

**APPENDIX E**  
**NUTRIENT AND FOOD CODING ANALYSIS**



This appendix describes (1) the software, nutrient database, and coding procedures used to code the information recorded on the meal and plate waste observation forms; (2) the quality assurance procedures used to review the coding; and (3) the methods used to analyze and report meal pattern compliance, food preferences, and most frequently served foods.

## **A. NUTRIENT CODING OF MEAL OBSERVATION AND PLATE WASTE FORMS**

### **1. Coding Software and Nutrient Database**

The University of Texas-Houston Health Science Center and the Agricultural Research Service (ARS), United States Department of Agriculture (USDA), collaborated in the development of the Food Intake Analysis System<sup>®</sup> 3.99 (FIAS). FIAS is a DOS-based software application that allows entry and nutrient analysis of dietary data.

As described in Appendix A, for each mealtime observed during Summer Food Service Program (SFSP) Implementation Study site visits, 5 or 10 plates were sampled for observation of foods served, and 10 plates were sampled for observation of foods wasted. Interviewers provided complete descriptions of each plate's foods and recorded the portion size or amount of each food served or wasted on meal observation and plate waste forms. Mathematica Policy Research, Inc. (MPR) hired two nutrition coders to code these forms. Before coding began, MPR sent the coders to a 2-day training class at the University of Texas, where they learned how to use FIAS.<sup>1</sup> The coders also completed additional practice exercises after the training, but before they began using FIAS to enter the study data.

Data from the forms were entered into FIAS's analysis program; the program uses the information on foods and portion sizes to calculate the nutrient content of each food reported as served or wasted. After this nutrient analysis was completed, FIAS produced ASCII files containing food codes and nutrients for each food served or wasted on each plate; these can be used with other database management and statistical software.

The FIAS 3.99 database consists of the Survey Nutrient Data Base (SNDB), developed by ARS and used in the 1998 Continuing Survey of Food Intakes by Individuals (CSFII) (Standard Reference (SR) Release 12; 1998). FIAS also includes a Primary Data Set (PDS), which consists of approximately 7,300 foods, and, for each food, a recipe and 49 nutrient values, including fatty acids.

The FIAS database has two important limitations. First, folate values in FIAS 3.99 include updated food composition data for cereal grains fortified with folic acid, but they do not distinguish between naturally occurring folate (food folate) and synthetic folic acid added during fortification. Dietary Folate Equivalents (DFEs) must be used to fully assess the most current Recommended Dietary Allowance (RDA) for folate (National Academy of Sciences, Institute of Medicine 1998). DFEs take into consideration the differing bioavailability from naturally

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<sup>1</sup>Both coders had background in nutrition.

occurring folate in foods and from synthetic folate in fortified foods (as well as from dietary supplements); thus the new RDA is expressed in terms of micrograms (mcg) of DFEs.<sup>2</sup>

Comparing the FIAS-based estimates of mean folate (mcg of total folate, unadjusted for food folate versus synthetic folate) with the current RDA for folate (expressed as DFEs) provides a lower bound for the percentage of the RDA level provided by SFSP foods. Some of the foods served at SFSP meals are fortified with folic acid (for example, cereals and breads), and folic acid contributes more to DFEs than does food folate; thus, the FIAS folate values would be adjusted upward if they were converted to DFEs. If data were available to adjust the folate values in the SFSP meals to produce DFEs, then the mean folate value would be higher. Thus, SFSP meals actually provide a higher percentage of the RDA than is reported here.

The second FIAS 3.99 limitation occurs because total vitamin A activity is expressed in international units (IUs) and retinol equivalents (REs); provitamin-A carotenoids are expressed in terms of REs. The Institute of Medicine's Dietary Reference Institute committee recommended the use of a new method of calculating vitamin A activity, from the previous method based on individual carotenoids, to a new unit based on Retinol Activity Equivalents (RAEs) (National Academy of Sciences, Institute of Medicine, 2001).<sup>3</sup> The revised RDA for vitamin A is based on RAEs, but the FIAS 3.99 database produces REs; thus, because some proportion of the foods SFSP provide carotenoids with a lower RAE value than RE value, the comparisons of mean vitamin A provided in SFSP foods with the RDA will overestimate the percentage of the RDA met.

## 2. Initial Data Review

After receiving the meal observation and plate waste forms from the field interviewers, MPR survey staff in Princeton, New Jersey, copied them and sent the originals to MPR's Washington, DC, office for nutrient coding. Nutrition coders in the Washington office logged in the forms and reviewed them for completeness. In addition, Dr. Ronette Briefel, the senior project nutritionist, reviewed the forms completed during each interviewer's initial site visits in order to provide feedback to each interviewer early in the data collection period. She also reviewed additional site forms as necessary, to answer questions arising during coding.

Throughout the data collection period, the interviewers received additional training on frequently recurring meal recording issues. The training was provided through periodic mailings and telephone calls.

Nutrition coders who had questions after receiving the observation and plate waste forms or whose forms lacked completed information sent data retrieval forms to field coordinators. The

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<sup>2</sup>To calculate the DFE, it is necessary to have separate values for naturally occurring food folate and for synthetic folic acid added to food:  $\text{mcg DFE} = \text{mcg food folate} + (1.7 \text{ times mcg folic acid})$  (National Academy of Sciences, Institute of Medicine 1998).

<sup>3</sup>Darkly colored, carotene-rich fruits and vegetables, such as carrots, sweet potatoes, and broccoli, provide half as much vitamin A as previously estimated.

field coordinators, in turn, telephoned the interviewers to receive answers to the coders' questions. Interviewers sometimes were able to provide the missing information. In some cases, however, they were unable to recall the information (for example, the type of milk served); in other cases, they had not been able to observe it (for example, whether a sandwich had condiments). The nutrition coders used the coding guidelines developed by the study nutritionists to address incomplete information.

### **3. Coding Guidelines**

The nutrition research staff worked with the nutrition coders to develop coding guidelines for this study (Table E.1). The guidelines were adapted from guidelines currently used in national food consumption surveys. To illustrate how the guidelines worked, consider the following example, on developing guidelines for chocolate milk. FIAS has a "Not Further Specified" (NFS) option to be used when the information on the food consumed was extremely limited, and the coders needed guidance on when to use that option. Because FIAS did not include 1-percent chocolate milk in the database, but this was commonly reported, the coders coded 1-percent chocolate milk as the recipe, "chocolate syrup, low-fat milk added." They used the recipe, rather than FIAS's chocolate milk NFS option, because the recipe provided a more accurate nutrient profile.

To make coding decisions, the coders relied on information from the food labels and recipes sent in by interviewers, the coding guidelines, and consultation with the project's nutritionists, Dr. Briefel and Ms. Teresa Zavitsky, as necessary. The nutritionists met weekly with the coders to review and resolve any coding problems or issues, and to ensure that the coders used the study's coding guidelines in a consistent fashion. Few recipes were received from the field interviewers, and the coders were able to match and code all of them to a food or recipe in the FIAS system.

### **4. Quality Assurance Procedures for Coding Work**

Several steps were taken to ensure the quality of the food and nutrient coding. All forms were reviewed for content and completeness by the coders and/or by one of the project's nutritionists. As coders entered the meals, they flagged and attached notes to items that raised questions; the questions were then answered by a nutritionist. In addition, a nutritionist reviewed the FIAS data for the first 12 sites, which represented almost 10 percent of all meals entered, and for a random 20 percent of the remaining sites. After all the data had been entered and reviewed, data entry errors that had been flagged by FIAS, such as duplicate site numbers or missing information, were corrected, and an analysis program was run to produce ASCII files.

Finally, to catch any errors that had escaped FIAS's flagging procedure, a nutritionist examined the output for each meal for such measures as the range in the number of foods and the calories per plate served for the same meal at the same site. Substantial differences between the number of foods or the total number of calories on one plate relative to others at a site signaled the nutritionist to check for data entry errors by comparing the original meal form with information entered into FIAS. The data were considered to be clean and ready for final food and nutrient analysis through FIAS only after all outliers were checked and corrected.

TABLE E.1

## NUTRIENT CODING GUIDELINES USED IN THE SFSP IMPLEMENTATION STUDY

**A. General Rules**

1. If interviewer coded 10 standardized meals in error and they are all identical, only code 5 meals for Meal Observation.
2. Do not code food items brought from home.
3. Code all condiments and items added to food.

**B. Foods Missing in FIAS Database**

1. Apple without peel (use apple with peel), #63101000
2. 1-percent (low fat) chocolate milk and 1-percent (low fat) strawberry milk (use syrup added to 1-percent milk), #11513600

**C. Coding Meals—Food Descriptions<sup>1</sup>**

1. Orange juice—use “canned, bottled, or in a carton, unsweetened, 100% juice,” #61210220, if not specified.
2. Shredded cheese used as a topping or in a Mexican dish, code as natural, prepared cheese, #14104010
3. Assume canned fruits and vegetables unless specified as fresh.
4. According to the USDA database,
  - Beef, ground, extra-lean, and raw:** ~17% fat (g/100g)
  - Beef, ground, lean, raw:** ~21% fat (g/100g)
  - Beef, ground, regular, raw:** ~27% fat (g/100g)
 FIAS does not list ground beef by % fat, but rather by its classification (extra lean, lean, regular) in their database. Therefore, if the interviewer recorded the % fat, use the following ranges to classify the ground beef in FIAS:
  - Ranges:    ≤19% would be classified as **extra-lean**;
  - ≥20 and <25% as **lean**;
  - and ≥25% as **regular**.
5. Code American cheese as processed, #14410200, if NFS.
6. Code “Corn, yellow” if corn NFS.

**D. Coding Meals—Portion Sizes**

1. Height of hamburger buns—code as 1.50 inches if not further specified (NFS). Otherwise, code as #51150000 (Roll, white, soft) and choose hamburger roll under gram weights.
2. Height of chocolate chip cookies—code as 0.33 inches (1/3 of an inch) if NFS.
3. Assume ½ pint for milk and 4 fluid ounces for juice if NFS.
4. If peanut butter is spread on bread, and the amount of peanut butter is not given, record 2 Tbsp.
5. In general, use the FIAS coding guidelines for determining the portion size of unknown amounts of items added to foods or spread on bread.
  - a. Sandwiches:
 

1. Cheese (1 type): 1 oz	1. Meat (1 type): 2 oz
2. Cheese (2 types): ¾ oz each	2. Meat (2 types): 1½ oz each
3. Cheese (3 +): ½ oz each	3. Meat (3 +): 1 oz each
  - b. If peanut butter is spread on a graham cracker, and the amount of peanut butter is not given, record 1.5 Tbsp.

**E. Coding Plate Waste**

1. A few bites/sips left = code 1/8 left (in between visual code 0 and 1).
2. Visual code 4 (1-2 bites eaten) = code 7/8 of original portion size (or 0.875).
3. Code the measured amount listed (not the visual code); use the visual code for the proportion left if that is all the information you have.
4. Crumbs/syrup (e.g., from fruit cocktail)—code 0 waste because it is considered to be a negligible amount.

<sup>1</sup>Food codes listed are 8-digit codes in the USDA Survey Nutrient Database.

NFS = not further specified.

## **B. ANALYSIS OF FOODS AND FOOD GROUP INFORMATION**

Identifying SFSP foods provided and determining their contributions to meal pattern compliance, plate waste, and the nutrient content of the meals provided additional policy-relevant information (see Chapter V).

### **1. Most Frequently Served Foods**

It was necessary to manipulate the food code data in the analysis of the most frequently served foods (Tables V.5 and V.6). Similar foods were aggregated into broad categories to increase the sample size for each food category. A mixed dish sometimes was entered into FIAS as a single food; sometimes it was broken down into its component parts. The way it was entered in FIAS determined how it was categorized in the food group analysis. For example, if a burrito's components were entered (tortilla, cheese, meat, and so on), it would contain foods in several food categories. However, if the burrito that was served resembled a burrito that existed in FIAS's database, it would have been entered as "burrito" and counted in the "mixed dish" category. Therefore, the prevalence of "mixed dish" items is underestimated in Tables V.5 and V.6.

### **2. Analysis of Food Preferences**

As in the analysis of most frequently served foods, to analyze children's food preferences, it was necessary to apply or manipulate food codes. During the site supervisor interview, site supervisors were asked to list the food that children most liked in each of five categories, and to list the food children most disliked in those categories. (The categories are meat or meat alternate, vegetable, fruit, bread or bread alternate, and milk [see Table V.7]). To analyze these reported food preferences, it was necessary to aggregate foods into broader categories than those created by the FIAS food codes. Although similar to the food groups used in the analysis of frequently served foods, these food groups were less specific. In the case of fruit, for example, some site supervisors specified that the children at their site liked "fresh peaches" or "canned peaches" the most, whereas other site supervisors simply reported "peaches." It also was necessary to aggregate foods into broader categories in order to have sufficient sample sizes to produce meaningful estimates. Table E.2 lists the categories chosen, and the foods that fell into the categories.

### **3. Meal Pattern Compliance**

To compare the meals served by nonschool sponsors with the SFSP meal pattern requirements (as shown in Table E.3),<sup>4</sup> it was necessary to complete the following data processing steps:

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<sup>4</sup>School sponsors may use this meal pattern or the same menu planning approach they use for the school meals programs. Menu planning approaches used in the school meals programs are described in 7CFR 210.10 and 7CFR 220.8.

TABLE E.2

FOOD CATEGORIES USED TO GROUP SITE SUPERVISORS' REPORTS  
OF MOST/LEAST LIKED FOODS

**Bread**  
 Bagel  
 Biscuits  
 Buns—include hot dog, hamburger, hoagie  
 Bread—dark  
 Bread—corn  
 Bread—white; other (include soft)  
 Bread—egg  
 Breadsticks  
 Crackers—include Saltines  
 Croissants  
 Garlic bread  
 Muffins  
 Pita  
 Rolls—all types  
 English muffins  
 Dessert-type foods—cookies, donuts, cinnamon rolls

**Milk**  
 Chocolate milk—skim  
 Chocolate milk—1% (low fat)  
 Chocolate milk—2% (reduced fat)  
 Chocolate milk—whole  
 Chocolate milk—NFS  
 Powdered milk  
 White milk—skim  
 White milk—1% (low fat)  
 White milk—2% (reduced fat)  
 While milk—whole  
 White milk—NFS  
 Strawberry milk

**Fruit**  
 Apples—include fresh, apple sauce, apple crisp, canned  
 Apricots  
 Bananas  
 Canteloupe  
 Dried fruit  
 Grapefruit  
 Grapes  
 Kiwi  
 Mixed fruit cup—include fresh and canned, fruit cocktail  
 Nectarine  
 Oranges  
 Peaches—include fresh and canned  
 Pears—include fresh and canned  
 Pineapple—include fresh and canned  
 Plums—include fresh and canned  
 Raisins  
 Strawberries  
 Tangerines  
 Watermelon

**Vegetables**  
 Beans—include lima, black, baked, NFS  
 Bean salad  
 Broccoli  
 Cabbage—include cole slaw  
 Carrots  
 Celery  
 Corn  
 Cucumbers  
 Green beans and string beans  
 Mixed vegetables  
 Onions  
 Peas—include black-eyed peas  
 Peppers—include green, red  
 Potatoes—include French fries, Tator tots  
 Potatoes—include potato salad, mashed potatoes  
 Salad—include tossed salad, chef salad  
 Spinach  
 Squash  
 Tomatoes  
 Lettuce and tomatoes (on sandwich)



TABLE E.2 (continued)

<b>Meats</b>
Bacon
Beef—hot—include ground, chopped, roast, chicken fried steak, cubes, stew, NFS
Burger—include hamburger, cheeseburger
Chicken—include nuggets, strips, fried, cutlets
Chicken—hot—include breast, soup, baked, NFS
Chicken—sandwich—include chicken salad, patty
Corn dogs
Fish—other—include fried, baked, cod, sticks
Fish—tuna—include sandwiches, casseroles
Grilled cheese
Ham or pork—hot—include riblet, barbecued, chops, roast, NFS
Hot dogs
Italian dishes—include lasagna, ravioli, spaghetti
Meat loaf
Mexican—include tacos, quesadillas, burritos, fajitas, carne guisada, tostada, nachos
Macaroni & cheese
Peanut butter & jelly
Pizza
Pot pie
Refried beans
Sausage
Sloppy Joes—include barbecue, picadillo
Veggie patties, egg rolls
Ham
Turkey
Roast beef
Bologna
Salami
Deli sandwiches/combo meat sandwiches

NFS = Not Further Specified.

TABLE E.3

SFSP MEAL PATTERN REQUIREMENTS<sup>a</sup>

<b>Breakfast Meal Pattern</b>		
<i>Select all three components for a reimbursable meal</i>		
1 milk	1 cup	fluid milk
1 fruit/vegetable	½ cup	juice <sup>1</sup> and/or vegetable
1 grains/bread <sup>2</sup>	1 slice	bread or
	1 serving	cornbread or biscuit or roll or muffin or
	¾ cup	cold dry cereal or
	½ cup	hot cooked cereal or
	½ cup	pasta or noodles or grains
1 meat/meat alternate <sup>3</sup>		
<sup>1</sup> Fruit or vegetable juice must be full-strength. <sup>2</sup> Breads and grains must be made from whole-grain or enriched meal or flour. Cereal must be whole-grain or enriched or fortified. <sup>3</sup> The meat/meat alternate option at breakfast is optional.		
<b>Lunch and Supper Meal Pattern</b>		
<i>Select all four components for a reimbursable meal</i>		
1 milk	1 cup	fluid milk
1 fruit/vegetable	¾ cup	juice <sup>1</sup> and/or vegetable
1 grains/bread <sup>2</sup>	1 slice	bread or
	1 serving	cornbread or biscuit or roll or muffin or
	¾ cup	cold dry cereal or
	½ cup	hot cooked cereal or
	½ cup	pasta or noodles or grains
1 meat/meat alternate	2 oz	lean meat or poultry or fish <sup>3</sup> or
	2 oz	alternate protein product or
	2 oz	cheese or
	1 large	egg or
	½ cup	cooked dry beans or peas or
	4 Tbsp	peanut or other nut or seed butter or
	1 oz	nuts and/or seeds <sup>4</sup> or
	8 oz	yogurt <sup>5</sup>
<sup>1</sup> Fruit or vegetable juice must be full-strength. <sup>2</sup> Breads and grains must be made from whole-grain or enriched meal or flour. Cereal must be whole-grain or enriched or fortified. <sup>3</sup> A serving consists of the edible portion of cooked lean meat or poultry or fish. <sup>4</sup> Nuts and seeds may meet only one-half of the total meat/meat alternate serving and must be combined with another meat/meat alternate to fulfill the lunch or supper requirement. <sup>5</sup> Yogurt may be plain or flavored, unsweetened or sweetened.		

<sup>a</sup>School sponsors may use this meal pattern or the same menu planning approach they use for the school meals programs. Menu planning approaches used in the school meals programs are described in 7CFR210.10 and 7CFR220.8.

- Match FIAS output files to the Pyramid Servings Database for USDA Survey Food Codes. This step provided the number of pyramid servings in 100 grams of food, by food code.<sup>5</sup>
- Adjust the pyramid serving sizes to uniformly match the SFSP meal pattern requirements<sup>6</sup>
- Group foods and sum serving sizes for comparison with the meal pattern requirements. For example, to determine whether the fruit/vegetable requirement was met, all fruits and vegetables served on a plate were grouped, and the servings were summed.
- Compare each plate's foods and adjusted serving sizes with the SFSP meal pattern requirements for that meal. For each plate, the analysis assessed whether all components were present in the required amounts, and whether each component was present in the required amount. For plates that did not meet the requirements, the amounts of individual components were further broken down into one of two categories: (1) component present, but in an insufficient amount; or (2) component not present (see Tables V.8 and V.9).

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<sup>5</sup>Data are grouped by the 5 major pyramid food groups (grain, vegetable, fruit, dairy, and meat) and by selected subgroups, as well as by fats, added sugars, and alcohol (30 groups in all). The database was produced by the Community Nutrition Research Group (CNRG), Agricultural Research Service, USDA, and is available on the CNRG website, <http://www.barc.usda.gov/bhnrc/cnrg>.

<sup>6</sup>For example, based on the Pyramid Servings Database, three-quarters of a cup of 100-percent juice is considered one serving. However, for breakfast, the meal pattern requirement is one-half of a cup of 100-percent juice, which is two-thirds of the pyramid serving. Therefore, the original pyramid serving size amount was multiplied by a factor of 1.5 to account for this adjustment ( $0.67 * 1.5 = 1.0$ ).