 8.8 |
| | | | 4 | Butter/oil/margarine/other fats | 2.7 | 4 | Hot dogs/cold cuts/sausages/bacon | 6.1 |
| | | | 5 | Baby food dinners | 2.4 | 5 | Chicken/turkey | 4.7 |
| | | | 6 | Cheese | 2.2 | 6 | Beef | 3.4 |
| | | | 7 | Infant cereal | 2.1 | 7 | Cookies | 3.2 |
| | | | 8 | Cookies | 1.5 | 8 | Eggs | 2.8 |
| | | | 9 | Crackers/pretzels/rice cakes | 1.2 | 9 | Breast milk | 2.7 |
| | | | | | | 10 | Crackers/pretzels/rice cakes | 2.7 |
| | | | | | | 11 | Infant formula | 2.6 |
| | | | | | | 12 | Bread/rolls/biscuits/bagels/tortilla | 2.1 |
| | | | | | | 13 | Chips/other salty snacks | 2.1 |
| | | | | | | 14 | Cakes/pies/other baked goods | 1.9 |
| | | | | | | 15 | Peanut butter/nuts/seeds | 1.9 |
| | | | | | | 16 | Ice cream/frozen yogurt/pudding | 1.3 |
| | | | | | | 17 | Pancakes/waffles/and french toast | 1.2 |
| | | | | | | 18 | Noninfant cereals | 1.1 |

Table 4. Sources of saturated fat among US infants and toddlers 4 to 24 months of age from the 2002 Feeding Infants and Toddlers Study

| 4 to 5 Months | | | 6 to 11 Months | | | 12 to 24 Months | | |
|---------------|----------------|------------|----------------|---------------------------------|------------|-----------------|--------------------------------------|------------|
| Rank | Food group | % of Total | Rank | Food group | % of Total | Rank | Food group | % of Total |
| 1 | Infant formula | 60.4 | 1 | Infant formula | 61.4 | 1 | Milk (cow's/goat's/soy) | 44.5 |
| 2 | Breast milk | 38.4 | 2 | Breast milk | 17.3 | 2 | Cheese | 12.7 |
| | | | 3 | Milk (cow's/goat's/soy) | 5.8 | 3 | Butter/oil/margarine/other fats | 7.9 |
| | | | 4 | Cheese | 3.2 | 4 | Hot dogs/cold cuts/sausages/bacon | 5.2 |
| | | | 5 | Butter/oil/margarine/other fats | 2.0 | 5 | Beef | 3.0 |
| | | | 6 | Baby food dinners | 1.8 | 6 | Chicken/turkey | 2.9 |
| | | | | | | 7 | Breast milk | 2.8 |
| | | | | | | 8 | Infant formula | 2.7 |
| | | | | | | 9 | Cookies | 2.3 |
| | | | | | | 10 | Eggs | 2.0 |
| | | | | | | 11 | Ice cream/frozen yogurt/pudding | 1.5 |
| | | | | | | 12 | Crackers/pretzels/rice cakes | 1.5 |
| | | | | | | 13 | Cakes/pies/other baked goods | 1.5 |
| | | | | | | 14 | Bread/rolls/biscuits/bagels/tortilla | 1.2 |

[% contribution for food group X]

$$\div [(100 - \% \text{ contribution for supplements}) \div 100]$$

Energy, Macronutrients, Cholesterol, and Fiber

For all groups of infants and toddlers, infant formula, breast milk, or milk is the first or first and second most important source of energy, macronutrients, and cholesterol (Tables 1-6). Infant formula is the leading source of energy and all macronutrients for the first year of life and is replaced by milk in the second year of life. The percent-

age of energy contributed by milks (formula, breast milk, and milk) declines steadily as children age, going from 88% of energy at 4 to 5 months to 24% of energy at 12 to 24 months. The most precipitous drop in the contribution of milks (from 88% of energy to 66%) occurs between 4 to 5 months and 6 to 8 months, as infants begin consuming complementary foods (data not shown). Comparable patterns are noted for all macronutrients.

Among infants 6 to 11 months, nonmilk foods included in the top 10 sources of energy are infant cereal, 100% juice, commercial baby food dinners, bananas, cookies, apples/

Table 5. Sources of cholesterol among US infants and toddlers 4 to 24 months of age from the 2002 Feeding Infants and Toddlers Study

| 4 to 5 Months | | | 6 to 11 Months | | | 12 to 24 Months | | |
|---------------|----------------|------------|----------------|-----------------------------------|------------|-----------------|-----------------------------------|------------|
| Rank | Food group | % of Total | Rank | Food group | % of Total | Rank | Food group | % of Total |
| 1 | Breast milk | 86.1 | 1 | Breast milk | 34.0 | 1 | Milk (cow's/goat's/soy) | 32.1 |
| 2 | Infant formula | 12.0 | 2 | Eggs | 14.9 | 2 | Eggs | 28.4 |
| | | | 3 | Milk (cow's/goat's/soy) | 10.6 | 3 | Chicken/turkey | 8.8 |
| | | | 4 | Infant formula | 9.8 | 4 | Cheese | 7.0 |
| | | | 5 | Baby food dinners | 8.2 | 5 | Beef | 4.2 |
| | | | 6 | Chicken/turkey | 5.8 | 6 | Hot dogs/cold cuts/sausages/bacon | 3.4 |
| | | | 7 | Cheese | 4.4 | 7 | Pancakes/waffles/french toast | 2.3 |
| | | | 8 | Beef | 2.4 | 8 | Butter/oil/margarine/other fats | 2.2 |
| | | | 9 | Butter/oil/margarine/other fats | 1.5 | 9 | Breast milk | 2.2 |
| | | | 10 | Hot dogs/cold cuts/sausages/bacon | 1.2 | 10 | Pork/ham | 1.5 |
| | | | 11 | Pork/ham | 1.1 | 11 | Fish/shellfish | 1.4 |
| | | | 12 | Cakes/pies/other baked goods | 1.0 | 12 | Ice cream/frozen yogurt/pudding | 1.2 |
| | | | | | | 13 | Cakes/pies/other baked goods | 1.2 |

applesauce, and commercial baby food desserts. Nonmilk foods included in the top 10 energy sources for toddlers 12 to 24 months are notably different, reflecting increased consumption of foods from the family table: 100% juice, sweetened beverages (mainly fruit-flavored drinks), cheese, bread/rolls/biscuits/bagels/tortillas, chicken/turkey, butter/oil/margarine/other fats, noninfant cereals, cookies, and hot dogs/cold cuts/sausages/bacon. Full-strength juices and sweetened beverages are the second and third most important sources of energy in this age group. The energy contribution of sweetened beverages increases as toddlers age—from 3% of total energy intake among 12- to 14-month-olds to 6% among 19- to 24-month-olds (data not shown).

For infants 4 to 11 months, the most important nonmilk contributor to protein intake is infant cereals. Among infants 6 to 11 months, commercial baby food dinners and chicken/turkey each contribute about 5% to 6% of protein intake. The fact that baby food dinners and chicken/turkey [the most commonly consumed meat (39)] make comparable contributions to total protein intake, despite the significantly larger concentration of protein in chicken/turkey (eg, 9 g protein per oz of chicken breast vs 0.6 to 0.8 g protein per oz of commercial baby food chicken dinners*) reflects the fact that relatively few infants consume meats before 9 months of age. A previous FITS analysis found that among infants 7 and 8 months old, 40% consumed baby food dinners in a day, compared with 4% for commercial baby food meats and 8% for non-baby food meats (39). By 12 to 24 months, infant cereals and commercial baby food dinners have been replaced by cheese and beef as leading nonmilk contributors to protein intake.

Among infants, the vast majority of fat (79% to 98%) is provided by infant formula, breast milk, and milk. Among toddlers, all of these types of milk contribute about 37% of

total fat intake. Fifteen other food groups provide at least 1% of fat in toddlers' diets. Of these nonmilk groups, the top 10 are butter/oil/margarine/other fats, cheese, hot dogs/cold cuts/sausages/bacon, chicken/turkey, beef, cookies, eggs, crackers/pretzels/rice cakes, bread/rolls/biscuits/bagels/tortillas, and chips/other salty snacks.

For infants 4 to 11 months, the top three nonmilk source of carbohydrate are infant cereal, 100% juice, and bananas. Among toddlers, infant cereals and bananas have been replaced by sweetened beverages and bread/rolls/biscuits/bagels/tortillas. Table 7 illustrates an interesting change in sources of dietary fiber as children age. Among infants 4 and 5 months old, infant cereal is the leading source of dietary fiber, contributing 21% of total intake. Most of the other foods included in the top 10 sources of fiber are fruits and vegetables, specifically, apples/applesauce, bananas, pears, carrots, sweet potatoes, winter squash, green beans, and peaches/nectarines/plums. Commercial baby food dinners are also in the top 10 list and contribute 6% of total fiber intake. The top 10 sources of fiber for 6- to 11-month-olds are similar, but the contribution of commercial baby food dinners is greater and the contribution of infant cereals is smaller. In addition, the rank order of some of the fruits and vegetables is different and sweet potatoes have been replaced by noninfant cereals. Diets consumed by toddlers include more grain-based sources of fiber and fewer and different fruits and vegetables. Noninfant cereal is the single largest contributor of fiber in this age group (9%). The infant cereal and baby food dinners consumed by infants have been replaced by bread/rolls/biscuits/bagels/tortillas, pasta, and flour/baking ingredients. In addition, pears, carrots, winter squash, peaches/nectarines/plums, and green beans have been replaced by white potatoes, milk, dried beans/peas/vegetarian meat substitutes, and 100% juices. The presence of dried beans/peas/vegetarian meat substitutes reflects the high fiber density of these foods rather than frequent consumption. In contrast, 100% juices are low in fiber, but are widely consumed. The fiber from milk is contributed by soy milk and fla-

*Protein content per 1 oz edible portion plain, cooked chicken breast, skin removed before cooking (8.76 g), and per 1 oz commercial baby food chicken dinners reported in FITS (0.60 to 0.82 g), as reported in the Nutrition Data System for Research, version v4.03/31.

Table 6. Sources of carbohydrate among US infants and toddlers 4 to 24 months of age from the 2002 Feeding Infants and Toddlers Study

| 4 to 5 Months | | | 6 to 11 Months | | | 12 to 24 Months | | |
|---------------|-------------------|------------|----------------|--------------------------------------|------------|-----------------|--|------------|
| Rank | Food group | % of Total | Rank | Food group | % of Total | Rank | Food group | % of Total |
| 1 | Infant formula | 51.5 | 1 | Infant formula | 33.7 | 1 | Milk (cow's/goat's/soy) | 14.6 |
| 2 | Breast milk | 27.2 | 2 | Infant cereal | 9.0 | 2 | 100% juice | 11.8 |
| 3 | Infant cereal | 8.8 | 3 | 100% juice | 7.8 | 3 | Sweetened beverages | 8.9 |
| 4 | 100% juice | 3.1 | 4 | Breast milk | 7.7 | 4 | Bread/rolls/biscuits/bagels/tortilla | 5.5 |
| 5 | Bananas | 1.9 | 5 | Bananas | 4.8 | 5 | Noninfant cereals | 5.1 |
| 6 | Apples/applesauce | 1.5 | 6 | Baby food dinners | 3.3 | 6 | Bananas | 4.0 |
| | | | 7 | Apples/applesauce | 3.1 | 7 | Cookies | 3.8 |
| | | | 8 | Baby food desserts | 2.6 | 8 | Pasta | 3.8 |
| | | | 9 | Cookies | 2.3 | 9 | Flour/baking ingredients | 3.5 |
| | | | 10 | Pears | 2.0 | 10 | White potatoes | 3.2 |
| | | | 11 | Milk (cow's/goat's/soy) | 2.0 | 11 | Crackers/pretzels/rice cakes | 2.8 |
| | | | 12 | Noninfant cereals | 1.8 | 12 | Sugar/syrups/jams/jellies/other sweeteners | 2.2 |
| | | | 13 | Peaches/nectarines/plums | 1.7 | 13 | Yogurt | 2.1 |
| | | | 14 | Bread/rolls/biscuits/bagels/tortilla | 1.6 | 14 | Cakes/pies/other baked goods | 1.9 |
| | | | 15 | Crackers/pretzels/rice cakes | 1.3 | 15 | Apples/applesauce | 1.9 |
| | | | 16 | Yogurt | 1.2 | 16 | Rice | 1.7 |
| | | | 17 | Pasta | 1.2 | 17 | Candy | 1.7 |
| | | | 18 | Sweetened beverages | 1.2 | 18 | Pancakes/waffles/french toast | 1.7 |
| | | | 19 | Sweet potatoes | 1.1 | 19 | Infant formula | 1.6 |
| | | | 20 | White potatoes | 1.1 | 20 | Ice cream/frozen yogurt/pudding | 1.4 |
| | | | | | | 21 | Breast milk | 1.2 |
| | | | | | | 22 | Chips/other salty snacks | 1.1 |
| | | | | | | 23 | Cereal/granola bars | 1.1 |

vored milks/milk beverages that could not be disaggregated. The pattern of declining fruit and vegetable contribution to fiber intake is observed even when all fruits and vegetables (excluding legumes) are considered in the aggregate. The total amount of dietary fiber contributed by all fruits and vegetables declines from 67% among infants 4 and 5 months, to 56% among infants 6 to 11 months, and 43% among toddlers (data not shown).

Vitamins

Tables 8 through 18 show sources of vitamins. For infants, formula is the leading contributor of all vitamins examined. Among infants 4 and 5 months old, breast milk is the second or third most important source of all vitamins examined. Among older infants and toddlers, non-milk foods contribute appreciable amounts of vitamins. For example, the second and third most important sources of vitamin C among infants 6 to 11 months old are 100% juice and infant cereal. Among toddlers, the two leading sources of vitamin C are 100% juice and sweetened beverages, which provide 37% and 12% of total intake, respectively. This is to be expected, given that juices and fruit-flavored drinks are widely consumed by this age group (39,41) and that most juices and fruit drinks are fortified with vitamin C. Consumption of citrus juices, naturally high in vitamin C, was less common than consumption of other juices. Sixteen percent of toddlers consumed orange or orange-blend juices, compared with 46% of toddlers for other types of juice (data not shown). When fruits and vegetables are considered in the

aggregate, 100% fruit juice is still the leading source of vitamin C, fruits contribute somewhat more vitamin C than sweetened beverages (14% vs 12%), and vegetables contribute 10% of total vitamin C (data not shown).

Fortified infant and noninfant cereals are major contributors of vitamins in the diets of infants and toddlers, reflecting both their widespread consumption and nutrient content. Infant cereal is the second or third most important source of thiamin, riboflavin, niacin, and vitamin B-6 in the diets of infants and the third or fourth most important source of vitamins C and E. Noninfant cereals are the leading source of folate in toddlers' diets, contributing 20% of total intake, and the second most important source of folate in the diets of infants 6 to 11 months old (11%). Among toddlers, noninfant cereals are also the third leading contributor to vitamin B-6 intakes and the second most important food source of all other vitamins examined except vitamins C, E, K, and D.

Supplements also make substantial contributions to vitamin intakes of infants and toddlers; this is particularly true for toddlers. In this age group, supplements are the leading contributors of vitamin E (25%) and niacin (15%) and contribute 10% or more of vitamin A (15%), vitamin C (10%), folate (14%), thiamin (11%), vitamin B-6 (11%), vitamin B-12 (13%), and vitamin D (23%). Supplements also contribute to intakes of these vitamins among infants, but to a lesser degree, generally ranging from 1% to 3% for infants 4 and 5 months to 7% for infants 6 to 11 months. Vitamin D is an exception; supplements provide 5% of total intake of 4- and 5-month-old infants and 14%

Table 7. Sources of dietary fiber among US infants and toddlers 4 to 24 months of age from the 2002 Feeding Infants and Toddlers Study

| 4 to 5 Months | | | 6 to 11 Months | | | 12 to 24 Months | | |
|---------------|--------------------------|------------|----------------|--|------------|-----------------|--|------------|
| Rank | Food group | % of Total | Rank | Food group | % of Total | Rank | Food group | % of Total |
| 1 | Infant cereal | 20.6 | 1 | Baby food dinners | 12.4 | 1 | Noninfant cereals | 9.0 |
| 2 | Apples/applesauce | 12.7 | 2 | Infant cereal | 11.8 | 2 | Bananas | 8.3 |
| 3 | Bananas | 8.6 | 3 | Bananas | 8.6 | 3 | Bread/rolls/biscuits/bagels/tortilla | 8.1 |
| 4 | Pears | 8.5 | 4 | Apples/applesauce | 8.4 | 4 | White potatoes | 5.9 |
| 5 | Carrots | 6.5 | 5 | Pears | 7.0 | 5 | Apples/applesauce | 4.5 |
| 6 | Baby food dinners | 6.2 | 6 | Carrots | 4.0 | 6 | Pasta | 3.6 |
| 7 | Sweet potatoes | 6.1 | 7 | Noninfant cereals | 3.9 | 7 | Milk (cow's/goat's/soy) | 3.5 |
| 8 | Winter squash | 5.5 | 8 | Green beans | 3.8 | 8 | Dried beans and peas/vegetarian meat substitutes | 3.3 |
| 9 | Green beans | 4.6 | 9 | Winter squash | 3.4 | 9 | 100% juice | 3.0 |
| 10 | Peaches/nectarines/plums | 4.6 | 10 | Peaches/nectarines/plums | 3.4 | 10 | Flour/baking ingredients | 3.0 |
| 11 | Peas | 3.6 | 11 | Peas | 2.9 | 11 | Green beans | 2.7 |
| 12 | 100% juice | 2.4 | 12 | Mixed/garden vegetables | 2.8 | 12 | Cookies | 2.7 |
| 13 | Infant formula | 2.0 | 13 | Sweet potatoes | 2.8 | 13 | Peas | 2.7 |
| 14 | Mixed/garden vegetables | 1.8 | 14 | Bread/rolls/biscuits/bagels/tortilla | 2.5 | 14 | Crackers/pretzels/rice cakes | 2.5 |
| 15 | Other fruits | 1.7 | 15 | White potatoes | 2.0 | 15 | Pears | 2.2 |
| | | | 16 | 100% juice | 1.8 | 16 | Chips/other salty snacks | 2.2 |
| | | | 17 | Dried beans and peas/vegetarian meat substitutes | 1.7 | 17 | Tomatoes/tomato sauce | 2.1 |
| | | | 18 | Cookies | 1.5 | 18 | Carrots | 2.1 |
| | | | 19 | Baby food desserts | 1.4 | 19 | Baby food dinners | 2.1 |
| | | | 20 | Crackers/pretzels/rice cakes | 1.3 | 20 | Peaches/nectarines/plums | 1.5 |
| | | | 21 | Pasta | 1.2 | 21 | Other vegetables | 1.5 |
| | | | 22 | Other fruits | 1.0 | 22 | Broccoli | 1.5 |
| | | | | | | 23 | Pancakes/waffles/french toast | 1.4 |
| | | | | | | 24 | Corn | 1.3 |
| | | | | | | 25 | Peanut butter/nuts/seeds | 1.3 |
| | | | | | | 26 | Cakes/pies/other baked goods | 1.2 |
| | | | | | | 27 | Citrus fruits | 1.1 |
| | | | | | | 28 | Berries | 1.1 |
| | | | | | | 29 | Sweetened beverages | 1.1 |
| | | | | | | 30 | Infant cereal | 1.1 |
| | | | | | | 31 | Mixed/garden vegetables | 1.1 |
| | | | | | | 32 | Cereal/granola bars | 1.0 |

of intake for infants 6 to 11 months. Another article in this series examines supplement use and finds that supplement use is relatively uncommon (~8%) at ages 4 and 5 months, but increases with age to 19% among infants 6 to 11 months and 31% among toddlers (35).

In keeping with the previously reported findings for dietary fiber, foods that are often cited as “rich” sources of vitamin A make meaningful contributions to intakes of infants because they are consumed with some frequency (39). For example, carrots, sweet potatoes, and winter squash together contribute 17% of total vitamin A intake among infants 6 to 11 months old. Toddlers consume these foods less often, so carrots contribute only 8% to total vitamin A intake and sweet potatoes and winter squash contribute <1%.

Minerals and Electrolytes

Tables 19 through 25 show sources of minerals, including the electrolytes sodium and potassium. Among infants,

infant formula is the leading contributor of all minerals examined. Among infants 4 and 5 months old, breast milk also makes a significant contribution (10% or more) to intakes of all minerals except iron. Among toddlers, milk is the leading contributor of all minerals except iron and sodium.

Among infants, infant cereal is the most important nonmilk source of all minerals except sodium (all infants) and potassium (infants 6 to 11 months). Among toddlers, noninfant cereal is the leading contributor to iron intakes, the second most important source of zinc, and the third or fourth most important source of magnesium and phosphorus. Other fortified or enriched grain products, including infant cereals, bread/rolls/biscuits/bagels/tortillas, flour/baking ingredients, and pasta also make important contributions to toddlers’ iron intakes. The most frequently consumed type of meat (chicken/turkey) appears lower on the ranked list of iron sources than each of these grain-based food groups. Interestingly, 100% juice,

Table 8. Sources of vitamin A among US infants and toddlers 4 to 24 months of age from the 2002 Feeding Infants and Toddlers Study

| 4 to 5 Months | | | 6 to 11 Months | | | 12 to 24 Months | | |
|---------------|-----------------------------------|------------|----------------|-----------------------------------|------------|-----------------|-----------------------------------|------------|
| Rank | Food group | % of Total | Rank | Food group | % of Total | Rank | Food group | % of Total |
| 1 | Infant formula | 53.2 | 1 | Infant formula | 44.5 | 1 | Milk (cow's/goat's/soy) | 30.2 |
| 2 | Breast milk | 34.1 | 2 | Breast milk | 12.6 | 2 | Supplements—vitamins and minerals | 15.2 |
| 3 | Carrots | 4.4 | 3 | Carrots | 10.0 | 3 | Noninfant cereals | 8.1 |
| 4 | Sweet potatoes | 3.3 | 4 | Supplements—vitamins and minerals | 6.6 | 4 | Carrots | 8.0 |
| 5 | Supplements—vitamins and minerals | 2.5 | 5 | Sweet potatoes | 5.6 | 5 | Cheese | 5.5 |
| | | | 6 | Baby food dinners | 5.3 | 6 | Butter/oil/margarine/other fats | 4.9 |
| | | | 7 | Milk (cow's/goat's/soy) | 2.5 | 7 | Infant formula | 3.0 |
| | | | 8 | Mixed/garden vegetables | 2.4 | 8 | Eggs | 3.0 |
| | | | 9 | Noninfant cereals | 1.9 | 9 | Breast milk | 3.0 |
| | | | 10 | Winter squash | 1.7 | 10 | Sweetened beverages | 2.6 |
| | | | | | | 11 | Cereal/granola bars | 1.6 |
| | | | | | | 12 | Mixed/garden vegetables | 1.1 |
| | | | | | | 13 | Baby food dinners | 1.1 |
| | | | | | | 14 | Organ meats | 1.1 |
| | | | | | | 15 | Melons | 1.0 |

which is low in iron (eg, apple juice has about 1 mg iron per cup)[†] contributes 5% of toddlers' iron intakes because of its widespread consumption. When all types of meat, poultry, and fish are considered in the aggregate, they contribute less than 1% of iron in the diets of infants 6 to 11 months old and 8% of iron in the diets of toddlers (data not shown).

The leading nonmilk sources of zinc in the diets of infants and toddlers are infant cereal (infants 4 to 11 months old) and noninfant cereal (infants 6 to 11 months old and toddlers). Individual types of meat make more substantial contributions to toddlers' zinc intakes than they do to iron intakes. For example, beef, chicken/turkey, and hot dogs/cold cuts/sausages/bacon, are the third, fifth, and eighth leading sources of zinc in toddler diets.

Compared with contributions to vitamin intakes, supplements play a substantially smaller role in mineral intakes. Supplements make important contributions to intakes of iron (10%) and zinc (5%) among toddlers.

DISCUSSION

To our knowledge, this is the first study to provide national estimates of the sources of nutrients in the diets of US infants and toddlers and the first analysis of nutrient sources to include contributions from dietary supplements. Previous analyses of the FITS data showed that, overall, the diets of US infants and toddlers are nutritionally adequate and that the risk of nutrient deficiency is negligible (38). The data presented in this article pro-

vide information on how infants and toddlers are satisfying their nutrient needs. Infant formula, breast milk, and milk are leading sources of a broad array of essential nutrients. Fortified food products also play a major role in the diets of infants and toddlers. In the case of iron and infant cereals, this pattern is reassuring because consumption of iron-fortified infant cereals is one of several strategies recommended by the Centers for Disease Control and Prevention to prevent iron deficiency (55). However, for other nutrients, the relative importance of fortified foods may reflect undesirable feeding patterns. For example, the data on vitamin A sources show that the contribution of vegetables that are naturally rich in vitamin A decreases as children age, and that a substantial proportion of the vitamin A consumed by toddlers comes from fortified cereals and supplements. Similarly, by the time children reach toddlerhood, two of the three leading sources of vitamin C are fortified juices and fortified sweetened beverages (primarily fruit drinks), and noninfant cereals and other grain products that are fortified with iron and folate outstrip foods that are naturally rich in these nutrients.

Although fortified foods can make important contributions to nutrient intakes, it is important to remember that sound dietary practices are based on consumption of *foods* rather than isolated nutrients. Scientific knowledge about the influence of the myriad chemical components that occur naturally in foods is still developing. Therefore, consumption of a wide variety of foods rather than reliance on fortified foods and supplements is the optimal way to satisfy nutrient requirements (56). Moreover, the foundations for lifelong dietary habits are formed early in life. Daily consumption of fruits and vegetables is a cornerstone of a healthy diet (53,57,58). Yet, a previous

[†]Iron content per 8 fl oz apple juice (0.92 mg), as reported in the Nutrition Data System for Research, version v4.03/31.

Table 9. Sources of vitamin C among US infants and toddlers 4 to 24 months of age from the 2002 Feeding Infants and Toddlers Study

| 4 to 5 Months | | | 6 to 11 Months | | | 12 to 24 Months | | |
|---------------|-----------------------------------|------------|----------------|-----------------------------------|------------|-----------------|-----------------------------------|------------|
| Rank | Food group | % of Total | Rank | Food group | % of Total | Rank | Food group | % of Total |
| 1 | Infant formula | 54.1 | 1 | Infant formula | 38.4 | 1 | 100% juice | 37.1 |
| 2 | Breast milk | 21.5 | 2 | 100% juice | 21.0 | 2 | Sweetened beverages | 12.1 |
| 3 | 100% juice | 8.1 | 3 | Infant cereal | 7.6 | 3 | Supplements—vitamins and minerals | 10.0 |
| 4 | Infant cereal | 6.4 | 4 | Breast milk | 6.7 | 4 | Milk (cow's/goat's/soy) | 5.2 |
| 5 | Apples/applesauce | 2.5 | 5 | Apples/applesauce | 3.9 | 5 | Bananas | 3.0 |
| 6 | Bananas | 2.0 | 6 | Supplements—vitamins and minerals | 3.6 | 6 | Melons | 2.6 |
| 7 | Supplements—vitamins and minerals | 1.4 | 7 | Bananas | 3.5 | 7 | Infant formula | 2.6 |
| 8 | Peaches/nectarines/plums | 1.1 | 8 | Baby food desserts | 2.3 | 8 | Tomatoes/tomato sauce | 2.5 |
| | | | 9 | Pears | 2.2 | 9 | Noninfant cereals | 2.5 |
| | | | 10 | Peaches/nectarines/plums | 2.0 | 10 | Citrus fruits | 2.3 |
| | | | | | | 11 | Berries | 2.2 |
| | | | | | | 12 | White potatoes | 2.2 |
| | | | | | | 13 | Broccoli | 2.0 |
| | | | | | | 14 | Breast milk | 1.6 |
| | | | | | | 15 | Candy | 1.4 |
| | | | | | | 16 | Other vegetables | 1.3 |
| | | | | | | 17 | Apples/applesauce | 1.1 |

Table 10. Sources of vitamin E among US infants and toddlers 4 to 24 months of age from the 2002 Feeding Infants and Toddlers Study

| 4 to 5 Months | | | 6 to 11 Months | | | 12 to 24 Months | | |
|---------------|-----------------------------------|------------|----------------|-----------------------------------|------------|-----------------|--------------------------------------|------------|
| Rank | Food group | % of Total | Rank | Food group | % of Total | Rank | Food group | % of Total |
| 1 | Infant formula | 62.2 | 1 | Infant formula | 61.2 | 1 | Supplements—vitamins and minerals | 24.9 |
| 2 | Breast milk | 29.8 | 2 | Breast milk | 13.0 | 2 | Milk (cow's/goat's/soy) | 8.6 |
| 3 | Infant cereal | 3.4 | 3 | Supplements—vitamins and minerals | 4.9 | 3 | Butter/oil/margarine/other fats | 6.8 |
| 4 | Supplements—vitamins and minerals | 1.5 | 4 | Infant cereal | 4.7 | 4 | Infant formula | 6.8 |
| | | | 5 | 100% juice | 2.4 | 5 | Breast milk | 4.9 |
| | | | 6 | Apples/applesauce | 1.3 | 6 | Chips/other salty snacks | 4.1 |
| | | | | | | 7 | Noninfant cereals | 3.3 |
| | | | | | | 8 | Peanut butter/nuts/seeds | 3.0 |
| | | | | | | 9 | Eggs | 2.4 |
| | | | | | | 10 | Tomatoes/tomato sauce | 2.2 |
| | | | | | | 11 | 100% juice | 2.2 |
| | | | | | | 12 | Bread/rolls/biscuits/bagels/tortilla | 2.1 |
| | | | | | | 13 | Crackers/pretzels/rice cakes | 2.1 |
| | | | | | | 14 | Cookies | 2.1 |
| | | | | | | 15 | Chicken/turkey | 2.0 |
| | | | | | | 16 | Bananas | 1.5 |
| | | | | | | 17 | Cheese | 1.4 |
| | | | | | | 18 | Peaches/nectarines/plums | 1.4 |
| | | | | | | 19 | Cakes/pies/other baked goods | 1.3 |
| | | | | | | 20 | Broccoli | 1.2 |
| | | | | | | 21 | Salad dressings/mayo | 1.1 |
| | | | | | | 22 | Fish/shellfish | 1.0 |

analysis of FITS data showed that substantial proportions of toddlers and infants over 6 months of age consumed no fruits and vegetables as distinct food items in a day (39). Studies of older children, which indicate that few children consume recommended amounts of fruits and vegetables, suggest that this pattern continues into childhood and adolescence (59-61).

This analysis also reveals that vitamin supplements make substantial contributions to toddlers' intakes of vitamin A, thiamin, folate, vitamin B-12, vitamin B-6, vitamin C, and vitamin D and smaller, but still noteworthy, contributions to older infants' intakes of these nutrients. The American Academy of Pediatrics recommends supplementation with iron and vitamin D for specific subgroups of infants, but suggests that "routine supplementation is not necessary for healthy, growing children who consume a varied diet" (62). Another article in this series compares intakes of supplement users and nonusers and finds that, although mean intakes of users were greater than nonusers, the estimated prevalence of inadequate intakes is very low (<1%) for both groups for all nutrients except vitamin E (35). Other researchers who have compared supplement users and nonusers among infants and children have reached similar conclusions (63,64). Use of vitamin and mineral supplements may also increase risk of toxicity. The FITS analysis of supplement users and nonusers found that nearly all (97%) toddlers who used supplements had intakes above the Tolerable Upper Intake Level for vitamin A, about two thirds were above the Tolerable Upper Intake Level for zinc, and nearly one fifth were above the Tolerable Upper Intake Level for folate (35).

LIMITATIONS

This study has some limitations that should be acknowledged. First, all of our data were self-reported. Caregivers may have over- or underreported intakes. There is reason to believe that overreporting was more common than underreporting (38). However, mean energy intakes of FITS toddlers are consistent with mean energy intakes reported for 1-year-olds in CSFII 1994-1996, 1998 (65) and in the Third National Health and Nutrition Examination Survey (66). Thus, if overreporting is present, it appears to be comparable to that observed in national nutrition monitoring surveys. Second, analyses are based on intake of foods and supplements during a single 24-hour period recall rather than "usual" food intake. To our knowledge, methods for estimating usual food intake at the individual level have not been developed. Moreover, the methods used to assess food sources of nutrients are consistent with those used in assessing food sources for the population at large (2,4,9) and there is some evidence to suggest that there is less day-to-day variation in dietary intake among infants and toddlers than among older children and adults (67). Third, the contribution of breast milk may be over- or underestimated, given that intake of breast milk was imputed, based on age and consumption of infant formula, rather than measured precisely, and a consistent nutrient profile was used for breast milk fed to infants of all ages [in reality, concentrations of some nutrients in breast milk decline over time (68)]. Nonetheless, including estimates of breast milk intake is clearly preferable to omitting any assess-

ment of breast milk (69). The method used to impute breast milk intake was based on assumptions used in establishing calcium DRIs (46) and has been used by other researchers (52). Finally, results of our analysis are necessarily influenced by the food classification system used. For example, most fruits, vegetables, and meats were considered individually rather than as groups. When these foods were considered in the aggregate, some conclusions are slightly different. To minimize this limitation, we included information on key contributions of aggregate food groups in the text. The disaggregation of food mixtures may make our results less useful to researchers interested in defining food groups for inclusion in dietary assessment instruments (eg, food frequencies) or in assessing intakes of specific food mixtures (2). Our analysis was designed to provide the most accurate picture possible of the contributions of key food groups. Although our approach was closely modeled after the techniques used by Subar and colleagues (2,9) and Cotton and colleagues (4), our results cannot be compared directly with findings from their analyses. Important issues that limit comparability include differences in data collection time periods, food classification decisions, nutrient databases, and recipes used for food mixtures.

CONCLUSIONS

In working with parents and caregivers of infants and toddlers, dietetics professionals and other health professionals need to stress the importance of foods (rather than isolated nutrients) in maintaining health, supporting proper growth and development, and in nurturing lifelong healthful eating patterns. Caregivers should be encouraged to feed a wide variety of foods from the basic food groups, especially fruits, vegetables, and whole grains, and to avoid reliance on fortified foods and supplements. Information from this analysis can be used to illustrate the decline in use of vegetables that are naturally rich in key vitamins as children age, and this can be used as a springboard to discuss implications for developing food habits. In assessing total intakes, dietetics professionals need to probe for and include supplement use. This is especially important for nutrients that appear to have some potential for toxic levels of intake (vitamin A, zinc, folate). Education about the potential risk of excessive intakes from the cumulative contributions of fortified foods and supplements is also important. Use of 100% juices and fruit-flavored drinks should be limited to avoid excess energy intake and displacement of more nutrient-dense foods. Foods that are naturally rich in iron should be encouraged among infants over 6 months of age. The heme iron in naturally iron-rich animal foods may promote increased absorption of nonheme iron and the increased concentration of zinc in these animal products may promote increased absorption of zinc, relative to zinc in fortified foods (68,70). The latter consideration is especially important for infants who are exclusively breastfed up to 6 months of age (57,70).

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Table 11. Sources of folate among US infants and toddlers 4 to 24 months of age from the 2002 Feeding Infants and Toddlers Study

| 4 to 5 Months | | | 6 to 11 Months | | | 12 to 24 Months | | |
|---------------|-----------------------------------|------------|----------------|--------------------------------------|------------|-----------------|--|------------|
| Rank | Food group | % of Total | Rank | Food group | % of Total | Rank | Food group | % of Total |
| 1 | Infant formula | 75.2 | 1 | Infant formula | 45.4 | 1 | Noninfant cereals | 19.9 |
| 2 | Breast milk | 14.1 | 2 | Noninfant cereals | 11.0 | 2 | Supplements—vitamins and minerals | 13.9 |
| 3 | Supplements—vitamins and minerals | 2.9 | 3 | Supplements—vitamins and minerals | 5.1 | 3 | Milk (cow's/goat's/soy) | 8.0 |
| 4 | Infant cereal | 1.5 | 4 | Baby food dinners | 3.7 | 4 | Pasta | 7.9 |
| | | | 5 | Breast milk | 3.7 | 5 | Bread/rolls/biscuits/bagels/tortilla | 6.8 |
| | | | 6 | Pasta | 3.0 | 6 | Flour/baking ingredients | 5.1 |
| | | | 7 | Bananas | 2.4 | 7 | Rice | 3.0 |
| | | | 8 | Bread/rolls/biscuits/bagels/tortilla | 2.4 | 8 | 100% juice | 3.0 |
| | | | 9 | Infant cereal | 2.0 | 9 | Crackers/pretzels/rice cakes | 2.7 |
| | | | 10 | Green beans | 1.9 | 10 | Cereal/granola bars | 2.6 |
| | | | 11 | Milk (cow's/goat's/soy) | 1.4 | 11 | Infant formula | 2.1 |
| | | | 12 | Crackers/pretzels/rice cakes | 1.4 | 12 | Cookies | 1.9 |
| | | | 13 | Cookies | 1.4 | 13 | Pancakes/waffles/french toast | 1.8 |
| | | | 14 | 100% juice | 1.3 | 14 | Bananas | 1.7 |
| | | | 15 | Rice | 1.2 | 15 | Eggs | 1.7 |
| | | | 16 | Flour/baking ingredients | 1.1 | 16 | Cakes/pies/other baked goods | 1.3 |
| | | | 17 | Peas | 1.0 | 17 | Dried beans and peas/vegetarian meat substitutes | 1.3 |
| | | | | | | 18 | Chips/other salty snacks | 1.0 |
| | | | | | | 19 | Chicken/turkey | 1.0 |

Table 12. Sources of thiamin among US infants and toddlers 4 to 24 months of age from the 2002 Feeding Infants and Toddlers Study

| 4 to 5 Months | | | 6 to 11 Months | | | 12 to 24 Months | | |
|---------------|-----------------------------------|------------|----------------|--------------------------------------|------------|-----------------|--------------------------------------|------------|
| Rank | Food group | % of Total | Rank | Food group | % of Total | Rank | Food group | % of Total |
| 1 | Infant formula | 60.1 | 1 | Infant formula | 37.1 | 1 | Milk (cow's/goat's/soy) | 19.2 |
| 2 | Infant cereal | 28.0 | 2 | Infant cereal | 27.2 | 2 | Supplements—vitamins and minerals | 11.3 |
| 3 | Breast milk | 6.1 | 3 | Supplements—vitamins and minerals | 5.0 | 3 | Noninfant cereals | 10.3 |
| 4 | Supplements—vitamins and minerals | 1.8 | 4 | Noninfant cereals | 3.9 | 4 | Bread/rolls/biscuits/bagels/tortilla | 6.9 |
| | | | 5 | Milk (cow's/goat's/soy) | 3.0 | 5 | Flour/baking ingredients | 6.0 |
| | | | 6 | Baby food dinners | 2.3 | 6 | 100% juice | 3.9 |
| | | | 7 | Bread/rolls/biscuits/bagels/tortilla | 2.1 | 7 | Pasta | 3.8 |
| | | | 8 | Breast milk | 1.7 | 8 | Crackers/pretzels/rice cakes | 3.1 |
| | | | 9 | Cookies | 1.6 | 9 | Cookies | 2.5 |
| | | | 10 | Crackers/pretzels/rice cakes | 1.5 | 10 | Pork/ham | 2.3 |
| | | | 11 | 100% juice | 1.5 | 11 | White potatoes | 2.2 |
| | | | 12 | Pasta | 1.2 | 12 | Infant cereal | 2.2 |
| | | | 13 | Flour/baking ingredients | 1.2 | 13 | Pancakes/waffles/french toast | 2.2 |
| | | | | | | 14 | Infant formula | 2.1 |
| | | | | | | 15 | Chicken/turkey | 1.8 |
| | | | | | | 16 | Hot dogs/cold cuts/sausages/bacon | 1.7 |
| | | | | | | 17 | Cereal/granola bars | 1.6 |
| | | | | | | 18 | Rice | 1.4 |
| | | | | | | 19 | Cakes/pies/other baked goods | 1.2 |
| | | | | | | 20 | Chips/other salty snacks | 1.2 |
| | | | | | | 21 | Sweetened beverages | 1.1 |

Table 13. Sources of riboflavin among US infants and toddlers 4 to 24 months of age from the 2002 Feeding Infants and Toddlers Study

| 4 to 5 Months | | | 6 to 11 Months | | | 12 to 24 Months | | |
|---------------|-----------------------------------|------------|----------------|-----------------------------------|------------|-----------------|--------------------------------------|------------|
| Rank | Food group | % of Total | Rank | Food group | % of Total | Rank | Food group | % of Total |
| 1 | Infant formula | 59.0 | 1 | Infant formula | 40.4 | 1 | Milk (cow's/goat's/soy) | 44.0 |
| 2 | Infant cereal | 21.0 | 2 | Infant cereal | 22.4 | 2 | Supplements—vitamins and minerals | 8.6 |
| 3 | Breast milk | 14.8 | 3 | Milk (cow's/goat's/soy) | 6.5 | 3 | Noninfant cereals | 6.8 |
| 4 | Supplements—vitamins and minerals | 1.3 | 4 | Breast milk | 4.4 | 4 | Eggs | 3.4 |
| | | | 5 | Supplements—vitamins and minerals | 4.0 | 5 | Cheese | 3.0 |
| | | | 6 | Noninfant cereals | 2.9 | 6 | Bread/rolls/biscuits/bagels/tortilla | 3.0 |
| | | | 7 | Baby food dinners | 2.1 | 7 | Flour/baking ingredients | 2.3 |
| | | | 8 | Bananas | 1.7 | 8 | 100% juice | 2.2 |
| | | | 9 | Yogurt | 1.3 | 9 | Yogurt | 1.9 |
| | | | 10 | 100% juice | 1.2 | 10 | Chicken/turkey | 1.9 |
| | | | | | | 11 | Infant formula | 1.7 |
| | | | | | | 12 | Infant cereal | 1.7 |
| | | | | | | 13 | Bananas | 1.5 |
| | | | | | | 14 | Crackers/pretzels/rice cakes | 1.5 |
| | | | | | | 15 | Pancakes/waffles/french toast | 1.4 |
| | | | | | | 16 | Pasta | 1.2 |
| | | | | | | 17 | Cereal/granola bars | 1.2 |
| | | | | | | 18 | Cookies | 1.1 |
| | | | | | | 19 | Beef | 1.1 |

Table 14. Sources of niacin among US infants and toddlers 4 to 24 months of age from the 2002 Feeding Infants and Toddlers Study

| 4 to 5 Months | | | 6 to 11 Months | | | 12 to 24 Months | | |
|---------------|-----------------------------------|------------|----------------|--------------------------------------|------------|-----------------|--------------------------------------|------------|
| Rank | Food group | % of Total | Rank | Food group | % of Total | Rank | Food group | % of Total |
| 1 | Infant formula | 62.7 | 1 | Infant formula | 39.7 | 1 | Supplements—vitamins and minerals | 14.9 |
| 2 | Infant cereal | 21.8 | 2 | Infant cereal | 22.0 | 2 | Chicken/turkey | 13.8 |
| 3 | Breast milk | 8.7 | 3 | Supplements—vitamins and minerals | 6.2 | 3 | Noninfant cereals | 12.1 |
| 4 | Supplements—vitamins and minerals | 2.1 | 4 | Noninfant cereals | 4.1 | 4 | Flour/baking ingredients | 5.8 |
| | | | 5 | Baby food dinners | 3.5 | 5 | Bread/rolls/biscuits/bagels/tortilla | 5.7 |
| | | | 6 | Chicken/turkey | 3.1 | 6 | Beef | 3.6 |
| | | | 7 | Breast milk | 2.4 | 7 | Milk (cow's/goat's/soy) | 3.5 |
| | | | 8 | Bread/rolls/biscuits/bagels/tortilla | 1.5 | 8 | Pasta | 2.9 |
| | | | 9 | Bananas | 1.5 | 9 | White potatoes | 2.7 |
| | | | 10 | Crackers/pretzels/rice cakes | 1.0 | 10 | Crackers/pretzels/rice cakes | 2.4 |
| | | | | | | 11 | Hot dogs/cold cuts/sausages/bacon | 2.2 |
| | | | | | | 12 | 100% juice | 2.2 |
| | | | | | | 13 | Infant formula | 2.2 |
| | | | | | | 14 | Infant cereal | 2.0 |
| | | | | | | 15 | Cereal/granola bars | 2.0 |
| | | | | | | 16 | Cookies | 1.9 |
| | | | | | | 17 | Peanut butter/nuts/seeds | 1.7 |
| | | | | | | 18 | Pancakes/waffles/french toast | 1.6 |
| | | | | | | 19 | Pork/ham | 1.5 |
| | | | | | | 20 | Fish/shellfish | 1.4 |
| | | | | | | 21 | Rice | 1.2 |
| | | | | | | 22 | Bananas | 1.2 |
| | | | | | | 23 | Cakes/pies/other baked goods | 1.0 |
| | | | | | | 24 | Tomatoes/tomato sauce | 1.0 |

Table 15. Sources of vitamin B-6 among US infants and toddlers 4 to 24 months of age from the 2002 Feeding Infants and Toddlers Study

| 4 to 5 Months | | | 6 to 11 Months | | | 12 to 24 Months | | |
|---------------|-----------------------------------|------------|----------------|-----------------------------------|------------|-----------------|--------------------------------------|------------|
| Rank | Food group | % of Total | Rank | Food group | % of Total | Rank | Food group | % of Total |
| 1 | Infant formula | 61.0 | 1 | Infant formula | 31.6 | 1 | Milk (cow's/goat's/soy) | 16.0 |
| 2 | Infant cereal | 12.7 | 2 | Bananas | 14.0 | 2 | Bananas | 12.3 |
| 3 | Breast milk | 8.1 | 3 | Infant cereal | 8.8 | 3 | Noninfant cereals | 11.6 |
| 4 | Bananas | 6.2 | 4 | Noninfant cereals | 5.4 | 4 | Supplements—vitamins and minerals | 10.6 |
| 5 | 100% juice | 2.1 | 5 | Supplements—vitamins and minerals | 4.9 | 5 | Chicken/turkey | 6.7 |
| 6 | Supplements—vitamins and minerals | 2.0 | 6 | 100% juice | 4.1 | 6 | 100% juice | 6.1 |
| 7 | Sweet potatoes | 1.2 | 7 | Baby food dinners | 3.6 | 7 | White potatoes | 5.5 |
| | | | 8 | Milk (cow's/goat's/soy) | 2.8 | 8 | Beef | 2.4 |
| | | | 9 | White potatoes | 2.3 | 9 | Cereal/granola bars | 1.9 |
| | | | 10 | Chicken/turkey | 2.1 | 10 | Infant formula | 1.6 |
| | | | 11 | Breast milk | 1.8 | 11 | Tomatoes/tomato sauce | 1.3 |
| | | | 12 | Apples/applesauce | 1.7 | 12 | Hot dogs/cold cuts/sausages/bacon | 1.3 |
| | | | 13 | Carrots | 1.6 | 13 | Bread/rolls/biscuits/bagels/tortilla | 1.2 |
| | | | 14 | Sweet potatoes | 1.3 | 14 | Melons | 1.1 |
| | | | | | | 15 | Pork/ham | 1.1 |
| | | | | | | 16 | Sweetened beverages | 1.1 |
| | | | | | | 17 | Eggs | 1.1 |
| | | | | | | 18 | Cheese | 1.0 |

Table 16. Sources of vitamin B-12 among US infants and toddlers 4 to 24 months of age from the 2002 Feeding Infants and Toddlers Study

| 4 to 5 Months | | | 6 to 11 Months | | | 12 to 24 Months | | |
|---------------|-----------------------------------|------------|----------------|-----------------------------------|------------|-----------------|-----------------------------------|------------|
| Rank | Food group | % of Total | Rank | Food group | % of Total | Rank | Food group | % of Total |
| 1 | Infant formula | 86.8 | 1 | Infant formula | 62.4 | 1 | Milk (cow's/goat's/soy) | 48.7 |
| 2 | Breast milk | 9.3 | 2 | Milk (cow's/goat's/soy) | 9.5 | 2 | Supplements—vitamins and minerals | 13.2 |
| 3 | Supplements—vitamins and minerals | 2.8 | 3 | Supplements—vitamins and minerals | 7.4 | 3 | Noninfant cereals | 7.3 |
| | | | 4 | Noninfant cereals | 4.7 | 4 | Beef | 6.0 |
| | | | 5 | Breast milk | 2.9 | 5 | Cheese | 3.9 |
| | | | 6 | Yogurt | 2.2 | 6 | Eggs | 3.7 |
| | | | 7 | Beef | 2.1 | 7 | Hot dogs/cold cuts/sausages/bacon | 2.8 |
| | | | 8 | Baby food dinners | 1.9 | 8 | Fish/shellfish | 2.6 |
| | | | 9 | Cheese | 1.3 | 9 | Yogurt | 2.4 |
| | | | 10 | Eggs | 1.2 | 10 | Infant formula | 2.2 |
| | | | | | | 11 | Chicken/turkey | 1.6 |

Table 17. Sources of vitamin K among US infants and toddlers 4 to 24 months of age from the 2002 Feeding Infants and Toddlers Study

| 4 to 5 Months | | | 6 to 11 Months | | | 12 to 24 Months | | |
|---------------|----------------|------------|----------------|---------------------------------|------------|-----------------|--------------------------------------|------------|
| Rank | Food group | % of Total | Rank | Food group | % of Total | Rank | Food group | % of Total |
| 1 | Infant formula | 87.1 | 1 | Infant formula | 64.2 | 1 | Broccoli | 14.4 |
| 2 | Spinach/greens | 3.7 | 2 | Spinach/greens | 7.2 | 2 | Spinach/greens | 11.6 |
| 3 | Breast milk | 2.2 | 3 | Green beans | 4.6 | 3 | Butter/oil/margarine/other fats | 8.8 |
| 4 | Green beans | 1.8 | 4 | Broccoli | 3.0 | 4 | Infant formula | 5.7 |
| | | | 5 | Baby food dinners | 2.6 | 5 | Milk (cow's/goat's/soy) | 5.3 |
| | | | 6 | Peas | 2.2 | 6 | Crackers/pretzels/rice cakes | 5.2 |
| | | | 7 | Carrots | 1.6 | 7 | Cookies | 5.0 |
| | | | 8 | Mixed/garden vegetables | 1.4 | 8 | Green beans | 4.4 |
| | | | 9 | Cookies | 1.3 | 9 | Other vegetables | 4.3 |
| | | | 10 | Crackers/pretzels/rice cakes | 1.2 | 10 | Peas | 3.1 |
| | | | 11 | Pears | 1.2 | 11 | Cakes/pies/other baked goods | 2.1 |
| | | | 12 | Peaches/nectarines/plums | 1.1 | 12 | Salad dressings/mayonnaise | 2.1 |
| | | | 13 | Butter/oil/margarine/other fats | 1.0 | 13 | Carrots | 1.8 |
| | | | | | | 14 | Grapes | 1.7 |
| | | | | | | 15 | Bread/rolls/biscuits/bagels/tortilla | 1.7 |
| | | | | | | 16 | Pancakes/waffles/french toast | 1.7 |
| | | | | | | 17 | Yogurt | 1.6 |
| | | | | | | 18 | Chicken/turkey | 1.5 |
| | | | | | | 19 | Chips/other salty snacks | 1.5 |
| | | | | | | 20 | Tomatoes/tomato sauce | 1.3 |
| | | | | | | 21 | Mixed/garden vegetables | 1.2 |
| | | | | | | 22 | Other foods | 1.1 |
| | | | | | | 23 | Baby food dinners | 1.1 |

Table 18. Sources of vitamin D among US infants and toddlers 4 to 24 months of age from the 2002 Feeding Infants and Toddlers Study

| 4 to 5 Months | | | 6 to 11 Months | | | 12 to 24 Months | | |
|---------------|-----------------------------------|------------|----------------|-----------------------------------|------------|-----------------|-----------------------------------|------------|
| Rank | Food group | % of Total | Rank | Food group | % of Total | Rank | Food group | % of Total |
| 1 | Infant formula | 90.8 | 1 | Infant formula | 75.1 | 1 | Milk (cow's/goat's/soy) | 58.6 |
| 2 | Supplements—vitamins and minerals | 4.6 | 2 | Supplements—vitamins and minerals | 13.5 | 2 | Supplements—vitamins and minerals | 22.9 |
| 3 | Breast milk | 4.4 | 3 | Milk (cow's/goat's/soy) | 6.5 | 3 | Infant formula | 4.1 |
| | | | 4 | Breast milk | 1.6 | 4 | Butter/oil/margarine/other fats | 2.8 |
| | | | | | | 5 | Fish/shellfish | 2.5 |
| | | | | | | 6 | Noninfant cereals | 2.0 |
| | | | | | | 7 | Eggs | 1.8 |

Table 19. Sources of calcium among US infants and toddlers 4 to 24 months of age from the 2002 Feeding Infants and Toddlers Study

| 4 to 5 Months | | | 6 to 11 Months | | | 12 to 24 Months | | |
|---------------|----------------|------------|----------------|-------------------------|------------|-----------------|--------------------------------------|------------|
| Rank | Food group | % of Total | Rank | Food group | % of Total | Rank | Food group | % of Total |
| 1 | Infant formula | 66.0 | 1 | Infant formula | 53.8 | 1 | Milk (cow's/goat's/soy) | 63.9 |
| 2 | Breast milk | 20.3 | 2 | Infant cereal | 13.2 | 2 | Cheese | 9.7 |
| 3 | Infant cereal | 11.2 | 3 | Milk (cow's/goat's/soy) | 9.5 | 3 | Yogurt | 3.1 |
| | | | 4 | Breast milk | 7.1 | 4 | Infant formula | 2.4 |
| | | | 5 | Cheese | 2.5 | 5 | Bread/rolls/biscuits/bagels/tortilla | 1.9 |
| | | | 6 | Yogurt | 2.1 | 6 | Noninfant cereals | 1.9 |
| | | | 7 | Baby food dinners | 1.8 | 7 | 100% juice | 1.8 |
| | | | 8 | 100% juice | 1.0 | 8 | Ice cream/frozen yogurt/pudding | 1.1 |
| | | | | | | 9 | Flour/baking ingredients | 1.1 |
| | | | | | | 10 | Sweetened beverages | 1.0 |
| | | | | | | 11 | Infant cereal | 1.0 |

Table 20. Sources of iron among US infants and toddlers 4 to 24 months of age from the 2002 Feeding Infants and Toddlers Study

| 4 to 5 Months | | | 6 to 11 Months | | | 12 to 24 Months | | |
|---------------|----------------|------------|----------------|-----------------------------------|------------|-----------------|--|------------|
| Rank | Food group | % of Total | Rank | Food group | % of Total | Rank | Food group | % of Total |
| 1 | Infant formula | 59.1 | 1 | Infant formula | 40.6 | 1 | Noninfant cereals | 20.6 |
| 2 | Infant cereal | 37.0 | 2 | Infant cereal | 40.0 | 2 | Supplements—vitamins and minerals | 10.2 |
| | | | 3 | Noninfant cereals | 4.0 | 3 | Infant cereal | 7.5 |
| | | | 4 | Supplements—vitamins and minerals | 2.0 | 4 | Bread/rolls/biscuits/bagels/tortilla | 5.8 |
| | | | 5 | 100% juice | 1.9 | 5 | 100% juice | 5.3 |
| | | | 6 | Baby food dinners | 1.4 | 6 | Infant formula | 3.9 |
| | | | | | | 7 | Milk (cow's/goat's/soy) | 3.7 |
| | | | | | | 8 | Flour/baking ingredients | 3.3 |
| | | | | | | 9 | Pasta | 3.3 |
| | | | | | | 10 | Chicken/turkey | 3.0 |
| | | | | | | 11 | Crackers/pretzels/rice cakes | 2.6 |
| | | | | | | 12 | Beef | 2.4 |
| | | | | | | 13 | Cookies | 2.3 |
| | | | | | | 14 | Sweetened beverages | 2.1 |
| | | | | | | 15 | Pancakes/waffles/french toast | 1.8 |
| | | | | | | 16 | Eggs | 1.5 |
| | | | | | | 17 | Dried beans and peas/vegetarian meat substitutes | 1.3 |
| | | | | | | 18 | Rice | 1.2 |
| | | | | | | 19 | Cakes/pies/other baked goods | 1.2 |
| | | | | | | 20 | Hot dogs/cold cuts/sausages/bacon | 1.2 |
| | | | | | | 21 | Cereal/granola bars | 1.1 |
| | | | | | | 22 | White potatoes | 1.0 |

Table 21. Sources of zinc among US infants and toddlers 4 to 24 months of age from the 2002 Feeding Infants and Toddlers Study

| 4 to 5 Months | | | 6 to 11 Months | | | 12 to 24 Months | | |
|---------------|----------------|------------|----------------|-------------------------|------------|-----------------|--|------------|
| Rank | Food group | % of Total | Rank | Food group | % of Total | Rank | Food group | % of Total |
| 1 | Infant formula | 80.1 | 1 | Infant formula | 59.9 | 1 | Milk (cow's/goat's/soy) | 28.2 |
| 2 | Breast milk | 12.7 | 2 | Infant cereal | 6.3 | 2 | Noninfant cereals | 12.2 |
| 3 | Infant cereal | 4.3 | 3 | Noninfant cereals | 4.7 | 3 | Beef | 6.7 |
| | | | 4 | Breast milk | 4.2 | 4 | Cheese | 6.4 |
| | | | 5 | Baby food dinners | 3.6 | 5 | Chicken/turkey | 5.0 |
| | | | 6 | Milk (cow's/goat's/soy) | 3.5 | 6 | Supplements—vitamins and minerals | 4.9 |
| | | | 7 | Beef | 1.4 | 7 | Infant formula | 3.0 |
| | | | 8 | Cheese | 1.4 | 8 | Hot dogs/cold cuts/sausages/bacon | 2.7 |
| | | | 9 | Chicken/turkey | 1.3 | 9 | Bread/rolls/biscuits/bagels/tortilla | 2.4 |
| | | | 10 | Yogurt | 1.1 | 10 | Yogurt | 2.0 |
| | | | | | | 11 | Eggs | 1.8 |
| | | | | | | 12 | Pasta | 1.8 |
| | | | | | | 13 | Pork/ham | 1.6 |
| | | | | | | 14 | Flour/baking ingredients | 1.3 |
| | | | | | | 15 | Dried beans and peas/vegetarian meat substitutes | 1.3 |
| | | | | | | 16 | Cereal/granola bars | 1.2 |
| | | | | | | 17 | 100% juice | 1.1 |
| | | | | | | 18 | White potatoes | 1.0 |

Table 22. Sources of magnesium among US infants and toddlers 4 to 24 months of age from the 2002 Feeding Infants and Toddlers Study

| 4 to 5 Months | | | 6 to 11 Months | | | 12 to 24 Months | | |
|---------------|----------------|------------|----------------|--------------------------------------|------------|-----------------|--|------------|
| Rank | Food group | % of Total | Rank | Food group | % of Total | Rank | Food group | % of Total |
| 1 | Infant formula | 49.5 | 1 | Infant formula | 27.8 | 1 | Milk (cow's/goat's/soy) | 38.3 |
| 2 | Infant cereal | 19.3 | 2 | Infant cereal | 15.8 | 2 | 100% juice | 5.7 |
| 3 | Breast milk | 17.0 | 3 | Bananas | 6.8 | 3 | Noninfant cereals | 4.8 |
| 4 | Bananas | 3.1 | 4 | Milk (cow's/goat's/soy) | 6.6 | 4 | Bananas | 4.5 |
| 5 | 100% juice | 1.7 | 5 | Baby food dinners | 4.8 | 5 | Bread/rolls/biscuits/bagels/tortilla | 3.7 |
| 6 | Green beans | 1.2 | 6 | Breast milk | 4.2 | 6 | White potatoes | 2.9 |
| 7 | Sweet potatoes | 1.1 | 7 | 100% juice | 3.7 | 7 | Chicken/turkey | 2.6 |
| | | | 8 | Noninfant cereals | 2.4 | 8 | Pasta | 2.3 |
| | | | 9 | Green beans | 2.2 | 9 | Cheese | 2.2 |
| | | | 10 | Bread/rolls/biscuits/bagels/tortilla | 1.4 | 10 | Yogurt | 1.6 |
| | | | 11 | Pears | 1.3 | 11 | Cookies | 1.6 |
| | | | 12 | Sweet potatoes | 1.2 | 12 | Peanut butter/nuts/seeds | 1.5 |
| | | | 13 | Winter squash | 1.2 | 13 | Flour/baking ingredients | 1.5 |
| | | | 14 | White potatoes | 1.2 | 14 | Sweetened beverages | 1.4 |
| | | | 15 | Yogurt | 1.2 | 15 | Infant formula | 1.3 |
| | | | 16 | Baby food desserts | 1.1 | 16 | Crackers/pretzels/rice cakes | 1.3 |
| | | | 17 | Carrots | 1.1 | 17 | Beef | 1.2 |
| | | | 18 | Apples/applesauce | 1.1 | 18 | Tomatoes/tomato sauce | 1.2 |
| | | | | | | 19 | Dried beans and peas/vegetarian meat substitutes | 1.1 |
| | | | | | | 20 | Infant cereal | 1.1 |

Table 23. Sources of phosphorus among US infants and toddlers 4 to 24 months of age from the 2002 Feeding Infants and Toddlers Study

| 4 to 5 Months | | | 6 to 11 Months | | | 12 to 24 Months | | |
|---------------|----------------|------------|----------------|--------------------------------------|------------|-----------------|---------------------------------------|------------|
| Rank | Food group | % of Total | Rank | Food group | % of Total | Rank | Food group | % of Total |
| 1 | Infant formula | 70.4 | 1 | Infant formula | 45.2 | 1 | Milk (cow's/goat's/soy) | 49.4 |
| 2 | Breast milk | 13.4 | 2 | Infant cereal | 12.1 | 2 | Cheese | 8.3 |
| 3 | Infant cereal | 11.3 | 3 | Milk (cow's/goat's/soy) | 9.4 | 3 | Chicken/turkey | 3.9 |
| | | | 4 | Baby food dinners | 4.0 | 4 | Noninfant cereals | 3.0 |
| | | | 5 | Breast milk | 3.7 | 5 | Bread/rolls/biscuits/bagels/tortilla | 2.9 |
| | | | 6 | Cheese | 2.7 | 6 | Yogurt | 2.4 |
| | | | 7 | Yogurt | 2.1 | 7 | Eggs | 2.2 |
| | | | 8 | Noninfant cereals | 1.7 | 8 | Flour/baking ingredients | 2.1 |
| | | | 9 | Chicken/turkey | 1.6 | 9 | Beef | 1.9 |
| | | | 10 | 100% juice | 1.3 | 10 | Infant formula | 1.6 |
| | | | 11 | Bread/rolls/biscuits/bagels/tortilla | 1.1 | 11 | 100% juice | 1.6 |
| | | | 12 | Bananas | 1.1 | 12 | Pasta | 1.4 |
| | | | | | | 13 | Fish/shellfish | 1.3 |
| | | | | | | 14 | Pancakes/waffles/french toast | 1.2 |
| | | | | | | 15 | Hot dogs/cold cuts/sausages/ bacon | 1.2 |
| | | | | | | 16 | White potatoes | 1.1 |
| | | | | | | 17 | Crackers/pretzels/rice cakes | 1.0 |

Table 24. Sources of sodium among US infants and toddlers 4 to 24 months of age from the 2002 Feeding Infants and Toddlers Study

| 4 to 5 Months | | | 6 to 11 Months | | | 12 to 24 Months | | |
|---------------|-------------------|------------|----------------|---------------------------------------|------------|-----------------|---------------------------------------|------------|
| Rank | Food group | % of Total | Rank | Food group | % of Total | Rank | Food group | % of Total |
| 1 | Infant formula | 62.9 | 1 | Infant formula | 24.2 | 1 | Other foods | 18.2 |
| 2 | Breast milk | 27.4 | 2 | Other foods | 13.9 | 2 | Milk (cow's/goat's/soy) | 15.2 |
| 3 | Condiments | 1.7 | 3 | Cheese | 6.0 | 3 | Cheese | 9.2 |
| 4 | Supplements—other | 1.1 | 4 | Milk (cow's/goat's/soy) | 4.9 | 4 | Hot dogs/cold cuts/sausages/ bacon | 6.6 |
| 5 | Infant cereal | 1.1 | 5 | Breast milk | 4.7 | 5 | Bread/rolls/biscuits/bagels/tortilla | 6.4 |
| | | | 6 | Baby food dinners | 4.3 | 6 | Chicken/turkey | 4.5 |
| | | | 7 | Bread/rolls/biscuits/bagels/tortilla | 4.3 | 7 | Noninfant cereals | 4.0 |
| | | | 8 | Noninfant cereals | 3.9 | 8 | Crackers/pretzels/rice cakes | 3.9 |
| | | | 9 | Crackers/pretzels/rice cakes | 3.7 | 9 | Condiments | 2.9 |
| | | | 10 | Cookies | 3.0 | 10 | Pancakes/waffles/french toast | 2.6 |
| | | | 11 | Hot dogs/cold cuts/sausages/ bacon | 2.3 | 11 | Cookies | 2.4 |
| | | | 12 | Chicken or turkey | 2.1 | 12 | Flour/baking ingredients | 1.6 |
| | | | 13 | Consomme/broth/bouillon | 1.8 | 13 | Chips/other salty snacks | 1.6 |
| | | | 14 | Pancakes/waffles/french toast | 1.5 | 14 | Tomatoes/tomato sauce | 1.5 |
| | | | 15 | Condiments | 1.3 | 15 | Butter/oil/margarine/other fats | 1.5 |
| | | | 16 | Tomatoes/tomato sauce | 1.1 | 16 | Pork/ham | 1.4 |
| | | | 17 | Carrots | 1.0 | 17 | Cakes/pies/other baked goods | 1.2 |
| | | | 18 | Yogurt | 1.0 | 18 | Consomme/broth/bouillon | 1.2 |
| | | | 19 | Green beans | 1.0 | | | |

Table 25. Sources of potassium among US infants and toddlers 4 to 24 months of age from the 2002 Feeding Infants and Toddlers Study

| 4 to 5 Months | | | 6 to 11 Months | | | 12 to 24 Months | | |
|---------------|-------------------|------------|----------------|--------------------------|------------|-----------------|--------------------------------------|------------|
| Rank | Food group | % of Total | Rank | Food group | % of Total | Rank | Food group | % of Total |
| 1 | Infant formula | 55.1 | 1 | Infant formula | 34.1 | 1 | Milk (cow's/goat's/soy) | 40.0 |
| 2 | Breast milk | 21.4 | 2 | Bananas | 7.1 | 2 | 100% juice | 10.4 |
| 3 | Infant cereal | 7.4 | 3 | Milk (cow's/goat's/soy) | 6.5 | 3 | Bananas | 5.6 |
| 4 | Bananas | 3.0 | 4 | Infant cereal | 6.5 | 4 | White potatoes | 4.4 |
| 5 | 100% juice | 2.6 | 5 | 100% juice | 6.5 | 5 | Sweetened beverages | 2.7 |
| 6 | Sweet potatoes | 1.9 | 6 | Breast milk | 5.7 | 6 | Chicken/turkey | 2.2 |
| 7 | Carrots | 1.2 | 7 | Baby food dinners | 4.2 | 7 | Tomatoes/tomato sauce | 2.1 |
| 8 | Apples/applesauce | 1.1 | 8 | Sweet potatoes | 2.3 | 8 | Yogurt | 2.0 |
| | | | 9 | Apples/applesauce | 2.1 | 9 | Beef | 1.6 |
| | | | 10 | Carrots | 1.9 | 10 | Bread/rolls/biscuits/bagels/tortilla | 1.5 |
| | | | 11 | White potatoes | 1.7 | 11 | Infant formula | 1.4 |
| | | | 12 | Pears | 1.6 | 12 | Noninfant cereals | 1.4 |
| | | | 13 | Peaches/hectarines/plums | 1.5 | 13 | Cheese | 1.1 |
| | | | 14 | Winter squash | 1.5 | 14 | Melons | 1.1 |
| | | | 15 | Yogurt | 1.4 | 15 | | |
| | | | 16 | Green beans | 1.4 | 16 | | |
| | | | 17 | Baby food desserts | 1.3 | 17 | | |
| | | | 18 | Mixed/garden vegetables | 1.0 | 18 | | |