Appendixes

A

Comparison of Current and Revised Food Packages

LIST OF TABLES

SIDE-BY-SIDE COMPARISON OF THE CURRENT AND REVISED FOOD PACKAGES

TABLE A-1 Comparison of the Current and Revised Food Packages for Young Infants, Maximum Monthly Allowances

	Current Food Package I	Revised Food Package I
Partially Breast-Fed Infants[a]		
Specialty Food		
Infant Formula	*Birth through 3.9 months of age:* about 806 fluid ounces of iron-fortified formula[b] (example: 403 fluid ounces of liquid concentrate) [26 fluid ounces of formula per day]	*1 month through 3.9 months of age:* about 384 fluid ounces of iron-fortified formula[b] (example: 52 ounces of powdered formula) [12 fluid ounces of formula per day]
		4 through 5.9 months of age: about 442 fluid ounces of iron-fortified formula[b] (example: 221 fluid ounces of liquid concentrate) [14 fluid ounces of formula per day]
Fully Formula-Fed Infants[a]		
Specialty Food		
Infant Formula	*Birth through 3.9 months of age:* about 806 fluid ounces of iron-fortified formula[b] (example: 403 fluid ounces of liquid concentrate) [26 fluid ounces of formula per day]	*Birth through 3.9 months of age:* about 806 fluid ounces of iron-fortified formula[b] (example: 403 fluid ounces of liquid concentrate) [26 fluid ounces of formula per day]
		4 through 5.9 months of age: about 884 fluid ounces of iron-fortified formula[b] (example: 442 fluid ounces of liquid concentrate) [29 fluid ounces of formula per day]
Participant Eligibility		
Partially Breast-Fed Infants[a]	Birth through 3.9 months of age	1 month through 5.9 months of age
Fully Formula-Fed Infants[a]	Birth through 3.9 months of age	Birth through 5.9 months of age

[a]Infants are certified without respect to the feeding method to be used; however, the amount of formula prescribed for infants will vary depending on whether they are fully breast-fed, partially breast-fed, or fully formula-fed.

[b]The number of fluid ounces of formula refers to the amount as prepared according to directions on the container.

TABLE A-2 Comparison of the Current and Revised Food Packages for Older Infants, Maximum Monthly Allowances

	Current Food Package II	Revised Food Package II
Fully Breast-Fed Infants[a]		
Food Group		
Fruits and Vegetables	96 fluid ounces of vitamin C-rich juice [3.1 fluid ounces per day]	256 ounces of baby food fruits and vegetables [8.3 ounces per day]
Grains	24 ounces of iron-fortified infant cereal	24 ounces of iron-fortified infant cereal
Meat		77.5 ounces baby food meat [2.5 ounces per day]
Partially Breast-Fed Infants[a]		
Specialty Food		
Infant Formula	About 806 fluid ounces of iron-fortified formula[b] (example: 403 fluid ounces of liquid concentrate) [26 fluid ounces of formula per day]	About 312 fluid ounces of iron-fortified formula[b] (example: 156 fluid ounces of liquid concentrate) [10 fluid ounces of formula per day]
Food Group		
Fruits and Vegetables	96 fluid ounces of vitamin C-rich juice [3.1 fluid ounces per day]	128 ounces of baby food fruits and vegetables [4.1 ounces per day]
Grains	24 ounces of iron-fortified infant cereal	24 ounces of iron-fortified infant cereal
Fully Formula-Fed Infants[a]		
Specialty Food		
Infant Formula	About 806 fluid ounces of iron-fortified formula[b] (example: 403 fluid ounces of liquid concentrate) [26 fluid ounces of formula per day]	About 624 fluid ounces of iron-fortified formula[b] (example: 312 fluid ounces of liquid concentrate) [20 fluid ounces of formula per day]
Food Group		
Fruits and Vegetables	96 fluid ounces of vitamin C-rich juice [3.1 fluid ounces per day]	128 ounces of baby food fruits and vegetables [4.1 ounces per day]

continues

TABLE A-2 Continued

	Current Food Package II	Revised Food Package II
Grains	24 ounces of iron-fortified infant cereal	24 ounces of iron-fortified infant cereal
Participant Eligibility		
	Infants, 4 through 11.9 months of age	Infants, 6 through 11.9 months of age

[a]Infants are certified without respect to the feeding method to be used; however, the amount of formula prescribed for infants will vary depending on whether they are fully breast-fed, partially breast-fed, or fully formula-fed.

[b]The number of fluid ounces of formula refers to the amount as prepared according to directions on the container.

TABLE A-3 Comparison of the Current and Revised Food Packages for Participants with Special Dietary Needs, Maximum Monthly Allowances

	Current Food Package III	Revised Food Package III
Specialty Food		
Formula	About 806 fluid ounces of iron-fortified formula[a] (example: 403 fluid ounces of liquid concentrate), additional amounts may be approved for nutritional need (up to 104 fl oz of formula)	About 806 fluid ounces of iron-fortified formula[a] (example: 403 fluid ounces of liquid concentrate), additional amounts may be approved for nutritional need
Food Group		
Fruits and Vegetables	144 fluid ounces of vitamin C-rich juice [4.8 fluid ounces per day]	Any foods from the life stage-appropriate package are included, if consistent with the participant's special health needs.
Milk and Alternatives	Any foods as described above	
Grains	36 ounces of iron-fortified cereal	Any foods as described above
Meat and Alternatives		Any foods as described above
Participant Eligibility		
	Children and women	Infants, children, and women

[a]May be special formulas or medical formulas, not just infant formula. The number of fluid ounces of formula refers to the amount as prepared according to directions on the container.

TABLE A-4 Comparison of the Current and Revised Food Packages for Children, Maximum Monthly Allowances

	Current Food Package IV	Revised Food Package IV
Food Group		
Fruits and Vegetables	288 fluid ounces of vitamin C-rich juice [9.6 fluid ounces per day]	128 fluid ounces of vitamin C-rich juice [4.3 fluid ounces per day] $8 cash-value voucher for fresh fruits and vegetables[a]
Milk and Alternatives	24 quarts of milk with some allowed substitutions [3.2 cups per day]	16 quarts of milk with more allowed substitutions [2.1 cups per day] • 1-year-old: whole milk (3.5–4% milk fat) • 2- through 4-year-old: 2% milk fat or less
Grains	36 ounces of iron-fortified cereal	36 ounces of iron-fortified whole grain cereal 2 pounds of whole grain bread or other whole grain options
Meat and Alternatives	2–2.5 dozen eggs 1 pound of dried beans or peas *or* 18 ounces of peanut butter	1 dozen eggs 1 pound of dried beans or peas or the equivalent canned *or* 18 ounces of peanut butter
Participant Eligibility		
	Children, 1 through 4.9 years of age	Children, 1 through 4.9 years of age

[a]Alternatively, a processed fruit and vegetable option is available.

TABLE A-5 Comparison of the Current and Revised Food Packages for Pregnant Women and Partially Breastfeeding Women, Maximum Monthly Allowances

	Current Food Package V	Revised Food Package V
Food Group		
Fruits and Vegetables	288 fluid ounces of vitamin C-rich juice [9.6 fluid ounces per day]	144 fluid ounces of vitamin C-rich juice [4.8 fluid ounces per day] $10 cash-value voucher for fresh fruits and vegetables[a]
Milk and Alternatives	28 quarts of milk with some allowed substitutions [3.7 cups per day]	22 quarts of milk, 2% milk fat or less, with more allowed substitutions [2.9 cups per day]
Grains	36 ounces of iron-fortified cereal	36 ounces of iron-fortified whole grain cereal 1 pound of whole-grain bread or other whole-grain options
Meat and Alternatives	2–2.5 dozen eggs 1 pound of dried beans or peas *or* 18 ounces of peanut butter	1 dozen eggs 1 pound of dried beans or peas or the equivalent canned *and* 18 ounces of peanut butter
Participant Eligibility		
Length of Eligibility		
Eligibility During Pregnancy	Throughout pregnancy	Throughout pregnancy
Eligibility After Giving Birth	Up to 12 months after delivery	From 1 month through 11.9 months after delivery
Description of Breastfeeding		
	Definition of Breastfeeding: Breastfeeding an average of once per day	Definition of Partial Breastfeeding: Breastfeeding and requesting formula in amounts that do not exceed approximately half the amount of formula allowed for a fully formula-fed infant

[a]Alternatively, a processed fruit and vegetable option is available.

TABLE A-6 Comparison of the Current and Revised Food Packages for Non-Breastfeeding Postpartum Women, Maximum Monthly Allowances

	Current Food Package VI	Revised Food Package VI
Food Group		
Fruits and Vegetables	192 fluid ounces of vitamin C-rich juice [6.4 fluid ounces per day]	96 fluid ounces of vitamin C-rich juice [3.2 fluid ounces per day] $10 cash-value voucher for fresh fruits and vegetables[a]
Milk and Alternatives	24 quarts of milk with some allowed substitutions [3.2 cups per day]	16 quarts of milk, 2% milk fat or less, with more allowed substitutions [2.1 cups per day]
Grains	36 ounces of iron-fortified cereal	36 ounces of iron-fortified whole-grain cereal
Meat and Alternatives	2–2.5 dozen eggs	1 dozen eggs 1 pound of dried beans or peas or the equivalent canned *or* 18 ounces of peanut butter
Participant Eligibility		
Length of Eligibility		
	Up to 6 months after delivery	Up to 6 months after delivery

[a]Alternatively, a processed fruit and vegetable option is available.

TABLE A-7 Comparison of the Current and Revised Food Packages for Fully Breastfeeding Women, Maximum Monthly Allowances

	Current Food Package VII	Revised Food Package VII
Food Group		
Fruits and Vegetables	336 fluid ounces of vitamin C-rich juice [11 fluid ounces per day] 2 pounds fresh carrots (canned or frozen carrots allowed)	144 fluid ounces of vitamin C-rich juice [4.8 fluid ounces per day] $10 cash-value voucher for fresh fruits and vegetables[a]
Milk and Alternatives	28 quarts of milk with some allowed substitutions [3.7 cups per day] 1 pound of cheese [about one-half ounce per day]	24 quarts of milk, 2% milk fat or less, with more allowed substitutions [3.2 cups per day] 1 pound of cheese [about one-half ounce per day]
Grains	36 ounces of iron-fortified cereal	36 ounces of iron-fortified whole-grain cereal 1 pound of whole grain bread or other whole grain options
Meat and Alternatives	2–2.5 dozen eggs 26 ounces canned fish (light tuna) 1 pound of dried beans or peas *and* 18 ounces of peanut butter	2 dozen eggs 30 ounces canned fish (light tuna or salmon) 1 pound of dried beans or peas or the equivalent canned *and* 18 ounces of peanut butter
Participant Eligibility		
Length of Eligibility		
	Up to 12 months after delivery	Up to 12 months after delivery

[a]Alternatively, a processed fruit and vegetable option is available.

B

Nutrient Profiles of Current and Revised Food Packages

INTRODUCTION

For the analyses presented in this report, the committee conducted detailed analyses of the nutrient content of the current and revised WIC food packages. Many of the details are presented in here in Appendix B. Additional details are presented in Appendix E—*Cost Calculations*. Specifically, details of the assumptions used in both the nutrient and cost analyses of the food packages are presented in Tables E-1 and E-2.

The following is a list of the tables presented here in Appendix B.

TABLE B-1 Specifications for Foods in the Revised Food Packages

Category / Food	Package Number and Participant Description	Allowable Foods and Minimum Requirements
Infant Foods		
Infant formula	**I-FF, II-FF** Infants, fully formula-fed, 0–11.9 mo **I-BF/FF-B, II-BF/FF** Infants, partially breast-fed, 4–11.9 mo	No change from current specifications. All allowed infant formulas must meet the definitions and requirements for an infant formula as regulated by FDA: Federal Food, Drug, and Cosmetic Act, definitions [21 USC § 321(z)]; requirements [21 CFR § 106 and §107]; and any updates of these regulations. The iron fortification level must be 10 mg per liter of formula (as prepared for consumption as directed on the container). Liquid concentrate, powdered, or ready-to-feed forms of formula are allowed.[a]
Infant formula, powdered	**I-BF/FF-A** Infants, partially breast-fed, 1–3.9 mo	Only powdered formula is allowed (except when powdered formula is contraindicated).[b]
Infant formula, powdered	**I-BF** Infants, fully breast-fed	Allowed only during the first month after birth under special conditions. Only powdered formula is allowed (except when powdered formula is contraindicated).[b]
Baby food fruits and vegetables	**II** Infants, 6–11.9 mo	Commercial baby food fruits and vegetables without added sugars, starches, or salt (i.e., sodium). Texture may range from strained through diced. Fresh banana may replace up to 16 oz of baby food fruit (e.g., 4 4-oz jars per month) at a rate of 1 lb of bananas per 8 oz of baby food fruit.
Infant cereal	**II** Infants, 6–11.9 mo	No change from current specifications. Infant cereal, instant (must conform to USDA commercial item description A-A-20022B and any updates of these regulations) Must contain a minimum of 45 mg of iron per 100 g of dry cereal. Infant cereals containing infant formula, milk, fruit, or other noncereal ingredients are not allowed.
Baby food meat	**II-BF** Infants, fully breast-fed, 6–11.9 mo	Single major ingredient, commercial baby food meat without added sugars, starches, vegetables, or salt (i.e., sodium). Broth (unsalted; that is,

TABLE B-1 Continued

Category / Food	Package Number and Participant Description	Allowable Foods and Minimum Requirements
		without added sodium) may be an ingredient. Texture may range from pureed through diced.
Fruits and Vegetables		
Juice	**IV, V, VI, VII** Children and women	No change from current specifications. Must be pasteurized 100% unsweetened fruit juice (must conform to FDA standard of identity [21 CFR § 146] and any updates of these regulations) or vegetable juice (must conform to FDA standard of identity [21 CFR § 156] and any updates of these regulations) and contain at least 30 mg of vitamin C per 100 mL of juice. Juices that are fortified with other nutrients may be allowed at the state agency's option. Juice may be fresh, from concentrate, frozen, canned, or shelf-stable. Vegetable juice may be regular or lower in sodium.[c]
Fresh fruits and vegetables	**IV, V, VI, VII** Children and women	Any variety of fresh whole or cut fruit without added sugars. Any fresh whole or cut vegetable except white potatoes (orange yams and sweet potatoes are allowed); without added sugars, fats, or oils.
Processed fruits and vegetables[d]	**IV, V, VI, VII** Children and women	Any variety of canned[e] fruits (must conform to FDA standard of identity [21 CFR § 145] and any updates of these regulations); juice pack or water pack without added sugars. Any variety of frozen fruits without added sugars. Any variety of canned[e] or frozen vegetables (must conform to FDA standard of identity [21 CFR § 155] and any updates of these regulations) except white potatoes (orange yams and sweet potatoes are allowed); without added sugars, fats, or oils. May be regular or lower in sodium.[c] Excludes soups, condiments such as catsup, pickles, and olives.
	V, VI, VII Women	Any type of dried fruits without added sugars, fats, oils, or salt (i.e., sodium).

continues

TABLE B-1 Continued

Category / Food	Package Number and Participant Description	Allowable Foods and Minimum Requirements
Milk and Alternatives		
Milk	**IV-A** Children, 1–1.9 y	Similar in types and forms under current specification, except that only whole milk (not less that 3.25% milk fat) is allowed. Cow's milk (must conform to FDA standard of identity [21 CFR § 131.110]; USDA commercial item description A-A-20338; and any updates of these regulations) or goat's milk, pasteurized fluid whole milk, finished milk contains at least 400 IU (ca. 10 mcg) of vitamin D per quart of milk or reconstituted milk. May be fluid, shelf-stable, evaporated (21 CFR § 131.130; A-A-20072B), or dried (i.e., powdered) (21 CFR § 131.147). Lactose-reduced milk (must conform to FDA standard of identity [21 CFR § 184.1387 or § 184.1388] and any updates of these regulations) (i.e., must contain at least 70% less lactose than regular milk) is allowed. Buttermilk (must conform to FDA standard of identity for cultured milk [21 CFR § 131.112—cultured buttermilk, kefir cultured milk, acidophilus cultured milk] and any updates of these regulations) may be allowed at the state agency's option.
	IV-B, V, VI, VII Children (≥ 2 y) and women (adolescent and adult)	Similar in types and forms under current specification, except that no more than 2% milk fat allowed. Cow's milk (must conform to FDA standard of identity [21 CFR § 131.110]; USDA commercial item description A-A-20338; and any updates of these regulations) or goat's milk, pasteurized fluid fat-reduced milk (i.e., reduced-fat milk [2% or less milk fat]; lowfat milk [1% or less milk fat]; or nonfat milk [skim milk]), finished milk contains at least 400 IU (ca. 10 mcg) of vitamin D and 2,000 IU (ca. 600 mcg) vitamin A per quart of milk or reconstituted milk. May be fluid, shelf-stable, evaporated [21 CFR § 131.130; A-A-20072B], or

TABLE B-1 Continued

Category / Food	Package Number and Participant Description	Allowable Foods and Minimum Requirements
		powdered (i.e., dry whole milk) [21 CFR § 131.127]. Milk includes lactose-reduced milk and buttermilk as above except no more than 2% milk fat.
Cheese	**IV, V, VI, VII** Children and women	No change from current specifications. Domestic cheese (must conform to FDA standard of identity [21 CFR § 133] and any updates of these regulations); brick, cheddar, colby, jack, monterey, mozzarella, muenster, pasteurized processed American, provolone, Swiss, or blends of any of these cheeses are allowed. Allowed cheeses may be regular or reduced in content of fat, cholesterol, or sodium—that is, labeled low, free, reduced, less, or light in any of these nutrients.[c]
Yogurt, fat-reduced	**IV, V, VI, VII** Children and women	Yogurt (must conform to FDA standard of identity [21 CFR § 131.200] and any updates of these regulations; reduced-fat [FDA, 1998; that is, no more than 2% milk fat], low-fat [21 CFR § 131.203; FDA, 1998; that is, no more than 1% milk fat], or nonfat [21 CFR § 131.206; that is, less than 0.5% milk fat]); plain or flavored with ≤ 17 g of total sugars per 100 g yogurt. May contain low-calorie sweetener (i.e., sugar substitutes) approved by the FDA. Yogurts that are fortified with vitamin D, vitamin A, and other nutrients may be allowed at the state agency's option.[f]
Soy beverage	**V, VI, VII** Women	Soy beverage (sometimes referred to as "soy milk") must be fortified to contain nutrients in amounts similar to cow's milk. Specifications are to include at least 300 mg calcium and 120 IU (ca. 3 mcg) vitamin D per 8 fl oz. Soy beverages typically contain no cholesterol and are low in saturated fat.

continues

TABLE B-1 Continued

Category / Food	Package Number and Participant Description	Allowable Foods and Minimum Requirements
Tofu	Women	Calcium-set tofu (prepared with only calcium salts [e.g., calcium sulfate]). May not contain added fats, oils, or sodium.
Grains		
Cereal	**IV, V, VI, VII** Children and women	Ready-to-eat cereals and hot cereals (must conform to FDA standard of identity—21 CFR § 170.3[n][4]); USDA commercial item description A-A-20000B (for ready-to-eat cereals); and any updates of these regulations]: • contain a minimum of 28 mg iron per 100 g dry cereal; • contain ≤ 21.2 g sucrose and other sugars per 100 g dry cereal (≤ 6 g per dry oz); and • meet labeling requirements for making a health claim as a "whole-grain food with moderate fat content" (see CFSAN, 1999, 2003b): –contain a minimum of 51% whole grains—a minimum of 51% of the grain in the product must be whole grains—using dietary fiber as the indicator; –meet the regulatory definitions for "low saturated fat" (≤ 1 g saturated fat per RACC) and "low cholesterol" (≤ 20 mg cholesterol per RACC); –bear quantitative *trans* fat labeling; and –contain ≤ 6.5 g total fat per RACC and ≤ 0.5 g *trans* fat per RACC. Instant-, quick- and regular-cooking forms are allowed.
Whole grain bread	**IV, V, VII** Children and women except non-breastfeeding postpartum women	Whole wheat bread (must conform to FDA standard of identity [21 CFR § 136.180] and any updates of these regulations) *or* Bread must meet labeling requirements for making a health claim as a "whole-grain food with moderate fat content" (see CFSAN, 1999, 2003b): • contain a minimum of 51% whole grains—a minimum of 51% of the grain in the product must be whole grains—using dietary fiber as a marker;

TABLE B-1 Continued

Category / Food	Package Number and Participant Description	Allowable Foods and Minimum Requirements
		• meet the regulatory definitions for "low saturated fat" (≤ 1 g saturated fat per RACC) and "low cholesterol" (≤ 20 mg cholesterol per RACC); • bear quantitative *trans* fat labeling; and • contain ≤ 6.5 g total fat per RACC and ≤ 0.5 g *trans* fat per RACC.
Other whole grains	**IV, V, VII** Children and women except non-breastfeeding postpartum women	Brown rice, bulgur, oatmeal, whole-grain barley without added sugars, fats, oils, or salt (i.e., sodium). May be instant-, quick-, or regular-cooking. Soft corn or whole wheat tortillas without added fats or oils may be allowed at the state agency's option.
Meat and Alternatives		
Eggs	**IV, V, VI, VII** Children and women	Fresh shell domestic hens' eggs (no standard of identity has been established [21 CFR § 160.100]) or dried eggs (must confirm to FDA standard of identity [21 CFR § 160.105] and any updates of these regulations) made from whole eggs (liquid or shell eggs) that have been pasteurized and dried. No change from current specifications. Hard boiled eggs, where readily available in small quantities, may be provided for participants with limited cooking facilities.
Fish	**VII** Woman, fully breastfeeding	Canned only: • light tuna (no white tuna or albacore) (must conform to FDA standard of identity [21 CFR § 161.190]; USDA commercial item description A-A-20155C; and any updates of these regulations); • salmon (bones, if any, must be soft and friable) (must conform to FDA standard of identity [21 CFR § 161.170]; USDA commercial item description A-A-20158D; and any updates of these regulations); and • other varieties of fish that do not pose a mercury hazard (≤ 1.0 ppm, the standard set for tuna [USDA commercial item description A-A-20155C] as amended by

continues

TABLE B-1 Continued

Category / Food	Package Number and Participant Description	Allowable Foods and Minimum Requirements
		additional standards such as EPA's stricter Tissue Residue Criterion of ≤ 0.3 ppm for freshwater and estuarine fish [EPA, 2001]) as identified by advisories from the FDA and EPA. May be packed in water or oil. May be regular or lower in sodium content.[c]
Dry beans (legumes)	**IV, V, VI, VII** Children and women	Any type of mature dry beans, peas, or lentils in dry-packaged (i.e., dried) or canned[e] forms.[g] Examples include but are not limited to black beans ("turtle beans"), blackeye peas (cowpeas of the blackeye variety, "cow beans"), garbanzo beans (chickpeas), great northern beans, kidney beans, lima beans ("butter beans"), pinto beans, soybeans, split peas, and lentils. All categories exclude soups. May not contain added sugars, fats, or oils. Canned legumes may be regular or lower in sodium content.[c] Baked beans may be provided for participants with limited cooking facilities.
Peanut butter	**IV, V, VI, VII** Children and women	No change from current specifications. Peanut butter (must conform to FDA standard of identity [21 CFR §164.150]; USDA commercial item description A-A-20328; and any updates of these regulations); creamy or chunky, regular or reduced fat, salted or unsalted[c] forms are allowed.
Additional Foods for Food Package III		
Exempt infant formula	**III** Infants, children, and women with special dietary needs	Must meet the requirements for an exempt infant formula as regulated by FDA: Federal Food, Drug, and Cosmetic Act, definitions (21 USC § 350[a][h]; 21 CFR § 107.3); requirements (21 CFR § 106 and § 107); and any updates of these regulations.
Medical foods	**III** Infants, children, and women with special dietary needs	Certain enteral products that are specifically formulated to provide nutritional support for individuals with a diagnosed medical condition, allowable when the use of conventional foods is precluded, restricted, or inadequate.

TABLE B-1 Continued

[a]Following the current practice (see Table 1-1—*Current WIC Food Packages*), the revised maximum monthly allowances for infant formula are listed as fl oz of the liquid concentrate form (see Table 4-1—*Revised WIC Food Packages*). In converting a maximum monthly allowance for formula to powdered or ready-to-feed forms, the committee's recommendations for rounding to whole cans may vary from current practice if only rounding up to whole cans was used. For details, see Table B-6—*Substitution Rates for Various Volumes of Formula Concentrate*.

[b]An example of when powdered formula is contraindicated is any situation in which water quality is compromised.

[c]Any of the following lower sodium forms are allowable: (Adapted from FDA website [Kurtzweil, 1995].)

- *Sodium-free*—less than 5 mg sodium per serving;
- *Very low sodium*—35 mg sodium or less per serving or, if the serving is 30 g or less or 2 tablespoons or less, 35 mg sodium or less per 50 g of the food;
- *Low-sodium*—140 mg sodium or less per serving or, if the serving is 30 g or less or 2 tablespoons or less, 140 mg sodium or less per 50 g of the food;
- *Light in sodium*—at least 50 percent less sodium per serving than average reference amount for same food with no sodium reduction;
- *Lightly salted*—at least 50 percent less sodium per serving than reference amount (If the food is not "low in sodium," the statement "not a low-sodium food" must appear on the same panel as the Nutrition Facts panel.); and
- *Reduced or less sodium*—at least 25 percent less sodium per serving than reference food.

[d]Processed fruits and vegetables can be substituted for fresh produce on the basis of equivalent numbers of servings. The committee's calculations were based on information in USDA's *Food Buying Guide for Child Nutrition Programs* (FNS, 1884a, 1984b). For women, 140 oz of canned fruit plus 140 oz of canned vegetables would be approximately equivalent to $10 fresh fruits and vegetables; for children, 110 oz of canned fruit plus 110 oz of canned vegetables would be approximately equivalent to $8 fresh fruits and vegetables.

[e]For the purposes of this specifications table, the term *canned* refers to processed food items in cans or other shelf-stable containers.

[f]As more brands of fortified yogurt appear in the market, state agencies may decide to increase the total amount of yogurt that can be substituted for milk.

[g]Canned legumes could substitute for dried legumes at the rate or 64 oz of canned beans for 1 lb dried beans. The equivalence of 64 oz of canned beans for 1 lb dried beans was calculated using several methods. One method used the following conversion factors: 1 lb of dried beans = 6 cups of cooked beans (drained); and 1 15-oz can of beans (mature legumes) = 1 1/2 cups cooked beans (drained) (American Dry Bean Board, 2004). Thus, 1 lb of dried beans = 4 15-oz cans of beans (60 oz). Common can sizes for legumes currently on the market ranged from 15 to 16 oz; the equivalence was raised from 60 oz to 64 oz of canned beans for 1 lb dried beans to allow a participant to obtain 4 16-cans per month.

NOTES: BF = fully breast-fed (i.e., the infant receives no formula through the WIC program); BF/FF = partially breast-fed (i.e., the infant is breast-fed but receives some formula through the WIC program); ca. = calculated amount; CFR = Code of Federal Regulations; DHHS = U.S. Department of Health and Human Services; EPA = U.S. Environmental Protection Agency; FDA = U.S. Food and Drug Administration; FF = fully formula-fed; IU = International Units; mL = milliliter; RACC = reference amounts customarily consumed per eating occasion, defined in 21 CFR § 101.12; USC = U.S. Code; USDA = U.S. Department of Agriculture.

DATA SOURCES: CFR (U.S. Congress, 2004b); CFSAN (CFSAN, 1999, 2003b); USDA commercial item descriptions (USDA, 2005); FDA Standards of Identity (FDA, 2005); USC (U.S. Congress, 2005).

TABLE B-2A Nutrient Analysis of Current and Revised Food Packages Using NDS-R,[a] Elements

	Dietary Component		
	Calcium (mg/d)	Iron (mg/d)	Zinc (mg/d)
Current Food Package I (0–3.9 mo)	417	9.5	4.9
Revised Food Package I-FF-A (0–3.9 mo)	417	9.5	4.9
Change from current package	0	0	0
Current Food Package II (4–5.9 mo)	555	19.6	6.4
Revised Food Package I-FF-B (4–5.9 mo)	457	10.4	5.4
Change from current package	–98	–9.2	–1.0
Current Food Package II (6–11.9 mo)	555	19.6	6.4
Revised Food Package II-FF (6–11.9 mo)	475	17.6	5.4
Change from current package	–80	–2.0	–1.0
Current Food Package II, breast-fed[b]	138	10.1	1.5
Revised Food Package II-BF (6–11.9 mo)	202	11.4	3.3
Change from current package	+64	+1.3	+1.8
Current Food Package IV (1–4.9 y)	1,219	13.8	9.3
Revised Food Package IV-A (1–1.9 y)	1,084	15.4	10.5
Change from current package	–135	+1.6	+1.2
Revised Food Package IV-B (2–4.9 y)	1,085	15.5	10.7
Change from current package	–134	+1.7	+1.4
Current Food Package V	1,374	13.9	9.9
Revised Food Package V	1,341	16.9	11.8
Change from current package	–33	+3.0	+1.9
Current Food Package VI	1,199	13.0	8.8
Revised Food Package VI	1,063	15.4	10.0
Change from current package	–136	+2.4	+1.2
Current Food Package VII	1,494	15.3	11.1
Revised Food Package VII	1,538	17.7	12.9
Change from current package	+44	+2.4	+1.8

NOTES: The sodium content of the revised food packages was increased when the processed option (i.e., canned fruits and vegetables as described in Tables B-4 and E-2) was substituted for fresh produce; using canned vegetables, the sodium content increased by 27% for Food Package IV, 32% for Food Package V, 48% for Food Package VI, and 24% for Food Package VII. See notes for Tables B-2A through B-2E following Table B-2E.

Selenium (mcg/d)	Magnesium (mg/d)	Phosphorus (mg/d)	Sodium (mg/d)	Potassium (mg/d)
13.3	45	262	145	567
13.3	45	262	145	567
0	0	0	0	0
16.0	81	359	175	858
14.6	49	287	159	622
–1.4	–32	–72	–16	–236
16.0	81	359	175	858
13.2	79	312	144	788
–2.8	–2	–47	–31	–70
2.7	36	97	29	290
10.0	67	209	71	642
7.3	+31	+112	+42	+352
38.7	158	969	875	1,683
35.4	192	803	791	1,522
–3.3	+34	–166	–84	–161
36.6	187	819	796	1,533
–2.1	+29	–150	–79	–150
41.6	173	1,093	940	1,883
38.5	232	1,023	848	2,026
–3.1	+59	–70	–92	+143
37.5	127	898	829	1,393
26.5	159	722	571	1,463
–11.0	+32	–176	–258	+70
64.5	215	1,302	1,198	2,237
68.0	255	1,267	1,033	2,235
–3.5	+40	–35	–165	–2

TABLE B-2B Nutrient Analysis of Current and Revised Food Packages Using NDS-R,[a] Fat-Soluble Vitamins

	Dietary Component		
	Vitamin A (mcg RAE/d)	Retinol (mcg/d)	Vitamin D (mcg/d)
Current Food Package I (0–3.9 mo)	424	413	7.8
Revised Food Package I-FF-A (0–3.9 mo)	424	413	7.8
Change from current package	0	0	0
Current Food Package II (4–5.9 mo)	426	413	7.8
Revised Food Package I-FF-B (4–5.9 mo)	465	453	8.6
Change from current package	+39	+40	+0.8
Current Food Package II (6–11.9 mo)	426	413	7.8
Revised Food Package II-FF (6–11.9 mo)	467	320	6.0
Change from current package	+41	–93	–1.8
Current Food Package II, breast-fed[b]	3	0	0.0
Revised Food Package II-BF (6–11.9 mo)	274	1	0.1
Change from current package	+271	+1	+0.1
Current Food Package IV (1–4.9 y)	612	596	7.5
Revised Food Package IV-A (1–1.9 y)	573	345	5.5
Change from current package	–39	–251	–2.0
Revised Food Package IV-B (2–4.9 y)	681	455	5.6
Change from current package	+69	–141	–1.9
Current Food Package V	680	663	8.9
Revised Food Package V	833	552	7.3
Change from current package	+153	–111	–1.6
Current Food Package VI	609	596	7.5
Revised Food Package VI	734	455	5.6
Change from current package	+125	–141	–1.9
Current Food Package VII	971	701	10.1
Revised Food Package VII	945	662	10.3
Change from current package	–26	–39	+0.2

See notes for Tables B-2A through B-2E following Table B-2E.

Vitamin E (mg AT/d)	Vitamin E (mg ATE/d)
5.8	8.1
5.8	8.1
0	0
6.4	9.2
6.4	8.9
0	–0.3
6.4	9.2
5.6	8.0
–0.8	–1.2
0.5	1.1
1.8	2.4
+1.3	+1.3
4.8	8.3
6.9	12.7
+2.1	+4.4
6.6	12.4
+1.8	+4.1
4.8	8.3
8.3	15.3
+3.5	+7.0
3.9	7.3
7.1	13.6
+3.2	+6.3
6.0	9.7
9.0	16.1
+3.0	+6.4

TABLE B-2C Nutrient Analysis of Current and Revised Food Packages Using NDS-R,[a] Water-Soluble Vitamins

	Dietary Component		
	Vitamin C (mg/d)	Thiamin (mg/d)	Riboflavin (mg/d)
Current Food Package I (0–3.9 mo)	58.5	0.45	0.76
Revised Food Package I-FF-A (0–3.9 mo)	58.5	0.45	0.76
Change from current package	0	0	0
Current Food Package II (4–5.9 mo)	82.7	0.78	1.17
Revised Food Package I-FF-B (4–5.9 mo)	64.2	0.49	0.83
Change from current package	–18.5	–0.29	–0.34
Current Food Package II (6–11.9 mo)	82.7	0.78	1.17
Revised Food Package II-FF (6–11.9 mo)	52.1	0.69	1.03
Change from current package	–30.6	–0.09	–0.14
Current Food Package II, breast-fed[b]	24.2	0.33	0.41
Revised Food Package II-BF (6–11.9 mo)	13.2	0.38	0.59
Change from current package	–11.0	+0.05	+0.18
Current Food Package IV (1–4.9 y)	116.4	1.04	2.08
Revised Food Package IV-A (1–1.9 y)	85.2	1.20	1.90
Change from current package	–31.2	+0.16	–0.18
Revised Food Package IV-B (2–4.9 y)	84.5	1.20	1.91
Change from current package	–31.9	+0.16	–0.17
Current Food Package V	117.5	1.09	2.30
Revised Food Package V	98.3	1.28	2.19
Change from current package	–19.2	+0.19	–0.11
Current Food Package VI	84.4	0.96	2.05
Revised Food Package VI	80.9	1.10	1.82
Change from current package	–3.5	+0.14	–0.23
Current Food Package VII	135.1	1.18	2.42
Revised Food Package VII	98.8	1.33	2.48
Change from current package	–36.3	+0.15	+0.06

See notes for Tables B-2A through B-2E following Table B-2E.

Niacin (mg/d)	Vitamin B_6 (mg/d)	Vitamin B_{12} (mcg/d)	Folate (mcg DFE/d)
5.3	0.32	1.49	124
5.3	0.32	1.49	124
0	0	0	0
8.3	0.51	1.54	126
5.8	0.35	1.64	135
–2.5	–0.16	+0.10	+9
8.3	0.51	1.54	126
7.5	0.46	1.20	113
–0.8	–0.05	–0.34	–13
3.0	0.18	0.05	3
5.8	0.36	0.99	34
+2.8	+0.18	+0.94	+31
10.3	1.31	5.56	494
13.7	1.63	4.89	512
+3.4	+0.32	–0.67	+18
13.7	1.62	5.09	512
+3.4	+0.31	–0.47	+18
10.4	1.36	6.07	500
15.0	1.79	6.34	571
+4.6	+0.43	+0.27	+71
9.0	1.21	5.56	439
12.7	1.57	5.40	506
+3.7	+0.36	–0.16	+67
15.1	1.56	6.88	551
18.4	1.93	7.89	587
+3.3	+0.37	+1.01	+36

TABLE B-2D Nutrient Analysis of Current and Revised Food Packages Using NDS-R,[a] Macronutrients, Fiber, Phytate, and Cholesterol

	Dietary Component		
	Food Energy (kcal/d)	Protein (g/d)	Protein (% of energy)
Current Food Package I (0–3.9 mo)	529	11.2	8.5
Revised Food Package I-FF-A (0–3.9 mo)	529	11.2	8.5
Change from current package	0	0	0
Current Food Package II (4–5.9 mo)	663	13.3	8.0
Revised Food Package I-FF-B (4–5.9 mo)	581	12.3	8.5
Change from current package	–82	–1.0	+0.5
Current Food Package II (6–11.9 mo)	663	13.3	8.0
Revised Food Package II-FF (6–11.9 mo)	547	11.4	7.8
Change from current package	–116	–1.9	–0.2
Current Food Package II, breast-fed[b]	134	2.1	6.1
Revised Food Package II-BF (6–11.9 mo)	257	11.7	16.3
Change from current package	+123	+9.6	+10.2
Current Food Package IV (1–4.9 y)	797	41.2	21.3
Revised Food Package IV-A (1–1.9 y)	753	31.9	17.4
Change from current package	–44	–9.3	–3.9
Revised Food Package IV-B (2–4.9 y)	668	32.1	19.9
Change from current package	–129	–9.1	–1.4
Current Food Package V	858	45.5	21.9
Revised Food Package V	823	42.4	21.2
Change from current package	–35	–3.1	+0.7
Current Food Package VI	676	37.0	22.5
Revised Food Package VI	577	29.5	19.6
Change from current package	–99	–7.5	–2.9
Current Food Package VII	1,061	60.1	23.3
Revised Food Package VII	981	58.1	24.4
Change from current package	–80	+2.0	+1.1

See notes for Tables B-2A through B-2E following Table B-2E.

Carbohydrate (g/d)	Carbohydrate (% of energy)	Fiber (g/d)	Phytic Acid (mg/d)	Cholesterol (mg/d)
57.8	43.6	<0.1	<1	6
57.8	43.6	<0.1	<1	6
0	0	0	0	0
86.4	52.1	0.3	44	6
63.4	43.6	<0.1	<1	7
−23.0	−8.5	−0.3	−44	+1
86.4	52.1	0.3	44	6
73.9	54.3	2.4	62	5
−12.5	+2.2	+2.1	+18	−1
28.7	85.7	0.3	44	<1
43.1	67.9	5.1	80	30
+14.4	−17.8	+4.8	+36	+30
95.5	49.6	6.0	303	279
102.3	55.0	10.6	534	156
+6.8	+5.4	+4.6	+231	−123
102.8	62.6	10.6	534	113
+7.3	+13.0	+4.6	+231	−166
101.6	49.0	4.6	303	288
117.8	57.3	12.5	705	118
+16.2	+8.3	+7.9	+402	−170
78.3	47.1	2.6	156	279
84.4	64.3	9.0	462	111
+6.1	+17.2	+6.4	+306	−168
116.2	44.4	7.3	453	307
121.6	49.6	12.6	710	227
+5.4	+5.2	+5.3	+257	−80

TABLE B-2E Nutrient Analysis of Current and Revised Food Packages Using NDS-R,[a] Fats

	Dietary Component		
	Total Fat (g/d)	Total Fat (% of energy)	Saturated Fat (% of energy)
Current Food Package I (0–3.9 mo)	28.2	48.0	19.4
Revised Food Package I-FF-A (0–3.9 mo)	28.2	48.0	19.4
Change from current package	0	0	0
Current Food Package II (4–5.9 mo)	29.3	39.7	15.8
Revised Food Package I-FF-B (4–5.9 mo)	31.0	48.0	19.4
Change from current package	+1.7	+8.3	+3.6
Current Food Package II (6–11.9 mo)	29.3	39.7	15.8
Revised Food Package II-FF (6–11.9 mo)	23.0	37.7	15.0
Change from current package	–6.3	–2.0	–0.8
Current Food Package II, breast-fed[b]	1.0	6.9	1.6
Revised Food Package II-BF (6–11.9 mo)	4.6	15.4	4.7
Change from current package	+3.6	+8.5	+3.1
Current Food Package IV (1–4.9 y)	29.2	30.6	15.6
Revised Food Package IV-A (1–1.9 y)	27.0	31.3	15.7
Change from current package	–2.2	+0.7	+0.1
Revised Food Package IV-B (2–4.9 y)	16.7	20.8	8.5
Change from current package	–12.5	–9.8	–7.1
Current Food Package V	31.3	30.4	15.8
Revised Food Package V	23.4	25.1	8.7
Change from current package	–7.9	–5.3	–7.1
Current Food Package VI	24.7	31.4	17.2
Revised Food Package VI	16.0	18.7	7.9
Change from current package	–8.7	–12.7	–9.3
Current Food Package VII	41.4	33.8	16.1
Revised Food Package VII	32.0	28.7	10.0
Change from current package	–9.4	–5.1	–6.1

NOTES FOR TABLES B-2A THROUGH B-2E: AT = α(alpha)-tocopherol; ATE = α(alpha)-tocopherol equivalents; BF = fully breast-fed; BF/FF = partially breast-fed; DFE = dietary folate equivalents (1 DFE = 1 mcg food folate = 0.6 mcg of folic acid from fortified food or as a supplement consumed with food = 0.5 mcg of a supplement taken on an empty stomach); FF = fully formula-fed; RAE = retinol activity equivalents.

[a]The primary nutrient analysis for this report (Tables B-2A through B-2E) used Nutrition Data System for Research software version 5.0/35 (2004) developed by the Nutrition Coordinating Center (NCC), University of Minnesota, Minneapolis, MN (Schakel et al., 1988, 1997; Schakel, 2001). A secondary nutrient analysis was prepared using the USDA Nutrient Database for Standard Reference (SR-17) (NDL, 2004) (Tables B-3A through B-3E). The analysis using SR-17 is presented only here in Appendix B.

Fatty Acids				
Saturated (g/d)	Monounsaturated (g/d)	Polyunsaturated (g/d)	*n*-6 / *n*-3[c] (g/d)	*Trans*[d] (g/d)
11.5	10.5	5.7	5.1 / 0.52	0.02
11.5	10.5	5.7	5.1 / 0.52	0.02
0	0	0	0 / 0	0
11.7	10.7	6.0	5.4 / 0.57	0.02
12.6	11.5	6.2	5.6 / 0.57	0.02
+0.9	+0.8	+0.2	+0.2 / 0	0
11.7	10.7	6.0	5.4 / 0.57	0.02
9.1	8.4	4.8	4.3 / 0.47	0.02
–2.6	–2.3	–1.2	–1.1 / –0.10	0
0.2	0.2	0.4	0.1 / 0.05	<0.01
1.4	1.6	0.9	0.1 / 0.11	0.14
+1.2	+1.4	+0.5	0 /+ 0.06	+0.14
13.8	10.0	2.9	2.5 / 0.28	0.59
13.1	8.8	3.0	2.6 / 0.35	0.69
–0.7	–1.2	+0.1	+0.1 / +0.07	+0.10
6.3	6.2	2.6	2.4 / 0.16	0.42
–7.5	–3.8	–0.3	–0.1 / –0.12	–0.17
15.1	10.8	3.0	2.6 / 0.31	0.66
7.9	8.7	4.6	4.3 / 0.30	0.45
–7.2	–2.1	+1.6	+1.7 / –0.01	–0.21
12.9	8.0	1.6	1.3 / 0.26	0.53
5.9	5.8	2.8	2.6 / 0.21	0.28
–7.0	–2.2	+1.2	+1.3 / –0.05	–0.25
19.0	14.5	4.8	4.2 / 0.44	0.81
12.0	11.6	5.6	5.0 / 0.53	0.58
–7.0	–2.9	+0.8	+0.8 /+ 0.09	–0.23

[b]For fully breast-fed infants, the formula was omitted in the nutrient calculations for current Food Package II.

[c]For *n*-6 polyunsaturated fatty acids, such as linoleic acid, the first double bond from the methyl end is at the sixth carbon atom; for *n*-3 fatty acids, such as linolenic acid, the first double bond from the methyl end is at the third carbon atom.

[d]The term *trans fatty acids* refers to unsaturated fatty acids that contain at least one double bond in the *trans* configuration (that is, with carbon atoms on opposite sides of the longitudinal axis of the double bond).

DATA SOURCES: FNS, 2004e; NDS-R software version 5.0/35, 2004 (Schakel et al., 1988, 1997; Schakel, 2001). Fresh fruits and vegetables were used in the analyses shown for Food Packages IV–VII. An additional analyses was conducted using canned fruits and vegetables (data not shown).

TABLE B-3A Nutrient Analysis of Current and Revised Food Packages Using **USDA Nutrient Database for Standard Reference (SR-17)**,[a] Elements

	Dietary Component		
	Calcium (mg/d)	Iron (mg/d)	Zinc (mg/d)
Current Food Package I (0–3.9 mo)	401	9.3	4.8
Revised Food Package I-FF-A (0–3.9 mo)	401	9.3	4.8
Change from current package	0	0	0
Current Food Package II (4–5.9 mo)	603	20.6	5.3
Revised Food Package I-FF-B (4–5.9 mo)	439	10.2	5.3
Change from current package	–164	–10.4	0
Current Food Package II (6–11.9 mo)	603	20.6	5.3
Revised Food Package II-FF (6–11.9 mo)	533	18.7	4.3
Change from current package	–70	–1.9	–1.0
Current Food Package II, breast-fed[b]	203	11.3	0.5
Revised Food Package II-BF (6–11.9 mo)	266	13.1	2.2
Change from current package	+63	+1.8	+1.7
Current Food Package IV (1–4.9 y)	1,253	14.7	10.0
Revised Food Package IV-A (1–1.9 y)	1,098	17.4	11.6
Change from current package	–158	+2.7	+1.6
Revised Food Package IV-B (2–4.9 y)	1,077	17.4	11.5
Change from current package	–179	+2.7	+1.5
Current Food Package V	1,410	14.8	10.6
Revised Food Package V	1,445	18.4	12.7
Change from current package	+35	+3.6	+2.1
Current Food Package VI	1,236	13.9	9.5
Revised Food Package VI	1,153	17.1	11.1
Change from current package	–83	+3.2	+1.6
Current Food Package VII	1,544	16.0	11.8
Revised Food Package VII	1,658	19.2	13.9
Change from current package	+114	+3.2	+2.1

NOTES FOR TABLE B-3A: The sodium content of the revised food packages was increased when the processed option (i.e., canned fruits and vegetables as described in Tables B-4 and E-2) was substituted for fresh produce; using canned vegetables, the sodium content increased by 45% for Food Package IV, 36% for Food Package V, 49% for Food Package VI, and 25% for Food Package VII. See notes for Tables B-3A through B-3E following Table B-3E.

Selenium (mcg/d)	Magnesium (mg/d)	Phosphorus (mg/d)	Sodium (mg/d)	Potassium (mg/d)
12.8	37	258	138	558
12.8	37	258	138	558
0	0	0	0	0
15.6	90	401	152	764
14.0	41	283	152	612
–1.6	–49	–118	0	–152
15.6	90	401	152	764
12.9	89	353	126	690
–2.7	–1	–48	–26	–74
2.8	52	144	14	206
10.2	82	235	77	555
+7.4	+30	+91	+63	+349
44.7	152	976	800	1,695
41.2	179	819	598	1,542
–3.5	+27	–166	–202	–153
36.6	178	792	590	1,515
–8.1	+26	–184	–210	–180
48.8	166	1,100	854	1,890
41.7	222	1,055	719	2,041
–7.1	+56	–45	–135	–151
43.3	120	903	756	1,392
29.4	154	753	526	1,498
–13.9	+34	–150	–230	+106
71.4	208	1,307	1,122	2,270
71.6	245	1,303	1,008	2,249
+0.2	+37	–4	–114	–21

TABLE B-3B Nutrient Analysis of Current and Revised Food Packages Using **USDA Nutrient Database for Standard Reference (SR-17)**,[a] Fat-Soluble Vitamins

	Dietary Component	
	Vitamin A (mcg RAE/d)	Retinol (mcg/d)
Current Food Package I (0–3.9 mo)	462	462
Revised Food Package I-FF-A (0–3.9 mo)	462	462
Change from current package	0	0
Current Food Package II (4–5.9 mo)	462	462†
Revised Food Package I-FF-B (4–5.9 mo)	507	507
Change from current package	+45	+45
Current Food Package II (6–11.9 mo)	462	462†
Revised Food Package II-FF (6–11.9 mo)	500	358†
Change from current package	+38	–104
Current Food Package II, breast-fed[b]	0	0†
Revised Food Package II-BF (6–11.9 mo)	280	1†
Change from current package	+280	+1
Current Food Package IV (1–4.9 y)	576	565
Revised Food Package IV-A (1–1.9 y)	512	309
Change from current package	–64	–256
Revised Food Package IV-B (2–4.9 y)	622	420
Change from current package	+46	–145
Current Food Package V	642	631
Revised Food Package V	767	507
Change from current package	+125	–124
Current Food Package VI	573	565
Revised Food Package VI	677	421
Change from current package	+104	–144
Current Food Package VII	901	667
Revised Food Package VII	867	606
Change from current package	–34	–61

See notes for Tables B-3A through B-3E following Table B-3E.

Vitamin D (IU/d)	Vitamin E (mg AT/d)	Vitamin E (mg ATE/d)
314†	6.5	N/A*
314†	6.5	N/A*
0	0	
314†	7.6	N/A*
345†	7.1	N/A*
+31	–0.5	
314‡	7.6†	N/A*
243‡	6.7†	N/A*
–71	–0.9	
N/A*	1.2†	N/A*
N/A*	2.4†	N/A*
	+1.2	
311‡	4.6†	N/A*
218‡	6.0†	N/A*
–93	+1.4	
221‡	6.6†	N/A*
–90	+2.0	
368‡	4.7†	N/A*
318‡	7.5†	N/A*
–50	+2.8	
311‡	3.7†	N/A*
243‡	6.5†	N/A*
–68	+2.8	
409‡	5.9†	N/A*
419‡	7.9†	N/A*
+10	+2.0	

TABLE B-3C Nutrient Analysis of Current and Revised Food Packages Using **USDA Nutrient Database for Standard Reference (SR-17)**,[a] Water-Soluble Vitamins

	Dietary Component	
	Vitamin C (mg/d)	Thiamin (mg/d)
Current Food Package I (0–3.9 mo)	57.5	0.45
Revised Food Package I-FF-A (0–3.9 mo)	57.5	0.45
Change from current package	0	0
Current Food Package II (4–5.9 mo)	81.2	1.06
Revised Food Package I-FF-B (4–5.9 mo)	63.1	0.49
Change from current package	–18.1	–0.57
Current Food Package II (6–11.9 mo)	81.2	1.06
Revised Food Package II-FF (6–11.9 mo)	64.7	0.98
Change from current package	–16.5	–0.08
Current Food Package II, breast-fed[b]	23.7	0.62
Revised Food Package II-BF (6–11.9 mo)	40.3	0.66
Change from current package	+16.6	+0.04
Current Food Package IV (1–4.9 y)	110.7	1.27
Revised Food Package IV-A (1–1.9 y)	84.2	1.51
Change from current package	–26.5	+0.24
Revised Food Package IV-B (2–4.9 y)	84.5	1.46
Change from current package	–26.2	+0.19
Current Food Package V	110.7	1.32
Revised Food Package V	95.1	1.56
Change from current package	–15.6	+0.24
Current Food Package VI	79.0	1.17
Revised Food Package VI	78.8	1.37
Change from current package	–0.2	+0.20
Current Food Package VII	128.2	1.43
Revised Food Package VII	95.2	1.61
Change from current package	–33.0	+0.18

See notes for Tables B-3A through B-3E following Table B-3E.

Riboflavin (mg/d)	Niacin (mg/d)	Vitamin B_6 (mg/d)	Vitamin B_{12} (mcg/d)	Folate (mcg DFE/d)
0.74	5.3	0.32	1.45	140
0.74	5.3	0.32	1.45	140
0	0	0	0	0
1.27	12.6	0.46	1.45	146
0.82	5.8	0.35	1.59	154
–0.45	–6.8	–0.11	+0.14	+8
1.27	12.6	0.46	1.45	146
1.15	11.8	0.41	1.12	129
–0.12	–0.8	–0.06	–0.33	–17
0.53	7.3	0.14	0	6
0.75	10.2	0.32	0.95	37
+0.22	+2.9	+0.18	+0.95	+31
2.42	12.2	1.61	6.29	549
2.25	16.3	1.91	5.36	566
–0.17	+4.1	+0.30	–0.93	+17
2.18	16.2	1.90	5.31	563
–0.24	+4.0	+0.29	–0.98	+14
2.66	12.4	1.66	6.90	556
2.65	17.4	2.07	6.87	610†
–0.01	+5.0	+0.41	–0.03	+54
2.38	10.9	1.49	6.29	485
2.23	15.2	1.84	5.84	552†
–0.15	+4.3	+0.35	+0.45	+67
2.78	17.1	1.87	7.64	617
2.85	20.8	2.20	8.45	627†
+0.07	+3.7	+0.33	+0.81	+10

TABLE B-3D Nutrient Analysis of Current and Revised Food Packages Using **USDA Nutrient Database for Standard Reference (SR-17)**,[a] Macronutrients, Fiber, Phytate, and Cholesterol

	Dietary Component		
	Food Energy (kcal/d)	Protein (g/d)	Protein (% of energy)
Current Food Package I (0–3.9 mo)	523	10.9	8.4%
Revised Food Package I-FF-A (0–3.9 mo)	523	10.9	8.4%
Change from current package	0	0	0
Current Food Package II (4–5.9 mo)	657	12.7	7.7%
Revised Food Package I-FF-B (4–5.9 mo)	574	12.0	8.4%
Change from current package	–83	–0.7	0.7%
Current Food Package II (6–11.9 mo)	657	12.7	7.7%
Revised Food Package II-FF (6–11.9 mo)	541	10.8	7.6%
Change from current package	–116	–1.9	–0.1%
Current Food Package II, breast-fed[b]	134	1.8	5.3%
Revised Food Package II-BF (6–11.9 mo)	252	12.4	17.9%
Change from current package	+118	+10.6	+12.6%
Current Food Package IV (1–4.9 y)	784	41.1	21.5%
Revised Food Package IV-A (1–1.9 y)	737	31.3	17.0%
Change from current package	–47	–9.8	–4.5%
Revised Food Package IV-B (2–4.9 y)	636	30.4	18.5%
Change from current package	–148	–10.7	–3.0%
Current Food Package V	845	45.4	21.5%
Revised Food Package V	795	41.9	21.1%
Change from current package	–50	–3.5	–0.4%
Current Food Package VI	663	36.9	22.2%
Revised Food Package VI	563	29.6	21.0%
Change from current package	–100	–7.3	–1.2%
Current Food Package VII	1,046	60.0	22.9%
Revised Food Package VII	948	57.6	24.3%
Change from current package	–98	–2.4	+1.4%

See notes for Tables B-3A through B-3E following Table B-3E.

Carbohydrate (g/d)	Carbohydrate (% of energy)	Fiber (g/d)	Phytic Acid (mg/d)	Cholesterol (mg/d)
52.5	40.1%	<0.1	N/A*	11
52.5	40.1%	<0.1	N/A*	11
0	0	0		0
81.2	49.4%	0.2	N/A*	11
57.6	40.1%	<0.1	N/A*	12
–23.6	–9.3%	–0.2		+1
81.2	49.4%	0.2	N/A*	11
70.2	51.6%	2.6	N/A*	9
–11.0	+2.2%	+2.4		–2
28.7	85.5%	0.2	N/A*	<1
41.2	64.1%	4.9	N/A*	30
+12.5	–21.4%	+4.7		30
94.9	49.2%	6.2	N/A*	275
100.5	54.6%	10.1	N/A*	137
+5.6	+5.4%	+3.9		–138
100.0	61.9%	10.1	N/A*	112
+5.1	+12.7%	+3.9		–163
101.2	47.9%	4.8	N/A*	283
113.1	56.9%	12.0†	N/A*	124†
+11.9	+9.0%	+7.2		–159
77.8	46.9%	2.7	N/A*	275
82.3	58.4%	9.3†	N/A*	114†
+4.5	+11.5%	+6.6		–161
115.8	44.3%	7.7	N/A*	302
116.6	49.2%	12.0†	N/A*	233†
+0.8	+4.9%	+4.3		–69

TABLE B-3E Nutrient Analysis of Current and Revised Food Packages Using **USDA Nutrient Database for Standard Reference (SR-17),**[a] Fats

	Dietary Component		
	Total Fat (g/d)	Total Fat (% of energy)	Saturated Fat (% of energy)
Current Food Package I (0–3.9 mo)	27.8	47.8%	19.3%
Revised Food Package I-FF-A (0–3.9 mo)	27.8	47.8%	19.3%
Change from current package	0	0	0
Current Food Package II (4–5.9 mo)	29.0	39.7%	15.7%
Revised Food Package I-FF-B (4–5.9 mo)	30.5	47.8%	19.3%
Change from current package	+1.5	+8.1%	+3.6%
Current Food Package II (6–11.9 mo)	29.0	39.7%	15.7%
Revised Food Package II-FF (6–11.9 mo)	22.8	37.8%	14.8%
Change from current package	–6.2	–1.9%	–0.9%
Current Food Package II, breast-fed[b]	1.2	8.2%	1.5%
Revised Food Package II-BF (6–11.9 mo)	4.8	16.8%	5.9%
Change from current package	+3.6	+8.6%	+4.4%
Current Food Package IV (1–4.9 y)	28.1	31.0%	15.7%
Revised Food Package IV-A (1–1.9 y)	26.0	31.8%	14.5%
Change from current package	–2.1	+0.8%	–1.2%
Revised Food Package IV-B (2–4.9 y)	15.3	20.6%	8.7%
Change from current package	–12.8	–10.4%	–7.0%
Current Food Package V	30.1	32.1%	15.9%
Revised Food Package V	22.7	25.7%	9.4%
Change from current package	–7.4	–6.4%	–6.5%
Current Food Package VI	23.5	32.0%	17.3%
Revised Food Package VI	15.4	24.6%	9.7%
Change from current package	–8.1	–7.4%	–7.6%
Current Food Package VII	39.9	34.4%	16.1%
Revised Food Package VII	30.9	29.3%	11.6%
Change from current package	–9.0	–5.1%	–4.5%

NOTES FOR TABLES B-3A THROUGH B-3E: AT = α(alpha)-tocopherol; ATE = α(alpha)-tocopherol equivalents; DFE = dietary folate equivalents (1 DFE = 1 mcg food folate = 0.6 mcg of folic acid from fortified food or as a supplement consumed with food = 0.5 mcg of a supplement taken on an empty stomach); IU = International Units; kcal = kilocalories; N/A = not available; RAE = retinol activity equivalents. † Estimate of nutrient content calculated from an incomplete data set due to data missing from the database, an inherent shortcoming of Standard Reference 17. ‡ Nutrient content is not listed because of substantial error in the calculation introduced due to data missing from the SR-17 database. * Data not available in database.

[a]The nutrient analysis in this table is part of the secondary analyses for this report using the USDA Nutrient Database for Standard Reference (SR-17) (NDL, 2004) (Tables B-3A through B-3E). The primary nutrient analysis is presented in Tables B-2A through B-2E, and uses Nutrition Data System for Research (NDS-R) software version 5.0/35 (2004) developed by

Fatty Acids				
Saturated (g/d)	Monounsaturated (g/d)	Polyunsaturated (g/d)	*n*-6 / *n*-3[c] (g/d)	*Trans*[d] (g/d)
11.2	10.4	5.6	N/A* / N/A*	N/A*
11.2	10.4	5.6	N/A* / N/A*	N/A*
0	0	0		
11.5	10.7	6.1	N/A* / N/A*	N/A*
12.3	11.4	6.2	N/A* / N/A*	N/A*
+0.8	+0.7	+0.1		
11.5	10.7	6.1	N/A* / N/A*	N/A*
8.9	8.4	4.9	N/A* / N/A*	N/A*
–2.6	–2.3	–1.2		
0.2	0.3	0.5	N/A* / N/A*	N/A*
1.7	1.7	0.9	N/A* / N/A*	N/A*
+1.5	+1.4	+0.4		
13.6	9.1	3.0	N/A* / N/A*	N/A*
11.9	7.9	3.3	N/A* / N/A*	N/A*
–1.7	–1.2	+0.3		
6.2	5.4	2.5	N/A* / N/A*	N/A*
–7.4	–3.7	–0.5		
14.9	9.6	3.1	N/A* / N/A*	N/A*
8.3	8.1	4.5	N/A* / N/A*	N/A*
–6.6	–1.5	+1.4		
12.7	7.0	1.7	N/A* / N/A*	N/A*
6.1	5.2	2.7	N/A* / N/A*	N/A*
–6.6	–1.8	+1.0		
18.7	13.3	4.9	N/A* / N/A*	N/A*
12.3	10.7	5.4	N/A* / N/A*	N/A*
–6.4	–2.6	+0.5		

the Nutrition Coordinating Center (NCC), University of Minnesota, Minneapolis, MN (Schakel et al., 1988, 1997; Schakel, 2001).

[b]For fully breast-fed infants, the formula was omitted in the nutrient calculations for current Food Package II.

[c]For *n*-6 polyunsaturated fatty acids, such as linoleic acid, the first double bond from the methyl end is at the sixth carbon atom; for *n*-3 fatty acids, such as linolenic acid, the first double bond from the methyl end is at the third carbon atom.

[d]The term *trans fatty acids* refers to unsaturated fatty acids that contain at least one double bond in the *trans* configuration.

DATA SOURCES: FNS, 2004e; USDA Nutrient Database for Standard Reference, Release 17 (NDL, 2004). Fresh fruits and vegetables were used in the analyses shown for Food Packages IV–VII. An additional analyses was conducted using canned fruits and vegetables (data not shown).

TABLE B-4 Comparison of Food Items Used in Nutrient Analyses from Two Databases

Food[a]	Source of Nutrient Data Nutrition Data System for Research (NDS-R) v. 5.0/35, Univ. of Minnesota[b]
Infant Foods	
Formula	Enfamil with Iron (Mead Johnson) Similac with Iron (Ross/ Abbott) Good Start (Carnation)
Juice	Apple juice, unsweetened, reconstituted from frozen, vitamin C-rich ("with ascorbic acid added") Orange juice, unsweetened, reconstituted from frozen
Baby food, fruits	Applesauce, junior Peaches, junior Pears, junior
Baby food, vegetables	Carrots, junior Green beans, junior Squash, junior
Infant cereal	Rice cereal, dry
Baby food, meats	Beef, strained Chicken, strained Lamb, strained
Fruits and Vegetables	
Juice	Apple juice, unsweetened, reconstituted from frozen, vitamin C-rich ("with ascorbic acid added") Orange juice, unsweetened, reconstituted from frozen
Fruits, fresh	Apples, with skin Oranges Bananas
Fruits, canned	Applesauce, unsweetened Peaches, juice pack or unsweetened, not drained (i.e., packing liquid utilized) Pineapple, juice pack or unsweetened, not drained (i.e., packing liquid utilized)
Vegetables, fresh	Carrots, raw Carrots, cooked from fresh Tomatoes, raw Tomatoes, cooked from fresh Green or snap beans, cooked from fresh
Vegetables, canned	Carrots, regular,[e] drained

Nutrient Database for Standard Reference, Release 17 (SR-17), Nutrient Data Laboratory, USDA[c]	NDB No.[d]
Same	03803
Same	03850
Good Start Supreme with iron (Nestlé)	03800
Same	09411
Same	09215
Same	03117
Same	03131
Same	03133
Same	03100
Same	03092
Same	03105
Same	03194
Same	03002
Same	03012
Same	03010
Same	09411
Same	09215
Apples, with skin (8% refuse)	09003
Oranges, all commercial varieties (27% refuse)	09200
Bananas (36% refuse)	09040
Applesauce, unsweetened, without added ascorbic acid	09019
Peaches, juice pack, solids and liquid	09238
Pineapple, juice pack, solids and liquid	09268
Same (0% refuse)	11124
Carrots, cooked, boiled, drained (0% refuse)	11125
Tomatoes, red, ripe, raw, year round average (9% refuse)	11529
Tomatoes, red, ripe, cooked	11530
Beans, snap, green, cooked, boiled, drained (0% refuse)	11053
Carrots, regular pack, drained solids	11128

continues

TABLE B-4 Continued

Food[a]	Source of Nutrient Data Nutrition Data System for Research (NDS-R) v. 5.0/35, Univ. of Minnesota[b]
	Tomatoes, regular,[e] drained
	Green beans, regular,[e] drained
Milk and Alternatives	
Milk	Whole, 3.5–4% milk fat
	Reduced-fat, 2% milk fat (appears to be with vitamin A added)
	Low-fat, 1% milk fat (appears to be with vitamin A added)
	Nonfat, skim (appears to be with vitamin A added)
Cheese	American cheese, process[f]
	Cheddar cheese, natural
	Monterey Jack cheese, natural
	Mozzarella cheese, part skim milk
Yogurt	Low-fat, plain[g]
	Low-fat, vanilla
	Nonfat, plain[g]
	Nonfat, vanilla
Soy beverage	Ready-to-drink, regular,[h] calcium-rich ("fortified")
Tofu	Calcium salts used in processing
Grains	
Cereal, ready-to-eat	Cheerios (General Mills)
	Corn flakes
	Kix (General Mills)
	Mini-Wheats, Frosted Bite Size (Kellogg's)
	Total Whole Grain (General Mills)
Cereal, hot	Cream of wheat, regular-cooking, regular salt option for preparation
	Oatmeal, instant-cooking, iron-fortified, regular salt option for preparation
Whole grains	Whole wheat bread
	Brown rice, cooked in salted water
Meat and Alternatives	
Eggs	Whole
Fish, canned	Tuna, water pack, regular,[e] drained
	Tuna, oil pack, regular,[e] drained
	Salmon, regular,[e] drained

Nutrient Database for Standard Reference, Release 17 (SR-17), Nutrient Data Laboratory, USDA[c]	NDB No.[d]
Tomatoes, red, ripe, whole, regular pack	11531
Beans, snap, green, regular pack, drained solids	11056
Whole, 3.25% milk fat	01077
Reduced-fat, fluid, 2% milk fat, with added vitamin A	01079
Low-fat, fluid, 1% milk fat, with added vitamin A	01082
Nonfat, skim, fat-free, fluid, with added vitamin A	01085
American cheese, pasteurized process, with disodium phosphate	01042
Cheddar cheese	01009
Monterey cheese	01025
Same	01028
Low-fat, plain,[g] 12 g protein/8 oz	01117
Low-fat, vanilla, 11 g protein/8 oz	01119
Skim, plain,[g] 13 g protein/8 fl oz	01118
Nonfat, vanilla or lemon flavor, sweetened with low-calorie sweetener	01184
"Soy milk", fluid, calcium-rich ("calcium fortified")	16139
Firm, prepared with calcium sulfate	16426
Same	08013
Corn Flakes (Kellogg's)	08020
Same	08048
Same	08319
Same	08077
Farina, regular-cooking, iron-fortified ("enriched")	08112
Cereal, oats, instant, iron-fortified ("fortified"), plain[g]	08122
Whole-wheat bread, commercially prepared	18075
Brown rice, long-grain	20036
Whole, large, fresh (12% refuse)	01123
Tuna, light, canned in water, drained solids	15121
Tuna, light, canned in oil, drained solids	15119
Salmon, pink, solids with bone and liquid	15084

continues

TABLE B-4 Continued

Food[a]	Source of Nutrient Data Nutrition Data System for Research (NDS-R) v. 5.0/35, Univ. of Minnesota[b]
Beans, dried	Black beans Garbanzo beans (chickpeas) Kidney beans Northern beans Pinto beans Lentils
Beans, canned	Black beans, regular[e] Garbanzo beans (chickpeas), regular[e] Kidney beans, regular[e] Northern beans, regular[e]
Peanut butter	Regular[e]

[a]All food items (edible portion) for nutrient analyses were chosen with no added salt and no added fat cooking preparation options unless otherwise noted in the table.

[b]The primary nutrient analysis for this report (Tables B-2A through B-2E) used Nutrition Data System for Research software version 5.0/35 (2004) developed by the Nutrition Coordinating Center (NCC), University of Minnesota, Minneapolis, MN (Schakel et al., 1988, 1997; Schakel, 2001).

[c]A secondary nutrient analysis was prepared using the USDA Nutrient Database for Standard Reference, Release 17 (SR-17) (NDL, 2004) (Tables B-3A through B-3E). The analysis using SR-17 is presented only here in Appendix B.

[d]Identification number for food item in USDA Nutrient Data Laboratory Nutrient Database (NDL, 2004).

[e]"Regular" in this instance means regular pack with salt added in processing. In some cases this assumption was made as representative of likely participant choices (e.g., salted peanut butter is a likely participant choice rather than unsalted peanut butter). In other cases this

Nutrient Database for Standard Reference, Release 17 (SR-17), Nutrient Data Laboratory, USDA[c]	NDB No.[d]
Black beans, mature seeds	16014
Chickpeas (garbanzo beans, Bengal gram), mature seeds	16056
Kidney beans, red, mature seeds	16032
Great northern beans, mature seeds	16024
Pinto beans, mature seeds	16042
Lentils, mature seeds	16069
Pinto beans, mature seeds	16044
Chickpeas (garbanzo beans, Bengal gram), mature seeds	16058
Kidney beans, red, mature seeds	16034
Great northern beans, mature seeds	16026
Smooth style, with salt	16098

assumption was made as representative of likely state agency restrictions (e.g., salted canned vegetables are likely state agency restrictions if unsalted canned vegetables are more costly).

*f*American cheese can be processed with or without a sodium salt (e.g., disodium phosphate) (Nutrition Data, 2004). The American cheese used in these analyses appears to be processed with disodium phosphate resulting in a sodium content twice that of the other cheeses used in the nutrient analyses. Even greater differences in sodium content have been reported (Nutrition Data, 2004).

g"Plain" in this instance means not flavored because flavored products customarily have added sugars.

h"Regular" in this instance means not a reduced calorie product.

NOTES: The medical formulas and medical foods required by individuals with special dietary needs were omitted from the nutrient analyses.

TABLE B-5A Comparison of Current and Revised Food Packages with Regard to Nutrients Offered, Nutrients of Concern with Regard to Inadequate Intake

Participant Category and Priority Nutrient	Dietary Reference Intakes		
	EAR	AI*	RDA
Infants, 6–11.9 mo, breast-fed			
Food Package No.			
Iron, mg/d	6.9	—	11.0
Zinc, mg/d	2.5	—	3.0
WIC Children, 1–1.9 y			
Food Package No.			
Iron, mg/d	3.0	—	7.0
Vitamin E, mg AT/d[a]	—	—	6.0
Vitamin E, mg ATE/d[a]	—	—	—
Potassium, mg/d	—	3,000*	—
Fiber, g/d	—	19*	—
WIC Children, 2–4.9 y[b]			
Food Package No.			
Iron, mg/d	3.0 / 4.1		7.0 / 10.0
Vitamin E, mg AT/d[a]	—	—	6.0 / 7.0
Vitamin E, mg ATE/d[a]	—	—	—
Potassium, mg/d	—	3,000* / 3,800*	—
Fiber, g/d	—	19* / 25*	—
Pregnant women and lactating women, 14–44 y			
Food Package No.			
Calcium, mg/d	—	1,000*–1,300*	—
Iron, mg/d	6.5–23.0	—	9.0–27.0
Magnesium, mg/d	255–335	—	310–400
Vitamin E, mg AT/d[a]	—	—	15.0–19.0
Vitamin E, mg ATE/d[a]	—	—	—
Fiber, g/d	—	28*–29*	—
Potassium, mg/d	—	4,700*–5,100*	—
Vitamin A, mcg RAE/d	530–900	—	750–1,300
Vitamin C, mg/d	66–100	—	80–120
Vitamin D, mcg/d	—	5.0*	—
Vitamin B_6, mg/d	1.6–1.7	—	1.9–2.0
Folate, mcg DFE/d[a]	450–520	—	500–600
Non-breastfeeding postpartum women, 14–44 y			
Food Package No.			
Calcium, mg/d	—	1,000*–1,300*	—
Iron, mg/d	7.9–8.1	—	15–18
Magnesium, mg/d	255–300	—	310–360
Vitamin E, mg AT/d[a]	—	—	15.0
Vitamin E, mg ATE/d[a]	—	—	—
Fiber, g/d	—	25*–26*	—

Nutrients Offered		
Current Package	Revised Package	Change
Current II	*Revised II-BF*	
10.1	11.4	+
1.5	3.3	+
Current IV	*Revised IV-A*	
13.8	15.4	+
4.8	6.9	+
8.3	12.7	+
1,683	1,536	–
6.0	10.6	+
Current IV	*Revised IV-B*	
13.8	15.5	+
4.8	6.6	+
8.3	12.4	+
1,683	1,546	–
6.0	10.6	+
Current V	*Revised V*	
1,374	1,341	–
13.9	16.9	+
173	232	+
4.8	8.3	+
8.3	15.3	+
4.6	12.5	+
1,883	2,026	+
680	833	+
117	98	–
8.9	7.3	–
1.4	1.8	+
500	571	+
Current VI	*Revised VI*	
1,199	1,063	–
13.0	15.4	+
127	159	+
3.9	7.1	+
7.3	13.6	+
2.6	9.0	+

continues

TABLE B-5A Continued

Participant Category and Priority Nutrient	Dietary Reference Intakes		
	EAR	AI*	RDA
Potassium, mg/d	—	4,700*	—
Vitamin A, mcg RAE/d	485–500	—	700
Vitamin C, mg/d	56–60	—	65–75
Vitamin D, mcg/d	—	5.0*	—
Vitamin B_6, mg/d	1.0–1.1	—	1.2–1.3
Folate, mcg DFE/d[a]	320–330	—	400
Lactating women, 14–44 y			
Food Package No.	—	—	—
Calcium, mg/d	—	1,000*–1,300*	—
Iron, mg/d	6.5–7.0	—	9.0–10.0
Magnesium, mg/d	255–300	—	310–360
Vitamin E, mg AT/d[a]	—	—	19.0
Vitamin E, mg ATE/d[a]	—	—	—
Fiber, g/d	—	29*	—
Potassium, mg/d	—	5,100*	—
Vitamin A, mcg RAE/d	885–900	—	1,200–1,300
Vitamin C, mg/d	96–100	—	115–120
Vitamin D, mcg/d	—	5.0*	—
Vitamin B_6, mg/d	1.7	—	2.0
Folate, mcg DFE/d[a]	450	—	500

See notes for Tables B-5A through B-5C following Table B-5C.

Nutrients Offered		
Current Package	Revised Package	Change
1,393	1,463	+
609	734	+
84	81	–
7.5	5.6	–
1.2	1.6	+
439	506	+
Current VII	*Revised VII*	
1,494	1,538	+
15.3	17.7	+
215	255	+
6.0	9.0	+
9.7	16.1	+
7.3	12.6	+
2,237	2,235	+
971	945	–
135	99	–
10.1	10.3	+
1.6	1.9	+
551	587	+

TABLE B-5B Comparison of Current and Revised Food Packages with Regard to Nutrients Offered, Nutrients of Concern with Regard to Excessive Intake

Participant Category and Priority Nutrient	Dietary Reference Intakes		
	UL	Mean EER	AMDR†
Infants, 0–3.9 mo, fully formula-fed			
Food Package No.			
Zinc, mg/d	4.0	—	—
Preformed vitamin A, mcg/d	600	—	—
Food energy, kcal/d	—	555[c]	—
Infants, 4–5.9 mo, fully formula-fed			
Food Package No.			
Zinc, mg/d	4.0	—	—
Preformed vitamin A, mcg/d	600	—	—
Food energy, kcal/d	—	623[c]	—
Infants, 6–11.9 mo, fully formula-fed			
Food Package No.			
Zinc, mg/d	5.0	—	—
Preformed vitamin A, mcg/d	600	—	—
Food energy, kcal/d	—	754[c]	—
Children, 1–1.9 y			
Food Package No.			
Zinc, mg/d	7.0	—	—
Preformed vitamin A, mcg/d	600	—	—
Food energy, kcal/d	—	942[c]	—
Children, 2–4.9 y			
Food Package No.			
Zinc, mg/d	7.0 / 12.0[b]	—	—
Sodium, mg/d	1,500 / 1,900[b]	—	—
Preformed vitamin A, mcg/d	600 / 900[b]	—	—
Food energy, kcal/d			1,282[c]
Pregnant women and lactating women, 14–44 y			
Food Package No.			
Sodium, mg/d	2,300	—	—
Food energy, kcal/d	—	2,465[c]	—
Total fat, g/d	—	—	—
Total fat, % of food energy	—	—	25–35†, <19y 20–35†, ≥ 19y
Non-breastfeeding postpartum women, 14–44 y			
Food Package No.			
Sodium, mg/d	2,300	—	—
Food energy, kcal/d	—	2,163[c]	—
Total fat, g/d	—	—	—
Total fat, % of food energy			25–35†, <19y 20–35†, ≥ 19y

Nutrients Offered		
Current Package	Revised Package	Change
Current I	*Revised I-FF-A*	
4.9	4.9	=
413	413	=
529	529	=
Current II	*Revised I-FF-B*	
6.4	5.4	–
413	453	+
663	581	–
Current II	*Revised II-FF*	
6.4	5.4	–
413	320	–
663	547	–
Current IV	*Revised IV-A*	
9.3	10.5	+
596	345	–
797	753	–
Current IV	*Revised IV-B*	
9.3	10.7	+
875	796	–
596	455	–
797	672	–
Current V	*Revised V*	
940	848	–
858	823	–
31.3	23.4	–
30.4	25.1	–
Current VI	*Revised VI*	
829	571	–
676	577	–
24.7	16.0	–
31.4	22.9	–

continues

TABLE B-5B Continued

Participant Category and Priority Nutrient	Dietary Reference Intakes		
	UL	Mean EER	AMDR†
Lactating women, 14–44 y			
Food Package No.			
Sodium, mg/d	2,300	—	—
Food energy, kcal/d	—	2,465[c]	—
Total fat, g/d	—	—	—
Total fat, % of food energy	—	—	25–35†, <19y 20–35†, ≥ 19y

See notes for Tables B-5A through B-5C following Table B-5C.

Nutrients Offered		
Current Package	Revised Package	Change
Current VII	*Revised VII*	
1,198	1,133	–
1,061	981	–
41.4	32.0	–
33.8	28.7	–

TABLE B-5C Comparison of Current and Revised Food Packages with Regard to Nutrients Offered, Nutrients and Ingredients to Limit in the Diet[e]

Participant Category and Priority Nutrient	Dietary Guidance	Nutrients Offered: Current Package	Nutrients Offered: Revised Package	Change
Infants, 6–11.9 mo, fully breast-fed				
Food Package No.		*Current II*	*Revised II-BF*	
Trans fatty acids, g/d[d]	—	<0.1	0.14	+
Infants, 6–11.9 mo, fully formula-fed				
Food Package No.		*Current II*	*Revised II-FF*	
Trans fatty acids, g/d[d]	—	0.02	0.02	–
Children, 1–1.9 y				
Food Package No.		*Current IV*	*Revised IV-A*	
Trans fatty acids, g/d[d]	—	0.59	0.69	+
Children, 2–4.9 y[e]				
Food Package No.		*Current IV*	*Revised IV-B*	
Saturated fat, g/d	—	13.8	6.3	–
Saturated fat, % of food energy	<10	15.6	8.4	–
Cholesterol, mg/d	<300	279	113	–
Trans fatty acids, g/d[d]	—	0.59	0.42	–
Pregnant women and lactating women, 14–44 y[e]				
Food Package No.		*Current V*	*Revised V*	
Saturated fat, g/d	—	15.1	7.9	–
Saturated fat, % of food energy	<10	15.8	8.7	–
Cholesterol, mg/d	<300	288	118	–
Trans fatty acids, g/d	—	0.66	0.45	–
Non-breastfeeding postpartum women, 14–44 y[e]				
Food Package No.		*Current VI*	*Revised VI*	
Saturated fat, g/d	—	12.9	5.9	–
Saturated fat, % of food energy	<10	17.2	9.1	–
Cholesterol, g/d	<300	279	111	–
Trans fatty acids, g/d	—	0.53	0.28	–
Lactating women, 14–44 y[e]				
Food Package No.		*Current VII*	*Revised VII*	
Saturated fat, g/d	—	19.0	12.0	–
Saturated fat, % of food energy	<10	16.1	11.0	–
Cholesterol, mg/d	<300	307	227	–
Trans fatty acids, g/d	—	0.81	0.58	–

NOTES FOR TABLES B-5A THROUGH B-5C: AI = Adequate Intake, used when necessary, indicated by an asterisk (*); AMDR = Acceptable Macronutrient Distribution Range, indicated by a dagger (†); AT = α(alpha)-tocopherol; ATE = α(alpha)-tocopherol equivalents; DFE = dietary folate equivalents; EAR = Estimated Average Requirement, used when available; EER = Estimated Energy Requirement; kcal = kilocalories; RAE = retinol activity equivalents; RDA = Recommended Dietary Allowance; UL = Tolerable Upper Intake Level.

continues

TABLE B-5C Continued

[a]For discussion of important issues regarding differences between the Dietary Reference Intakes (DRIs) and dietary intake data in the units used for vitamin E and folate, please see the section *Data Set—Nutrients Examined* in Appendix A—*Nutrient Intake of WIC Subgroups*.

[b]Values are for children ages 2–3.9 y and children age 4 y, respectively.

[c]Mean EER (kcal/d) (Table B-5B) was calculated based on CSFII data (FSRG, 2000) using the method described in the DRI report (IOM, 2002/2005). For additional detail, see Appendix C—*Nutrient Intakes of WIC Subgroups*.

[d]*Trans* fatty acids have not specifically been identified as a hazard for infants and children, and thus are shown in Table 2-10 (Chapter 2—*Nutrient and Food Priorities*) as nutrients to limit only in the diets of adolescents and adults (IOM, 2002/2005). However, the current dietary guidance to limit *trans* fatty acids from processed foods in the diet is presumed to apply to all individuals regardless of age. The term *trans fatty acids* refers to unsaturated fatty acids that contain at least one double bond in the *trans* configuration.

[e]Added sugars were identified as an ingredient to limit in the diet for women and children over the age of 2 y; however, the committee did not include added sugars in the nutrient analyses because the databases used did not list added sugars as a separate component of foods.

DATA SOURCES: EARs, AIs, and RDAs (Table B-5A) are from the DRI reports (IOM, 1997, 1998, 2000b, 2001, 2002/2005, 2005a). ULs and AMDRs (Table B-5B) are from the DRI reports (IOM, 2001, 2002/2005, 2005a). The dietary guidance in Table B-5C is from the American Heart Association (AHA, 2004) and the *Dietary Guidelines for Americans 2005* (DHHS/USDA, 2005). Nutrients offered were calculated using data from the Nutrition Coordinating Center (NCC), University of Minnesota, Minneapolis, MN, using Nutrition Data System for Research software (NDS-R version 5.0/35, 2004) (Schakel et al., 1988, 1997; Schakel, 2001). The assumptions used for the calculations of nutrient content of the current and revised food packages are detailed in Appendix D—*Cost Calculations*.

TABLE B-6 Substitutions for Various Volumes of Formula Concentrate—Easy Reference Guide[a]

		Liquid Concentrate
Formula-Fed infants		
I-FF-A: 0–3.9 mo	**Maximum monthly allowance**	**403 fl oz**
	Available units (e.g., cans)	13-fl oz
	Number of units (total oz powder)	31
	Amount as reconstituted	806 fl oz
I-FF-B: 4–5.9 mo	**Maximum monthly allowance**	**442 fl oz**
	Available units (e.g., cans)	13-fl oz
	Number of units (total oz powder)	34
	Amount as reconstituted	884 fl oz
II-FF: 6–11.9 mo	**Maximum monthly allowance**	**312 fl oz**
	Available units (e.g., cans)	13-fl oz
	Number of units (total oz powder)	24
	Amount as reconstituted	624 fl oz
Partially Breast-Fed Infants		
I-BF/FF-A: 1–3.9 mo	**Maximum monthly allowance**	
	Available units (e.g., cans)	Not recommended[f]
	Number of units (total oz powder)	
	Amount as reconstituted	
I-BF/FF-B: 4–5.9 mo	**Maximum monthly allowance**	**221 fl oz**
	Available units (e.g., cans)	13-fl oz
	Number of units (total oz powder)	17
	Amount as reconstituted	442 fl oz
II-BF/FF: 6–11.9 mo	**Maximum monthly allowance**	**156 fl oz**
	Available units (e.g., cans)	13-fl oz
	Number of units (total oz powder)	12
	Amount as reconstituted	312 fl oz

[a]When determining the maximum number of cans of each type of formula, the committee recommends rounding to whole cans to approximate the target amount (the maximum monthly allowance shown in Table 4-1, Chapter 4—*Revised Food Packages*). In some cases this may be different from the rounding currently in use (e.g., rounding up to whole cans). The results of this method may differ from the rounding currently in use; some rounding methods (e.g., rounding up to whole cans) could result in providing excess formula in some cases.

Ready-to-Feed	Powdered Formula[b]		
	Similac with Iron[c] (~7 fl oz/oz)	Enfamil with Iron[d] (~7 fl oz/oz)	Carnation Good Start[e] (~5 fl oz/oz)
800 fl oz	**103–115 oz powder**		
32-fl oz	12.9-oz	14.3-oz	12-oz
25	8 (103.2 oz powder)	8 (114.4 oz powder)	9 (108 oz powder)
800 fl oz	768 fl oz	840 fl oz	783 fl oz
896 fl oz	**114–120 oz powder**		
32-fl oz	12.9-oz	14.3-oz	12-oz
28	9 (116.1 oz powder)	8 (114.4 oz powder)	10 (120 oz powder)
896 fl oz	864 fl oz	840 fl oz	870 fl oz
640 fl oz	**84–91 oz powder**		
32-fl oz	12.9-oz	14.3-oz	12-oz
20	7 (90.3 oz powder)	6 (85.8 oz powder)	7 (84 oz powder)
640 fl oz	672 fl oz	630 fl oz	609 fl oz
	51–60 oz powder		
Not recommended[f]	12.9-oz 4 (51.6 oz powder) 384 fl oz	14.3-oz 4 (57.2 oz powder) 420 fl oz	12-oz 5 (60 oz powder) 435 fl oz
448 fl oz	**57–65 oz powder**		
32-fl oz	12.9-oz	14.3-oz	12-oz
14	5 (64.5 oz powder)	4 (57.2 oz powder)	5 (60 oz powder)
448 fl oz	480 fl oz	420 fl oz	435 fl oz
320 fl oz	**38–48 oz powder**		
32-fl oz	12.9-oz	14.3-oz	12-oz
10	3 (38.7 oz powder)	3 (42.9 oz powder)	4 (48 oz powder)
320 fl oz	288 fl oz	315 fl oz	348 fl oz

[b]This table uses container sizes currently available for Similac with Iron (Ross), Enfamil with Iron (Mead Johnson), and Carnation Good Start Supreme (Nestlé) as examples of commonly prescribed formulas with reconstitution rates of ~7 fl oz of formula per oz powder (e.g., Similac with Iron, Enfamil with Iron) and ~5 fl oz of formula per oz powder (e.g., Carnation Good Start Supreme).

continues

TABLE B-6 Continued

[c]A 12.9-oz can of powdered formula reconstitutes to 94–96 fl oz of formula; for calculation purposes 96 fl oz was used as representative of Similac with Iron (Abbott Laboratories, 2004). The container sizes in this column are representative of other formulas currently being used in the WIC program: Similac Advance with Iron (Ross; reconstitutes to 96 fl oz); and Enfamil Lipil with Iron (Mead Johnson; reconstitutes to 94 fl oz).

[d]A 14.3-oz can of powdered formula reconstitutes to 105 fl oz of formula (Mead Johnson, 2004). The container sizes in this column are representative of Enfamil with Iron (Mead Johnson).

[e]A 12-oz can of powdered formula reconstitutes to 87 fl oz of formula (Nestlé, 2005). The container sizes in this column are representative of Carnation Good Start Supreme (Nestlé) and Carnation Good Start Essentials (Nestlé).

[f]Formula concentrate and ready-to-feed formula are not recommended because the partially breast-fed infant ages 0–3.9 mo will not routinely consume the entire contents of a can with a 24 h period leading to issues of food safety and wastage. For this reason, powdered formula is recommended. For the few circumstances where powdered formula is inappropriate (e.g., the water supply is inappropriate for preparation of formula from powder), formula can be prescribed in other forms at the following monthly maximum allowances: 208 fl oz liquid concentrate (e.g., 16 13-fl oz cans; 416 fl oz formula as reconstituted); or 416 fl oz ready-to-feed formula (e.g., 13 32-fl oz cans).

DATA SOURCES: Abbott Laboratories, 2004; Mead Johnson, 2004; Nestlé, 2005.

C

Nutrient Intake of WIC Subgroups

This appendix presents the details of the final analyses the committee conducted to identify priority nutrients to consider in revising the WIC food packages. Using the Dietary Reference Intakes (DRIs) and the methods described by the Institute of Medicine (IOM, 2000a) to assess nutrient adequacy, the committee assessed the nutrient adequacy of the diets of categorical WIC subgroups—WIC infants under 1 year of age, WIC children 1 through 4 years of age, and pregnant, lactating, and non-breastfeeding postpartum women. Chapter 2—*Nutrient and Food Priorities*—of this report presents a summary of the results. The first section of this appendix describes the DRIs and then discusses how to use them in assessing nutrient adequacy. The next section describes the data set used in the analyses, and the final section includes tables with the detailed analysis results. For a discussion and interpretation of the results, see Chapter 2 of this report.

The results presented in this appendix and summarized in Chapter 2—*Nutrient and Food Priorities*—update the results of similar analyses conducted by the committee for its first report, *Proposed Criteria for Selecting the WIC Food Packages: A Preliminary Report of the Committee to Review the WIC Food Packages* (IOM, 2004b). Based on comments received on that report and on initial analyses conducted in response to those comments, the committee expanded the set of nutrients examined and defined the WIC subgroups to correspond more closely to those served by the WIC program. The priority nutrients identified by the two analyses are essentially the same, but the specific results of the analyses differ.

DIETARY REFERENCE INTAKES (IOM, 1997–2005)

Over the past decade, knowledge of nutrient requirements has increased substantially, resulting in a set of new dietary reference standards called the Dietary Reference Intakes (IOM, 1997, 1998, 2000b, 2001, 2002/2005, 2005a). The DRIs replace the earlier Recommended Dietary Allowances and are the appropriate standards to use in determining whether diets are nutritionally adequate without being excessive.

The DRIs for micronutrients include four reference standards—the Estimated Average Requirement, the Recommended Dietary Allowance, the Adequate Intake, and the Tolerable Upper Intake Level (IOM, 2003a)—as follows.

- **Estimated Average Requirement (EAR)** is the usual intake level that is estimated to meet the requirement of half the healthy individuals in a life stage and gender group. At this level of intake, the other half of the healthy individuals in the specified group would not have their needs met.
- **Recommended Dietary Allowance (RDA)** is the usual intake level that is sufficient to meet the nutrient requirement of nearly all healthy individuals in a particular age and gender group (97.5 percent of the individuals in a group). If the distribution of requirements in the group is assumed to be normal, the RDA can be derived as the EAR plus two standard deviations of requirements.
- **Adequate Intake (AI)—**When information is not sufficient to determine an EAR (and, thus, an RDA), then an AI is set for the nutrient. The AI is a recommended average daily nutrient intake level based on experimentally derived intake levels or approximations of observed mean nutrient intakes by a group (or groups) of apparently healthy people who are maintaining a defined nutritional state or criterion of adequacy.
- **Tolerable Upper Intake Level (UL)—**Many nutrients have a UL, which is the highest level of usual nutrient intake that is likely to pose no risks of adverse health effects to individuals in the specified life stage group. As intake increases above the UL, the risk of adverse effects increases. The absence of a UL does not imply that the nutrient does not have a tolerable upper intake level, but, rather, that the available evidence at this times does not permit its estimation.

Three of the four DRIs—the EAR, AI, and UL—are appropriate to use in assessing the nutrient intakes of population subgroups. The RDA, however, should not be used in assessing group intakes. Tables F-1A and F-1B in Appendix F—*Supplementary Information*—present the DRIs for the micronutrients examined in the assessment of the nutrient adequacy of the diets of WIC-eligible population subgroups.

TABLE C-1 Acceptable Macronutrient Distribution Ranges

	Range (percentage of food energy intake)		
Macronutrient	Children, 1–3 y	Children, 4 y	Women, 13–44 y
Protein	5–20	10–30	10–35
Carbohydrate	45–65	45–65	45–65
Fat	30–40	25–35	20–35

DATA SOURCE: DRI report (IOM, 2002/2005).

For macronutrients, a somewhat different set of DRIs has been developed (IOM, 2002/2005). In the case of food energy, dietary requirements are expressed in terms of Estimated Energy Requirements (EERs). An adult EER is defined as the dietary energy intake needed to maintain energy balance in a healthy adult of a given age, gender, body weight, height, and level of physical activity. In children, the EER is defined as the sum of the dietary energy intake predicted to maintain energy balance for an individual's age, body weight, height, and activity level, plus an allowance for normal growth and development. For fat, protein, and carbohydrate, the DRIs include Acceptable Macronutrient Distribution Ranges (AMDRs) for intakes as a percentage of energy intakes (Table C-1). Tables F-1C and F-1D in Appendix F—*Supplementary Information*—present the DRIs for macronutrients and subcategories (e.g., saturated fat) examined in the assessment of the diets of WIC-eligible population subgroups.

In addition to micronutrients and macronutrients, other nutrients and dietary components have DRIs. Potassium and fiber have AIs, and sodium has an AI for infants under 1 year of age and a UL for children and older adults. Current dietary guidance is that the percentage of food energy intake from added sugars not exceed 25 percent (IOM, 2002/2005). The *Dietary Guidelines* recommend food energy intake from saturated fat not exceed 10 percent and that the daily intake of cholesterol not exceed 300 milligrams (DHHS/USDA, 2005).

USING THE DRIS TO ASSESS NUTRIENT ADEQUACY

To assess the nutrient adequacy of WIC-eligible subgroups, three questions are important.

1. What are the characteristics of the usual nutrient intake distributions?

2. What proportion of the subgroup is at risk of inadequate usual intake?
3. What proportion is at risk of excessive intake levels?

What are the characteristics of the usual nutrient intake distributions?

In order to describe the characteristics of the usual intake distribution, and to use the DRIs in assessing diets, one needs information on the distribution of usual nutrient intakes. The usual intake of a nutrient is defined as the long-term average intake of the nutrient by the individual (NRC, 1986; Beaton, 1994; IOM, 2000a). Usual intake is not observed; rather, dietary recalls provide data on observed nutrient intakes over some specified period of time. Even discounting errors related to the dietary recall data and its analysis, observed daily intake measures usual intake with error. That is, nutrient intake varies from day to day within an individual. This day-to-day variability is "noise"—the individual-to-individual variability in usual nutrient intake provides the needed information. Because for most nutrients, the day-to-day variability in intakes can be larger than the individual-to-individual variability, it is very important to "remove" the effect of this additional variability when estimating the distribution of usual intakes (Beaton et al., 1979).

The National Research Council (NRC, 1986) proposed a simple additive measurement error model that permits adjusting the data for the presence of the day-to-day variability in intakes. The NRC model assumes that the observed daily intake for an individual can be expressed as a deviation from the individual's usual intake. Subsequently, researchers at Iowa State University (ISU) developed and modified approaches that permit estimating the usual intake distributions with a higher degree of accuracy. This method, proposed by Nusser et al., (1996), is known as the ISU method for estimating usual nutrient intake distributions, and is now widely used by the nutrition community (see, for example, Carriquiry, 1999; IOM, 2000a). Software packages are available that produce estimates of the mean and variance of usual intake in the group, as well as estimates of any percentile of interest. Importantly, these software packages produce estimates of the usual intake distributions of groups and are not appropriate for estimation of the usual intake of *individuals*.

What proportion of the subgroup has inadequate usual intake?

Assessing the prevalence of nutrient inadequacy in a group requires estimating the proportion of individuals in the group whose usual intakes of a nutrient do not meet requirements. For most nutrients with an EAR, the committee used the EAR cut-point method to estimate the prevalence of

inadequacy among categorical WIC subgroups. The EAR cut-point method involves estimating the proportion of individuals in a group whose usual nutrient intakes are less than the EAR. Under certain assumptions, the proportion with usual intakes less than the EAR is an estimate of the proportion of a group whose usual intakes do not meet requirements (Beaton, 1994; Carriquiry, 1999; IOM, 2000a).

Given the available information about the distribution of requirements for most nutrients, it appears that the underlying assumptions of the EAR cut-point method hold for most nutrients except iron in premenopausal women and energy. To assess iron adequacy, the probability approach proposed in the National Research Council report (1986) was used. With this approach, a probability model, based on the requirement distribution for iron, was used to estimate the probability of inadequacy at each level of usual iron intake.

When more than one EAR applied to a WIC subgroup (e.g., because the age range of the subgroup did not match an age range of the DRIs), the analytic approach to estimating the percentage with usual intakes involved (1) dividing observed intakes by the EAR, (2) adjusting the ratio using the usual intake adjustment software, and (3) estimating the percentage with the ratio less than 1. This approach was used for low-income children ages 1 through 4 years, vitamin C for smokers and nonsmokers, and, in some cases, for low-income pregnant and lactating women.

In the case of energy, the reference value used is the Estimated Energy Requirement (EER). Since populations in balance should have usual intake and EER distributions with roughly equal mean values, the analysis compares the mean usual intake of food energy with the mean EER for each subgroup to examine energy adequacy. In addition, for protein, carbohydrate, and fat, tables present (1) the usual distributions of intake as a percentage of observed energy intake and (2) estimates of the proportion outside the AMDR.

For nutrients without an EAR—that is, for nutrients with an AI—usual intake distributions are presented and mean intakes are compared with the AI. Importantly, however, limited inferences can be made regarding the prevalence of inadequacy for nutrients with an AI. If mean intake levels are equal to or exceed the AI, it is likely that the prevalence of inadequacy is low; but if mean intakes are less than the AI, no conclusions can be drawn about the prevalence of inadequacy (IOM, 2000a).

What proportion is at risk of excessive intake levels?

The proportion with usual intakes exceeding the UL is an estimate of the proportion of each subgroup at risk of excessive intake levels. Because ULs have not been established for all nutrients, this question can be ad-

dressed only for those nutrients with ULs. Because the data used in the analysis do not include intakes from supplements, the assessment of the risk of excessive intake was limited to considering nutrient intake from foods. This means that the committee could not assess the risk of excessive intake for those nutrients whose ULs refer to intakes from supplements only, and the assessment of risk is incomplete to the extent that subgroup members took nutrient supplements. The committee estimated the proportion at risk of excessive intake levels for calcium; iron; zinc; vitamins A, B_6, and C; and folate (folic acid). Risk of excessive intake levels for magnesium and vitamin E were not assessed.

DATA SET

The primary data set used in this analysis is the 1994–1996 and 1998 Continuing Survey of Food Intakes by Individuals (CSFII). The 1994–1996 CSFII provides information on food and nutrient intake over two non-consecutive days for 16,103 individuals of all ages and gender, and of a variety of income levels, racial and ethnic groups, and sociodemographic characteristics. The three-year survey was designed so that the information collected on any one year would constitute a nationally representative sample of individuals of all ages. The samples were selected using stratified, clustered multistage sampling procedures, with an oversampling of low-income individuals. Food intake data were collected using 24-hour dietary recall questionnaires, which included information on the type and amounts of all foods consumed by individuals over two non-consecutive days. In addition, the survey provides sociodemographic information, including income and participation in food assistance programs.

The 1998 Supplemental Children's Survey was designed to be a one-time supplement to the 1994–1996 CSFII, using the same design and survey methodology of the CSFII. Dietary intake data were collected from 5,559 infants and children aged 0 through 9 years over two non-consecutive days between November 1997 and October 1998. The sample was designed to be a stand-alone, nationally representative sample of children in that age range; also, however, it could be combined with the dietary information collected for infants and children up to nine years of age in the 1994–1996 CSFII. Combining the data from the Supplemental Children's Survey sample and the 1994–1996 CSFII provides a large sample of children for the committee's analysis.

Analysis Sample[1]

The analysis sample includes respondents from the CSFII 1994–1996 and 1998 who completed 24-hour dietary recalls and were in one of the following categorical subgroups.

- *WIC Infants, Non-Breastfed, Less Than One Year of Age*—The analysis sample included WIC infants 0 through 3 months of age [sample size (n) = 152], WIC infants 4 through 5 months of age (n = 104), and WIC infants 6 through 11 months of age (n = 275). Because data are not available on the quantity of breast milk consumed, breast-fed infants were excluded from most analyses of nutrient intake.
- *Infants, Breast-Fed, 6 Through 11 Months of Age* (n = 143)—Because of concerns about the adequacy of iron and zinc intakes of older breast-fed infants, the committee assessed the adequacy of these nutrients for breast-fed infants 6 through 11 months of age. (Since the iron and zinc content of breast milk is very low for older breast-fed infants, the absence of data on the quantity of breast milk consumed does not affect the analysis of iron and zinc adequacy.) Because of small sample sizes for WIC (or low-income) breast-fed infants 6 through 11 months of age, the analysis examined *all* breast-fed infants in this age group.
- *WIC Children, 1 Through 4 Years of Age*—The analysis sample included WIC children one year of age (n = 287), and WIC children 2 through 4 years of age (n = 872).
- *Pregnant Women and Lactating Women, Ages 14 Through 44 Years* (n = 123)—This analysis sample included *all* pregnant women and *all* lactating women combined, regardless of participation in the WIC program; otherwise the samples would have been too small to analyze meaningfully.
- *Women, Non-Breastfeeding, up to One Year Postpartum, Ages 14 Through 44 Years* (n = 105)—Because of small sample sizes for non-breastfeeding women up to six months postpartum and low-income non-breastfeeding women up to one year postpartum, the analysis included all low-income and high-income non-breastfeeding women up to one year postpartum.

[1]In all of the analyses of the CSFII data, including the C-SIDE estimation procedures, the appropriate (one-day) weights were used to statistically allow for the complex design of the data set (that is, the appropriate weights were used to statistically allow the data set to be representative of the national population).

Nutrients Examined

The nutrients and dietary components examined include:

- Nutrients currently targeted by the WIC program—calcium, iron, vitamin A, vitamin C, and protein;
- Macronutrients—food energy and the percentage of food energy from protein, carbohydrate, and fat; and
- Other nutrients and dietary components considered of public health significance—selenium, magnesium, phosphorus, sodium, potassium, vitamin E, thiamin, riboflavin, niacin, vitamin B_6, vitamin B_{12}, folate, fiber, and cholesterol; also saturated fat and added sugars as a percentage of food energy intake.

An important issue is to ensure that comparable units for each nutrient are used among the various resources used. Specific issues arise regarding the units for vitamin E, niacin and folate.

- *Vitamin E*—The DRIs report vitamin E as AT [α(alpha)-tocopherol]. Thus, the EARs for vitamin E apply only to RRR-α(alpha)-tocopherol, the form of α(alpha)-tocopherol that occurs naturally in foods, and the 2R-stereoisomeric forms, a portion of the α(alpha)-tocopherol used in fortified foods and dietary supplements. Analysis of dietary intake (CSFII) was based on data in which the units for reporting vitamin E were ATE [α(alpha)-tocopherol equivalents which include the contribution of eight naturally occurring tocopherols]. Because of the differences in the units between the intake data and the EARs, the estimated prevalences of inadequacy of vitamin E intakes in this report are likely to be *underestimates*.
- *Niacin*—Analysis of dietary intake of niacin was based solely on preformed niacin; however, the EAR is based on niacin equivalents (which allows for some conversion of the amino acid tryptophan to niacin). Thus, the estimated prevalence of inadequacy of niacin intakes is likely to be an *overestimate*.
- *Folate in Dietary Folate Equivalents*—The DRIs report folate as microgram DFE (Dietary Folate Equivalents). Dietary intake data (CSFII) reports folate in micrograms. For this report, the amount of folate was calculated by applying the nutrient values from the Food and Nutrient Database for Dietary Studies (FSRG, 2004) to the CSFII folate data. The CSFII data included some food codes not included in the FNDDS; for those food codes the committee applied conversions developed by USDA's Center for Nutrition Policy and Promotion (CNPP database received from Tracy Von Ins, OANE, FNS, USDA, October, 2004) to obtain the total amount of folate (as microgram DFE) consumed per day for all foods eaten. The values of "folate as dietary folate equivalents" were compared to the EARs.

- *Folate as Folic Acid*—The UL for folate applies only to folic acid, the form of folate used in fortification and supplementation. For estimates of intake used in comparison to the UL for folate, the variable *folic acid* was obtained from the nutrient data, calculated by applying the nutrient values from the FNDDS Nutrient Values file (FSRG, 2004) to the amount of food eaten. This represents folate from fortification only. The committee was not able to obtain folic acid data for all foods because the CSFII data included some food codes not included in the FNDDS; the conversion database developed by CNPP did not contain folic acid values. The net effect of this small amount of missing data is to slightly *underestimate* the percentage with dietary intakes above the UL.

The following is a list of the data tables presented in this appendix.

TABLE C-2A Usual Intake Distributions of Selected Micronutrients and Electrolytes: WIC Infants, 0 Through 3 Months, Non-Breastfed

Nutrient	Units (per day)	Intake Distribution (percentiles and mean)						AI*	UL	%>UL
		10th	25th	Median	Mean	75th	90th			
Calcium	mg	350	430	530	562	660	810	210*	ND	—
Iron	mg	7.5	9.5	11.8	12.7	14.8	18.8	0.27*	40	0.2
Zinc	mg	3.7	4.6	5.8	6.1	7.2	8.7	2*	4	86.0
Selenium	mcg	10	12	16	17	19	24	15*	45	0.3
Magnesium	mg	38	47	59	63	74	94	30*	na[a]	—
Phosphorus	mg	217	269	343	368	437	547	100*	ND	—
Sodium	mg	129	158	200	216	256	323	120*	ND	—
Potassium	mg	470	560	690	736	860	1,060	400*	ND	—
Vitamin A	mcg RAE	362	440	550	586	692	854	400*	—	—
Vitamin A, preformed	mcg	367	445	547	581	677	833		600	38.3
Vitamin E[b]	mg	6.5	8.2	10.2	11.1	12.9	16.4	4*	ND	—
Vitamin C	mg	44	55	71	78	93	121	40*	ND	—
Thiamin	mg	0.36	0.44	0.55	0.60	0.70	0.90	0.2*	ND	—
Riboflavin	mg	0.53	0.66	0.84	0.92	1.08	1.39	0.3*	ND	—
Niacin[b]	mg	4.5	5.4	6.8	7.5	8.7	11.3	2*	na[c]	—
Folate[b]	mcg DFE	95	123	158	166	200	246	65*	ND	—
Vitamin B_6	mg	0.26	0.32	0.40	0.42	0.50	0.61	0.1*	ND	—
Vitamin B_{12}	mcg	1.14	1.40	1.76	1.92	2.24	2.87	0.4*	ND	—

NOTES FOR TABLE C-2A: Analysis sample was data for non-breastfed infants from birth through 3.9 mo of age participating in the WIC program at the time of the survey (n = 152). See additional notes for Tables C-2A through C-2G following Table C-2G.

TABLE C-2B Usual Intake Distributions of Selected Micronutrients and Electrolytes: WIC Infants, 4 Through 5 Months, Non-Breastfed

Nutrient	Units (per day)	Intake Distribution (percentiles and mean)						AI*	UL	%>UL
		10th	25th	Median	Mean	75th	90th			
Calcium	mg	467	562	665	675	776	893	210*	ND	—
Iron	mg	10.6	13.1	16.1	16.7	19.5	23.5	0.27*	40	0.3
Zinc	mg	4.9	5.9	6.9	7.0	8.1	9.3	2*	4	96.8
Selenium	mcg	14	17	20	20	23	27	15*	45	<0.1
Magnesium	mg	62	72	85	87	100	115	30*	na[a]	—
Phosphorus	mg	309	370	447	456	532	616	100*	ND	—
Sodium	mg	179	206	242	247	282	323	120*	ND	—
Potassium	mg	730	830	960	974	1,100	1,250	400*	ND	—
Vitamin A	mcg RAE	536	606	687	693	773	859	400*	—	—
Vitamin A, preformed	mcg	453	533	620	626	712	806		600	56.3
Vitamin E[b]	mg	8.8	10.1	12.2	12.6	14.7	16.9	4*	ND	—
Vitamin C	mg	78	93	115	124	145	181	40*	ND	—
Thiamin	mg	0.52	0.64	0.80	0.84	1.00	1.22	0.2*	ND	—
Riboflavin	mg	0.81	0.96	1.15	1.19	1.38	1.61	0.3*	ND	—
Niacin[b]	mg	6.8	8.2	10.0	10.5	12.1	14.7	2*	na[c]	—
Folate[b]	mcg DFE	137	163	194	196	227	258	65*	ND	—
Vitamin B_6	mg	0.41	0.46	0.53	0.53	0.60	0.67	0.1*	ND	—
Vitamin B_{12}	mcg	1.40	1.71	2.06	2.07	2.43	2.76	0.4*	ND	—

NOTES FOR TABLE C-2B: Analysis sample was data for non-breastfed infants 4–5.9 mo of age participating in the WIC program at the time of the survey (n = 104). See additional notes for Tables C-2A through C-2G following Table C-2G.

TABLE C-2C Usual Intake Distributions of Selected Micronutrients and Electrolytes: WIC Infants, 6 Through 11 Months, Breast-Fed and Non-Breastfed

Nutrient	Units (per day)	Intake Distribution (percentiles and mean)						EAR or AI*	% Inadeq	UL	%>UL
		10th	25th	Median	Mean	75th	90th				
Breast-Fed Infants											
Iron	mg	2.7	4.9	8.5	10.0	13.5	19.3	6.9	39.5	40	0.3
Zinc	mg	0.6	1.1	2.0	2.5	3.4	5.0	2.5	60.3	5	10.0
Non-Breastfed Infants											
Calcium	mg	450	560	690	720	850	1,030	270*	—	ND	—
Iron	mg	10.5	13.4	16.8	17.5	20.8	25.2	6.9	1.7	40	0.3
Zinc	mg	4.8	5.8	7.0	7.2	8.4	9.7	2.5	0.3	5	87.6
Selenium	mcg	19	24	31	34	41	52	20*	—	60	5.1
Magnesium	mg	77	95	118	124	147	177	75*	—	na[a]	—
Phosphorus	mg	362	450	569	601	714	871	275*	—	ND	—
Sodium	mg	270	380	600	739	970	1,410	370*	—	ND	—
Potassium	mg	880	1,060	1,290	1,349	1,560	1,880	700*	—	ND	—
Vitamin A	mcg RAE	547	639	745	763	865	1,000	500*	—	ND	—
Vitamin A, preformed	mcg	350	451	562	618	736	974		—	600	42.7
Vitamin E[b]	mg	5.6	8.2	10.8	10.9	13.3	16.0	5*	—	ND	—
Vitamin C	mg	77	98	124	130	155	190	50*	—	ND	—
Thiamin	mg	0.63	0.79	0.98	1.03	1.22	1.49	0.3*	—	ND	—
Riboflavin	mg	0.92	1.13	1.38	1.44	1.68	2.02	0.4*	—	ND	—
Niacin[b]	mg	7.9	9.7	12.0	12.4	14.7	17.5	4*	—	na[c]	—
Folate[b]	mcg DFE	153	187	228	236	275	329	80*	—	ND	—
Vitamin B_6	mg	0.53	0.64	0.78	0.82	0.95	1.15	0.3*	—	ND	—
Vitamin B_{12}	mcg	1.43	1.76	2.17	2.56	2.81	4.00	0.5*	—	ND	—

NOTES FOR TABLE C-2C: Analysis sample was data for non-breastfed infants 6–11.9 mo of age participating in the WIC program at the time of the survey (n = 275). See additional notes for Tables C-2A through C-2G following Table C-2G.

TABLE C-2D Usual Intake Distributions of Selected Micronutrients and Electrolytes: WIC Children, 12 Through 23 Months

Nutrient	Units (per day)	Intake Distribution (percentiles and mean)						EAR or AI*	% Inadeq	UL	%>UL
		10th	25th	Median	Mean	75th	90th				
Calcium	mg	540	700	900	937	1,130	1,380	500*	—	2.5	0.1
Iron	mg	6.5	8.4	11.1	11.9	14.6	18.3	3.0	1.6	40	<0.1
Zinc	mg	4.9	5.9	7.3	7.8	9.2	11.2	2.5	0.2	7	55.7
Selenium	mcg	34	43	54	56	67	79	17	0.3	90	4.0
Magnesium	mg	127	153	184	188	219	254	65	0.1	na[a]	—
Phosphorus	mg	645	784	952	980	1,143	1,349	380	0.6	3,000	<0.1
Sodium	mg	970	1,300	1,730	1,816	2,230	2,770	1,000*	—	1.5	63.5
Potassium	mg	1,380	1,650	1,980	2,029	2,350	2,740	3,000*	—	ND	—
Vitamin A	mcg RAE	361	447	570	612	730	914	210	0.5	—	—
Vitamin A, preformed	mcg	282	358	465	495	600	748		—	600	25.0
Vitamin E[b]	mg	2.8	3.6	4.7	5.3	6.3	8.5	5	55.3	200	<0.1
Vitamin C	mg	55	74	101	109	136	174	13	<0.1	400	<0.1
Thiamin	mg	0.78	0.93	1.12	1.15	1.34	1.58	0.4	0.1	ND	—
Riboflavin	mg	1.24	1.48	1.78	1.82	2.11	2.46	0.4	<0.1	ND	—
Niacin[b]	mg	7.0	9.1	11.9	12.6	15.3	18.9	5	2.5	na[c]	—
Folate[b]	mcg DFE	200	260	343	378	455	597	120	1.2	—	—
Folic acid[b,d]	mcg	—	—	—	—	—	—	—	300	7.7	
Vitamin B_6	mg	0.83	1.00	1.24	1.30	1.53	1.86	0.4	<0.1	30	<0.1
Vitamin B_{12}	mcg	2.00	2.55	3.27	3.47	4.17	5.21	0.7	0.1	ND	—

NOTES FOR TABLE C-2D: Analysis sample was data for non-breastfed children 12–23.9 mo of age participating in the WIC program at the time of the survey (n = 287). See additional notes for Tables C-2A through C-2G following Table C-2G.

TABLE C-2E Usual Intake Distributions of Selected Micronutrients and Electrolytes: WIC Children, 2 Through 4 Years

Nutrient	Units (per day)	Intake Distribution (percentiles and mean)					
		10th	25th	Median	Mean	75th	90th
Calcium	mg	530	650	810	833	990	1,160
Iron	mg	8.8	10.6	13.0	13.6	16.0	19.1
Zinc	mg	6.1	7.2	8.7	9.1	10.6	12.6
Selenium	mcg	50	60	71	73	84	98
Magnesium	mg	141	169	203	208	242	283
Phosphorus	mg	720	857	1,021	1,041	1,204	1,388
Sodium	mg	1,700	2,030	2,440	2,519	2,930	3,440
Potassium	mg	1,480	1,790	2,160	2,211	2,580	3,000
Vitamin A	mcg RAE	394	483	603	657	764	975
Vitamin A, preformed	mcg	313	381	468	513	586	756
Vitamin E[b]	mg	3.4	4.3	5.4	6.0	7.0	9.0
Vitamin C	mg	65	86	113	118	146	178
Thiamin	mg	0.95	1.11	1.32	1.36	1.56	1.82
Riboflavin	mg	1.27	1.51	1.80	1.85	2.15	2.49
Niacin[b]	mg	10.7	13.0	15.9	16.4	19.2	22.8
Folate[b]	mcg DFE	335	404	494	517	604	727
Folic acid[b,d]	mcg	—	—	—	—	—	—
Vitamin B_6	mg	1.04	1.24	1.50	1.55	1.81	2.13
Vitamin B_{12}	mcg	2.30	2.71	3.25	3.57	4.01	5.11

NOTES FOR TABLE C-2E: Analysis sample was data for children 2–4.9 y of age participating in the WIC program at the time of the survey (n = 872). See additional notes for Tables C-2A through C-2G following Table C-2G.

EAR or AI*[a]	% Inadeq	UL[e]	%>UL
500* / 800*	—	2.5	<0.1
3.0 / 4.1	0.4	40	<0.1
2.5 / 4.0	0.1	7 / 12	58.1
17 / 23	<0.1	90 / 150	9.1
65 / 110	0.5	na[d]	—
380 / 405	0.2	3,000	<0.1
1,000* / 1,200*	—	1.5 / 1.9	92.8
3,000* / 3,800*	—	ND	—
210 / 275	0.4	—	—
	—	600 / 900	16.1
5 / 6	47.0	200 / 300	<0.1
13 / 22	<0.1	400 / 650	<0.1
0.4 / 0.5	<0.1	ND	—
0.4 / 0.5	<0.1	ND	—
5 / 6	0.1	na[c]	—
120 / 160	<0.1	—	—
	—	300 / 400	11.8
0.4 / 0.5	<0.1	30 / 40	<0.1
0.7 / 1.0	<0.1	ND	—

TABLE C-2F Usual Intake Distributions of Selected Micronutrients and Electrolytes: Adolescent and Adult Women, Pregnant or Lactating

Nutrient	Units (per day)	Intake Distribution (percentiles and mean)					
		10th	25th	Median	Mean	75th	90th
Calcium	mg	590	740	920	956	1,140	1,360
Iron	mg	10.8	12.8	15.6	16.5	19.2	23.6
Zinc	mg	8.6	9.9	11.4	11.7	13.2	15.1
Selenium	mcg	71	84	99	103	117	139
Magnesium	mg	196	234	282	291	339	398
Phosphorus	mg	964	1,137	1,343	1,359	1,564	1,775
Sodium	mg	2,630	2,940	3,310	3,330	3,690	4,060
Potassium	mg	2,030	2,410	2,860	2,909	3,360	3,850
Vitamin A	mcg RAE	444	605	834	902	1,124	1,446
Vitamin A, preformed	mcg	299	405	552	589	732	926
Vitamin E[b]	mg	4.9	6.1	7.8	8.3	9.9	12.3
Vitamin C	mg	49	75	116	134	173	242
Thiamin	mg	1.08	1.31	1.60	1.67	1.96	2.34
Riboflavin	mg	1.43	1.73	2.12	2.19	2.57	3.04
Niacin[b]	mg	14.5	17.5	21.1	21.8	25.3	29.9
Folate[b]	mcg DFE	322	411	535	570	691	863
Folic acid[b,d]	mcg	—	—	—	—	—	—
Vitamin B_6	mg	1.20	1.49	1.88	1.95	2.33	2.81
Vitamin B_{12}	mcg	3.05	3.75	4.63	4.79	5.66	6.74

NOTES FOR TABLE C-2F: Analysis sample was data for pregnant or lactating adolescent and adult women ages 14–44 y (n = 123). Because of sample size limitations, the analysis sample combined all pregnant women and all lactating women. The DRIs shown in the table are for women ages 19–30 y of age only; however, the analysis was conducted on the entire sample. See additional notes for Tables C-2A through C-2G following Table C-2G.

EAR or AI* (19–30 y)			UL (19–30 y)		
Pregnant	Lactating	% Inadeq	Pregnant	Lactating	%>UL
1,000*	1,000*	—	2,500	2,500	<0.1
22	6.5	7.5	45	45	0.1
9.5	10.4	23.8	40	40	<0.1
49	59	1.4	400	400	<0.1
290	255	49.4	na[a]	na[a]	—
580	580	0.4	3,500	4,000	<0.1
1,500*	1,500*	—	2,300	2,300	97.2
4,700*	5,100*	—	ND	ND	—
550	900	31.2	ND	ND	—
		—	3,000	3,000	<0.1
12	16	94.4	1,000	1,000	<0.1
70	100	32.7	2,000	2,000	<0.1
1.2	1.2	17.2	ND	ND	—
1.2	1.3	3.8	ND	ND	—
14	13	8.1	na[c]	na[c]	—
520	450	41.5	—	—	—
		—	1,000	1,000	<0.1
1.6	1.7	34.0	100	100	<0.1
2.2	2.4	1.5	ND	ND	—

TABLE C-2G Usual Intake Distributions of Selected Micronutrients and Electrolytes: Adolescent and Adult Women, Non-Breastfeeding Postpartum

Nutrient	Units (per day)	Intake Distribution (percentiles and mean)					
		10th	25th	Median	Mean	75th	90th
Calcium	mg	430	530	640	668	780	930
Iron	mg	11.1	12.2	13.6	13.7	15.0	16.4
Zinc	mg	9.2	9.4	9.7	9.7	10.0	10.2
Selenium	mcg	72.2	79.0	87.0	87.8	95.8	104.4
Magnesium	mg	161	183	210	213	240	269
Phosphorus	mg	832	925	1,034	1,042	1,151	1,263
Sodium	mg	2,320	2,580	2,890	2,912	3,220	3,540
Potassium	mg	1,570	1,790	2,060	2,086	2,350	2,630
Vitamin A	mcg RAE	316	406	528	556	675	831
Vitamin A, preformed	mcg	195	264	361	388	482	615
Vitamin E[b]	mg	5.2	5.9	6.8	6.9	7.8	8.7
Vitamin C	mg	34	49	72	79	101	135
Thiamin	mg	1.03	1.18	1.36	1.38	1.57	1.77
Riboflavin	mg	1.15	1.34	1.57	1.60	1.83	2.10
Niacin[b]	mg	13.0	15.2	17.9	18.1	20.7	23.7
Folate[b]	mcg DFE	312	377	463	482	566	675
Folic acid[b,d]	mcg	—	—	—	—	—	—
Vitamin B_6	mg	1.01	1.17	1.37	1.39	1.59	1.80
Vitamin B_{12}	mcg	2.20	3.10	4.60	5.48	6.80	9.90

NOTES FOR TABLE C-2G: Analysis sample was data for non-breastfeeding postpartum adolescent and adult women ages 14–44 y (n = 105). See additional notes for Tables C-2A through C-2G following this table.

NOTES FOR TABLES C-2A THROUGH C-2G: AI = Adequate Intake, used when EAR could not be determined, indicated by an asterisk (*); DFE = dietary folate equivalents; EAR = Estimated Average Requirement; na = not applicable; ND = not determined, EAR could not be determined or UL not determined due to lack of data of adverse effects; RAE = retinol activity equivalents; RE = retinol equivalents; UL = Tolerable Upper Intake Level; %>UL, percentage with usual intake greater than UL; % Inadeq = percentage with inadequate intakes as estimated from percentage with usual intake less than EAR.

[a]The UL for magnesium represents intake from pharmacological agents only and does not include intake from food and water.

[b]For discussion of important issues regarding differences between the DRI and dietary intake data in the units used for vitamin E, niacin, and folate, please see the section *Data Set—Nutrients Examined*—here in Appendix C.

EAR or AI* (19–30 y)			UL (19–30 y)		
Pregnant	Lactating	% Inadeq	Pregnant	Lactating	%>UL
1,300*	1,000*	—	2.5	2.5	<0.1
7.9	8.1	9.5	45	45	<0.1
7.3	6.8	<0.1	34	40	<0.1
45	45	<0.1	400	400	<0.1
300	265	87.5	na[a]	na[a]	
1,055	580	0.7	4,000	4,000	<0.1
1,500*	1,500*	—	2.3	2.3	90.7
4,700*	4,700*	—	ND	ND	—
485	500	44.1	ND	ND	—
		—	2,800	3,000	<0.1
12	12	99.8	800	1,000	<0.1
56	60	42.2	1,800	2,000	<0.1
0.9	0.9	3.2	ND	ND	—
0.9	0.9	1.2	ND	ND	—
11	11	3.3	na[c]	na[c]	—
330	320	12.0	—	—	—
		—	800	1,000	<0.1
1	1.1	17.1	80	100	<0.1
2	2	6.6	ND	ND	—

[c]The UL for niacin represents intake of free niacin likely to be ingested only in supplements or fortified foods.

[d]For folic acid, the form of folate used in food fortification, the intake distribution could not be calculated because available dietary intake data were incomplete. For detailed explanation, please see the section *Data Set—Nutrients Examined*—here in Appendix C.

[e]Values are for children ages 2–3.9 y and children age 4 y, respectively. For this analyses, the intake of each child was compared to the age-appropriate DRI.

DATA SOURCES: Intake data are from 1994–1996 and 1998 Continuing Survey of Food Intake by Individuals (CSFII) (FSRG, 2000); data set does not include intake from dietary supplements (e.g., multivitamin and mineral preparations). Intake distributions were calculated using C-SIDE (ISU, 1997).

TABLE C-3A Usual Intake Distributions of Selected Macronutrients: WIC Infants, 0 Through 3 Months, Non-Breastfed

		Intake Distribution (percentiles and mean)					
Nutrient	Units	10th	25th	Median	Mean	75th	90th
Food energy	kcal/d	437	523	635	673	778	951
EER[a]	kcal/d	406	468	559	555	640	687
Protein	g/d	9.4	11.4	14.1	14.9	17.6	21.5
	% of energy	8	8	9	9	9	10
Carbohydrate	g/d	47	57	71	75	87	106
	% of energy	41	43	44	44	46	48
Fat, total	g/d	22	27	33	35	40	49
	% of energy	43	45	47	46	48	49
Saturated fatty acids	g/d	9	11	13	14	16	20
	% of energy	16	18	19	19	20	21

NOTES FOR TABLE C-3A: Analysis sample was data for non-breastfed infants from birth through 3.9 mo of age participating in the WIC program at the time of the survey (n = 152). See additional notes for Tables C-3A through C-3G following Table C-3G.

TABLE C-3B Usual Intake Distributions of Macronutrients and Fiber: WIC Infants, 4 Through 5 Months, Non-Breastfed

		Intake Distribution (percentiles and mean)					
Nutrient	Units	10th	25th	Median	Mean	75th	90th
Food energy	kcal/d	603	684	786	802	903	1,021
EER[a]	kcal/d	471	541	614	623	675	765
Protein	g/d	12.6	14.9	17.5	17.8	20.3	23.2
	% of energy	8	8	9	9	9	10
Carbohydrate	g/d	73	83	96	98	111	126
	% of energy	43	46	48	49	52	57
Fat, total	g/d	28	33	38	38	44	49
	% of energy	37	40	42	42	45	47
Saturated fatty acids	g/d	11	13	15	15	17	20
	% of energy	14	16	17	17	18	19
Fiber	g/d	<1	<1	1	2	3	5

NOTES FOR TABLE C-3B: Analysis sample was data for non-breastfed infants 4–5.9 mo of age participating in the WIC program at the time of the survey (n = 104). See additional notes for Tables C-3A through C-3G following Table C-3G.

TABLE C-3C Usual Intake Distributions of Macronutrients, Cholesterol, and Fiber: WIC Infants, 6 Through 11 Months, Non-Breastfed

		Intake Distribution (percentiles and mean)					
Nutrient	Units	10th	25th	Median	Mean	75th	90th
Food energy	kcal/d	691	821	970	992	1,137	1,319
EER[a]	kcal/d	570	641	740	754	854	958
Protein[b]	g/d	15.9	19.7	24.9	26.7	31.8	39.9
	% of energy	8	9	10	11	12	13
Carbohydrate	g/d	91	107	128	131	151	176
	% of energy	47	50	53	54	57	60
Fat, total	g/d	27	33	40	40	47	55
	% of energy	30	34	37	36	40	43
Saturated fatty acids	g/d	11	13	16	16	19	22
	% of energy	11	13	15	14	16	18
Cholesterol	mg/d	13	23	47	71	92	160
Fiber	g/d	2	3	5	5	6	8

[b]For protein, 0.6% of WIC infants ages 6–11.9 mo had inadequate intakes.

NOTES FOR TABLE C-3C: Analysis sample was data for non-breastfed infants 6–11.9 mo of age participating in the WIC program at the time of the survey (n = 275). See additional notes for Tables C-3A through C-3G following Table C-3G.

TABLE C-3D Usual Intake Distributions of Macronutrients, Cholesterol, and Fiber: WIC Children, 12 Through 23 Months

		Intake Distribution (percentiles and mean)					
Nutrient	Units	10th	25th	Median	Mean	75th	90th
Food energy	kcal/d	901	1,065	1,262	1,288	1,482	1,708
EER[a]	kcal/d	729	827	935	942	1,050	1,165
Protein[b]	g/d	32	38	46	48	56	66
	% of energy	12	13	15	15	16	18
Carbohydrate	g/d	115	137	164	168	194	226
	% of energy	46	49	53	53	57	61
Fat, total	g/d	32	39	48	49	58	68
	% of energy	28	31	33	33	36	39
Saturated fatty acids	g/d	14	17	21	21	25	30
	% of energy	11	13	15	15	17	18
Cholesterol	mg/d	97	130	176	192	238	309
Fiber	g/d	4	6	8	8	10	12

[b]For protein, <0.1% of WIC children ages 1–1.9 y had inadequate intakes.

NOTES FOR TABLE C-3D: Analysis sample was data for non-breastfed children 12–23.9 months of age participating in the WIC program at the time of the survey (n = 287). See additional notes for Tables C-3A through C-3G following Table C-3G.

TABLE C-3E Usual Intake Distributions of Macronutrients, Cholesterol, and Fiber: WIC Children, 2 Through 4 Years

		Intake Distribution (percentiles and mean)					
Nutrient	Units	10th	25th	Median	Mean	75th	90th
Food energy	kcal/d	1,112	1,312	1,553	1,585	1,822	2,095
EER[a]-Low Active	kcal/d	1,000	1,146	1,285	1,282	1,412	1,545
EER[a]-Active	kcal/d	1,019	1,207	1,411	1,389	1,567	1,700
Protein[b]	g/d	40	47	56	57	67	77
	% of energy	13	14	15	15	16	17
Carbohydrate	g/d	146	173	208	213	247	286
	% of energy	48	51	54	54	57	60
Added sugars	g/d	6	8	12	13	17	21
	% of energy	7	9	12	13	16	20
Fat, total	g/d	39	47	57	58	68	80
	% of energy	28	30	33	33	35	38
Saturated fatty acids[c]	g/d	15	18	22	22	26	30
	% of energy	10	11	13	13	14	15
Cholesterol[d]	mg/d	134	165	206	216	257	311
Fiber	g/d	7	8	11	11	13	16

[b]For protein, <0.1% of WIC children ages 2–4.9 y had inadequate intakes.

[c]For saturated fatty acids, 9% of WIC children ages 2–4.9 y had intakes that followed dietary guidance to limit to less than 10% of food energy intake.

[d]For cholesterol, 88% of WIC children ages 2–4.9 y had intakes that followed dietary guidance to limit intake to less than 300 mg per day.

NOTES FOR TABLE C-3E: Analysis sample was data for children 2–4.9 y of age participating in the WIC program at the time of the survey (n = 872). See additional notes for Tables C-3A through C-3G following Table C-3G.

TABLE C-3F Usual Intake Distributions of Macronutrients, Cholesterol, and Fiber: Adolescent and Adult Women, Pregnant or Lactating

		Intake Distribution (percentiles and mean)					
Nutrient	Units	10th	25th	Median	Mean	75th	90th
Food energy	kcal/d	1,557	1,798	2,088	2,115	2,403	2,707
EER[a]-Low Active	kcal/d	2,279	2,355	2,451	2,465	2,560	2,671
Protein[b]	g/d	58	68	79	79	90	102
	% of energy	14	15	16	16	16	17
Carbohydrate	g/d	199	235	279	285	328	378
	% of energy	49	51	54	54	56	59
Added sugars	g/d	10	14	20	22	27	35
	% of energy	8	11	15	16	19	24
Fat, total	g/d	55	64	76	77	88	99
	% of energy	28	30	32	32	35	37
Saturated fatty acids[c]	g/d	19	23	27	27	32	37
	% of energy	9	10	12	12	13	14
Cholesterol[d]	mg/d	173	210	260	271	320	385
Fiber	g/d	10	13	17	18	21	26

[b]For protein, 17% of pregnant and lactating women had inadequate intakes.

[c]For saturated fatty acids, 19% of pregnant and lactating women had intakes that followed dietary guidance to limit to less than 10% of food energy intake.

[d]For cholesterol, 68% of pregnant and lactating women had intakes that followed dietary guidance to limit intake to less than 300 mg per day.

NOTES FOR TABLE C-3F: Analysis sample was data for pregnant or lactating adolescent and adult women ages 14–44 y (n = 123). Because of sample size limitations, the analysis sample combined all pregnant women and all lactating women. See additional notes for Tables C-3A through C-3G following Table C-3G.

TABLE C-3G Usual Intake Distributions of Macronutrients, Cholesterol, and Fiber: Adolescent and Adult Women, Non-Breastfeeding Postpartum

		Intake Distribution (percentiles and mean)					
Nutrient	Units	10th	25th	Median	Mean	75th	90th
Food energy	kcal/d	1,363	1,540	1,754	1,774	1,986	2,210
EER[a]-Low Active	kcal/d	1,988	2,058	2,148	2,163	2,253	2,359
Protein[b]	g/d	50	57	64	65	72	80
	% of energy	12	14	15	15	16	18
Carbohydrate	g/d	159	189	226	229	266	305
	% of energy	47	49	52	52	55	57
Added sugars	g/d	8	13	19	21	27	36
	% of energy	8	12	17	18	24	30
Fat, total	g/d	55	60	66	66	72	77
	% of energy	32	32	33	33	34	35
Saturated fatty acids[c]	g/d	17	20	23	23	26	29
	% of energy	10	11	11	11	12	12
Cholesterol[d]	mg/d	152	179	213	219	253	292
Fiber	g/d	7	9	12	12	15	18

[b]For protein, 4% of non-breastfeeding postpartum women had inadequate intakes.

[c]For saturated fatty acids, 4% of non-breastfeeding postpartum women had intakes that followed dietary guidance to limit to less than 10% of food energy intake.

[d]For cholesterol, 92% of non-breastfeeding postpartum women had intakes that followed dietary guidance to limit intake to less than 300 mg per day.

NOTES FOR TABLE C-3G: Analysis sample was data for non-breastfeeding postpartum adolescent and adult women ages 14–44 y (n = 105). See additional notes for Tables C-3A through C-3G following this table.

NOTES FOR TABLES C-3A THROUGH C-3G: EER = Estimated Energy Requirement; kcal = kilocalories.

[a]Mean EER (kcal/d) was calculated based on CSFII data (FSRG, 2000) using the method described in the DRI report (IOM, 2002/2005). For pregnant women, EER calculations assumed the second trimester. For lactating women, EER calculations assumed the first 6 month period postpartum.

DATA SOURCES: Intake data are from 1994–1996 and 1998 Continuing Survey of Food Intake by Individuals (CSFII) (FSRG, 2000); data set does not include intake from dietary supplements (e.g., multivitamin and mineral preparations). Intake distributions were calculated using C-SIDE (ISU, 1997).

TABLE C-4 Usual Intakes and Percentages with Reported Usual Intakes of Macronutrients and Added Sugars Outside Dietary Guidance

Nutrient (Dietary Guidance)	Participant Category			
	WIC Children, 1–1.9 y (n = 287)	WIC Children, 2–4.9 y (n = 872)	Pregnant Women and Lactating Women (n = 123)	Non-Breastfeeding Postpartum Women (n = 105)
Protein (AMDR†[a] as percentage of food energy)	(5–20†)	(5–20†, 2–3.9 y) (10–30†, 4–4.9 y)	(10–30†, <19 y) (10–35†, ≥19 y)	(10–35†)
Mean usual intake (g/d)	48	57	79	65
%<AMDR	<0.1	0.5	<0.1	0.3
%>AMDR	1.5	1.0	<0.1	<0.1
Carbohydrate, total (AMDR†[a] as percentage of food energy)	(45–65†)	(45–65†)	(45–65†)	(45–65†)
Mean usual intake (g/d)	168	213	285	229
%<AMDR	7.5	2.0	1.5	4.8
%>AMDR	2.8	1.1	0.2	0.1
Added Sugars (<25% of food energy)				
Mean usual intake (g/d)	—	13	22	21
%>25% of energy	na	2.9	7.3	20.4
Fat, total (AMDR†[a] as percentage of food energy)	(30–40†)	(30–40†, 2–3.9 y) (25–35†, 4–4.9 y)	(25–35†, <19 y) (20–35†, ≥19 y)	(25–35†, <19 y) (20–35†, ≥19 y)
Mean usual intake (g/d)	49	58	77	66
%<AMDR	20.8	18.1	0.2	<0.1
%>AMDR	5.5	10.4	24.5	4.9

continues

TABLE C-4 Continued

Nutrient (Dietary Guidance)	Participant Category			
	WIC Children, 1–1.9 y (n = 287)	WIC Children, 2–4.9 y (n = 872)	Pregnant Women and Lactating Women (n = 123)	Non-Breastfeeding Postpartum Women (n = 105)
Fat, saturated (<10% of food energy)[b]				
Mean usual intake (g/d)	21	22	27	23
%>10% of energy	na	91.0	80.9	96.2

[a]AMDRs are presented as a range of intakes expressed as percentage of food energy intake (IOM, 2002/2005). For this analyses, the intake of each individual was compared to the age-appropriate AMDR.

[b]The dietary guidance in this table for saturated fat is a part of the *Dietary Guidelines for Americans* (DHHS/USDA, 2005). The Dietary Reference Intake (DRI) guidance for saturated fat is to consume amounts as low as possible while consuming a nutritionally adequate diet (IOM, 2002/2005).

NOTES: This table is similar to Table 2-5; more detail is presented here in Appendix C. AMDR = Acceptable Macronutrient Distribution Range, indicated by a dagger (†); n = sample size; na = not applicable; %<AMDR, percentage with usual intake less than AMDR; %>AMDR, percentage with usual intake greater than AMDR.

DATA SOURCES: Intake data were obtained from 1994–1996 and 1998 Continuing Survey of Food Intake by Individuals (CSFII) (FSRG, 2000). All young children were non-breastfed. Usual intake distributions were calculated using C-SIDE (ISU, 1997). AMDRs and dietary guidance for added sugars were obtained from the DRI report (IOM, 2002/2005). Dietary guidance for saturated fat was obtained from the *Dietary Guidelines* (DHHS/USDA, 2005) (see note *b*).

D

Evaluating Potential Benefits and Risks of the Revised Food Packages

Three of the six criteria guiding the development of the revised WIC food packages focused on nutrient and food intakes. Specifically, the committee aimed to develop WIC food packages that would (1) reduce the prevalence of inadequate nutrient intakes and of excessive nutrient intakes, (2) lead to dietary patterns that are consistent with the *Dietary Guidelines for Americans* for individuals two years and older,[1] and (3) contribute to dietary patterns that are consistent with dietary guidance for infants and children younger than 2 years of age.

This appendix summarizes the results from an evaluation of the potential nutrient benefits and risks for the WIC target population associated with the revised WIC food packages. Potential benefits are characterized as reductions in the prevalence of inadequate nutrient intake and reductions in the prevalence of excessive nutrient intake. Potential risks are characterized as increases in the prevalence of inadequate intake, increases in the prevalence of excessive nutrient intake, and any departures from consistency with the *Dietary Guidelines* and dietary guidance for those younger than 2 years of age. Chapter 6—*How the Revised Food Packages Meet the Criteria Specified*—addresses ways in which the revised packages provide

[1]Failure to meet the *Dietary Guidelines for Americans* was identified as a nutrition risk criteria for the WIC program (IOM, 1996).

potential benefits through improved consistency with the *Dietary Guidelines* and dietary guidance for those younger than 2 years of age.

This is not a complete assessment of risk and benefits in that it is not feasible to estimate what long-term health benefits and risks would be associated with a change in specific foods offered in the WIC program. Assuming that the recommendations in this report are adopted at the federal level, those benefits and risks would depend upon many factors, including the following:

- The extent to which the WIC state agencies allow local agencies to prescribe the maximum amounts of food in the revised food packages;
- The extent to which the WIC state agencies incorporate more allowed choices in the food package offerings;
- The success of approaches to nutrition education that address the revised food packages;
- The extent of redemption of the WIC food instruments for the revised packages;
- Whether the entire amount of food in the package is consumed by the WIC participant; and
- The association of consuming those foods with long-term health benefits.

Notably, the committee used current dietary guidance from the *Dietary Guidelines* and Dietary Reference Intakes (DRIs) when redesigning the food packages, and these sources incorporate information on reduced risk of chronic diseases into their dietary guidance. The *Dietary Guidelines for Americans 2005* "provide science-based advice [for people two years and older] to promote health and to reduce risk for chronic diseases through diet and physical activity" (DHHS/USDA, 2005, p. 1). The DRIs are intended to minimize the risk of nutrient inadequacy (including both classical deficiency states and the reduction of the risk of chronic disease and disorders) or nutrient excess and are intended to be applied to the healthy general population in the United States and Canada (IOM, 1997). Thus, the more closely that diets adhere to current dietary guidance, the greater the likelihood that they will result in long-term health benefits.

METHODS FOR EVALUATING NUTRITIONAL BENEFITS AND RISKS

The method for evaluating nutritional benefits and risks associated with changes in the WIC food packages is a modification of the risk assess-

ment method first outlined by the National Research Council in 1983 (NRC, 1983). In risk assessment, *hazard identification* is followed by *dose-response assessment* and *exposure assessment* before the results are combined in risk characterization.

In risk assessment, the term *hazard identification* refers to the characterization of potential adverse effects on human health and the conditions necessary to elicit those effects. Inadequate nutrition can be characterized for specific nutrients as either inadequate intake or excessive intake that increases the risk of poor health outcomes, i.e., the risk of hazards. Detailed discussions of the possible hazards associated with poor dietary choices and inadequate nutrient intake are available in the DRI reports (IOM, 1997, 1998, 2000b, 2001, 2002/2005, 2005a). Concerns about excessive intake of some nutrients (e.g., excessive preformed vitamin A intake and excessive intake of food energy) arise because of potential toxicity or potential for unhealthy body weight gain, respectively, in the examples given.

In risk assessment, *dose-response assessment* describes how changes in dose (in this case, changes in the intake of nutrients) influence the likelihood of a hazard being realized (that is, the likelihood of changes in health status). It is outside the scope of this report to discuss changes in health status. Therefore, for the analysis presented in this report, there is no formal assessment of changes in the number or severity of health effects due to changes in intake. That is, there is no formal *dose-response assessment* describing the likelihood of changes in health status. This report focuses on dietary inadequacy or excess as the hazard, rather than on changes in health status.

In risk assessment, *exposure assessment* seeks to predict the change in exposure. In this case, *exposure assessment* for each WIC population addresses the changes in usual nutrient intake distributions that result from changes in individual intakes that are based on the changes in the nutrients provided by the revised food packages.

As the final step in risk assessment, *risk characterization* reflects the integration of the previous three steps in order to help inform decision makers about quantitative levels of risk to human health status under different scenarios. This report contains a modified *risk characterization* because the committee was able to consider only dietary status (that is, the risk of inadequate intake and the risk of excessive intake), not health status.

In summary, this evaluation of nutritional benefits and risks brings together information from (1) the assessment of inadequate nutrition (*hazard identification*), (2) considerations of the influence of potential changes in nutrients provided in the food packages on either inadequate intake or

excessive intake (a modified *dose-response assessment*), and (3) prediction of changes in usual intakes of nutrients (*exposure assessment*) to provide a quantitative description (that is, a modified *risk characterization*) of the potential change in nutritional status of the WIC population as the result of the recommended changes in the WIC food packages.

Nutrient Intake

The committee conducted a detailed evaluation to compare potential benefits and risks for the WIC participant subpopulations resulting from proposed changes in the food packages.

- *Potential benefits* are characterized as reductions in the prevalences of nutrient inadequacy or nutrient excess.
- *Potential risks* are characterized as increases in the prevalences of nutrient inadequacy or increases in the risk of excessive nutrient intakes.

The committee's analysis applied the framework proposed by the IOM Subcommittee on the Interpretation and Uses of the DRIs (IOM, 2003a). This framework considers improving the distribution of usual nutrient intakes as the ultimate goal of a group planning activity such as changing the WIC food packages. Specifically, the goal is to achieve usual nutrient intake distributions with an acceptably low prevalence of inadequate intakes and a low prevalence of excessive intakes.

Changes in the contents of a WIC food package alter the nutrient profile of the package and thus the amounts of nutrients offered to WIC participants. (See Tables C-5A through C-5C for comparison of current and revised food packages with regard to priority nutrients offered.) Increases in nutrient intakes that lead to reductions in the prevalence of inadequacy are considered as benefits of the revised WIC food packages, as are decreased intakes of nutrients of concern for excessive intake. In contrast, reductions in nutrient intakes that lead to increases in the prevalence of inadequate intake are considered as risks of the revised food package. In addition, increases in nutrient intakes that increase the prevalence of excessive intakes also are considered to be a risk of the revised food package. Because foods contain many different nutrient components and because package changes address many different attributes, a change in the types and amounts of foods in a package has the potential of having both positive effects (that is, benefits) and negative effects (that is, risks) on the nutrient profile.

Importantly, at this point, it is not possible to estimate the precise impact of any food package changes on nutrient intakes. The WIC program

can control only what is offered to participants, not what they actually consume. Some WIC participants consume a larger amount of a specific nutrient than is offered in their current food package. For example, such individuals consume the foods from the WIC food packages plus foods from the family resources, making their total intake of a nutrient greater than that offered in the food package. In contract, some WIC participants consume less of a specific nutrient than is provided by the maximum food package for their category. There are several reasons why estimated nutrient intakes may be less than nutrients offered through WIC food packages, including:

- Less than the maximum allowance of food may be prescribed for a WIC participant, and less food may be redeemed than prescribed (e.g., a participant does not use all her food instruments in a month);
- WIC foods may be shared with other people or discarded; and
- Food intakes may be underreported or misreported.

With the revised WIC food packages, consumption patterns may change, leading to changes in both the shape and position of usual nutrient intake distributions. The major challenge in estimating the benefits and risks of changes in the WIC food packages is to predict what the usual nutrient intake distributions would be after the changes in the WIC food packages are implemented. Ultimately, evidence of the benefits and risks will come from data collection and analyses that occur after changes in the WIC food packages have been implemented. Nonetheless, the committee considered several approaches to predicting the changes in the usual intake distributions resulting from the change in the WIC food packages.

The Delta Approach

The first, and most straightforward, approach (the delta approach) was based on a starting assumption that any changes in the WIC food packages would be reflected solely in the nutrient intake by the individual WIC participant (i.e., infant, child, woman). Thus, the analysis of benefits and risks would start with the existing distribution of usual nutrient intake of WIC participants (which presumably reflects the existing intrahousehold allocation of WIC food packages). Then, for each package and each nutrient, the difference between the nutrient content of the revised WIC food package minus that of the corresponding current package is added to the previously estimated usual intakes of WIC participants.

A shortcoming of this approach is that it ignores the reality that individuals do not always consume what is offered to them. Indeed, much of

the nutrient inadequacy reported in Chapter 2—*Nutrient and Food Priorities*—results from the fact that individuals do not consume all of the food offered in the current WIC food packages. For example, the mean amount of calcium offered in the maximum allowance for the non-breastfeeding postpartum food package is 1,199 mg per day, but the mean calcium intake by these women is 668 mg per day. In fact, even the 90th percentile of usual calcium intake by non-breastfeeding postpartum women (930 mg/d) is less than the amount offered by the maximum allowance in the current food package. Given that the mean intake of calcium is less than the amount currently offered, it is not reasonable to assume that a change in the amount of calcium offered through a revised WIC food package will lead to the same quantitative change in mean intake.

Results of analyses with this approach are reported in Tables D-1A through D-1C at the end of this appendix; because of the concerns in the application of the delta approach, the consideration of risks and benefits of the revised food packages will focus on results from the committee's second approach to predicting changes in population intake of nutrients—the proportional approach.

The Proportional Approach

The committee adopted a second approach (the proportional approach), with the following steps.

- For each usual intake, calculate the ratio of the intake to the amount offered in the current WIC food package. For example, at a usual calcium intake of 670 mg per day, the ratio is (670)/(1,200), or 0.56, indicating that at this intake, a non-breastfeeding postpartum woman would consume an average of 56 percent of the calcium offered in the WIC food package.
- If usual intake is less than the amount offered, the change in the amount offered is multiplied by this ratio to predict changes in the intake. Continuing with the calcium example, if the amount offered is reduced by 200 mg per day, the reduction in usual intake above is assumed to be (0.56) × (200 mg/d) = 112 mg/d. In contrast, under the delta approach, the reduction would be 200 mg per day, regardless of current usual intake of calcium. (In fact, the delta approach could lead to prediction of negative intakes.)
- If usual intake exceeds the amount offered, changes in the amount offered are simply added to usual intakes.

Several assumptions are associated with the proportional approach. First, it assumes that the ratio of intake to the amount offered is the same

before and after the change in the WIC food package. Since many of the changes proposed are expected to increase the consumption of WIC foods, this assumption is not likely to hold. On the other hand, this assumption appears to be better than the assumption that any difference in what is offered leads to a difference in what is consumed, even for those who are not consuming much of what is offered in the first place. In addition, until usual intake data are available *after* the change in WIC food package, using information on current consumption patterns provides a reasonable starting point.

A second key assumption is that individuals who consume more of a nutrient than is currently offered in the WIC food package will change their consumption by the extent of change in the amount offered by the revised food package relative to the current package. This approach does not account for certain food purchasing and consumption practices. For example, if more of a food is offered in the revised package, a participant may decrease the amount of that food (or of another food) that is bought with her own money but eat the same amount of the food. Similarly, if the amount of an offered food is reduced, the participant may buy more of that food and eat a similar amount. In the absence of data *a priori* on what changes in intake will result from changes in the food package, the assumption that consumption will change by a proportion of the difference between the current and revised package is a starting assumption.

APPLICATION OF METHODS

The WIC food packages are intended to supplement the diet of specific groups of low-income women, infants, and children. The potential risks and benefits of this intervention can be evaluated in several ways. As detailed in this report, the committee examined how the current and revised packages correspond with the *Dietary Guidelines*. The committee also evaluated the degree of inadequacy or excess nutrient intake predicted to occur in the participant subpopulations with the current and revised packages. Other benefits of the revised packages, such as the increased variety of foods available and the incentives for breastfeeding, are not quantified. Reliable data were not available to assess intakes of *trans* fatty acids; however, the amount of *trans* fatty acids in the current and proposed food packages were estimated and are included in the Appendix C—*Nutrient Profiles*. The current and revised WIC food packages contain insignificant amounts of industrial *trans* fats—the source of *trans* fat deemed to be of concern by the Dietary Guidelines Advisory Committee (DHHS/USDA, 2004).

Nutrient Intake Profiles

Changing the mix of foods offered in the WIC food packages leads to complex changes in the nutrients available to WIC participants. Efforts to address specific priority nutrients are challenging because foods contain many different components.

The committee characterized the effect of revised food packages in two ways. First, the change in nutrient content of packages was calculated. This measure can be estimated quite well; the only important assumptions are the choices of foods when options are presented (see Chapter 4—*Revised Food Packages*) (See details in Appendix D—*Cost Calculations*.). Next, predicted changes in nutrient intake were developed. The values of the predicted percentage inadequate or of the predicted changes in mean intake of a nutrient are subject to considerable uncertainty because of lack of knowledge of the consumption patterns and practices that will occur. Nonetheless, this approach provides useful insight into the possible benefits and risks of changes in the packages.

The committee characterized changes in nutrients available in each package and estimated how these changes would influence predicted nutrient intake. Tables detailing changes in predicted intake of more than 30 micro- and macronutrients plus cholesterol and food energy for each of the current and revised WIC food packages are in Appendix C—*Nutrient Profiles*. Here in Appendix D the focus is on the specific food components identified as priorities in Chapter 2—*Nutrient and Food Priorities*—because of concern about either inadequate or excessive intakes. For priority nutrients with inadequate intakes for WIC subpopulations (e.g., calcium, vitamin E, fiber), Table D-1A presents current and predicted mean intakes, and current and predicted percentages with inadequate intakes, if applicable. Similar information is presented in Table D-1B for nutrients of concern with regard to excessive intake (e.g., sodium, preformed vitamin A, food energy), but this table shows current and predicted percentages with intakes greater than the Tolerable Upper Intake Level (UL) or Acceptable Macronutrient Distribution Range (AMDR). Comparisons for nutrients to limit in the diet (i.e., saturated fat and cholesterol) are shown in Table D-1C.

Formula-Fed Infants Younger Than One Year of Age

For formula-fed infants younger than one year of age, the committee identified nutrients of concern with regard to excessive intake, and the proposed changes to Food Packages I and II address these nutrients. The only nutrient with a change in intake in the non-desired direction is pre-

formed vitamin A in Food Package I; for this nutrient, the percentage of infants 4 through 5 months of age with intakes greater than the UL (600 mcg retinol/d) is predicted to increase by approximately 10 percentage points (Table D-1B). The committee increased the maximum allowance of formula for formula-fed infants in this age range to address their increased nutritional needs. The composition of formula makes it impossible to increase formula intake without increasing the intake of preformed vitamin A. In Food Package II-FF, for formula-fed infants ages 6 through 11 months, the percentage of the population above the UL for preformed vitamin A is predicted to decrease by 13.6 percentage points (Table D-1B).

Children 1 Year of Age

Children one year of age (12–23 mo of age), served by Food Package IV-A, are predicted to show improvement in almost all food components. The substantial increase in predicted intake of fiber (Table D-1A), decreases in the predicted percentage of the population with inadequate intake of vitamin E (Table D-1A), and the predicted reductions in intakes of sodium and food energy are all benefits of the revised food package (Table D-1B).

The only priority nutrients with predicted changes in the non-desired direction are potassium, with an estimated 8 percent decrease in mean intake (Table D-1A), and zinc, with an increase in the percentage of the population above the 7 mg UL (Table D-1B). The committee has minimal concern regarding excessive intake of zinc because of the basis for setting the UL (IOM, 2001). The method used to set the ULs for zinc resulted in relatively narrow margins between the UL and the Recommended Dietary Allowance (RDA); the ULs are approximately 2.4 times the RDAs for children (IOM, 2001). There has been no evidence of adverse effects from ingestion of zinc as naturally occurring in food (IOM, 2001; Brown et al., 2004a). However, zinc is used as a fortificant in some foods that are commonly consumed by children (e.g., breakfast cereal). Further study is needed of the contribution of the zinc in such food products to possible overconsumption of zinc.

Children 2 Through 4 Years of Age

The revised Food Package IV-B serves children 2 through 4 years of age. The revised food package has many predicted benefits including sharp increases in intake of vitamin E and fiber (Table D-1A) and reductions in the consumption of sodium, food energy, saturated fat, and cholesterol (Tables D-1B and D-1C). Two nutrients have predicted changes in intake in the non-desired direction; mean predicted intake of potassium decreases by

7 percent (Table D-1A) and the fraction of the population with predicted zinc intakes greater than the zinc UL increases (Table D-1B).

Adolescent and Adult Women

A major aim of the WIC program is supporting the nutrition of pregnant, lactating and non-breastfeeding postpartum women. Chapter 2—*Nutrient and Food Priorities*—and Appendix A—*Nutrient Intake of WIC Subgroups*—detail the many apparent nutrient intake inadequacies and excesses in these subpopulations. The committee proposed substantial revisions to Food Packages V through VII to address this situation.

Food Package V—Pregnant Women and Partially Breastfeeding Women—The revised Food Package V leads to decreases in the predicted percentages of the population with inadequate intake for most of the priority nutrients, with particularly large benefits for magnesium, vitamin E, vitamin B_6, and folate (Table D-1A). Other benefits include predicted increases in the intake of fiber and potassium (Table D-1A) and decreases in sodium, total fat, saturated fat, and cholesterol (Tables D-1B and D-1C). Two nutrients have changes in the non-desired direction; the predicted mean intake of calcium decreases slightly because of a reduction in the amount of milk and milk products in the package, and the predicted percentage of the population with inadequate intake of vitamin C increases by 11 percentage points (Table D-1A). The amount of calcium offered in the food package, however, exceeds the Adequate Intake (AI) for calcium.

Food Package VI—Non-Breastfeeding Postpartum Women—Other than a predicted decrease in calcium and a predicted increase in the percentage with inadequate vitamin C intake, the revised Food Package VI makes progress toward addressing the priority nutrients identified by the committee (Table D-1A). For example, there is a reduction in the percentage with inadequate intake of iron, magnesium, vitamin E, vitamin A, fiber, potassium, vitamin B_6 and folate (Table D-1A). Intake of sodium, food energy, total fat, saturated fat, and cholesterol all decrease, as intended (Tables D-1B and D-1C).

Food Package VII—Fully Breastfeeding Women—The revised Food Package VII is intended both to enhance maternal nutrition in support of breastfeeding and (combined with changes in other packages) to provide an incentive for breastfeeding. The package addresses very well the priority nutrients for this group, with increased predicted mean intakes of calcium,

potassium, and fiber, and predicted decreases in the percentages with inadequate intakes of iron, magnesium, vitamin E, vitamin B_6, and folate (Table D-1A). Again, intakes of sodium, food energy, total fat, saturated fat, and cholesterol are all predicted to decrease (Tables D-1B and D-1C). There is a small increase in the percentage of the population predicted to have an inadequate intake of vitamin A (Table D-1A). For vitamin C, the analysis predicts an increase in the percentage of the population with inadequate intake (Table D-1A).

CAVEATS AND OTHER POTENTIAL BENEFITS AND RISKS

Because of the uncertainties and assumptions associated with predicting the usual intake distributions that would result from changes in the WIC food package, the estimates of changes in the prevalence of inadequacy and in the risk of excessive intakes are uncertain. Although the quantitative predictions are uncertain, the direction of the change is likely to be robust. The committee urges that the quantitative results of the benefit and risk analysis be interpreted with caution.

In addition, given the importance of assessing the benefits and risks of the revised WIC food packages, the committee recommends that USDA conduct pilot studies and randomized, controlled trials to estimate the changes in the usual nutrient intake distribution and the resulting changes in the prevalence of inadequacy and excessive intakes (see Chapter 7—*Recommendations for Implementation and Evaluation*).

Non-Quantified Benefits and Risks

Among the benefits and risks that are not amenable to quantification are the following. The first two benefits listed and the first risk listed would affect the accuracy of the predictions of the prevalence of inadequate or excess nutrient intake presented in Tables D-1A and D-1B.

Benefits

- *Increased choice of foods, if adopted, may increase the consumption of WIC foods by the participants in whole or in part.* Participants who choose the additional options might consume all or consume somewhat more of the food in the package (possibly sharing the remainder with other household members). More food instruments may be redeemed, and less food may be discarded (or possibly given away). In these cases, the estimated prevalence of inadequacy may decrease and mean intakes of certain nutrients having an AI may increase more than predicted in Table D-1A.

• *Certain changes in food packages could have multiplier effects.* By reinforcing the *Dietary Guidelines*, the packages may help some participants make more healthful food selections with other food purchases.

• *Benefits could come from the increased variety of foods available and the incentives for breastfeeding in the revised packages.* For example, breastfeeding rates might increase.

Risks

• *Specific changes in allowed foods could lead to decreased consumption of certain WIC foods.* The change from whole milk to fat-reduced milks could lead to lower milk consumption, and the requirement that grain products be whole grain could lead to lower grain consumption—especially if nutrition education efforts are not implemented to decrease these possibilities. In this case, certain prevalences of inadequacy may increase and mean intakes of selected nutrients having an AI may increase.

• *Dietary changes could lead to undesirable nutrient-nutrient interactions*

–Increases in dietary fiber could possibly interfere with absorption of minerals. The analyses in this report did not adjust for mineral bioavailability. The intake analyses assumed the same average availabilities for minerals as were used in the development of the DRIs (18 percent for iron, 30 to 40 percent for zinc,[2] and 61 percent for calcium) (IOM, 1997, 2001). Because the diets of WIC participants generally are typical American diets, it seemed reasonable to use these average availabilities when evaluating intakes. It is the committee's hope that the revised packages will increase intakes of dietary fiber. Although this likely also will increase phytate intakes (from whole grains), the committee does not anticipate that this change will be large enough to substantially affect mineral bioavailability in the children's package (see Table B-2D in Appendix B—*Nutrient Profiles*). However, increases in some of the women's packages (up to an additional 400 mg of phytate per day) may reduce zinc availability (see Table B-2D).

–Increases in dietary oxalates could possibly interfere with the absorption of calcium. Unless participants consistently choose high-oxalate vegetables such as spinach, calcium availability should be unchanged.

[2]The fractional absorption for zinc used in the DRI reports was 0.4 for adults and 0.3 for preadolescent children (IOM, 2001).

SUMMARY

In summary, the revised food packages lead to improvements in nutritional adequacy in almost all cases under the assumptions used in these analyses. In addition, food components identified as priorities because of possible excess consumption are almost always reduced. The committee anticipates that the set of revised food packages will provide a clear net benefit to WIC participants.

The following is a list of tables presented in this appendix.

TABLE D-1A Comparison of Current and Revised Food Packages: Nutrients of Concern with Regard to Inadequate Intake

Participant Category and Priority Nutrient	EAR or AI*	Current Food Package, Usual Intake[a] Mean
Infants, 6–11.9 mo, breast-fed		
Food Package No.		*Current II*
Iron, mg/d	6.9	10.0
Zinc, mg/d	2.5	2.5
WIC Children, 1–1.9 y		
Food Package No.		*Current IV*
Iron, mg/d	3.0	11.9
Potassium, mg/d	3,000*	2,029
Vitamin E, mg ATE/d[c]	5.0	5.3
Fiber, g/d	19*	8.0
WIC Children, 2–4.9 y[d]		
Food Package No.		*Current IV*
Iron, mg/d	3.0 / 4.1	13.6
Potassium, mg/d	3,000* / 3,800*	2,211
Vitamin E, mg ATE/d[c]	5.0 / 6.0	6.0
Fiber, g/d	19* / 25*	10.9
Pregnant women and lactating women, 14–44 y[e]		
Food Package No.		*Current V*
Calcium, mg/d	1,000* – 1,300*	956
Iron, mg/d	6.5 – 23.0	16.5
Magnesium, mg/d	255 – 335	291
Potassium, mg/d	4,700* – 5,100*	2,909
Vitamin E, mg ATE/d[c]	12 / 16	8.3
Fiber, g/d	28* – 29*	17.7
Vitamin A, mcg RAE/d	530 – 900	902
Vitamin C, mg/d	66 – 100	134
Vitamin D, mcg/d	5.0*	N/A
Vitamin B_6, mg/d	1.6 – 1.7	2.0
Folate, mcg DFE/d)	450 – 520	570

Revised Food Package, Predicted Usual Intake[b]				Current Food Package[a]	Revised Food Package[b]
Mean	25th Percentile	Median	75th Percentile	%Inadequate	Predicted %Inadequate
Revised II-BF				*Current II*	*Revised II-BF*
10.9	5.5	9.5	14.7	39.5	34.0
4.0	2.5	3.9	5.2	60.3	25.4
Revised IV-A				*Current IV*	*Revised IV-A*
13.2	9.4	12.4	16.2	1.6	0.9
1,885	1,506	1,827	2,195	—	—
8.0	5.5	7.2	9.7	55.3	18.5
12.3	10.3	12.3	14.4	—	—
Revised IV-B				*Current IV*	*Revised IV-B*
15.0	11.9	14.6	17.6	0.4	0.1
2,078	1,651	2,022	2,438	—	—
8.7	6.4	8.1	10.5	47.0	11.4
15.4	12.9	15.1	17.6	—	—
Revised V				*Current V*	*Revised V*
934	721	902	1,113	—	—
19.3	15.6	18.5	22.2	7.5	3.4
349	292	341	398	49.4	20.3
3,052	2,548	3,005	3,506	—	—
14.3	11.2	14.4	16.9	94.4	43.6
25.6	21.0	24.8	29.2	—	—
1,041	741	987	1,277	31.2	20.2
119	63	97	154	32.7	43.5
—	—	—	—	—	—
2.4	1.9	2.3	2.8	34.0	11.9
633	469	606	761	41.5	29.2

continues

TABLE D-1A Continued

Participant Category and Priority Nutrient	EAR or AI*	Current Food Package, Usual Intake[a] Mean
Non-breastfeeding postpartum women, 14–44 y		
Food Package No.		*Current VI*
Calcium, mg/d	1,000* – 1,300*	668
Iron, mg/d	7.9 – 8.1	13.7
Magnesium, mg/d	255 – 300	213
Potassium, mg/d	4,700*	2,086
Vitamin E, mg ATE/d[c]	12	6.9
Fiber, g/d	25* – 26*	12.2
Vitamin A, mcg RAE/d	485 – 500	556
Vitamin C, mg/d	56 – 60	79
Vitamin D, mcg/d	5.0*	N/A
Vitamin B_6, mg/d	1.0 – 1.1	1.4
Folate, mcg DFE/d[c]	320 – 330	482
Lactating women, 14–44 y[e]		
Food Package No.	*Current VII*	*Revised VII*
Calcium, mg/d	1,000* – 1,300*	956
Iron, mg/d	6.5 – 7.0	16.5
Magnesium, mg/d	255 – 300	291
Potassium, mg/d	5,100*	2,909
Vitamin E, mg ATE/d[c]	16.0	8.3
Fiber, g/d	29*	17.7
Vitamin A, mcg RAE/d	885 – 900	902
Vitamin C, mg/d	96 – 100	134
Vitamin D, mcg/d	5.0*	N/A
Vitamin B_6, mg/d	1.7	2.0
Folate, mcg DFE/d[c]	450	570

See notes for Tables D-1A through D-1C following Table D-1C.

Revised Food Package, Predicted Usual Intake[b]				Current Food Package[a]	Revised Food Package[b]
Mean	25th Percentile	Median	75th Percentile	%Inadequate	Predicted %Inadequate
Revised VI	*Current VI*	*Revised VI*			
593	466	570	694	—	—
16.0	14.6	16.0	17.4	9.5	4.6
246	216	243	273	87.5	66.0
2,156	1,859	2,129	2,424	—	—
12.5	11.0	12.6	14.1	99.8	40.4
18.6	15.6	18.0	21.0	—	—
655	488	633	797	44.1	26.9
77	47	69	98	42.2	47.1
—	—	—	—	—	—
1.7	1.5	1.7	2.0	17.1	2.4
543	434	530	633	12.0	5.0
Current VII	*Revised VII*				
984	760	952	1,173	—	—
18.7	14.8	18.0	21.6	7.5	4.2
330	273	322	379	49.4	29.1
2,909	2,404	2,861	3,361	—	—
13.4	10.2	13.0	16.4	94.4	54.3
22.9	18.4	22.1	26.6	—	—
881	589	812	1,098	31.2	35.7
107	55	85	137	32.7	51.9
—	—	—	—	—	—
2.3	1.8	2.2	2.7	34.0	15.8
601	438	570	726	41.5	35.5

TABLE D-1B Comparison of Current and Revised Food Packages: Nutrients of Concern with Regard to Excessive Intake

Participant Category and Priority Nutrient	UL, Mean EER, or AMDR†	Current Food Package, Usual Intake[a] Mean
WIC Infants, 0–3.9 mo, formula-fed		
Food Package No.		*CurrentI*
Zinc, mg/d	4.0	6.1
Preformed vitamin A, mcg/d	600	581
Food energy, kcal/d	555[f]	673
WIC Infants, 4–5.9 mo, formula-fed		
Food Package No.		*Current II*
Zinc, mg/d	4.0	7.0
Preformed vitamin A, mcg/d	600	626
Food energy, kcal/d	623[f]	802
WIC Infants, 6–11.9 mo, formula-fed		
Food Package No.		*Current II*
Zinc, mg/d	5.0	7.2
Preformed vitamin A, mcg/d	600	618
Food energy, kcal/d	754[f]	992
WIC Children, 1–1.9 y		
Food Package No.		*Current IV*
Zinc, mg/d	7.0	7.8
Sodium, mg/d	1,500	1,816
Preformed vitamin A, mcg/d	600	495
Food energy, kcal/d	942[f]	1,288
WIC Children, 2–4.9 y[d]		
Food Package No.		*Current IV*
Zinc, mg/d	7.0 / 12.0	9.1
Sodium, mg/d	1,500 / 1,900	2,519
Preformed vitamin A, mcg/d	600 / 900	513
Food energy, kcal/d	1,282[f]	1,585
Pregnant women and lactating women, 14–44 y[e]		
Food Package No.		*Current V*
Sodium, mg/d	2,300	3,330
Food energy, kcal/d	2,465[f]	2,115
Total fat, g/d	na	76.7
Total fat, % of food energy	25–35†, <19 y 20–35†, ≥ 19 y`	32.3

Revised Food Package, Predicted Usual Intake[b]				Current Food Package[a]	Revised Food Package[b]
Mean	25th Percentile	Median	75th Percentile	%>UL or %>AMDR	Predicted %>UL or %>AMDR
Revised I-FF-A				*Current I*	*Revised I-FF-A*
6.1	4.6	5.8	7.2	86.0	86.0
581	445	547	677	38.3	38.3
673	523	635	778	—	—
Revised I-FF-B				*Current II*	*Revised I-FF-B*
6.1	4.9	5.9	7.1	96.8	91.5
666	573	660	752	56.3	68.0
721	602	704	820	—	—
Revised II-FF				*Current II*	*Revised II-FF*
6.2	4.9	6.0	7.4	87.6	72.3
530	358	470	644	42.7	29.5
877	705	853	1,021	—	—
Revised IV-A				*Current IV*	*Revised IV-A*
8.7	6.6	8.3	10.3	55.7	68.8
1,733	1,217	1,641	2,145	63.5	58.4
304	207	270	350	25.0	5.1
1,248	1,026	1,222	1,441	—	—
Revised IV-B				*Current IV*	*Revised IV-B*
10.3	8.3	10.0	11.9	58.1	72.6
2,440	1,949	2,363	2,851	92.8	90.1
405	291	358	449	16.1	7.2
1,460	1,188	1,429	1,697	—	—
Revised V				*Current V*	*Revised V*
3,241	2,850	3,218	3,606	97.2	95.8
2,082	1,762	2,054	2,372	—	—
68.8	56.6	67.7	79.9	—	—
27.2	24.6	27.1	29.6	24.5	1.4

continues

TABLE D-1B Continued

Participant Category and Priority Nutrient	UL, Mean EER, or AMDR†	Current Food Package, Usual Intake[a] Mean
Non-breastfeeding postpartum women, 14–44 y		
Food Package No.		*Current VI*
Sodium, mg/d	2,300	2,912
Food energy, kcal/d	2,163[f]	1,774
Total fat, g/d	na	66.1
Total fat, % of food energy	25–35†, <19 y 20–35†, ≥ 19 y	33.1
Lactating women, 14–44 y[e]		
Food Package No.		*Current VII*
Sodium, mg/d	2,300	3,330
Food energy, kcal/d	2,465[f]	2,115
Total fat, g/d	na	76.7
Total fat, % of food energy	25–35†, <19 y 20–35†, ≥ 19 y	32.3

See notes for Tables D-1A through D-1C following Table D-1C.

Revised Food Package, Predicted Usual Intake[b]				Current Food Package[a]	Revised Food Package[b]
Mean	25th Percentile	Median	75th Percentile	%>UL or %>AMDR	Predicted %>UL or %>AMDR
Revised VI				*Current VI*	*Revised VI*
2,646	2,319	2,623	2,948	90.7	76.4
1,674	1,442	1,654	1,885	—	—
57.4	51.4	57.0	62.9	—	—
24.6	23.8	24.6	25.4	4.9	<0.1
Revised VII				*Current VII*	*Revised VII*
3,267	2,877	3,245	3,633	97.2	96.3
2,037	1,717	2,009	2,327	—	—
67.4	55.1	66.3	78.4	—	—
27.6	25.3	27.5	29.8	24.5	1.6

TABLE D-1C Comparison of Current and Revised Food Packages: Nutrients of Concern to Limit in the Diet

Participant Category and Priority Nutrient	Dietary Guidance	Current Food Package, Usual Intake[a] Mean
WIC Children, 2–4.9 y		
Food Package No.		*Current IV*
Saturated fat, g/d	na	22.2
Saturated fat, % of food energy	<10	12.5
Cholesterol, mg/d	<300	216
Pregnant women and lactating women, 14–44 y[e]		
Food Package No.		*Current V*
Saturated fat, g/d	na	27.5
Saturated fat, % of food energy	<10	11.7
Cholesterol, mg/d	<300	271
Non-breastfeeding postpartum women, 14–44 y		
Food Package No.		*Current VI*
Saturated fat, g/d	na	22.9
Saturated fat, % of food energy	<10	11.3
Cholesterol, mg/d	<300	219
Lactating women, 14–44 y[e]		
Food Package No.		*Current VII*
Saturated fat, g/d	na	27.5
Saturated fat, % of food energy	<10	11.7
Cholesterol, mg/d	<300	271

NOTES FOR TABLES D-1A THROUGH D-1C: AI = Adequate Intake, used when necessary, indicated by an asterisk (*); AMDR = Acceptable Macronutrient Distribution Range, indicated by a dagger (†); AT = α(alpha)-tocopherol; ATE = α(alpha)-tocopherol equivalents; DFE = dietary folate equivalents; EAR = Estimated Average Requirement, used when available; EER = Estimated Energy Requirement; kcal = kilocalories; na = not applicable; N/A = not available, intake data were not available for vitamin D; RAE = retinol activity equivalents; UL = Tolerable Upper Intake Level; %Inadequate = percentage with inadequate intakes as estimated from percentage with usual intake less than EAR; %>AMDR = percentage with usual intake greater than AMDR; %>UL = percentage with usual intake greater than UL.

[a]Observed usual intakes were calculated using 1994–1996 and 1998 CSFII data.

[b]Mean intakes were predicted from the observed mean intakes by adding the difference between the current food package and the revised food package as appropriate for the individual's age and life stage, using the proportional method described in the text.

[c]For discussion of important issues regarding differences between the Dietary Reference Intake (DRI) and dietary intake data in the units used for vitamin E and folate, please see the section *Data Set—Nutrients Examined* in Appendix A—*Nutrient Intake of WIC Subgroups*.

Revised Food Package, Predicted Usual Intake[b]				Current Food Package[a]	Revised Food Package[b]
Mean	25th Percentile	Median	75th Percentile	% Following Dietary Guidance	Predicted % Following Dietary Guidance
Revised IV-B				*Current IV*	*Revised IV-B*
14.7	10.3	14.1	18.4	—	—
6.8	6.0	6.7	7.4	9.0	99.0
93	67	84	104	87.8	99.6
Revised V				*Current V*	*Revised V*
20.4	15.4	19.9	24.8	—	—
6.4	5.7	6.4	7.1	19.1	99.8
127	86	107	152	67.6	97.5
Revised VI				*Current VI*	*Revised VI*
15.8	12.4	15.5	18.9	—	—
6.0	5.7	6.0	6.3	3.8	>99.9
89	71	84	100	92.0	>99.9
Revised VII				*Current VII*	*Revised VII*
20.6	15.6	20.0	25.0	—	—
8.0	7.1	7.9	8.8	19.1	94.2
207	156	193	242	67.6	88.9

[d]Values are for children ages 2–3.9 y and children age 4 y, respectively.

[e]Because of sample size limitations, the analysis sample combined all pregnant women and all lactating women. Thus, the current mean intakes and current prevalence values (i.e., %Inadequate; %>AMDR; %>UL) are identical for any categories containing pregnant women or lactating women (i.e., recipients of current Food Packages V and VII).

[f]Mean EER (kcal/d) (Table D-1B) was calculated based on CSFII data (FSRG, 2000) using the method described in the DRI report (IOM, 2002/2005). For additional detail, see Appendix C—*Nutrient Intakes of WIC Subgroups*.

DATA SOURCES: Intake data are from 1994–1996 and 1998 Continuing Survey of Food Intake by Individuals (CSFII) (FSRG, 2000). EARs, AIs, ULs, and AMDRs are from the DRI reports (IOM, 1997, 1998, 2000b, 2001, 2002/2005, 2005a). Dietary guidance in Table D-1C is from the American Heart Association (AHA, 2004) and the *Dietary Guidelines for Americans 2005* (DHHS/USDA, 2005).

E

Cost Calculations

For the cost analyses presented in this report, the committee conducted detailed analyses of nationally representative pricing data for foods in the current and revised WIC food packages. The details, not presented in body of the report, are presented in this appendix.

A large part of the methodology for cost calculations involves the assumptions necessary for the analyses. Tables E-1 and E-2 show a side-by-side comparison of the assumptions used for the nutrient analyses and the cost analyses. Table E-3 is an easy reference guide of the costs used in the cost calculations. Details of the calculations used for program costs of the current and revised food packages are presented in Tables E-4 and E-5. These tables can be found at the end of this appendix.

List of tables:

- **Table E-5** Estimated Program Costs for Food per Month Using Revised Packages (2002), 352

In addition to the assumptions listed in Tables E-1 and E-2, several assumptions were used to distribute mother/infant pairs by the feeding method used. These are described as follows.

Assumptions on Infant Feeding in the WIC Program

A recent survey by the CDC on breastfeeding practices showed that among women participating in the WIC program, at 3 months postpartum 64 percent of mothers report breastfeeding in any amount with 36 percent reporting breastfeeding exclusively (CDC, 2004b). Based on these estimates, 28 percent (64 percent minus 36 percent) were partially breastfeeding at 3 months postpartum. The same survey indicated that at 6 months postpartum, 28 percent of mothers were breastfeeding in any amount with 11 percent exclusively breastfeeding (CDC, 2004b). Based on these estimates, 17 percent (28 percent minus 11 percent) were partially breastfeeding at 6 months postpartum. From these estimates (partial breastfeeding rates of 28 percent at 3 months and 17 percent at 6 months), a partially breastfed rate of 20 percent for infants ages 4 through 5 months of age was extrapolated.

For older infants, survey estimates of reported breastfeeding rates at 6 months (29 percent) and 12 months (14 percent) were used to extrapolate a rate of 21 percent breast-fed infants for the 6 through 11 month period (CDC, 2004b). The 21 percent of mothers who breast-fed infants were either fully or partially breastfeeding; the committee distributed them as 5 percent fully breastfeeding and 16 percent partially breastfeeding based on 2002 data from the Feeding Infants and Toddlers Study (Briefel et al., 2004a).

For the program cost analyses, breastfeeding rates were assumed to remain the same for both the current and revised food packages. Therefore, the following assumptions were used for the calculations:

- *Infants Ages 0 Through 3 Months*—36 percent fully breast-fed; 28 percent partially breast-fed (that is, 64 percent "ever breast-fed"); 36 percent fully formula-fed;
- *Infants Ages 4 and 5 Months*—11 percent fully breast-fed; 20 percent partially breast-fed (that is, 31 percent "ever breast-fed"); 69 percent fully formula-fed; and
- *Infants Ages 6 Through 11 Months*—5 percent fully breast-fed; 16 percent partially breast-fed (that is, 21 percent "ever breast-fed"); 79 percent fully formula-fed.

These percentages are estimates of what package use might be for the revised packages.

An additional term, *exclusively breast-fed*, is used among lactation professionals. That term, when used in the WIC program, does not necessarily mean that an infant is only receiving breast milk; it means, in this context, that an infant does not receive formula from the WIC program. Under the current system, exclusively breast-fed infants can receive cereal and juice, as early as four months of age. Therefore, they may not truly be *exclusively breast-fed*, as a lactation expert might define them.

Assumptions on Feeding Method for Women in the WIC Program

According to data from *WIC Participant and Program Characteristics: PC2002*, approximately 24 percent of all WIC participants are women (Kresge, 2003; Bartlett et al., 2003). Among these women, 45 percent are pregnant, 24 percent are breastfeeding, and 31 percent are non-breastfeeding postpartum women. The percentage of WIC women who were fully breastfeeding was not included in that report (Kresge, 2003; Bartlett et al., 2003).

Based on the distribution of infants by age (Kresge, 2003; Bartlett et al., 2003) and the assumptions on feeding method for infants, it was estimated that of the total infants participating in the WIC program that are breast-fed (in the WIC program sense), 45 percent are partially breast-fed and 55 percent are fully breast-fed. Breastfeeding women were distributed by the same percentage.[1] Thus, for women, estimates of 13 percent fully breastfeeding and 11 percent partially breastfeeding were used; that is, the calculations of program costs assumed a total of 24 percent of women participating in the WIC program were breastfeeding as cited by Kresge (2003) and Bartlett et al. (2003).

Possible Shifts in Participation Rates

In order to evaluate the sensitivity of the estimated program costs for food with the revised packages (Tables 5-3 and E-5) to changes in participation rates among the infant and women categories, the committee simulated

[1]In fact, the number of breast-fed infants reported participating in the WIC program is greater than the number of breastfeeding women reported: 678,560 versus 458,131 (Kresge, 2003). By applying the ratio of partially versus fully breast-fed infants to breastfeeding women, the committee assumed that the participation by women regarding partial versus exclusive breastfeeding is the same proportion as for infants.

costs with some shifting in categories. One such evaluation assumed the following:

- For infants age 0 through 3.9 months, there would be a 20 percent shift in infants from fully formula-fed to fully breast-fed;
- For infants age 1 through 3.9 months, there would be a 30 percent shift from partially breast-fed to fully breast-fed;
- For infants age 4 through 5.9 months, there would be a 10 percent shift from fully formula-fed to partially breast-fed, and a 30 percent shift from partially breast-fed to fully breast-fed; and
- For infants age 6 through 11.9 months, there would be an 8 percent shift from fully formula-fed to partially breast-fed, and a 30 percent shift from partially breast-fed to fully breast-fed.

The shifts in the infant categories were accompanied by the appropriate shift in the mother's classification. The result of these shifts was to decrease the average food package cost per participant from $34.57 to $33.93 per month for the revised packages.

TABLE E-1 Bases of Assumptions Used in Nutrient and Cost Analyses of Food Packages for Infants

	Assumption used in
Food[a]	Nutrient Analyses[b]
Formula	*Current and Revised Packages I and II*
	Milk-based formula (versus soy-based formula)
	Weighted mean of: Enfamil with Iron (Mead Johnson), 67.8%; Similac with Iron (Ross/ Abbott), 27.2%; and Good Start (Carnation/Nestlé), 5.0%
Juice	*Current Package II*
	Apple juice (vitamin C-rich)
Baby food, fruits	*Revised Package II* Fruit(s) as the only major ingredient(s)[d]
	Junior (stage 2), 4–8 oz/d
	Equal weighting of: Applesauce; Peaches; and Pears

Cost Analyses[a,c]	Type of Data Considered as Basis of Assumption	Source of Data[a]
Container sizes: na, used cost per fl oz data		**Oliveira et al., 2001**
	Representative of market share	Oliveira et al., 2001
	Market share within WIC program, 2001	Oliveira et al., 2001
Cost per fl oz data		Oliveira et al., 2001
Equal weighting of: Frozen concentrate, 6–12 fl oz container: Shelf-stable, 32–48 fl oz container; and	Representative of likely participant choices and state agency restrictions	**ACNielsen Homescan, 2001**
Same as for nutrient analyses	Representative of likely participant choices	Assumption based on age of participants
Same as for nutrient analyses	Nutritional and developmental appropriateness	AAP, 2004
	Representative of nutritional content	Assumption for analyses
Weighted mean (for total of 6 mo) of: • **Strained (stage 1) for 1 mo, 2.5 oz container;** • **Junior (stage 2) for 2 mo, 4 oz container; and** • **Advanced (stage 3) for 3 mo, 6 oz container**	Representative of developmental stages and nutritional needs	**ACNielsen Homescan, 2001** Manufacturer labeling and websites, 2004
Fresh banana substituted at a rate of 1 medium banana per 4 oz container for the maximum allowed (for 16 oz of baby food fruits). Assumed equivalence of 4 bananas for 2 pounds of fresh bananas.	Representative of likely participant choices	Assumption for analyses **ERS, 2004b** FNS, 1984b
Weighting of other choices assumed not relevant to pricing		Reflects all available data

continues

TABLE E-1 Continued

Food[a]	Assumption used in Nutrient Analyses[b]
Baby food, vegetables	*Revised Package II* Vegetable(s) as the only major ingredient(s)[e]
	Junior (stage 2), 4–8 oz/d
	Equal weighting of: Carrots; Green beans; and Squash, assumed to be winter squash
Cereal, baby	*Current and Revised Package II*
	Grain(s) as the only major ingredient(s)[f]
	Rice cereal, dry

Cost Analyses[a,c]	Type of Data Considered as Basis of Assumption	Source of Data[a]
Same as for nutrient analyses	Nutritional and developmental appropriateness	AAP, 2004
	Representative of nutritional content	Assumption for analyses
Weighted mean (for total of 6 mo) of: **• Strained (stage 1) for 1 mo, 2.5 oz container;** **• Junior (stage 2) for 2 mo, 4 oz container; and** **• Advanced (stage 3) for 3 mo, 6 oz container**	Representative of developmental stages and nutritional needs	**ACNielsen Homescan, 2001** Manufacturer labeling and websites, 2004
	Representative of likely participant choices	Assumption for analyses
Weighting of choices assumed not relevant to pricing		Reflects all available data
Container sizes: 8–16 oz		**ACNielsen Homescan, 2001**
Same as for nutrient analyses	Nutritional and developmental appropriateness	AAP, 2004
	Representative of likely participant choices	Assumption for analyses
Dry baby cereal, all types[c,f]	Representative of market share	ACNielsen Homescan, 2001
	Weighting assumed not relevant to pricing	Reflects all available data

continues

TABLE E-1 Continued

Food[a]	Assumption used in Nutrient Analyses[b]
Baby food, meats	*Revised Package II-BF* Meat as the only major ingredient(s)[g]
	Strained (stage 1), 2.5 oz/d
	Equal weighting of: Beef; Chicken; and Lamb

[a]For clarity, the food, container sizes, and source of pricing data are indicated in bold.

[b]The nutrient analyses referred to in this table use Nutrition Data System for Research (NDS-R) software version 5.0/35 (2004) developed by the Nutrition Coordinating Center (NCC), University of Minnesota, Minneapolis, MN (Schakel et al., 1988, 1997; Schakel, 2001). A second set of nutrient analyses using the USDA Nutrient Database for Standard Reference, Release 17 (SR-17) (NDL, 2004) is presented in Tables B-3A through B-3D, Appendix B—*Nutrient Profiles of Current and Revised Food Packages*.

[c]Organic baby foods were omitted from the cost analyses.

[d]Strained fruit prepared for infants without added sugars, starches, or salt. Mixtures of fruits are allowed for older infants. Texture may range from pureed through diced.

[e]Strained vegetable prepared for infants without added sugars, starches, or salt. Mixtures of vegetables are allowed for older infants. Texture may range from pureed through diced.

[f]Grain cereal products prepared for infants without added sugars, salt, or "formula ingredients" (e.g., nonfat dry milk). Mixtures of grains are allowed for older infants.

Cost Analyses[a,c]	Type of Data Considered as Basis of Assumption	Source of Data[a]
Same as for nutrient analyses	Nutritional and developmental appropriateness	AAP, 2004
	Representative of nutritional content	Reflects available data
Weighted mean (for total of 6 mo) of: • **Strained (stage 1) for 2 mo, 2.5–3 oz container;** and • **Junior (stage 2) for 4 mo, 2.5–3 oz container**	Representative of nutritional and developmental needs; reflects available data	**ACNielsen Homescan, 2001**
	Representative of likely participant choices	Assumption for analyses
Weighting of choices assumed not relevant to pricing		Reflects all available data

[g]Strained meat prepared for infants without added starches, vegetables, or salt. Broth (unsalted; that is, without added sodium) may be an ingredient. Texture may range from pureed through diced.

NOTES : na = not applicable. The medical formulas required by infants with special dietary needs were omitted from this table. For additional detail on food specifications, see Table B-1, Appendix B—*Nutrient Profiles of Current and Revised Food Packages*.

DATA SOURCES: Price data and other information were obtained from Economic Research Service, USDA (ERS, 2004b, 1999 price data; Oliveira et al., 2001, 2000 infant formula price data), and ACNielsen Homescan (ACNielsen, 2001, 2001 price data obtained through ERS, USDA). Additional information was obtained from the American Academy of Pediatrics (AAP, 2004), USDA (FNS, 1984b), and manufacturer labeling and websites (Abbott Laboratories Online, 2004; Mead Johnson, 2004; Nestlé, 2005).

TABLE E-2 Bases of Assumptions Used in Nutrient and Cost Analyses of Food Packages for Children and Women

Food[a]	Assumption used in Nutrient Analyses[b,c]
Fruits and Vegetables	
Juice	*Current and Revised Packages* Equal weighting of: Apple juice; and Orange juice
Apple juice	*Current and Revised Packages* Reconstituted from frozen
	Vitamin C-rich
Orange juice	*Current and Revised Packages* Reconstituted from frozen
	Not fortified
Fruits	
Fruits, fresh	*Revised Packages*
	Equal weighting of: Apples; Oranges; and Bananas

Cost Analyses[a]	Type of Data Considered as Basis of Assumption	Source of Data[a]
Same as for nutrient analyses	Representative of likely participant choices	Assumption for analyses
	Representative of nutritional content	Assumption for analyses
Equal weighting of: Frozen concentrate, 6–12 fl oz container; and Canned, 32–48 fl oz container	Representative of likely participant choices within state agency restrictions	**ACNielsen Homescan, 2001**
Same as for nutrient analyses		Assumption for analyses
	Representative of nutritional content	Assumption for analyses
Weighted mean of: Frozen concentrate, 6–12 fl oz container, 75%; and Canned, 36–46 fl oz container, 25%	Market share within likely state agency restrictions	**ACNielsen Homescan, 2001**
Not fortified or assumed not fortified from available data	Representative of likely state agency restrictions	Assumption for analyses
Container sizes: na, used cost per pound data		**ERS, 2004b** Assumptions for some types of analyses were based on data from a standard reference: FNS, 1984a, 1984b
Same as for nutrient analyses	Representative of consumer purchases and consumption data	Assumptions for analyses were based on data from various sources: Krebs-Smith et al., 1997; Putnam and Allshouse,

continues

TABLE E-2 Continued

Food[a]	Assumption used in Nutrient Analyses[b,c]
Fruits, canned	*Revised Packages*
	Juice pack or unsweetened
	Not drained (i.e., packing liquid utilized)
	Equal weighting of: Applesauce; Peaches; and Pineapple
Vegetables	
Vegetables, fresh	*Current and Revised Packages*
	Current Package VII Carrots

Cost Analyses[a]	Type of Data Considered as Basis of Assumption	Source of Data[a]
		1999; Smiciklas-Wright et al., 2002; Cotton et al., 2004; Reed et al., 2004
Container sizes: na, used cost per pound data	Nominal container size of 15 oz used in some types of analyses	**ERS, 2004b** Assumptions for some types of analyses were based on data from a standard reference: FNS, 1984a, 1984b
Same as for nutrient analyses	Representative of likely participant choices (i.e., participants are likely to choose juice pack rather than water pack)	Assumption for analyses
na	Representative of likely participant practices	Assumption for analyses
Same as for nutrient analyses	Representative of consumer purchases and consumption data	Assumptions for analyses were based on data from several sources: Krebs-Smith et al., 1997; Putnam and Allshouse, 1999; Smiciklas-Wright et al., 2002; Cotton et al., 2004; Reed et al., 2004
Container sizes: na, used cost per pound data		**ERS, 2004b** Assumptions for some types of analyses were based on data from a standard reference: FNS, 1984a, 1984b
Same as for nutrient analyses	Representative of likely participant choices (i.e., participants are likely to choose fresh carrots rather than canned)	Assumption for analyses

continues

TABLE E-2 Continued

Food[a]	Assumption used in Nutrient Analyses[b,c]
	Revised Packages Equal weighting of: Carrots; Tomatoes; and Green beans
Vegetables, canned	*Revised Packages*
	Regular[d]
	Drained
	Equal weighting of: Carrots; Tomatoes; and Green beans
Milk and Alternatives	
Milk	*Current and Revised Packages*
	Weighted mean of: Maximum allowance as milk, 50% (see †); and Milk with maximum of cheese, yogurt, and tofu allowed as substitutes for milk, 50% (see †) *Current Packages* Equal weighting of: Whole, 3.5–4% milk fat; Reduced-fat, 2% milk fat; Low-fat, 1% milk fat; and Nonfat, Skim

Cost Analyses[a]	Type of Data Considered as Basis of Assumption	Source of Data[a]
Same as for nutrient analyses	Representative of consumer purchases and consumption data	Assumptions for analyses were based on data from several sources: Krebs-Smith et al., 1997; Putnam and Allshouse, 1999; Smiciklas-Wright et al., 2002; Cotton et al., 2004; Reed et al., 2004
Container sizes: na, used cost per pound data	Nominal container size of 14.5 oz used in some types of analyses	**ERS, 2004b** Assumptions for some types of analyses were based on data from a standard reference: FNS, 1984a, 1984b
Same as for nutrient analyses	Representative of likely state agency restrictions	Assumption for analyses
na	Representative of likely participant practices	Assumption for analyses
Same as for nutrient analyses	Representative of consumer purchases and consumption data	Assumptions for analyses were based on data from several sources: Krebs-Smith et al., 1997; Putnam and Allshouse, 1999; Smiciklas-Wright et al., 2002; Cotton et al., 2004; Reed et al., 2004
Container size weighting: Gallon, 75%; and Half gallon, 25%		**ACNielsen Homescan, 2001**
Same as for nutrient analyses	Representative of likely participant choices	Assumption for analyses
Same as for nutrient analyses	Representative of likely participant choices	Assumption for analyses

continues

TABLE E-2 Continued

Food[a]	Assumption used in Nutrient Analyses[b,c]
	Revised Packages Whole milk (3.5–4% milk fat) only for 1-y-old children 2 y and above, equal weighting of: Reduced-fat, 2% milk fat; Low-fat, 1% milk fat; and Nonfat, Skim Plain[f] *Revised Packages for Women* †Weighted mean of: Milk, 90%; and Soy beverage, 10%
Cheese	*Current and Revised Packages* Equal weighting of: American cheese, process;[e] Cheddar cheese, natural; Monterey Jack cheese, natural; and Mozzarella cheese, part skim milk
Yogurt	*Revised Packages* Women, equal weighting of: Low-fat, 1% milk fat; and Nonfat Children, low-fat (1% milk fat) only Equal weighting of: Plain;[f] and Vanilla
Soy beverage ("soy milk")	*Revised Packages for Women* Ready-to-drink, regular,[g] calcium-rich ("fortified")

Cost Analyses[a]	Type of Data Considered as Basis of Assumption	Source of Data[a]
Same as for nutrient analyses	AAP recommendation	AAP, 2004
Same as for nutrient analyses	AHA recommendations Representative of likely participant choices	AHA, 2004 Assumption for analyses
Same as for nutrient analyses	Representative of likely national and state agency restrictions	Assumption for analyses
Same as for nutrient analyses	Representative of likely participant choices	Wenrich and Cason, 2004
Container size: 16 oz		**ACNielsen Homescan, 2001**
Market purchase weighting of: American Cheddar cheese, natural; and Mozzarella cheese	Representative of likely participant choices within available data specifications for market share	ACNielsen Homescan, 2001
Container sizes: 16–32 oz		**ACNielsen Homescan, 2001**
Same as for nutrient analyses	Representative of likely participant choices	Assumption for analyses
Children, equal weighting of: Low-fat, 1% milk fat; and Nonfat	Minimal effect of weighting on pricing—calculated same as for women	ACNielsen Homescan, 2001
Same as for nutrient analyses	Representative of likely participant choices within allowed substitutions	Assumption for analyses
Container sizes: 32–64 fl oz		**ACNielsen Homescan, 2001**
Equal weighting of: Refrigerated, assumed to be calcium-rich ("fortified"); and	Representative of likely participant choices	Assumption for analyses ACNielsen Homescan, 2001

continues

TABLE E-2 Continued

Food[a]	Assumption used in Nutrient Analyses[b,c]
	Plain[f]
Tofu	*Revised Packages for Women*
	Calcium salts used in processing
Grains	
Cereal	*Current and Revised Packages* Weighted mean of: Ready-to-eat cereal, 90%; and Hot cereal, 10%
Cereal, ready-to-eat	*Current and Revised Packages*
	Current Packages Equal weighting of: Cheerios (General Mills); Corn flakes; Kix (General Mills); Mini-Wheats, Frosted Bite Size (Kellogg's); and Total Whole Grain (General Mills)
	Revised Packages Equal weighting of: Cheerios (General Mills); Mini-Wheats, Frosted Bite Size (Kellogg's); and Total Whole Grain (General Mills)

Cost Analyses[a]	Type of Data Considered as Basis of Assumption	Source of Data[a]
Shelf-stable, assumed to be calcium-rich	For soy beverage purchases, data were not available on addition of calcium in shelf-stable products.	ACNielsen Homescan, 2001
	Representative of likely national and state agency restrictions	Assumption for analyses
Container sizes: 12–16 oz		**ACNielsen Homescan, 2001**
	Negligible contribution to calcium intake unless calcium salts are used in processing	Manufacturer labeling, 2004
Tofu was assumed to be processed with calcium salts.	For tofu purchases, data were not available regarding whether calcium salts were used in processing.	ACNielsen Homescan, 2001
Same as for nutrient analyses	Representative of market share	ACNielsen Homescan, 2001
Container sizes: 12–36 oz		**ACNielsen Homescan, 2001**
Equal weighting of: Cheerios (General Mills); Corn Flakes (Kellogg's); Kix (General Mills); Mini-Wheats, Frosted Bite Size (Kellogg's); and Total Whole Grain (General Mills)	Representative of likely participant choices within likely state agency restrictions	Assumption for analyses
Same as for nutrient analyses	Whole grain only	Manufacturer labeling, 2004
	Representative of likely participant choices within likely state agency restrictions	Assumption for analyses

continues

TABLE E-2 Continued

Food[a]	Assumption used in Nutrient Analyses[b,c]
Cereal, hot	*Current and Revised Packages*
	Regular salt option for preparation
	Current Packages Equal weighting of: Cream of wheat, regular-cooking; and
	Oatmeal, instant-cooking, iron-fortified
	Revised Packages Oatmeal, instant-cooking, iron-fortified
Whole grains	*Revised Packages* Equal weighting of: Whole wheat bread; and Brown rice
Whole wheat bread	*Revised Packages*
Brown rice	*Revised Packages*
	Cooked in salted water

Cost Analyses[a]	Type of Data Considered as Basis of Assumption	Source of Data[a]
Container sizes: 10–28 oz		**ACNielsen Homescan, 2001**
na	Representative of likely participant practices	Assumption for analyses
Equal weighting of: Cream of Wheat (Nabisco) (14–28 oz container)	Representative of likely participant choices	Assumption for analyses
Oatmeal, instant-cooking, assumed to be iron-fortified (10–18 oz outer container)	For instant-cooking oatmeal purchases, data were not available on iron-fortification.	Assumption for analyses
Oatmeal, instant-cooking, assumed to be iron-fortified (10–18 oz outer container)	Whole grain only For instant-cooking oatmeal purchases, data were not available on iron-fortification.	Manufacturer labeling, 2004 ACNielsen Homescan, 2001
Same as for nutrient analyses		Assumption for analyses
Container size: 16 oz		**ACNielsen Homescan, 2001**
Container sizes: 9.5–16 oz		**ACNielsen Homescan, 2001**
Market purchase weighting of: Regular-cooking; Parboiled; and Instant-cooking	Market share	Assumption for analyses
Omit basmati rice	Representative of likely state agency restrictions	Assumption for analyses
na	Representative of likely participant practices	Assumption for analyses

continues

TABLE E-2 Continued

Food[a]	Assumption used in Nutrient Analyses[b,c]
Meat and Alternatives	
Eggs	*Current and Revised Packages*
	Whole, fresh eggs
Fish, canned	*Revised Package VII* Weighted mean of: Canned tuna, 80% Canned salmon, 20%
Tuna	*Current and Revised Package VII*
	Equal weighting of: Water pack, regular[b] Oil pack, regular[b]
	Drained
Salmon	*Revised Package VII*
	Salmon, regular[d]
	Drained
Beans, dry (legumes)	*Current Packages* Dried beans only (i.e., no canned beans)
	Revised Packages Equal weighting of: Dried beans, 1 lb; and Canned beans, 4 15–16-oz cans
Beans, dried	*Current and Revised Packages*
	Equal weighting of: Black beans; Garbanzo beans (chickpeas); Kidney beans;

Cost Analyses[a]	Type of Data Considered as Basis of Assumption	Source of Data[a]
Container size: 1 doz		**BLS, 2004a**
Same as for nutrient analyses	Representative of market share	ACNielsen Homescan, 2001
Same as for nutrient analyses	Representative of market share	ACNielsen Homescan, 2001
Container sizes: 6 oz or less		**ACNielsen Homescan, 2001**
	Representative of likely participant choices	Assumption for analyses
Market purchase weighting of: Water pack, regular;[b] and Oil pack, regular[b]	Market share	ACNielsen Homescan, 2001
na	Representative of likely participant practices	Assumption for analyses
Container sizes: 14–16 oz		**ACNielsen Homescan, 2001**
Pink salmon	Representative of market share	Assumption for analyses
na	Representative of likely participant practices	Assumption for analyses
Same as for nutrient analyses	Current restrictions	Assumption for analyses
Same as for nutrient analyses	Representative of likely participant choices	Assumption for analyses
Container size: 16 oz		**ACNielsen Homescan, 2001**
	Representative of likely participant choices	Assumption for analyses

continues

TABLE E-2 Continued

Food[a]	Assumption used in Nutrient Analyses[b,c]
	Northern beans; Pinto beans; and Lentils
Beans, canned	*Revised Packages*
	Equal weighting of: Black beans; Garbanzo beans (chickpeas); Kidney beans; and Northern beans
	Regular[d]
	Plain[i]
Peanut butter	*Current and Revised Packages*
	Regular[d]

Cost Analyses[a]	Type of Data Considered as Basis of Assumption	Source of Data[a]
Market purchase weighting of: Black beans; Garbanzo beans (chickpeas); Kidney beans; Northern beans; and Pinto beans	Market share within available data specifications	ACNielsen Homescan, 2001
Container sizes: 15–16 oz		**ACNielsen Homescan, 2001**
	Representative of likely participant choices	Assumption for analyses
Market purchase weighting of: Black beans; Garbanzo beans (chickpeas); Kidney beans; and Northern beans	Market share	ACNielsen Homescan, 2001
	Representative of likely state agency restrictions in most cases	Assumption for analyses
Pack assumed to be regular[d]	Data were not available on type of pack.	ACNielsen Homescan, 2001
	Representative of likely state agency restrictions in most cases	Assumption for analyses
Pack assumed to be plain[i]	Data were not available on flavorings.	ACNielsen Homescan, 2001
Container size: 18 oz		**ACNielsen Homescan, 2001**
Type not specified	Representative of likely participant choices	Assumption for analyses

continues

TABLE E-2 Continued

Food[a]	Assumption used in Nutrient Analyses[b,c]
Peanut butter *or* **Beans (legumes)**	*Current Packages* Equal weighting of: Peanut butter (18 oz); and Dried beans (16 oz) *Revised Packages* Weighted mean of: Peanut butter, 50% (18 oz); Dried beans, 25% (16 oz); and Canned beans, 25% (4 cans)

[a]For clarity, the food, container sizes, and source of pricing data are indicated in bold.

[b]The nutrient analyses referred to in this table use Nutrition Data System for Research software version 5.0/35 (2004) developed by the Nutrition Coordinating Center (NCC), University of Minnesota, Minneapolis, MN (Schakel et al., 1988, 1997; Schakel, 2001). A second set of nutrient analyses using the USDA Nutrient Data Laboratory Standard Reference 17 (SR-17) (NDL, 2004) is presented in Tables B-3A through B-3D, Appendix B—*Nutrient Profiles of Current and Revised Food Packages*.

[c]All foods for nutrient analyses were chosen with no added salt and no added fat cooking preparation options unless otherwise noted in the table.

[d]"Regular" in this instance means "regular pack" or "regular pack with salt added in processing." In some cases this assumption was made as representative of likely participant choices (e.g., salted peanut butter is a likely participant choice rather than unsalted peanut butter). In other cases this assumption was made as representative of likely state agency restrictions (e.g., salted canned vegetables are likely state agency restrictions if unsalted canned vegetables are more costly).

[e]American cheese can be processed with or without a sodium salt (e.g., disodium phosphate) (Nutrition Data, 2004). The American cheese used in these analyses appears to be processed with disodium phosphate resulting in a sodium content twice that of the other cheeses used in the nutrient analyses. Even greater differences in sodium content have been reported (Nutrition Data, 2004).

Cost Analyses[a]	Type of Data Considered as Basis of Assumption	Source of Data[a]
Same as for nutrient analyses	Representative of likely participant choices	Assumption for analyses
Same as for nutrient analyses	Representative of likely participant choices	Assumption for analyses

f"Plain" in this instance means not flavored because flavored products customarily have added sugars.

g"Regular" in this instance means not a reduced calorie product.

h"Regular" in this instance means regular pack with salt added in processing but no fat or oil added in processing.

i"Plain" in this instance means not flavored because flavored products customarily have added sugars and salt.

NOTES FOR TABLE E-2: na = not applicable. The medical foods required by children and women with special dietary needs were omitted from this table. For additional detail on food specifications, see Table B-2, Appendix B—*Nutrient Profiles of Current and Revised Food Packages*.

DATA SOURCES: Price data and other information were obtained from Economic Research Service, USDA (ERS, 2004b, 1999 price data); ACNielsen Homescan (ACNielsen , 2001, price data for 2001 obtained through ERS, USDA); and the Bureau of Labor Statistics, U.S. Department of Labor (BLS, 2004a, equal weight for monthly 2002 price data). Additional information was obtained from American Academy of Pediatrics (AAP, 2004), American Heart Associations (AHA, 2004), Food and Nutrition Service (FNS, 1984a, 1984b), manufacturer labeling, and published resources (Krebs-Smith et al., 1997; Putnam and Allshouse, 1999; Smiciklas-Wright et al., 2002; Cotton et al., 2004; Reed et al., 2004; Wenrich and Cason, 2004).

TABLE E-3A Calculated Costs of Representative Amounts of Foods in Revised Packages for Infants (2002)[a]

Food Item	Unit	Approximate Cost per Unit ($)
Food Package I-FF-A		
Infant formula, liquid concentrate	fl oz concentrate	0.23
Post-rebate		
Food Package I-FF-B		
Infant formula, liquid concentrate	fl oz concentrate	0.23
Post-rebate		
Food Package I-BF/FF-A		
Infant formula, powder	fl oz reconstituted	~0.10
Food Package I-BF/FF-B		
Infant formula, powder	fl oz reconstituted	0.23
Post-rebate		
Food Package II-FF		
Infant formula, liquid concentrate	fl oz concentrate	0.23
Post-rebate		
Infant cereal	oz	0.20
Baby food fruits and vegetables [b,c]	oz	0.12
Fresh bananas [b,c]	lb	0.51
Total		
Food Package II-BF/FF		
Infant formula, liquid concentrate	fl oz concentrate	0.23
Post-rebate		
Infant cereal	oz	0.20
Baby food fruits and vegetables [b,c]	oz	0.12
Fresh bananas [b,c]	lb	0.51
Total		
Food Package II-BF		
Infant cereal	oz	0.20
Baby food fruits and vegetables [b,c]	oz	0.12
Fresh bananas [b,c]	lb	0.51
Baby food meats	oz	0.29
Total		

[a]All costs use market purchase-weighted prices estimated using 1999–2002 price data as described in Chapter 5—*Evaluation of Cost*. See data sources. This table is a simplification using prices that have been rounded off; small discrepancies between this table and other sections of the report are due to errors introduced by rounding for the purposes of constructing this table. Tables E-3A and E-3B are intended as easy reference guides of the costs used in cost calculations. These costs are illustrated well using the revised food packages; therefore the current food packages were not included in these tables.

[b]Assumptions for the cost analyses included weighting alternate choices shown in this table as various quantities used in calculating costs. As an example using Food Package II-FF, the cost of the maximum allowance (128 oz) of baby food fruits and vegetables was calculated

Representative Amount in Food Package			
Quantity Used in Calculation[b]	Assumption, Proportion Used	Example	Cost ($)
403 fl oz concentrate	1	31 13-oz cans	92.69
			29.75
442 fl oz concentrate	1	34 13-oz cans	101.66
			32.63
384 fl oz reconstituted (51–60 oz powder)	1	4 12.9-oz cans	37.25
			11.96
221 fl oz concentrate	1	17 13-oz cans	50.83
			16.32
312 fl oz concentrate	1	24 13-oz cans	71.76
			23.04
24 oz	1	3 8-oz boxes	4.80
112 oz [d]	1	28 4-oz jars	13.44
2 lb [d]	1	2 lb fresh bananas	1.02
			42.30
156 fl oz concentrate	1	12 13-oz cans	35.88
			11.52
24 oz	1	3 8-oz boxes	4.80
112 oz [d]	1	28 4-oz jars	13.44
2 lb [d]	1	2 lb fresh bananas	1.02
			30.78
24 oz	1	3 8-oz boxes	4.80
240 oz [d]	1	60 4-oz jars	28.80
2 lb [d]	1	2 lb fresh bananas	1.02
77.5 oz	1	31 2.5-oz jars	22.48
			57.10

using a choice of 112 oz of baby food fruits and vegetable plus 2 lb of fresh bananas. For additional detail, see Table E-1.

[c]Allowed substitutions used in the calculations are indented below the food item; the total allowance for the food item is reflected in the sum of these entries.

[d]In Food Package II, 2 lb of fresh bananas may be substituted for 16 oz of baby food fruit.

NOTES FOR TABLE E-3A: ~ indicates approximate amount.

DATA SOURCES: Price data are from Economic Research Service, USDA (ERS, 2004b, 1999 price data; Oliveira et al., 2001, 2000 infant formula price data) and ACNielsen Homescan (ACNielsen, 2001, price data for 2001 obtained through ERS, USDA).

TABLE E-3B Calculated Costs of Representative Amounts of Foods in Revised Packages for Children and Women (2002)[a]

Food	Unit	Approximate Cost per Unit ($)
Food Package IV-A		
Juice	fl oz	~0.03
Milk, whole[b,c]	qt	0.73
Yogurt[b,c]	qt	2.28
Cheese[b,c,d]	lb	3.30
Cereal	oz	~0.20
Eggs	doz	1.03
Fresh fruits[b,c]	lb	~0.69
Canned fruits[b,c]	oz	~0.05
Fresh vegetables[b,c]	lb	~0.94
Canned vegetables[b,c]	oz	~0.03
Bread, whole wheat[b,c]	lb	1.80
Brown rice[b,c]	lb	1.77
Beans, dried[b,c]	lb	0.77
Beans, canned[b,c]	oz	~0.04
Peanut butter[b,c]	oz	0.10
Total		
Food Package IV-B		
Juice	fl oz	~0.03
Milk, fat-reduced[b,c]	qt	0.69
Yogurt[b,c]	qt	2.28
Cheese[b,c,d]	lb	3.30
Cereal	oz	~0.20
Eggs	doz	1.03
Fresh fruits[b,c]	lb	~0.69
Canned fruits[b,c]	oz	~0.05
Fresh vegetables[b,c]	lb	~0.94
Canned vegetables[b,c]	oz	~0.03
Bread, whole wheat[b,c]	lb	1.80
Brown rice[b,c]	lb	1.77
Beans, dried[b,c]	lb	0.77
Beans, canned[b,c]	oz	~0.04
Peanut butter[b,c]	oz	0.10
Total		
Food Package V		
Juice	fl oz	~0.03
Milk, fat-reduced[b,c]	qt	0.69
Soy beverage ("soy milk")[b,c]	qt	1.64

Representative Amount in Food Package			
Quantity Used in Calculation	Assumption, Proportion Used[b]	Example	Cost ($)
128 fl oz	1	3 32-fl oz cans	3.71
14 qt	1	7 half-gallons	10.22
1 qt	0.5	1 1-qt container	1.14
1 lb	0.5	1 1-lb package	1.65
36 oz	1	3 12-oz boxes	7.20
1 doz	1	1 doz	1.03
4.88 lb	0.5	—	1.70
110 oz	0.5	—	2.78
4.88 lb	0.5	—	2.30
110 oz	0.5	—	1.87
1 lb	1	1 1-lb loaf	1.80
1 lb	1	1 1-lb bag	1.77
1 lb	0.25	1 1-lb bag	0.19
64 oz	0.25	4 16-oz cans	0.72
18 oz	0.5	1 18-oz jar	0.90
			38.98
128 fl oz	1	3 32-fl oz cans	3.67
14 qt	1	7 half-gallons	9.66
1 qt	0.5	1 1-qt container	1.14
1 lb	0.5	1 1-lb package	1.65
36 oz	1	3 12-oz boxes	7.31
1 doz	1	1 doz	1.03
4.88 lb	0.5	—	1.70
110 oz	0.5	—	2.78
4.88 lb	0.5	—	2.30
110 oz	0.5	—	1.87
1 lb	1	1 1-lb loaf	1.80
1 lb	1	1 1-lb bag	1.77
1 lb	0.25	1 1-lb bag	0.19
64 oz	0.25	4 16-oz cans	0.72
18 oz	0.5	1 18-oz jar	0.90
			38.49
144 fl oz	1	3 46-fl oz cans	4.13
19 qt	0.9	6 gallons	11.80
19 qt	0.1	9 64-oz containers + 1 32-oz container	3.12

continues

TABLE E-3B Continued

Food	Unit	Approximate Cost per Unit ($)
Yogurt[b,c]	qt	2.28
Tofu[b,c]	lb	1.76
Cheese[b,c,d]	lb	3.30
Cereal	oz	~0.20
Eggs	doz	1.03
Fresh fruits[b,c]	lb	~0.69
Canned fruits[b,c]	oz	~0.05
Fresh vegetables[b,c]	lb	~0.94
Canned vegetables[b,c]	oz	~0.03
Bread, whole wheat[b,c]	lb	1.80
Brown rice[b,c]	lb	1.77
Beans, dried[b,c]	lb	0.77
Beans, canned[b,c]	oz	~0.04
Peanut butter	oz	0.10
Total		
Food Package VI		
Juice	fl oz	~0.03
Milk, fat-reduced[b,c]	qt	0.69
Soy beverage ("soy milk")[b,c]	qt	1.64
Yogurt[b,c]	qt	2.28
Tofu[b,c]	lb	1.76
Cheese[b,c,d]	lb	3.30
Cereal	oz	~0.20
Eggs	doz	1.03
Fresh fruits[b,c]	lb	~0.69
Canned fruits[b,c]	oz	~0.05
Fresh vegetables[b,c]	lb	~0.94
Canned vegetables[b,c]	oz	~0.03
Beans, dried[b,c]	lb	0.77
Beans, canned[b,c]	oz	~0.04
Peanut butter[b,c]	oz	0.10
Total		
Food Package VII		
Juice	fl oz	~0.03
Milk, fat-reduced[b,c]	qt	0.69
Soy beverage ("soy milk")[b,c]	qt	1.64
Yogurt[b,c]	qt	2.28
Tofu[b,c]	lb	1.76
Cheese[b,c,d]	lb	3.30
Cheese	lb	3.30
Cereal	oz	~0.20

Representative Amount in Food Package			
Quantity Used in Calculation	Assumption, Proportion Used[b]	Example	Cost ($)
1 qt	1	1 1-qt container	2.28
1 lb	0.5	1 1-lb container	0.88
1 lb	0.5	1 1-lb package	1.65
36 oz	1	3 12-oz boxes	7.30
1 doz	1	1 doz	1.03
6.1 lb	0.5	—	2.12
140 oz	0.5	—	3.48
6.1 lb	0.5	—	2.88
140 oz	0.5	—	2.38
1 lb	0.5	1 1-lb loaf	0.90
1 lb	0.5	1 1-lb bag	0.89
1 lb	0.5	1 1-lb bag	0.39
64 oz	0.5	4 16-oz cans	1.42
18 oz	1	1 18-oz jar	1.80
			48.45
96 fl oz	1	246-fl oz cans	2.76
14 qt	0.9	3 gallons + 1 half-gallon	8.69
14 qt	0.1	7 64-oz containers	2.30
1 qt	0.25	1 1-qt container	0.57
1 lb	0.25	1 1-lb container	0.44
1 lb	0.5	1 1-lb package	1.65
36 oz	1	3 12-oz boxes	7.30
1 doz	1	1 doz	1.03
6.1 lb	0.5	—	2.12
140 oz	0.5	—	3.48
6.1 lb	0.5	—	2.88
140 oz	0.5	—	2.38
1 lb	0.25	1 1-lb bag	0.19
64 oz	0.25	4 16-oz cans	0.72
18 oz	0.5	1 18-oz jar	0.90
			37.41
144 fl oz	1	3 46-fl oz cans	4.13
21 qt	0.9	6 gallons	13.04
21 qt	0.1	12 64-oz containers	3.45
1 qt	1	1 1-qt container	2.28
1 lb	0.5	1 1-lb container	0.88
1 lb	0.5	1 lb	1.65
1 lb	1	1 lb	3.30
36 oz	1	3 12-oz boxes	7.30

continues

TABLE E-3B Continued

Food	Unit	Approximate Cost per Unit ($)
Eggs	doz	1.03
Fresh fruits[b,c]	lb	~0.69
Canned fruits[b,c]	oz	~0.05
Fresh vegetables[b,c]	lb	~0.94
Canned vegetables[b,c]	oz	~0.03
Bread, whole wheat[b,c]	lb	1.80
Brown rice[b,c]	lb	1.77
Canned fish[b,c]		
Tuna[b,c]	oz	~0.09
Salmon[b,c]	oz	~0.11
Beans, dried[b,c]	lb	0.77
Beans, canned[b,c]	oz	~0.04
Peanut butter	oz	0.10
Total		

[a]All costs use market purchase-weighted prices estimated using 1999–2002 price data as described in Chapter 5—*Evaluation of Cost*. See data sources. This table is a simplification using prices that have been rounded off; small discrepancies between this table and other sections of the report are due to errors introduced by rounding for the purposes of constructing this table. Tables E-3A and E-3B are intended as easy reference guides of the costs used in cost calculations. These costs are illustrated well using the revised food packages; therefore the current food packages were not included in these tables.

[b]Assumptions for the cost analyses included weighting alternate choices shown in this table as proportions used for calculating costs. For example, the cost of the fruit was calculated using 0.5 as the proportion for both canned and fresh fruits; that means the cost was calculated using a choice of 50% canned and 50% fresh fruits. For additional detail, see Table E-2.

Representative Amount in Food Package			
Quantity Used in Calculation	Assumption, Proportion Used[b]	Example	Cost ($)
2 doz	1	2 doz	2.06
6.1 lb	0.5	—	2.12
140 oz	0.5	—	3.48
6.1 lb	0.5	—	2.88
140 oz	0.5	—	2.38
1 lb	0.5	1 1-lb loaf	0.90
1 lb	0.5	1 1-lb bag	0.89
30 oz	0.8	5 6-oz cans	2.08
29.4 oz	0.2	2 14.7-oz cans	0.62
1 lb	0.5	1 1-lb bag	0.39
64 oz	0.5	4 16-oz cans	1.42
18 oz	1	1 18-oz jar	1.80
			57.05

[c]Allowed substitutions used in the calculations are indented below the food item in the package; the total allowance for this food item is reflected in the sum of these entries.

[d]Cheese may be substituted for milk at the rate of 1 lb of cheese for 3 qt of milk.

NOTE FOR TABLE E-3B: ~ indicates approximate amount.

DATA SOURCES: Price data are from Economic Research Service, USDA (ERS, 2004b, 1999 price data); ACNielsen Homescan (ACNielsen, 2001, price data for 2001obtained through ERS, USDA); and the Bureau of Labor Statistics, U.S. Department of Labor (BLS, 2004a , 2002 price data).

TABLE E-4 Estimated Program Costs for Food per Month Using Current Packages (2002)[a]

Group	Age/Participant Category[b]	Description	Package
Infants	0–3.9 mo	Fully formula-fed	I
		Partially breast-fed[d]	I
		Fully breast-fed[d]	—
	Subtotals[e]		
	4–5.9 mo	Fully formula-fed	II
		Partially breast-fed [f]	II
		Fully breast-fed [f]	II
	Subtotals[e]		
	6–11.9 mo	Fully formula-fed	II
		Partially breast-fed [g]	II
		Fully breast-fed [g]	II
	Subtotals[e]		
	Totals for infant[e]		
Children	1–4.9 y[h]		IV
	Totals for children[e]		
Women	Pregnant[e]		V
	Partially breastfeeding[i]		V
	Non-breastfeeding postpartum [e]		VI
	Fully breastfeeding[i]		VII
	Totals for women[e]		
Totals for program			
Average food package cost per participant (per month)			

[a]All costs use market purchase-weighted prices estimated using 1999–2002 price data as described in Chapter 5—*Evaluation of Cost*. Data on number of participants were obtained from 2002 (Bartlett et al., 2003).

[b]See footnote *b* for Table E-5.

[c]The committee used data provided by FNS (public communication during open session, February, 2004, J. Hirschman, Office of Analysis, Nutrition and Evaluation, Food and Nutrition Service, USDA) to estimate that the average post-rebate cost of formula was 32.1%of the pre-rebate cost in 2002.

[d]Percentage of infants fully breast-fed at 3 mo of age was reported (CDC, 2004b, 2004c). Percentage of partially breast-fed infants was calculated from these data and data on the percentage of infants who had ever been breast-fed at 3 mo of age (CDC, 2004b, 2004c).

[e]Number of participants was calculated using data Exhibit 3.1 from USDA's *WIC Participant and Program Characteristics, 2002* (Bartlett et al., 2003), recognizing that some discrepancies exist in these data. An infant is defined as a participant who, at certification, is under 1 year of age and who would be classified as a child at the age of 366 d. However, in 2002, about 2.84% of WIC participants categorized as 1-y-old children are, in fact, 11-mo-old infants who have been recertified as 1-y-old children; additionally, about 0.38% of WIC participants who are classified as infants are participants who are older than 366 d.

[f]Percentage of infants fully or partially breast-fed at 4–5.9 mo of age was extrapolated

Percentage within Age/ Participant Category	Number of Participants[b]	Cost (pre-rebate, if applicable)	Post-Rebate Cost[c]	Program Cost (post-rebate, if applicable)
36	668,309	$ 92.69	$ 29.75	$ 19,882,193
28	519,796	$ 92.69	$ 29.75	$ 15,463,931
36	668,309	0		
100	**1,856,414**			**$ 35,346,124**
69	38,428	$ 100.37	$ 37.43	$ 1,438,360
20	11,138	$ 100.37	$ 37.43	$ 416,895
11	6,126	$ 7.68		$ 47,048
100	**55,692**			**$ 1,902,303**
79	118,955	$ 100.37	$ 37.43	$ 4,452,486
16	24,092	$ 100.37	$ 37.43	$ 901,764
5	7,529	$ 7.68		$ 57,823
100	**150,576**			**$ 5,412,073**
	2,062,682			**$ 42,660,500**
100	4,020,032	$ 39.29		$ 157,947,057
100	**4,020,032**			**$ 157,947,057**
45	878,619	$ 41.23		$ 36,225,461
11	205,559	$ 41.23		$ 8,475,198
31	597,451	$ 34.39		$ 20,546,340
13	252,572	$ 50.61		$ 12,782,669
100	**1,934,201**			**$ 78,029,668**
	8,016,915			**$ 278,637,225**
				$ 34.76

from data for infants at 3 and 6 mo of age (CDC, 2004b, 2004c; Abbott Labs, 2002, 2003 [2001 data]).

[g]Percentages of infants fully or partially breast-fed at 6–11.9 mo of age were calculated as the average of data reported for infants at 6 mo (CDC, 2004b, 2004c) and 12 mo of age (CDC, 2004b, 2004c; Briefel et al., 2004a).

[h]Includes 0.8% of children, age 1–4.9 y, who were reported as "age not reported."

[i]Percentage distribution of women as fully breastfeeding (55% of the total) or partially breastfeeding (45%of the total) was calculated according to the distribution of infants identified as fully or partially breast-fed (see notes *f* and *g*).

NOTES FOR TABLE E-4**:** This table is similar to Table 5-2; more detail is presented here in Appendix E.

DATA SOURCES: Price data are from Economic Research Service, USDA (ERS, 2004b, 1999 price data; Oliveira et al., 2001, 2000 infant formula price data); ACNielsen Homescan (ACNielsen, 2001, price data for 2001obtained through ERS, USDA); and the Bureau of Labor Statistics, U.S. Department of Labor (BLS, 2004a , 2002 price data). Data on rates of participation are from resources published by USDA (Bartlett et al., 2003, 2002 data; Kresge, 2003, 2002 data). Data on percentages of infants breast-fed were obtained from the *2003 National Immunization Survey* (CDC, 2004b, 2004c) and published resources (Abbott Labs, 2002, 2003; Briefel et al, 2004a).

TABLE E-5 Estimated Program Costs for Food per Month Using Revised Packages (2002)[a]

Group	Age or Participant Category[b]	Description	Package
Infants	0–3.9 mo	Fully formula-fed	I
		Partially breast-fed[d,e]	— (0–0.9 mo)
		Partially breast-fed[d,e]	I (1–3.9 mo)
		Fully breast-fed[d]	—
	Subtotals[g]		
	4–5.9 mo	Fully formula-fed	II
		Partially breast-fed[h]	II
		Fully breast-fed[h]	II
	Subtotals[g]		
	6–11.9 mo	Fully formula-fed	II
		Partially breast-fed[i]	II
		Fully breast-fed[i]	II
	Subtotals[g]		
	Totals for infants[g]		
Children	1–1.9 y [j]		IV-A
	2–4.9 y [j]		IV-B
	Totals for children[g]		
Women	Pregnant[g]		V
	Partially breastfeeding[k]		V
	Non-breastfeeding postpartum[g]		VI
	Fully breastfeeding[k]		VII
	Totals for women[g]		
Totals for program			
Average food package cost per participant (per month)			

[a]All costs use market purchase-weighted prices estimated using 1999–2002 price data as described in Chapter 5—*Evaluation of Cost*. Data on number of participants were obtained from 2002 (Bartlett et al., 2003).

[b]The analyses presented in Tables E-4 and E-5 used published data for FY2002 from FNS (Bartlett et al., 2003, Exhibits 3.1 and 5.7) for the number of participants in total and in each participant category, including age groups within the infant category. The data presented by Bartlett et al. were derived from data collected on participants *at the time of certification* in the WIC program. If the analyses are done using the assumption that infant ages were distributed equally across twelve months, instead of by age at certification, the average package cost per participant would be $37.10 for the current packages and $38.02 for the revised packages. This represents an increase of $0.92 for the revised packages compared to the current packages. Thus, by these estimates the revised packages would be 2.5 percent higher in cost than the current packages. These estimates represent the upper bound of effects on costs because attrition in participation rates occurs as infants mature; for example, FY2002 enrollment was 2.1 million for infants and 1.4 million for one-year-olds (Bartlett et al., 2003). In using the data presented by Bartlett et al., the participant numbers throughout FY2002 were

Percentage Within Age or Participant Category	Number of Participants[b]	Cost (pre-rebate, if applicable)	Cost Post-Rebate[c]	Program Cost (post rebate, if applicable)
36	668,309	$ 92.69	$ 29.75	$ 19,882,193
7	129,949	$ 4.65[f]	$ 1.49	$ 193,624
21	389,847	$ 37.25	$ 11.96	$ 4,662,570
36	668,309	0		
100	**1,856,414**			**$ 24,738,387**
69	38,428	$ 101.66	$ 32.63	$ 1,253,906
20	11,138	$ 50.83	$ 16.32	$ 181,772
11	6,126	0		
100	**55,692**			**$ 1,435,678**
79	118,955	$ 91.02	$ 42.30	$ 5,031,797
16	24,092	$ 55.14	$ 30.78	$ 741,552
5	7,529	$ 57.10		$ 429,906
100	**150,576**			**$ 6,203,255**
	2,062,682			**$ 32,377,320**
36	1,447,212	$ 38.98		$ 56,412,324
64	2,572,820	$ 38.49		$ 99,027,842
100	**4,020,032**			**$ 155,440,166**
45	878,619	$ 48.45		$ 42,569,090
11	205,559	$ 48.45		$ 9,959,334
31	597,451	$ 37.41		$ 22,350,642
13	252,572	$ 57.05		$ 14,409,233
100	**1,934,201**			**$ 89,288,299**
	8,016,915			**$ 277,105,785**
				$ 34.57

overestimated. If the analyses were done using FY2002 data presented as totals per participant category calculated from monthly averages (FNS, 2004f) instead of the annual totals from data collected at certification (Bartlett et al., 2003), the average package cost per participant would be $34.75 for the current packages and $34.57 for the revised packages. This represents a decrease of $0.18 for the revised packages compared to the current packages. Please note that the material in footnote b of Table E-5 was added after the report was released.

[c]The committee used data provided by FNS (public communication during open session, February, 2004, J. Hirschman, Office of Analysis, Nutrition and Evaluation, Food and Nutrition Service, USDA) to estimate that the average post-rebate cost of formula was 32.1% of the pre-rebate cost in 2002.

[d]Percentage of infants fully breast-fed at 3 mo of age was reported (CDC, 2004b, 2004c). Percentage of partially breast-fed infants was calculated from these data and data on the percentage of infants who had ever been breast-fed at 3 mo of age (CDC, 2004b, 2004c).

continues

TABLE E-5 Continued

[e]For the category of partially breast-fed infants 0–3.9 mo, the committee estimated that the number of infants aged 0–0.9 mo was 25% of the category total and the number of infants aged 1–3.9 mo was 75% of the total. In the absence of data on the proportion of infants to anticipate in each of the first 4 mo after birth, the committee assumed the distribution would be approximately equal in each month, using the census data for children under the age of 5 y as a model (20.0% ± 0.3% , mean ± SD) (U.S. Census Bureau, 2004).

[f]One alternative is to provide one small can (up to 15 oz) of powdered formula to breast-fed infants during the first mo postpartum if requested by the mother. The committee used the assumption that the number of breastfeeding mothers requesting formula in the first mo would approximate 50% of the current number of partially breastfeeding mother/infants pairs. The additional monthly cost per participant who choose this option would be $9.30 in pre-rebate costs and $2.98 in post-rebate costs. Using the estimate of 50% of the current partially breastfeeding participants (0.5 × 129,949 = 64,747) for the first mo postpartum, the additional monthly program cost would be $193,626 or an additional 2.4¢ in the average cost per participant.

[g]Number of participants was calculated using data Exhibit 3.1 from USDA's *WIC Participant and Program Characteristics, 2002* (Bartlett et al., 2003), recognizing that some discrepancies exist in these data. An infant is defined as a participant who, at certification, is under 1 y of age and who would be classified as a child at the age of 366 d. However, in 2002, about 2.84% of WIC participants categorized as 1-y-old children are, in fact, 11-mo-old infants who have been recertified as 1-y-old children; additionally, about 0.38% of WIC participants who are classified as infants are participants who are older than 366 days.

[h]Percentage of infants fully or partially breast-fed at 4–5.9 mo of age was extrapolated from data for infants at 3 and 6 mo of age (CDC, 2004b; Abbott Labs, 2002, 2003 [2001 data]).

[i]Percentages of infants fully or partially breast-fed at 6–11.9 mo of age were calculated as the average of data reported for infants at 6 mo (CDC, 2004b, 2004c) and 12 mo of age (CDC, 2004b, 2004c; Briefel et al., 2004a).

[j]The committee calculated the number of participants in each category using data from the USDA sponsored *WIC Participant and Program Characteristics 2002* (Bartlett et al., 2003); data from Exhibit 3.1 (Bartlett et al., 2003) were used to estimate the number of participants ages 1–1.9 y and 2–4.9 y.

[k]Percentage distribution of women as fully breastfeeding (55% of the total) or partially breastfeeding (45% of the total) was calculated according to the distribution of infants identified as fully or partially breast-fed (see notes *h* and *i*).

NOTES FOR TABLE E-5: This table is similar to Table 5-3; more detail is presented here in Appendix E.

DATA SOURCES: Price data are from Economic Research Service, USDA (ERS, 2004b, 1999 price data; Oliveira et al., 2001, 2000 infant formula price data); ACNielsen Homescan (ACNielsen, 2001, price data for 2001obtained through ERS, USDA); and the Bureau of Labor Statistics, U.S. Department of Labor (BLS, 2004a , 2002 price data). Data on rates of participation are from resources published by USDA (Bartlett et al., 2003, 2002 data; Kresge, 2003, 2002 data). Data on percentages of infants breast-fed were obtained from the *2003 National Immunization Survey* (CDC, 2004b, 2004c) and published resources (Abbott Labs, 2002, 2003; Briefel et al, 2004a).

F

Supplementary Information

LIST OF BOX, FIGURES, AND TABLES

BOX F-1
Chronology of Statutes Pertaining to the Definition of WIC Supplemental Foods

September 26, 1972: Public Law No. 92-433. The term *supplemental foods* is defined in the original WIC statute, Child Nutrition Act, as amended.

> § 17(f)(3): "Supplemental foods" shall mean those foods containing nutrients known to be lacking in the diets of populations at nutritional risks and, in particular, those foods and food products, containing high-quality protein, iron, calcium, vitamin A, and vitamin C. Such term may also include (at the discretion of the Secretary) any food product commercially formulated preparation specifically designed for infants.

July 11, 1973: In what appears to be the first WIC rule (*Fed Reg* p. 18447):

> § 246.2(v): "Supplemental food" means any food authorized to be made available under the WIC program.

October 7, 1975: Public Law No. 94-105. Child Nutrition Act §17(f)(3) is amended to include a new, final sentence:

> The contents of the food package shall be made available in such a manner as to provide flexibility, taking into account medical and nutritional objectives and cultural eating patterns.

January 12, 1976: Interim "Revision, Reorganization, and Republication" (*Fed Reg* p. 1743) reads:

> § 246.2(t): "Supplemental foods" means the foods authorized by FNS in this part to be made available under the WIC program.

August 26, 1977: Final "Revision, Reorganization, and Republication" (*Fed Reg* p. 43206) reads:

> § 246.2 (no "letter" designation): "Supplemental foods" means foods which meet the specifications of this part.

November 10, 1978: Public Law No. 95-627, the Child Nutrition Amendments of 1978, completely revised Child Nutrition Act § 17. In the revision, definitions were moved to subsection (b), with supplemental foods found at § 17(b)(14). The reference to nutrients of particular interest was deleted and additional direction was included at (f)(11).

> § 17(b)(14): "Supplemental foods" means those foods containing nutrients determined by nutritional research to be lacking in the diets of pregnant, breastfeeding, and postpartum women, infants, and children, as prescribed by the Secretary. State agencies may, with the approval of the Secretary, substitute different foods providing the nutritional equivalent of foods prescribed by the Secretary, to allow for different cultural eating patterns.
>
> In subparagraph (f)(11): The Secretary shall prescribe by regulation the supplemental foods to be made available in the program under this section. To the de-

gree possible, the Secretary shall assure that the fat, sugar, and salt content of the prescribed foods is appropriate.

January 9, 1979: Proposed Rule, to comply with section 3 of Public Law No. 95-627 § 3 (beginning *Fed Reg* p. 2114) deletes the definition of supplemental foods (no explanation is provided for this change):

§ 246.2 (no "letter" designation): "Supplemental foods" [Reserved]

July 27, 1979: Final Rule, to comply with Public Law No. 95-627 § 3 (beginning *Fed Reg* p. 44422):

§ 246.2 (no "letter" designation): "Supplemental foods" [Reserved].

July 8, 1983: Proposed Rule (beginning on *Fed Reg* p. 31502) issued to "reduce the regulatory burden on State and local agencies." It states:

A definition of "supplemental foods" was reserved in the 1979 regulations because of the pending issuance of the proposed food package Regulations. A definition consistent with the legislative definition and past regulatory definitions is proposed in this rulemaking.

§ 246.2 (no "letter" designation): "Supplemental foods" means those foods containing nutrients determined to be beneficial for pregnant, breastfeeding, and postpartum women, infants and children, as prescribed by the Secretary in section 246.10.

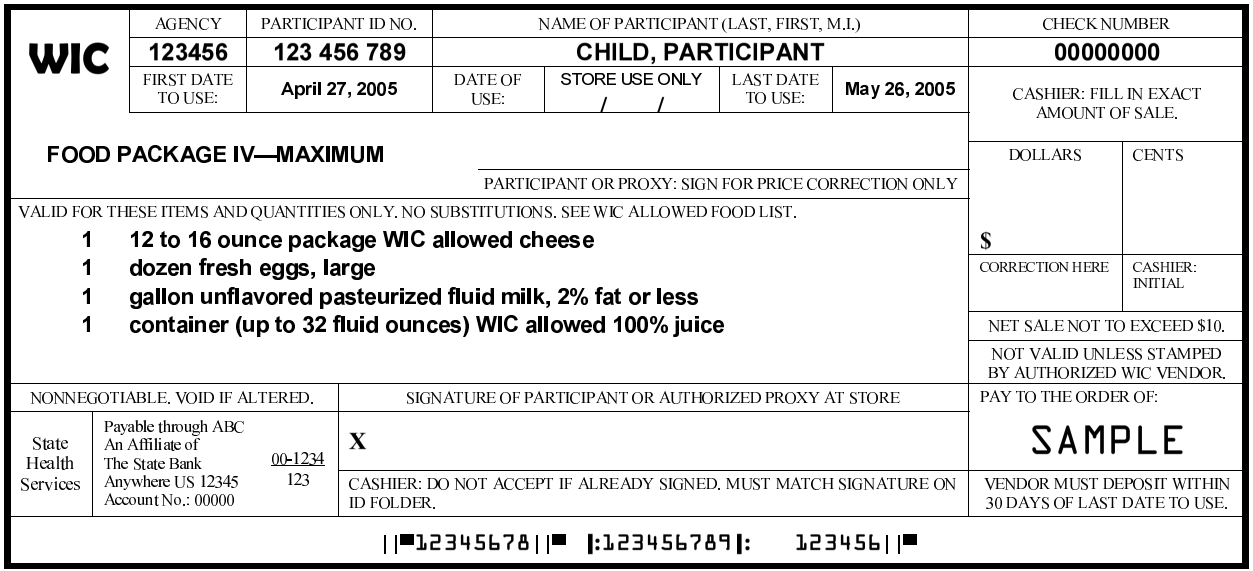
November 10, 1989: Public Law No. 101-147. Child Nutrition and WIC Reauthorization Act of 1989 continues the statutory emphasis on providing nutrients for which WIC participants are most vulnerable to deficiencies and adds concern regarding nutrient density and how to effectively provide the priority nutrients

June 30, 2004: Public Law No. 108-265. Child Nutrition and WIC Reauthorization Act of 2004 continues the statutory emphasis on nutrients that are lacking. It also adds language about foods to the definition, still at (b)(14), and adds material to (f)(11) without altering the sentences inserted in 1978. The new (b)(14) reads:

(b)(14): "Supplemental foods" means those foods containing nutrients determined by nutritional research to be lacking in the diets of pregnant, breastfeeding, and postpartum women, infants, and children, and those foods that promote the health of the population served by the program authorized by this section, as indicated by relevant nutrition science, public health concerns, and cultural eating patterns, as prescribed by the Secretary. State agencies may, with the approval of the Secretary, substitute different foods providing the nutritional equivalent of foods prescribed by the Secretary, to allow for different cultural eating patterns.

Child Nutrition Act § 17, includes the following relevant provisions in a paragraph primarily addressing state operations:

"(f)(11) SUPPLEMENTAL FOODS—
(A) IN GENERAL—The Secretary shall prescribe by regulation the supplemental foods to be made available in the program under this section.
(B) APPROPRIATE CONTENT—To the degree possible, the Secretary shall assure that the fat, sugar, and salt content of the prescribed foods is appropriate."



WIC

AGENCY	PARTICIPANT ID NO.	NAME OF PARTICIPANT (LAST, FIRST, M.I.)				CHECK NUMBER
123456	123 456 789	CHILD, PARTICIPANT				00000000
FIRST DATE TO USE:	April 27, 2005	DATE OF USE:	STORE USE ONLY / /	LAST DATE TO USE:	May 26, 2005	CASHIER: FILL IN EXACT AMOUNT OF SALE.

FOOD PACKAGE IV—MAXIMUM

PARTICIPANT OR PROXY: SIGN FOR PRICE CORRECTION ONLY

DOLLARS | CENTS

$

CORRECTION HERE | CASHIER: INITIAL

VALID FOR THESE ITEMS AND QUANTITIES ONLY. NO SUBSTITUTIONS. SEE WIC ALLOWED FOOD LIST.

1 12 to 16 ounce package WIC allowed cheese
1 dozen fresh eggs, large
1 gallon unflavored pasteurized fluid milk, 2% fat or less
1 container (up to 32 fluid ounces) WIC allowed 100% juice

NET SALE NOT TO EXCEED $10.

NOT VALID UNLESS STAMPED BY AUTHORIZED WIC VENDOR.

NONNEGOTIABLE. VOID IF ALTERED.

SIGNATURE OF PARTICIPANT OR AUTHORIZED PROXY AT STORE

X

CASHIER: DO NOT ACCEPT IF ALREADY SIGNED. MUST MATCH SIGNATURE ON ID FOLDER.

PAY TO THE ORDER OF:

SAMPLE

VENDOR MUST DEPOSIT WITHIN 30 DAYS OF LAST DATE TO USE.

State Health Services

Payable through ABC
An Affiliate of
The State Bank
Anywhere US 12345
Account No.: 00000

00-1234
123

||⑈12345678||⑈ ⑆:123456789⑆: 123456||⑈

FIGURE F-1A Representation of a standard WIC food instrument (net sale not to exceed $10).
NOTE: This sample of a standard food instrument is one of set that would be issued to the participant with a sum total equal to the entire prescription of food per month for this child participant. Some WIC state agencies currently issue a series of standard food instruments to be used throughout the month. This representation was constructed using food instruments received from a number of WIC state agencies; this sample illustrates features drawn from various food instruments and does not reflect the food instruments issued by a specific WIC state agency.

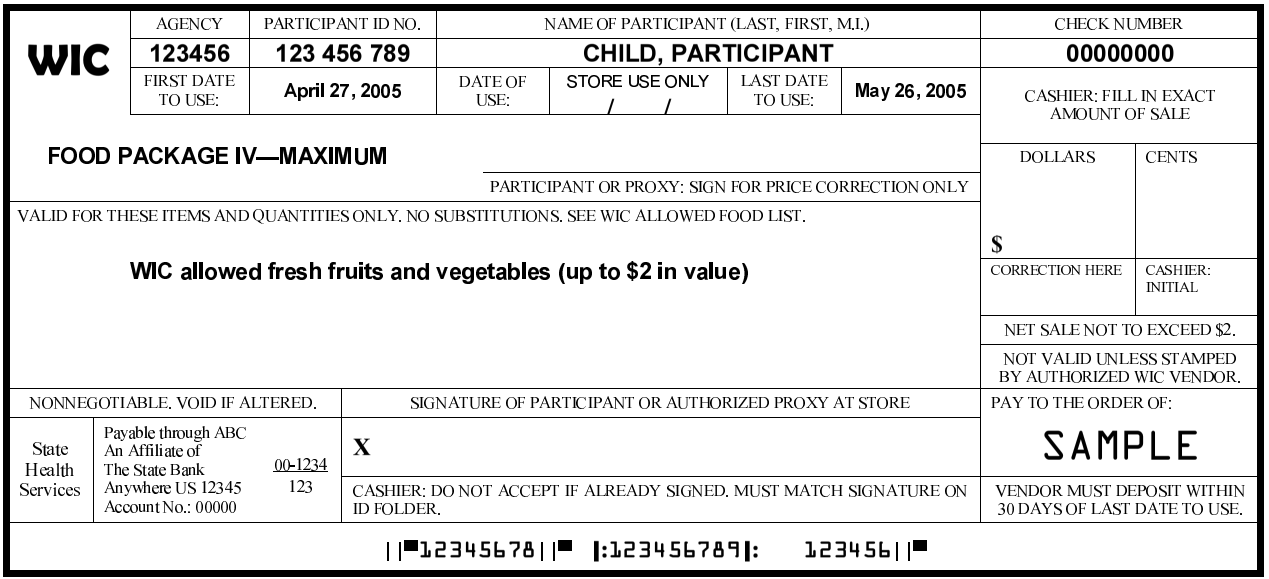


FIGURE F-1B Representation of a cash-value WIC food instrument (net sale not to exceed $2).
NOTE: This sample of a cash-value food instrument for fresh fruits and vegetables is one of a set that would be issued to the participant with a sum total cash-value of $8 per month for this child participant. Some WIC state agencies currently issue a series of standard food instruments to be used throughout the month. This example is representative of a WIC state agency in which food instruments are issued as four sets per month, easily accommodating participants who obtain groceries on an average of once per week. The cash-value voucher for fresh produce is a workable procedure in other scenarios; however, in situations were WIC foods are obtained on an average of once per month, the fresh fruit and vegetable option may not be optimal. In these situations, the processed fruit and vegetable option or a combination of the fresh and processed options may be more workable. From the committee's discussion with representatives of grocery vendors, an important feature is that the fresh produce is obtained on a food instrument separate from other grocery items.

TABLE F-1 Dietary Reference Intakes Used for Assessing Intakes of WIC-Eligible Subgroups, Elements

	Dietary Component		
Participant Category	Calcium (mg/d)	Iron (mg/d)	Zinc (mg/d)
Infants, 0 through 5 mo			
AI*[a]	210* (breast-fed) 320* (formula-fed)	0.27*	2.0*
UL	ND[b]	40.0	4.0
Infants, 6 through 11 mo			
EAR	—	6.9	2.5
RDA or AI*	270* (breast-fed) 340* (formula-fed)	11.0	3.0
UL	ND	40.0	5.0
Children, 1 through 3 y			
EAR	—	3.0	2.5
RDA or AI*	500*	7.0	3.0
UL	2,500	40.0	7.0
Children, 4 y			
EAR	—	4.1	4.0
RDA or AI*	800*	10.0	5.0
UL	2,500	40.0	12.0
Females, 14 through 18 y			
EAR	—	7.9	7.3
RDA or AI*	1,300*	15.0	9.0
UL	2,500	45.0	34.0
Females, 19 through 30 y			
EAR	—	8.1	6.8
RDA or AI*	1,000*	18.0	8.0
UL	2,500	45.0	40.0
Females, 31 through 44 y			
EAR	—	8.1	6.8
RDA or AI*	1,000*	18.0	8.0
UL	2,500	45.0	40.0
Pregnant females, < 19 y			
EAR	—	23.0	10.5
RDA or AI*	1,300*	27.0	12.0
UL	2,500	45.0	34.0

Selenium (mcg/d)	Magnesium (mg/d)	Phosphorus (mg/d)	Sodium (mg/d)	Potassium (mg/d)
15*	30*	100*	120*	400*
45	ND[b]	ND[b]	ND[b]	ND[b]
—	—	—	—	—
20*	75*	275*	370*	700*
60	ND	ND	ND	ND
17	65	380	—	—
20	80	460	1,000*	3,000*
90	65[c]	3,000	1,500	ND
23	110	405	—	—
30	130	500	1,200*	3,800*
150	110[c]	3,000	1,900	ND
45	300	1055	—	—
55	360	1,250	1,500*	4,700*
400	350[c]	4,000	2,300	ND
45	255	580	—	—
55	310	700	1,500*	4,700*
400	350[c]	4,000	2,300	ND
45	265	580	—	—
55	320	700	1,500*	4,700*
400	350[c]	4,000	2,300	ND
49	335	1,055	—	—
60	400	1,250	1,500*	4,700*
400	350[c]	3500	2,300	ND

continues

TABLE F-1 Continued

Participant Category	Dietary Component		
	Calcium (mg/d)	Iron (mg/d)	Zinc (mg/d)
Pregnant females, 19 through 30 y			
EAR	—	22.0	9.5
RDA or AI*	1,000*	27.0	11.0
UL	2,500	45.0	40.0
Pregnant females, 31 through 44 y			
EAR	—	22.0	9.5
RDA or AI*	1,000*	27.0	11.0
UL	2,500	45.0	40.0
Lactating females, < 19 y			
EAR	—	7.0	10.9
RDA or AI*	1,300*	10.0	13.0
UL	2,500	45.0	34.0
Lactating females, 19 through 44 y			
EAR	—	6.5	10.4
RDA or AI*	1,000*	9.0	12.0
UL	2,500	45.0	40.0

[a]For calcium, AIs were set for breast-fed and formula-fed infants. All other AIs presented for infants ages 0 to 5.9 mo are based on mean intake of healthy breast-fed infants. AIs for formula-fed infants ages 0 to 5.9 mo have not been set for these nutrients, although bioavailability of some nutrients, especially iron and zinc (Lönnerdal et al., 1981; Pabon and Lönnerdal, 2000), is known to be lower in infant formula than in breast milk.

[b]The UL was not determinable for infants birth through 5 months of age due to lack of data of adverse effects in this age group and due to concern with regard to lack of ability to handle excess amounts. The source of intake should be only from food (e.g., breast milk, infant formula) to prevent high levels of intake (IOM, 1997, 1998, 2000b, 2001, 2005a).

[c]The UL for magnesium represents intake from pharmacological agents only and does not include intake from food and water.

Selenium (mcg/d)	Magnesium (mg/d)	Phosphorus (mg/d)	Sodium (mg/d)	Potassium (mg/d)
49	290	580	—	—
60	350	700	1,500*	4,700*
400	350[c]	3,500	2,300	ND
49	300	580	—	—
60	360	700	1,500*	4,700*
400	350[c]	3,500	2,300	ND
59	300	1,055	—	—
70	360	1,250	1,500*	5,100*
400	350[c]	4,000	2,300	ND
59	265	580	—	—
70	320	700	1,500*	5,100*
400	350[c]	4,000	2,300	ND

NOTES FOR TABLE F-1: AI = Adequate Intake, used when necessary, indicated by an asterisk (*); EAR = Estimated Average Requirement, used when available; ND = not determined, UL not determined due to lack of data of adverse effects RDA = Recommended Dietary Allowance; UL = Tolerable Upper Intake Level.

DATA SOURCES: Institute of Medicine (IOM, 1997, 2000b, 2001, 2005a) (see IOM, 2005b).

TABLE F-2 Dietary Reference Intakes Used for Assessing Intakes of WIC-Eligible Subgroups, Vitamins

Participant Category	Dietary Component		
	Vitamin A[a] (mcg/d)	Vitamin D (mcg/d)	Vitamin E[b] (mg AT/d)
Infants, 0 through 5 mo			
AI*	400*	5*	4*
UL	600[e]	25	ND
Infants, 6 through 11 mo			
AI*	500*	5*	5*
UL	600[e]	25	ND
Children, 1 through 3 y			
EAR	210	—	5
RDA or AI*	300	5*	6
UL	600[e]	50	200
Children, 4 y			
EAR	275	—	6
RDA or AI*	400	5*	7
UL	900[e]	50	300
Females, 14 through 18 y			
EAR	485	—	12
RDA or AI*	700	5*	15
UL	2,800[e]	50	800
Females, 19 through 44 y			
EAR	500	—	12
RDA or AI*	700	5*	15
UL	3,000[e]	50	1,000
Pregnant females, < 19 y			
EAR	530	—	12
RDA or AI*	750	5*	15
UL	2,800[e]	50	800
Pregnant females, 19 through 44 y			
EAR	550	—	12
RDA or AI*	770	5*	15
UL	3,000[e]	50	1,000
Lactating females, < 19 y			
EAR	885	—	16
RDA or AI*	1,200	5*	19
UL	2,800[e]	50	800
Lactating females, 19 through 44 y			
EAR	900	—	16
RDA or AI*	1,300	5*	19
UL	3,000[e]	50	1,000

[a] The EAR and AI for vitamin A are expressed as retinol activity equivalents (RAEs) per day. 1 RAE = 1 mcg retinol, 12 mcg β-carotene, 24 mcg α-carotene, or 24 mcg β-cryptoxanthin.

[b] The EAR and AI for vitamin E are expressed as mg α-tocopherol (AT) per day. The EAR and AI for vitamin E include RRR-α-tocopherol, the only form of α-tocopherol that occurs naturally in foods, and the 2R-stereoisomeric forms of α-tocopherol that occur in fortified foods and dietary supplements. The UL for vitamin E applies to any form of α-tocopherol used in dietary supplements or added to foods as a fortificant or antioxidant. Note that the CSFII data used elsewhere in this report were originally calculated as mg α-tocopherol equivalents (ATE) per day, an older unit of measure for vitamin E.

Vitamin C (mg/d)	Thiamin (mg/d)	Riboflavin (mg/d)	Niacin[c] (mg/d)	Vitamin B_6 (mg/d)	Vitamin B_{12} (mcg/d)	Folate[d] (mcg/d)
40*	0.2*	0.3*	2*	0.1*	0.4*	65*
ND	ND	ND	ND	ND	ND	ND
50*	0.3*	0.4*	4*	0.3*	0.5*	80*
ND	ND	ND	ND	ND	ND	ND
13	0.4	0.4	5	0.4	0.7	120
15	0.5	0.5	6	0.5	0.9	150
400	ND	ND	10	30.0	ND	300
22	0.5	0.5	6	0.5	1.0	160
25	0.6	0.6	8	0.6	1.2	200
650	ND	ND	15	40.0	ND	400
56	0.9	0.9	11	1.0	2.0	330
65	1.0	1.0	14	1.2	2.4	400[f]
1,800	ND	ND	30	80.0	ND	800
60	0.9	0.9	11	1.1	2.0	320
75	1.1	1.1	14	1.3	2.4	400[f]
2,000	ND	ND	35	100.0	ND	1,000
66	1.2	1.2	14	1.6	2.2	520
80	1.4	1.4	18	1.9	2.6	600[f]
1,800	ND	ND	30	80.0	ND	800
70	1.2	1.2	14	1.6	2.2	520
85	1.4	1.4	18	1.9	2.6	600[f]
2,000	ND	ND	35	100.0	ND	1,000
96	1.2	1.3	13	1.7	2.4	450
115	1.4	1.6	17	2.0	2.8	500
1,800	ND	ND	30	80.0	ND	800
100	1.2	1.3	13	1.7	2.4	450
120	1.4	1.6	17	2.0	2.8	500
2,000	ND	ND	35	100.0	ND	1,000

[c] The AI for infants 0 through 5 months is expressed as preformed niacin (not niacin equivalents, NE).The EAR and AI for niacin for individuals above the age of 5 months are expressed as niacin equivalents (NE) per day. 1 mg of niacin = 60 mg of tryptophan. The UL for niacin is in mg/d and applies to synthetic forms obtained from fortified foods or dietary supplements.

[d] The EAR and AI for folate are expressed as dietary folate equivalents (DFE) per day. 1 DFE = 1 mcg food folate = 0.6 mcg of folic acid from fortified food or as a supplement

continues

TABLE F-2 Continued

consumed with food = 0.5 mcg of a supplement taken on an empty stomach. The UL for folate is expressed as mcg per day and applies to synthetic forms (i.e., folic acid) obtained from fortified foods or dietary supplements.

[e] The UL applies only to preformed vitamin A (i.e., retinol).

[f] In view of evidence linking folate intake with neural tube defects in the fetus, it is recommended that all women capable of becoming pregnant consume 400 mcg of folate as folic acid from fortified foods or supplements in addition to intake of food folate from a varied diet.

NOTES FOR TABLE F-2: AI = Adequate Intake, used when necessary, indicated by an asterisk (*); AT = α-tocopherol; DFE = dietary folate equivalents; EAR = Estimated Average Requirement, used when available; ND = not determined, UL not determined due to lack of data of adverse effects; RDA = Recommended Dietary Allowance; UL = Tolerable Upper Intake Level.

DATA SOURCES: Institute of Medicine (IOM, 1997, 1998, 2000b, 2001) (see IOM, 2005b).

TABLE F-3 FOLLOWS

TABLE F-3 Dietary Reference Intakes Used for Assessing Intakes of WIC-Eligible Subgroups, Selected Macronutrients

	Dietary Component	
Participant Category	Food Energy (kcal/d)	Protein (% of food energy)
Infants, 0 through 5 mo		
EER or AI*	570 (3 mo M) 520 (3 mo F)	ND
Infants, 6 through 11 mo		
EAR		
EER, RDA, or AI*	743 (9 mo M) 676 (9 mo F)	ND
Children, 1 through 3 y		
EAR		
EER, RDA, AI* or AMDR†	1046 (2 y M) 992 (2 y F)	5–20†
Children, 4 y		
EAR		
EER, RDA, AI* or AMDR†	1742 (6 y M) 1642 (6 y F)	10–30†
Females, 14 through 18 y		
EAR		
EER, RDA, AI* or AMDR†	2368 (16 y)	10–30†
Females, 19 through 44 y		
EAR		
EER, RDA, AI* or AMDR†	2403 (19 y)	10–35†
Pregnant females, < 19 y		
EAR		
EER, RDA, AI* or AMDR†	2368 (1st trimester) 2708 (2nd trimester) 2820 (3rd trimester)	10–30†
Pregnant females, 19 through 44 y		
EAR		
EER, RDA, AI* or AMDR†	2403 (1st trimester) 2743 (2nd trimester) 2855 (3rd trimester)	10–35†
Lactating females, < 19 y		
EAR		
EER, RDA, AI* or AMDR†	2698 (1st 6 mo) 2768 (2nd 6 mo)	10–30†
Lactating females, 19 through 44 y		
EAR		
EER, RDA, AI* or AMDR†	2733 (1st 6 mo) 2803 (2nd 6 mo)	10–35†

Total Carbohydrate (% of food energy)	Total Fat (% of food energy)	Protein[a] (g/d)	Total Carbohydrate (g/d)	Added Sugars[b] (% of food energy)	Fiber, total dietary (g/d)
ND	55‡ (31 g/d*)	9.1*	60*	<25	ND
ND	40‡ (30 g/d*)	11.0	95*	<25	ND
45–65†	30–40†[c]	13.0	100 130	<25	19*
45–65†	25–35†	19.0	100 130	<25	25*
45–65†	25–35†	46.0	100 130	<25	26*
45–65†	20–35†	46.0	100 130	<25	25*
45–65†	25–35†	71.0	135 175	<25	28*
45–65†	20–35†	71.0	135 175	<25	28*
45–65†	25–35†	71.0	160 210	<25	29*
45–65†	20–35†	71.0	160 210	<25	29*

continues

TABLE F-3 Continued

[a] The Dietary Reference Intakes (DRIs) for protein include an AI of 1.52 g/kg body weight/d for infants age 0 through 5 months and EARs of 1.2 g/kg body weight/d for infants age 6 through 11 months, 0.87 g/kg body weight/d for children ages 1 through 3 years, 0.76 g/kg body weight/d for children ages 4 through 8 years, 0.71 g/kg body weight/d for adolescent women (nonpregnant, nonlactating) ages 14 through 18 years, and 0.66 g/kg body weight/d for adult women (nonpregnant, nonlactating) ages 19 through 50 years. The EAR for protein intake per day is 0.88 g/kg body weight plus 21 g for pregnant women of all age groups and 1.05 g/kg body weight plus 21.2 g for lactating women of all age groups (IOM, 2002/2005).

[b] The DRI reports establish some dietary guidance for macronutrient intake beyond the AMDR. Part of this dietary guidance is that added sugars be limited to no more than 25% of total energy intake (IOM, 2002/2005).

[c] The American Academy of Pediatrics recommends that whole milk, rather than reduced fat milk, be consumed by children ages 13 through 23 mo (AAP, 2004). Dietary guidance from AAP to avoid atherogenic diets during childhood were applied to children 2 years of age and older (AAP, 1992b, 1998). The AAP recommendations, when taken out of context, might be interpreted that there should be no restriction of fat intake for children age 1 y. However, the AAP recommendation is not in conflict with the DRI reports that recommend a transitioning of dietary fat from the high fat diet of infancy (55% of energy from fat for ages 0 through 5 mo; 40% of energy from fat for ages 6 through 11 mo) to the moderate fat diet of childhood (25 to 35% of energy from fat) (IOM, 2002/2005). Thus it is appropriate to follow the AMDR recommendations for dietary fat to contribute 30 to 40% of food energy intake for children ages 13 through 23 mo (IOM, 2002/2005).

NOTES FOR TABLE F-3: AI = Adequate Intake, used when necessary, indicated by an asterisk (*); AMDR = Acceptable Macronutrient Distribution Range, indicated by a dagger (†); EAR = Estimated Average Requirement, used when available; EER = Estimated Energy Requirement; F = female; kcal = kilocalories; M = male; ND = not determined; RDA = Recommended Dietary Allowance. An AMDR for total fat has not been set for infants; however, the AIs for total fat (indicated by an asterisk (*) represent a high fat diet as indicated by the usual intake of total fat as the percentage of food energy intake for breast-fed infants (indicated by a double dagger [‡]).

DATA SOURCES: The American Heart Association (Krauss et al., 1996; AHA, 2004); and the Institute of Medicine (IOM, 2002/2005) (see IOM, 2005b).

TABLE F-4 FOLLOWS

TABLE F-4 Dietary Reference Intakes and Other Dietary Guidance Used for Assessing Intakes of WIC-Eligible Subgroups, Selected Fats

	Dietary Component	
Participant Category	Total Fat (% of food energy)	Saturated Fat[a] (% of food energy)
Infants, 0 through 5 mo		
AI*	55‡ (31 g/d*)	<10
UL	ND	ND
Infants, 6 through 11 mo		
AI*	40‡ (30 g/d*)	<10
UL	ND	ND
Children, 1 through 3 y		
AI* or AMDR†	30–40†[g]	<10
UL	ND	ND
Children, 4 y		
AI* or AMDR†	25–35†	<10
UL	ND	ND
Females, 14 through 18 y		
AI* or AMDR†	25–35†	<10
UL	ND	ND
Females, 19 through 44 y		
AI* or AMDR†	20–35†	<10
UL	ND	ND
Pregnant females, < 19 y		
AI* or AMDR†	25–35†	<10
UL	ND	ND
Pregnant females, 19 through 44 y		
AI* or AMDR†	20–35†	<10
UL	ND	ND
Lactating females, < 19 y		
AI* or AMDR†	25–35†	<10
UL	ND	ND
Lactating females, 19 through 44 y		
AI* or AMDR†	20–35†	<10
UL	ND	ND

[a]The dietary guidance for saturated fat presented in Table F-1D is from the American Heart Association (Krauss et al., 1996; AHA, 2004) and the *Dietary Guidelines for Americans* (USDA/DHHS, 2000; DHHS/USDA, 2005). The dietary guidance for saturated fat from the DRI report is to consume amounts as low as possible while consuming a nutritionally adequate diet (IOM, 2002/2005).

[b]The dietary guidance for monounsaturated fatty acids presented in Table F-1D is from the American Heart Association (Krauss et al., 1996).

[c]The AIs for *n*-6 fatty acids shown in Table F-1D are for linoleic acid (18:2, *n*-6). The AMDR for total *n*-6 fatty acids is 5 to 10% of food energy intake with at least 90% as linoleic acid and up to 10% from longer-chain *n*-6 fatty acids (IOM, 2002/2005). For *n*-6

Monounsaturated Fatty Acids[b] (% of food energy)	Polyunsaturated Fatty Acids (g/d)	*n*-6 Fatty Acids[c] (g/d)	*n*-3 Fatty Acids[d] (g/d)	*Trans* Fatty Acids[e]	Cholesterol[f] (mg/d)
≤ 15	4.4*	4.4*	0.5*	limit	<300 mg
ND	ND	ND	ND	ND	ND
≤ 15	4.6*	4.6*	0.5*	limit	<300 mg
ND	ND	ND	ND	ND	ND
≤ 15	7.0*	7.0*	0.7*	limit	<300 mg
ND	ND	ND	ND	ND	ND
≤ 15	10.0*	10.0*	0.9*	limit	<300 mg
ND	ND	ND	ND	ND	ND
≤ 15	11.0*	12.0*	1.1*	limit	<300 mg
ND	ND	ND	ND	ND	ND
≤ 15	12.0*	12.0*	1.1*	limit	<300 mg
ND	ND	ND	ND	ND	ND
≤ 15	13.0*	13.0*	1.4*	limit	<300 mg
ND	ND	ND	ND	ND	ND
≤ 15	13.0*	13.0*	1.4*	limit	<300 mg
ND	ND	ND	ND	ND	ND
≤ 15	13.0*	13.0*	1.3*	limit	<300 mg
ND	ND	ND	ND	ND	ND
≤ 15	13.0*	13.0*	1.3*	limit	<300 mg
ND	ND	ND	ND	ND	ND

polyunsaturated fatty acids, the first double bond from the methyl end is at the sixth carbon atom.

[d]The AIs for *n*-3 fatty acids shown in Table F-1D are for α(alpha)-linolenic acid (18:3, *n*-3). The AMDR for total *n*-3 fatty acids is 0.6 to 1.2% of food energy intake with at least 90% as α(alpha)-linolenic acid and up to 10% from longer-chain *n*-6 fatty acids (IOM, 2002/2005). For *n*-3 fatty acids, the first double bond from the methyl end is at the third carbon atom.

[e]The dietary guidance from the DRI report for *trans* fatty acids is to consume in amounts as low as possible while consuming a nutritionally adequate diet (IOM, 2002/2005). The term *trans fatty acids* refers to unsaturated fatty acids that contain at least one double bond in the

continues

TABLE F-4 Continued

trans configuration (that is, with carbon atoms on opposite sides of the longitudinal axis of the double bond).

*f*The dietary guidance for cholesterol presented in Table F-1D is from the American Heart Association (Krauss et al., 1996; AHA, 2004) and the *Dietary Guidelines* (USDA/DHHS, 2000; DHHS/USDA, 2005). The dietary guidance for cholesterol from the DRI report is to consume an amount as low as possible while consuming a nutritionally adequate diet (IOM, 2002/2005).

*g*The American Academy of Pediatrics recommends that whole milk, rather than reduced fat milk, be consumed by children ages 13 through 23 mo (AAP, 2004). Dietary guidance from AAP to avoid atherogenic diets during childhood were applied to children 2 years of age and older (AAP, 1992b, 1998). The AAP recommendations, when taken out of context, might be interpreted that there should be no restriction of fat intake for children age 1 y. However, the AAP recommendation is not in conflict with the DRI reports that recommend a transitioning of dietary fat from the high fat diet of infancy (55% of energy from fat for ages 0 through 5 mo; 40% of energy from fat for ages 6 through 11 mo) to the moderate fat diet of childhood (25 to 35% of energy from fat) (IOM, 2002/2005). Thus it is appropriate to follow the AMDR recommendations for dietary fat to contribute 30 to 40% of food energy intake for children ages 13 through 23 mo (IOM, 2002/2005).

NOTES FOR TABLE F-4: AI = Adequate Intake, used when necessary, indicated by an asterisk (*); AMDR = Acceptable Macronutrient Distribution Range, indicated by a dagger (†); ND = not determined; UL = Tolerable Upper Intake Level. An AMDR for total fat has not been set for infants; however, the AIs for total fat (indicated by an asterisk [*]) represent a high fat diet as indicated by the usual intake of total fat as the percentage of food energy intake for breast-fed infants (indicated by a double dagger [‡]).

DATA SOURCES: The American Heart Association (Krauss et al., 1996; AHA, 2004); and the Institute of Medicine (IOM, 2002/2005) (see IOM, 2005b).

G

Biographical Sketches of Committee Members

BARBARA L. DEVANEY, Ph.D., is an economist and senior fellow at Mathematica Policy Research, Inc. (Princeton, NJ). Dr. Devaney's expertise is in the areas of food assistance and child health programs and the nutrition policies that affect these programs. She has over 20 years of experience in designing and conducting program evaluations and has conducted numerous studies of the WIC Program, the Food Stamp Program, and school nutrition programs. She was the project director for the Feeding Infants and Toddlers Study (FITS) for the Gerber Products Company in which data on food and nutrient intakes of infants and toddlers were collected and analyzed (2001–2003). In addition, Dr. Devaney conducted analyses of the effects of WIC participation on infant mortality and very low birth-weight among Medicaid newborns, and has investigated the infant feeding practices, and health care utilization of infant WIC participants. Dr. Devaney has served on several Institute of Medicine panels including the Subcommittee on Interpretation and Uses of Dietary Reference Intakes and the Committee on Scientific Evaluation of the WIC Nutrition Risk Criteria. Dr. Devaney earned a B.A. degree in economics from Mount Holyoke College (South Hadley, MA) and a Ph.D. degree in economics from the University of Michigan.

GEORGE M. GRAY, Ph.D., is lecturer on risk analysis in the Department of Health Policy and Management in the School of Public Health at Harvard University. Dr Gray is also Executive Director of the Harvard Center for Risk Analysis. His primary research interests are risk characterization and risk communication (with an emphasis on agriculture, food safety, and

chemicals in the environment). Other interests include the scientific basis of human health risk assessment, application of risk assessment to policy decisions, and risk/risk tradeoffs in risk management. Dr. Gray receives research support from numerous sources, including the National Food Processors Association Research Foundation. Dr. Gray has served on various panels including the Risk Assessment Task Force of the Society of Toxicology, the Food Advisory Committee of the Center for Food Safety and Applied Nutrition (CFSAN) at FDA, and the National Advisory Environmental Health Science Council of NIEHS. Dr. Gray earned a B.S. degree from the University of Michigan and M.S. and Ph.D. degrees from the University of Rochester.

GAIL G. HARRISON, Ph.D., is professor in the Department of Community Health Sciences at the School of Public Health of the University of California—Los Angeles (UCLA). Dr. Harrison is also Senior Research Scientist in the UCLA Center for Health Policy Research and associate director of the Program for Healthy and At-Risk Populations in the Division of Cancer Prevention and Control, UCLA/Jonsson Comprehensive Cancer Center. Dr. Harrison's interests include pediatric and maternal nutrition, dietary and nutritional status assessment, food security, and international health and nutrition. Her recent research interests include assessment of variation in dietary intake patterns, cancer-protective interventions, estimation of dietary content of isoflavones, and changes in diet and prevalence of chronic diseases in developing countries. Dr. Harrison has been a member of the Food and Nutrition Board and has served on several Institute of Medicine panels including the Committee on Implications of Dioxin in the Food Supply, the Committee on Scientific Evaluation of WIC Nutrition Risk Criteria, the Committee on Food Consumption Patterns, and the Committee on International Nutrition Programs. She has served as a technical consultant to the WIC program of the Public Health Foundation of Los Angeles and to USDA's Agricultural Research Service and Economic Research Service. Dr. Harrison earned a B.S. degree in foods and nutrition from the University of California—Santa Barbara, an M.N.S. (nutritional sciences) degree from Cornell University, and a Ph.D. degree in biological anthropology at the University of Arizona. She was elected to the Institute of Medicine in 2003.

HELEN H. JENSEN, Ph.D., is professor in the Department of Economics in the College of Agriculture at Iowa State University (ISU). Dr. Jensen is also head of the Food and Nutrition Policy Division in the Center for Agricultural and Rural Development (CARD) at ISU. Her research focuses on nutrition policies, food assistance programs, food security issues, analysis of food demand, food hazard control options, food safety (with empha-

sis on the economics of food safety), and health economics. Dr. Jensen's current research includes participation in an evaluation of the nutrition education component of the WIC Program; her part in this competitive grant to the Iowa Department of Public Health from the Food and Nutrition Service of the USDA is analysis of the cost-effectiveness of the nutrition education intervention. Dr. Jensen currently serves on the Committee on National Statistics' (CNSTAT) Panel to review USDA's Measurement of Food Insecurity and Hunger and has served on several National Research Council panels including the Committee on Assessing the Nation's Framework for Addressing Animal Diseases (where she is currently serving), the Committee on Biological Threats to Agricultural Plants and Animals, and the Panel on Animal Health and Veterinary Medicine. Dr. Jensen earned a B.A. degree in economics from Carleton College (Northfield, MN), an M.S. degree in agricultural and applied economics from the University of Minnesota, and a Ph.D. degree in agricultural economics from the University of Wisconsin—Madison.

LUCIA L. KAISER, Ph.D., R.D., is Cooperative Extension Specialist in the Department of Nutrition in the College of Agriculture and Environmental Sciences at the University of California—Davis. Dr. Kaiser's research interests include the impact of acculturation and food security on the child/parent feeding relationship among Latinos and evaluation of nutrition education. She served in WIC programs in California for six years as supervising public health nutritionist and regional nutrition consultant. Dr. Kaiser currently administers a USDA/ Economic Research Service Small Grants Program to examine the impact of food assistance on nutrition. Dr. Kaiser earned a B.S. degree in biology from the College of William and Mary, and M.S. and Ph.D. degrees in nutrition from the University of California—Davis.

JEAN D. KINSEY, Ph.D., is professor of consumption economics in the Department of Applied Economics in the College of Agricultural, Food and Environmental Sciences at the University of Minnesota. Dr. Kinsey is also the Co-Director of The Food Industry Center that focuses on how various retailers in the food industry serve consumers and how retailers and suppliers interact in food distribution channels. The Food Industry Center at the University of Minnesota is one of 13 industry study centers funded by the nonprofit Sloan Foundation. Dr. Kinsey's research interests include food consumption trends, consumer buying behavior, food safety and consumer confidence, demographic changes in households, food industry structure, trends in food distribution and retail sales, effects of electronic technology on efficiency in retail outlets, economic effects of health and safety regulations, and regulation in the food industry. Dr. Kinsey earned a B.A. degree

in home economics from St. Olaf College (Northfield, MN) and M.S. and Ph.D. degrees from the University of California—Davis in consumer economics and agricultural economics, respectively. Dr. Kinsey was appointed a resident fellow at the National Center for Food and Agricultural Policy, Resources for the Future (1986–1987, Washington, DC); a distinguished fellow of the American Council on Consumer Interests (1997); and a fellow of the American Agricultural Economics Association (2000).

SUZANNE P. MURPHY, Ph.D., R.D., is a research professor at the Cancer Research Center of Hawaii at the University of Hawaii (Honolulu, HI) and director of the Nutrition Support Shared Resource at the center. Dr. Murphy's research interests include dietary assessment methodology, development of food composition databases (with emphasis on inclusion of ethnic foods), communication of nutrition principles (with emphasis on multicultural populations), and nutritional epidemiology of chronic diseases (with emphasis on cancer and obesity). She has served as a member of the National Nutrition Monitoring Advisory Council and as vice-chair of the 2000 Dietary Guidelines Advisory Committee. Dr. Murphy has served on several Institute of Medicine panels including the Subcommittee on Interpretation and Uses of Dietary Reference Intakes, which she chaired for two years; the Subcommittee on Upper Safe Reference Levels of Nutrients, and the Panel on Calcium and Related Nutrients; Dr. Murphy earned a B.S. degree in mathematics from Temple University, Philadelphia, an M.S. degree in molecular biology from San Francisco State University, and a Ph.D. degree in nutrition from the University of California—Berkeley.

ANGELA M. ODOMS-YOUNG, Ph.D., is an assistant professor of Public and Community Health in the School of Allied Health Professions of the College of Health and Human Sciences at Northern Illinois University (Dekalb, IL). Prior to her current position, Dr. Odoms-Young completed a Family Research Consortium Postdoctoral Fellowship focused on understanding family processes in diverse populations at the Pennsylvania State University and University of Illinois—Urbana-Champaign and a Community Health Scholars Fellowship in community-based research at the University of Michigan School of Public Health. Her research and teaching focus on race, poverty, and health; community-based participatory research; obesity prevention and management; religion and health (with emphasis on health issues impacting Muslim women); minority health (with emphasis on health disparities in minority populations and health perceptions among low-income families); health promotion (with emphasis on the lay health advisor model); and health education (with emphasis on communicating nutrition principles to minority families). Dr. Odoms-Young's research experience included participation in Welfare, Children, and Families: A Three-

City Ethnographic Study where she was interested in the influence of poverty on the nutrition and health beliefs of low-income women with young children. Dr. Odoms-Young earned a B.S. degree in foods and nutrition from the University of Illinois—Urbana/Champaign and M.S. and Ph.D. degrees from Cornell University in human nutrition and community nutrition, respectively.

KAREN E. PETERSON, Sc.D., R.D., is Associate Professor and Director of Public Health Nutrition in the Department of Nutrition with a joint appointment in the Department of Society, Human Development and Health in the School of Public Health at Harvard University. Her research focuses on biosocial and environmental determinants of body size and growth during critical periods of behavioral and biologic adaptation and the application of these principles to the design and evaluation of surveillance systems and of community-based interventions addressing overweight and undernutrition among low-income, multiethnic populations in the United States and Latin America. Dr. Peterson served for seven years in the Massachusetts WIC Program as a nutritionist and as a program director. Her current research includes examination of dietary behaviors on weight statue of children and new mothers enrolled in WIC. Dr. Peterson earned a B.S. degree in foods and nutrition from the University of Utah, completed her dietetics internship at Peter Bent Brigham Hospital, Boston, MA, and received a D.Sc. degree in nutrition from the School of Public Health at Harvard University. She chaired the CDC-funded "Building Comprehensive Obesity Surveillance" national workgroup and is currently President of the Maternal and Child Health Council of the Association of Schools of Public Health and President of the Graduate Faculties of Public Health Nutrition.

ANNA MARIA SIEGA-RIZ, Ph.D., R.D., is associate professor in the Department of Maternal and Child Health and the Department of Nutrition in the School of Public Health at the University of North Carolina (UNC)—Chapel Hill. Dr. Siega-Riz is a fellow at the Carolina Population Center and director of the Nutrition Epidemiology Core for the Clinical Nutrition Research Center in the Department of Nutrition also at UNC—Chapel Hill. Her research focuses on reproductive and minority health (with emphasis on maternal nutritional status and how it affects birth outcomes). Dr. Siega-Riz expertise includes maternal and early childhood health, maternal nutrition (with emphasis on iron, zinc, folate, and vitamin C), reproductive epidemiology, and effects of participation in the WIC Program. She approaches her research from a multidisciplinary team perspective as an effective way to address complex problems such as prematurity, fetal programming, and racial disparities in reproductive outcomes. Dr. Siega-Riz earned

a B.S.P.H. degree in nutrition from the School of Public Health at the UNC—Chapel Hill; an M.S. degree in food, nutrition, and food service management from UNC—Greensboro; and a Ph.D. degree in nutrition and epidemiology from the School of Public Health at UNC—Chapel Hill. She received the Mary C. Egan Award (2000; from the American Public Health Association—Food and Nutrition Section) which recognizes professional contributions and outstanding services of public health nutritionists.

VIRGINIA A. STALLINGS, M.D., is the Jean A. Cortner Endowed Chair in Pediatric Gastroenterology, director of the Nutrition Center, and deputy director of the Joseph Stokes Jr. Research Institute at Children's Hospital of Philadelphia. Dr. Stallings is also professor of pediatrics at the University of Pennsylvania School of Medicine. Her research interests include pediatric nutrition, nutrition science (with emphasis on evaluation of dietary intake and energy expenditure), and chronic disease (with emphasis on nutrition-related issues of children and adolescents with chronic illnesses). Dr. Stallings is on the board of the Dannon Institute and serves as a consultant on pediatric nutrition and educational issues to the Bristol-Myers/Squibb Foundation and Mead-Johnson Nutritionals. Dr. Stallings has served on several Institute of Medicine panels including the Food and Nutrition Board, the Committee on the Scientific Basis of Dietary Risk Eligibility Criteria for the WIC Program, and the Committee on Nutrition Services for Medicare Beneficiaries. Dr. Stallings received a B.S. degree in nutrition and foods from Auburn University, an M.S. degree in human nutrition and biochemistry from Cornell University, and an M.D. degree from the University of Alabama School of Medicine. Her medical training was completed with a pediatric residency at The University of Virginia and a pediatric nutrition fellowship at the Hospital for Sick Children, Toronto, Ontario. Dr. Stallings is board certified in pediatrics and clinical nutrition.

CAROL WEST SUITOR, Sc.D., is a nutrition consultant is a nutrition consultant who recently has worked with the World Health Organization, Abt Associates, and the Year 2005 Dietary Guidelines Advisory Committee. Pervious consulting work includes assisting the March of Dimes' Task Force for Nutrition and Optimal Human Development; assisting the year 2000 Dietary Guidelines Advisory Committee; studying school children's diets in conjunction with Mathematica Policy Research Inc.; and serving on the Advisory Committee for the Harvard School of Public Health's Dietary Intake Grant (ERS/USDA). Dr. Suitor served as study director for the Institute of Medicine for 8 years; studies included Nutritional Status During Pregnancy and Lactation (4 studies), Scientific Evaluation of WIC Nutrition Risk Criteria, and Dietary Reference Intakes on the B Vitamins and Choline. At Georgetown University in the National Center for Education in

Maternal and Child Health, Dr. Suitor managed projects on maternal and child nutrition. At the Harvard School of Public Health, she worked on the development and testing of instruments for collecting dietary information from low-income women. Dr. Suitor has served on several Institute of Medicine panels including the Committee on the Scientific Basis for Dietary Risk Eligibility Criteria for WIC Programs and the Committee on Evaluation of USDA's Methodology for Estimating Eligibility and Participation for the WIC Program. Dr. Suitor earned a B.S. degree in food and nutrition from Cornell University, an M.S. degree in nutrition from the University of California—Berkeley, and M.S. and Sc.D. degrees in maternal and child health from the School of Public Health at Harvard University.

H

Open Sessions

PRELIMINARY OPEN SESSION

February 26, 2004
The National Academy of Sciences
2101 Constitution Avenue, NW
Washington, DC

Suzanne Murphy, Committee Chair, moderated discussion with representatives from:

U. S. Department of Agriculture

- Dawn Aldridge, Executive Assistant; Office of the Secretary; Food, Nutrition and Consumer Services
- Jay Hirschman, Director, Special Nutrition Staff; Office of Analysis, Nutrition, and Evaluation; Food and Nutrition Service
- Laura Castro, Branch Chief, Special Nutrition Analysis; Office of Analysis, Nutrition, and Evaluation; Food and Nutrition Service
- Tracy Von Ins, Program Analyst; Office of Analysis, Nutrition, and Evaluation; Food and Nutrition Service
- Patricia Daniels, Director, National WIC Program; Food and Nutrition Service
- Jim Schaub, Director, Office of Risk Assessment and Cost-Benefit Analysis (ORACBA)

DISCUSSION OF METHODOLOGICAL APPROACHES

May 18, 2004
The Keck Center of the National Academies
500 Fifth Street, NW
Washington, DC

Suzanne Murphy, Committee Chair, moderated discussion with representatives from:

U. S. Department of Agriculture

- Dawn Aldridge, Executive Assistant; Office of the Secretary; Food, Nutrition and Consumer Services
- Tracy Von Ins, Program Analyst; Office of Analysis, Nutrition, and Evaluation; Food and Nutrition Service

National WIC Association

- Cecilia Richardson, MS, RD, LD; Nutrition Programs Director
- Jan Kallio, MS, RD; Vice President, Board of Directors, NWA; Asst. Director, Nutrition Services, WIC Program, Massachusetts Department of Public Health, Boston, MA

Local WIC State Agency

- Kathleen Knolhoff; Director, WIC Administration; Maryland Department of Health and Mental Hygiene
- Mary Dallavalle, MS, RD, LD; Nutrition Education Specialist, Office of the Maryland WIC Program

CALIFORNIA PANEL DISCUSSIONS

July 22, 2004
University of California–Los Angeles Campus
Neuropsychiatric Institute (NPI) Auditorium
740 Westwood Plaza
Los Angeles, CA

Possibilities for Incentivizing Breastfeeding
Kiran Saluja, Deputy Director, Public Health Foundation Enterprises WIC Program

Impact of Changes in the WIC Food Packages on WIC Agencies
Moderated by Suzanne Murphy, Committee Chair:

- Linnea Sallack, Director, California WIC Program
- Margaret Tate, Director, Arizona WIC Program

- Fatima Hoger, Nutrition and Breastfeeding Coordinator, Alaska WIC Program
- Eloise Jenks, Executive Director, WIC Program, Public Health Foundation Enterprises, Los Angeles
- Deana Herman, School of Public Health, University of California—Los Angeles
- Shirlee Runnings, Program Director, Human Resources Council, Mother Lode WIC Program, Amador and Calaveras Counties, California
- Douglas Greenaway, Executive Director, National WIC Association

Impact of Changes in the WIC Food Packages on Vendors
Moderated by Patricia Gradziel, Food Policy Unit, Nutrition Policy and Quality Improvement Section, California WIC Branch:

- Trisha Belisle, Manager, Retail Technology, Cub Foods, Stillwater, Minnesota
- Tina Luisoni, Training Specialist, Ralph's Foods, Los Angeles, California
- Rich Kuchinski, Training Manager, Raley's Foods, West Sacramento, California
- Don Bachman, Grocer Supervisor, Superior Super Warehouse, Santa Fe Springs, California
- Michael Amiri, Nutrición Fundamental, Los Angeles, California

Testimony by individuals or representatives from organizations:

- Douglas Greenaway, National WIC Association
- Alexis Forbes, Post/Kraft Foods
- Luz Amador, Garuda International, Inc.
- Zoey Goore
- Diane Woloshin, California WIC Association
- Evie Hansen, National Seafood Educators

WASHINGTON, DC PUBLIC FORUM

September 9, 2004
The Keck Center of the National Academies
500 Fifth Street, NW
Washington, DC

This session consisted of testimony by individuals or representatives from organizations:

- Cecilia Richardson representing the National WIC Association
- Nicholas Pyle representing Welch's

- Tracy Fox representing the Produce for Better Health Foundation
- Luz Amador representing Garuda International, Inc.
- Margaret Tate representing the USDA National Council on Maternal, Infant and Fetal Nutrition
- Karen Kafer representing the National Dairy Council
- Geraldine Henchy representing the Food Research and Action Center (FRAC)
- Joy Johanson representing the Center for Science in the Public Interest (CSPI)
- Regina Hildewine representing the National Food Processors Association
- Lawrence Kern representing the United Fresh Fruit and Vegetable Association
- Mike Wootton representing Sunkist Growers, Inc.
- Jessica Donze Black representing the American Dietetic Association
- Sandra Trinidad
- Maria Prince
- Diana Zuckerman representing the National Center for Policy Research for Women and Families
- Paul Weller representing the Apple Processors Association
- Jim Heimbach representing the U.S. Tuna Foundation and the National Fisheries Institute
- Maya Edmonds representing Soyfoods Association of North America
- Berry Friesen representing the Pennsylvania Hunger Action Center

I

Acronyms and Abbreviations

~	Approximate amount
*	Asterisk
†	Dagger
‡	Double dagger
§	Section
α	Alpha
β	Beta
AAP	American Academy of Pediatrics
ADA	American Dietetic Association
AHA	American Heart Association
AI	Adequate Intake
AMDR	Acceptable Macronutrient Distribution Range
ARS	Agricultural Research Service, U.S. Department of Agriculture
ASCN	American Society for Clinical Nutrition
AT	Alpha-tocopherol
ATE	Alpha-tocopherol equivalents
ATSDR	Agency for Toxic Substance and Disease Registry, U.S. Department of Health and Human Services
BARC	Beltsville Agricultural Research Center, U.S. Department of Agriculture
BLS	U.S. Bureau of Labor Statistics
BMI	Body mass index

c	Cup or cups
C-SIDE	C compiler version of SIDE
ca.	Approximately (that is, the calculated amount)
cc	Cubic centimeter
CDC	Centers for Disease Control and Prevention, U.S. Department of Health and Human Services
CDD	Chlorinated dibenzo-*p*-dioxin
CFR	Code of Federal Regulations, U.S. Congress
CFSAN	Center for Food Safety and Applied Nutrition, U.S. Food and Drug Administration
CNPP	Center for Nutrition Policy and Promotion, U.S. Department of Agriculture
CPA	Competent Professional Authority
CSFII	Continuing Survey of Food Intakes by Individuals
d	Day or days
DFE	Dietary Folate Equivalents
DHEW	U.S. Department of Health, Education, and Welfare
DHHS	U.S. Department of Health and Human Services
DLC	Dioxin-like compounds
doz	Dozen or dozens
DQI	Dietary Quality Index
DQI-R	Dietary Quality Index Revised
DRI	Dietary Reference Intake
EAR	Estimated Average Requirement
EBT	Electronic benefit transfer
EER	Estimated Energy Requirement
EPA	U.S. Environmental Protection Agency
ERS	Economic Research Service, U.S. Department of Agriculture
et al.	*et alia* (that is, and others)
FASEB	Federation of American Societies of Experimental Biology
FDA	Food and Drug Administration, U.S. Department of Health and Human Services
FITS	Feeding Infants and Toddlers Study
fl oz	Fluid ounce or fluid ounces
FNB	Food and Nutrition Board, Institute of Medicine, The National Academies
FNDDS	Food and Nutrient Database for Dietary Studies

FNS	Food and Nutrition Service, U.S. Department of Agriculture
FSIS	Food Safety and Inspection Service, U.S. Department of Agriculture
FSRG	Food Surveys Research Group, U.S. Department of Agriculture
FY	Fiscal year
g	Gram or grams
GAO	U.S. General Accounting Office (became U.S. Government Accountability Office on July 7, 2004)
h	Hour or hours
HEI	Healthy Eating Index
Inadeq	Inadequate
IOM	Institute of Medicine, The National Academies
IRI	Information Resources, Inc., Chicago, IL
ISU	Iowa State University
IU	International Unit or International Units
IZiNCG	International Zinc Nutrition Consultative Group
kcal	Kilocalorie or kilocalories
kg	Kilogram or kilograms
lb	Pound or pounds
LSRO	Life Sciences Research Office
m	Meter or meters
mcg	Microgram or micrograms
mg	Milligram or milligrams
mL	Milliliter of milliliters
mo	Month or months
n	Sample size (e.g., number of individuals included in analysis sample)
na	Not applicable
N/A	Not available
NAS	National Academy of Sciences, The National Academies
NAWD	National Association of WIC Directors (currently National WIC Association)
NCC	Nutrition Coordinating Center, University of Minnesota

ND	Not determined
NDL	Nutrient Data Laboratory, U.S. Department of Agriculture
NDS-R	Nutrient Data System for Research
NFCS	Nationwide Food Consumption Survey
NHANES	National Health and Nutrition Examination Survey
NIH	National Institutes of Health, U.S. Department of Health and Human Services
no.	Number or numbers
NRC	National Research Council, The National Academies
NWA	National WIC Association (formerly National Association of WIC Directors)
oz	Ounce or ounces
oz equiv	Ounce equivalent
PA	Physical activity
PAL	Physical activity level
PHS	Public Health Service, U.S. Department of Health and Human Services
ppm	Parts per million
Pub. L.	Public Law, U.S. Congress
qt	Quart or quarts
RACC	Reference amounts customarily consumed per eating occasion
RAE	Retinol Activity Equivalent
RDA	Recommended Dietary Allowance
RMA	Recognized Medical Authority
SD	Standard deviation
SIDE	Software for Intake Distribution Estimation
SKU	Stock-keeping unit
SR-17	Standard Reference 17, Nutrient Data Laboratory, U.S. Department of Agriculture
tsp	Teaspoon or teaspoons
UL	Tolerable Upper Intake Level
U.S.	United States
USC	U.S. Code
USDA	U.S. Department of Agriculture

VRG	Vegetarian Resource Group
WHO	World Health Organization, United Nations
WIC	Special Supplemental Nutrition Program for Women, Infants, and Children, Food and Nutrition Service, U.S. Department of Agriculture
wk	Week or weeks
y	Year or years

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