Appendix C
Analytic Approach Used in Determining the Nutrient Content of Meals and Snacks Offered

This appendix describes three aspects of the approach used in analyzing the average nutrient content of meals and snacks offered by CACFP family child care home providers:

- Relationship of menu survey and meal observation data;
- Method for estimating portion sizes from meal observation data; and
- Calculation of nutrient measures from menu data and portion size estimates.

The method for estimating the impacts of tiering on nutrient measures is described in Appendix D.

Menu and Meal Observation Data

As noted in the Introduction, a self-administered menu survey was used to collect detailed information about the foods offered to children in CACFP family child care homes. A total of 501 providers in 1995 and 542 Tier 2 providers in 1999 supplied this information for at least 3 days during a specified 5-day period. Providers were asked to record complete lists of the foods and beverages offered at all meals and snacks, differentiated by the age groups defined by the CACFP meal pattern (1-2-year-olds, 3-5-year-olds, 6-12-year-olds; see Exhibit 1). Each recorded food item was then assigned a 7-digit food code from the USDA Survey Nutrient Database using the Food Intake Analysis System (FIAS), version 2.3.[1] (For example, 6121001 represents "Orange juice, freshly squeezed.") A copy of the Menu forms for Monday of the menu recording week and a copy of the Foods You Prepare form (which providers completed when they made foods from scratch) are provided in Appendix B.

To determine the nutrient content of the meals and snacks offered over the course of the sample week it was necessary to estimate the portion size of each menu item. On-site meal observations were conducted by trained field staff in a limited number of settings (89 providers in 1995, 97 Tier 2 providers in 1999) over the course of 2 days.[2] Observations were conducted during the same week covered by the menu survey. Prior to each meal and snack, observers weighed or measured five reference portions of each food and beverage that would be offered to children between the ages of 1 and 12. Reference portions were defined as the smallest serving unit, determined by the provider, that could be served to a child. For example, the reference portion for fresh apple slices might be *1 slice*, for beef and macaroni casserole: *1 spoonful*, for potato tots:

[1] The same version of the FIAS was used for coding and nutrient analysis to ensure that comparisons of 1999 and 1995 menu data would not be affected by technical differences in nutrient databases. A limitation of this approach is that using FIAS 2.3 may not yield the most accurate nutrient estimates for the 1999 menus since a newer version of the nutrient database was available (FIAS 3.98). For this reason, an analysis was conducted to compare the two versions of the database. Findings are reported in Appendix E.

[2] For a handful of providers—six in 1995, five in 1999—observation data were collected on 1 day only.

1 tot, and for a ham and cheese sandwich: *1 sandwich*.[3] Beverages were measured in fluid ounces. Five portions are weighed or measured to assure that an accurate average amount for the reference portion is recorded. Using visual estimation techniques, observers then tallied the number of reference portions of each menu item served to each child, including second helpings.[4] Children were identified by CACFP age group. An example of the meal observer's portion size recording and observation forms are included in Appendix B.

To apply these observations to the much larger set of menus, an imputation procedure (described below) was developed which related observed portion sizes to the known characteristics of the menu and the provider. These relationships were assumed to hold for the menus for which no observation data were collected.

Estimating Portion Sizes from Meal Observations

The nutrient measures analyzed in this report were constructed based on actual provider menus and estimated portion sizes. The estimates of the portion sizes were obtained from a set of econometric models, as described below.

Scope of the Models

A separate model of portion size was estimated for each of 10 *major food groups*, defined primarily by their function in satisfying CACFP meal patterns:

- Milk
- Meat/meat alternates
- Bread/bread alternates
- Fruits (including fruit juice, fruit desserts)
- Vegetables
- Entrée mixtures
- Noncreditable beverages
- Noncreditable desserts
- Condiments (noncreditable)
- Miscellaneous noncreditable

A noncreditable item is one that does not contribute to satisfying the CACFP meal pattern. If a food is creditable in some circumstances but not others (1995 vs. 1999, snack vs. lunch), then the observed portions of that food may appear in both creditable and noncreditable food groups. For example, eggs sometimes appear as miscellaneous noncreditable because meat/meat alternates are not creditable at breakfast.

There were some changes in the types of foods that were creditable in 1995 and 1999. In general, more items are creditable in 1999 than in 1995. The major changes for 1999, based on a comparison of the CACFP meal patterns and FNS guidance materials available in each year, are:

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[3] Reference portions were also established for the components of a sandwich (e.g., the ham, cheese, bread, and any added spread). This made it possible to record observed portions for individual children who refused one or more components.

[4] For additional information on the visual estimation technique used, and the reliability of estimates, see Fox *et al*., 1997.

- yogurt was creditable (meat/meat alternate) for lunch and supper
- cereals were creditable (bread/bread alternate) for lunch and supper
- granola bars were creditable (bread/bread alternate) for breakfast
- cakes, cupcakes and brownies were creditable (bread/bread alternate) for snacks
- corn/taco chips, hard pretzels, and bagel chips were creditable (bread/bread alternate) at all meals

Other changes in the items that were creditable for CACFP meals and snacks were not considered in the model because the associated food items were not observed (e.g., pie crust for snacks). There were also changes in the minimum required portion sizes for bread and bread alternates.[5]

The sources of the data used to estimate the models were the meal observations conducted in 1995 and 1999 (Tier 2 only). The unit of analysis was the observed portion of a menu item served to a particular child by the provider at a given meal or snack. All portions are measured in grams. Each of the models includes an indicator for whether the portion was observed in 1995 or 1999.

Explanatory Variables: the Typical Amount Consumed

A key explanatory variable in all of the portion size models (except that for milk) was the amount of a food typically eaten by children of a particular age at a specific meal. This amount was estimated based on data from the 1994-96 Continuing Survey of Food Intake by Individuals (CSFII). Since it is not known whether meals eaten in family child care homes are more like those eaten in the child's own home or away from home, all eating locations were included. For purposes of the estimation, foods were categorized into *minor food groups*, each consisting of a set of specific foods for which consumption and serving patterns were expected to be similar. For example, within the major food group of "fruits," the sample of menus included 190 specific foods (as defined by 7-digit USDA food codes). These were aggregated into 52 minor food groups, such as "applesauce." This particular minor food group included the following four foods reported on menus:

6310111	Applesauce, stewed apples, not specified if sweetened
6310112	Applesauce, stewed apples, unsweetened
6310113	Applesauce, stewed apples, with sugar
6310115	Applesauce with other fruits

Also included in this minor food group was a food which did *not* appear on the menus, but occurred in the CSFII:

6310114	Applesauce, stewed apples, with low-calorie sweetener.

After defining the minor food groups, an auxiliary model using the CSFII data was estimated for each of the major food groups, with the following functional form:

$$TYPICAL_{ijk} = \exp\left(b_0 + \sum_I b_{1i}\, MINOR_i + \sum_j \sum_k b_{2jk}\, (AGEGROUP_j \times MEALTYPE_k)\right),$$

[5] The sources of information on creditable foods and serving sizes for data collected in 1995 and 1999 were the FNS guidance materials available to CACFP participants at the time: *What's In a Meal? Crediting Foods in the Child Care Food Program*, Mountain Plains Region, Nutrition and Technical Services, Food and Nutrition Service, USDA, 1995 and *Crediting Foods in the Child and Adult Care Food Program*, MidAtlantic Region, Food and Nutrition Service, USDA, Revised January 1998 and May 1998.

where $TYPICAL_{ijk}$= amount (in grams) of food in minor food group *i* eaten by a child in age group *j* at meal type *k*;

$MINOR_i$ = indicator that portion was in minor food group *i;*

$AGEGROUP_j$ = indicator that portion was eaten by child in CACFP age group *j* (*j*=1,2,3 corresponding to 1-2-year-olds, 3-5-year-olds, 6-10-year olds); and

$MEALTYPE_k$ = indicator that portion was eaten at meal type *k* (*k*=1,2,3) corresponding to breakfast, lunch/dinner/supper, snack).

CSFII data on 11-12-year-olds were deleted before estimating the models. The 1994-96 CSFII is a representative sample of children in the United States, and therefore contains approximately equal numbers of children of each year of age. CACFP, in contrast, serves few 11-12-year-olds relative to 6-10-year-olds. It was therefore judged that a better estimate of typical amounts for 6-12-year-olds *in CACFP* could be obtained by excluding the oldest children in this age group.

Variations on this approach were required for several of the major food groups. First, the typical amount consumed by children was not used as an explanatory variable in the model for milk. The milk group is unique in that (a) it comprises only a few different foods, (b) variations in amounts offered are related much more strongly to children's ages and meal type (e.g., meal vs. snack) than to the specific food item, and (c) patterns of amounts offered in CACFP homes across age groups and meal types differ significantly from patterns of consumption by children in the CSFII. In particular, 1-2-year-olds in CACFP tend to be offered similar amounts of milk as 3-5-year-olds, and children are offered as much milk at breakfast as at other meals and snacks—neither of which pattern is seen in the CSFII. Furthermore, over 96 percent of observed milk portions in CACFP homes were unflavored types (i.e., whole, low-fat, skim, or "not further specified"), all of which tend to be offered in similar amounts—in contrast with portions of fruit, where some foods are typically offered in small portions (e.g., raisins) and others in much larger portions (e.g., watermelon). The approach for milk was therefore to include explicitly in the model indicators for types of milk and for age groups interacted with meal types rather than the "typical" amount consumed.

Two other food groups required modifications to the model because they comprised more than one kind of food. First, an indicator for juice was added to the model for fruit. (Full-strength fruit juices were included in this major food group because they fulfill the same CACFP requirement.) Second, the "miscellaneous noncreditable" group, consisting of only 156 portion observations, comprised a wide variety of food types: bacon, sausage, eggs, peanut butter, and cheese (which are noncreditable at breakfast), and snack foods such as popcorn and potato chips. To avoid estimating separate models for each tiny category, these foods were all grouped together and indicators were allowed in the model for each type: breakfast meats, eggs, cheese, and peanut butter, with snack foods being the excluded category.

The final food group for which the "typical" amount offered was not sufficient to distinguish among portions was vegetables. Here the issue was that one highly popular subgroup of food, namely french fries and potato tots, tended to be offered in substantially larger portions than would be predicted. We therefore included an indicator for french fries/potato tots in the vegetable portion size model.

Explanatory Variables: the CACFP Standard

CACFP providers are expected to be guided by CACFP regulations regarding the minimum portion sizes required for meals and snacks to qualify for reimbursement (Exhibit 1). The models for creditable food groups therefore include as an explanatory variable a "CACFP standard" amount for that *specific* food, based on the age of the child, the meal type, and the year in which the food was offered (1995 vs. 1999). The standard amount can vary slightly within minor food groups, primarily because the minimum amounts may be stated in cups in the regulations but expressed in grams in the model, and the gram-to-cup ratio varies across foods within a minor group. Also, CACFP portion size specifications changed in some cases between 1995 and 1999, mostly regarding the gram amounts of breads and bread alternates. For example, the minimum serving size for a breakfast bar for the 1-2 and 3-5 age groups was 18 grams in 1995 and 25 grams in 1999.

Explanatory Variables: Characteristics of the Menu

The models also contain some characteristics of the menu (i.e. the meal or snack of which the observed portion constituted a part). These include:

- whether milk was offered (excluded from the milk model)
- number of meat/meat alternate courses offered[6]
- number of bread courses offered
- number of fruit courses offered
- number of vegetable courses offered
- number of noncreditable courses offered
- percent of a course constituted by the observed portion: usually 1.0, but 0.5 or 0.33 if several distinct foods were offered as part of a course (e.g., carrots and celery sticks as a single vegetable), or if children were given a choice of two items (e.g., chicken or fish nuggets)

If a food constituted only a fraction of a course, the portion size was expected to be smaller than if it comprised the entire course. The portion size was also expected to be smaller if more courses of the same type of food were offered (e.g., a provider who offered two vegetables at lunch would provide less of each than one who offered only one vegetable). Other food groups could be either complements or substitutes. For example, fruit portions tend to be smaller when (more) servings of vegetables are on the menu, but noncreditable beverage portions (e.g., soft drinks) tend to be larger when meat/meat alternates are on the menu.

Explanatory Variables: Provider and Neighborhood Characteristics

The models contain characteristics of the provider, taken from the provider operations survey: average daily attendance, number of eating opportunities that day relative to hours of operation (up to 12 hours), number of years the provider has been offering care, weekly full fee for a full-time preschooler, and provider's household income as a percent of the Federal poverty guideline.

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[6] If a provider offered two (or more) food items within a food group and, based on the observation data, children were likely to take some of each food item, the menu may contain multiple courses in that food group. For example, hot dog and macaroni and cheese were counted as two meat/meat alternate courses, because children were usually served both as well as a bread/bread alternate. A menu with french fries, broccoli, and peas counted as two vegetable courses, because the data suggested that while all children were served the french fries, they tended to get either broccoli or peas but not both.

Finally, the models contain characteristics of the locality. Some of these were taken directly from 1990 census block group data: percent urban[7], percent black, and percent Hispanic. Regional indicators are included as well: Northeast, South, Midwest, and West. A specially constructed measure of poverty was provided by USDA: percent of children up to age 12 in the census block group living in low-income households; those at or under 185 percent of the poverty guideline.

Three of the major food groups (noncreditable beverages, noncreditable desserts, and miscellaneous noncreditable) had markedly less data than the other groups—the number of observations of portion sizes ranged from 100 to 200, and represented 25 to 50 providers, in contrast with condiments and the creditable food groups, which had 1000 to 3000 observations of portion sizes, representing at least 140 providers. The data for the three small groups would not support the full model; there were not enough distinct providers to estimate the effects of characteristics that were constant across providers. The following variables were therefore dropped from these three models: average attendance, provider's years of experience, weekly fee (and the corresponding missing data indicator), provider income (and the corresponding missing data indicator), percent black in the neighborhood, and percent Hispanic in the neighborhood. Retained in the models were the 1999 vs. 1995 indicator, the typical amounts eaten by children in the CSFII, all of the menu characteristics, regional indicators, percent urban, and percent of low-income children in the census block group.

Missing Data

Two variables from the provider operations survey were sometimes missing: fee charged for preschoolers (because some providers do not serve any full-fee, full-time preschoolers) and household income (some providers declined to respond). Missing data indicators were included in the models for these two variables.

Other variables were imputed, according to the following procedures:

- *Neighborhood-level variables* (percent urban, percent Hispanic, percent black, and percent low-income children; missing for 14 providers for whom address information was incomplete): Values were assigned equal to those of a randomly selected provider from the same State.

- *Provider-level variables* (attendance, years of experience; missing for 76 providers): Values were assigned equal to those of a randomly selected provider from the same State and in the same "category" with regard to the four neighborhood-level variables. The categories were defined as above/below 50 percent urban, above/below 10 percent black, above/below 10 percent Hispanic, and above/below 14 percent of low-income children. For three providers, data donors were not an exact match on all of these variables, but in each case the value of one or more of the neighborhood-level variables of the provider with missing survey data was near the above-mentioned cutoffs so that a reasonable match could be found.

- *Hours of operation:* This variable was needed for each day of the week for which a provider submitted a menu (a total of 5,369 menu days). When missing (199 menu days), hours were

[7] This variable was usually 0 or 100 percent, but was occasionally an intermediate value because of the aggregation of census blocks with different values into census block groups. We used "urban" to refer to urbanized areas (as defined by the Census Bureau) that were within metropolitan areas. (The Census documentation notes that there can be both urban and rural territory within both metropolitan and nonmetropolitan areas.)

generally assigned equal to those of a randomly selected provider from the same State and in the same percent urban category for a day on which the *first eating opportunity* and the *last eating opportunity* corresponded. For example, an urban provider in Virginia who offered morning snack, lunch, and afternoon snack on a Tuesday might be missing hours of operation for Tuesday. An appropriate donor value for hours of operation would be those of another urban provider in Virginia on a day in which she offered morning snack (but not breakfast), and afternoon snack (but not supper or evening snack). For those providers for whom such a data donor was not available, the search was extended to similar providers in the same region (Northeast, South, Midwest, or West).

Functional Form and Estimation Technique

The functional form of the model is exponential. The "typical" amount and the CACFP standard are therefore included in logarithmic form (so that a given percentage increase in one of these variables corresponds to a given percentage increase in the dependent variable). Random provider effects are assumed. The software used is the SAS GLIMMIX macro.

A backward stepwise procedure was used to select the final models, using the following criteria:

- In general, the cutoff for inclusion is a t-statistic of 1.0.
- Regardless of their t-statistics, the 1995 vs. 1999 indicator and the CACFP standard amount (for creditable items) are always included in the model.
- If one of a "variable group" earns admission to the model, the remaining variables in its group are also included. These groups are weekly fee/missing data indicator for weekly fee, provider's income as percent of poverty/missing data indicator for provider's income as percent of poverty, and regional indicators for Northeast/South/West (Midwest is the excluded category).
- All other variables are subject to deletion.

Results

The estimated portion size models are reported in Exhibit C.1. The estimated impact of tiering is shown in the second row of the table. Thus, portion sizes for meat/meat alternates were estimated to be 14.5 percent larger among Tier 2 providers in 1999 than among providers in 1995, holding constant the CACFP standard for the particular food item, age group, and meal type; the amount of that food typically eaten by children of that age group at that meal type; the number of meat items offered at that meal; the number of bread items offered at that meal; the number of vegetable items offered at that meal; the fee charged by the provider; the racial composition of the neighborhood; the region of the country; and the income level of the neighborhood.

Exhibit C.1
Coefficients in Regression Models of Portion Size for Major Food Groups

	Creditable Food Group					
	Milk	Meats and Meat Alternates	Breads and Bread Alternates	Fruit	Vegetables	Mixed Entrées
Intercept	4.7361***	0.6655***	-0.029	0.3588*	1.4351***	1.8639***
1999 Tier 2	-0.0109	0.1450**	0.1170***	0.0044	0.1092	0.037
Log of CACFP standard	0.0895***	0.0770**	0.0393	0.0800***	-0.0549	0.1175**
Log of typical amount offered		0.7725***	0.8032***	0.6478***	0.7406***	0.5561***
Snack for 1-2-year-olds	-0.1118***					
Snack for 3-5-year olds	-0.0891***					
Whole milk	0.0639**					
Skim milk	0.073					
Flavored milk	0.1155*					
Whole chocolate milk	0.1624					
Other flavored milk	0.1331					
Juice				0.4652***		
French fries					0.1474***	
Eggs						
Cheese						
Peanut butter						
Percent of course constituted by food			0.6942***	0.7167***		
Number of meat items offered		-0.1699***			-0.0557	-0.1682**
Number of bread items offered		-0.1316***	-0.1240***	-0.0666***		-0.0812**
Number of fruit items offered	-0.0250*		0.0451**	-0.0674***	-0.1703***	-0.1056**
Number of vegetable items offered		-0.0313	-0.1134***	-0.0300*		-0.1434***

continued...

Exhibit C.1 (continued)
Regression Models of Portion Size for Major Food Groups

	Creditable Food Group (continued)					
	Milk	Meats and Meat Alternates	Breads and Bread Alternates	Fruit	Vegetables	Mixed Entrées
Milk offered			0.0959***			
Number of extra items offered	-0.0473*		0.1403***	0.048		
Average attendance				0.0097		
Number of eating opportunities			-0.5541**			
Caregiver's years of experience	-0.0034		0.004			0.0074
Weekly fee for fulltime care		0.0004	0.0011**	-0.001	-0.0021**	-0.0021**
Weekly fee unknown/ NA		0.1331	0.2378***	-0.07	-0.033	-0.1509
Provider's income as percent of Federal poverty level						
Provider's income unknown						
Urban				0.0589		0.1959***
Percent black in neighborhood	-0.1354	0.3829*				-0.2592
Percent Hispanic in neighborhood					0.9391***	
Northeast		0.086	-0.0809	-0.001	-0.039	0.087
South		-0.0353	-0.1439***	-0.1208*	-0.0501	-0.1588*
West		-0.0863	-0.0375	-0.0525	-0.1549*	-0.015
Percent low-income children in neighborhood		-0.2789	-0.2441**		-0.3718**	-0.2417

NA = Not applicable

Significance levels:
* = .10
** = .05
*** = .01

Continued...

Exhibit C.1 (continued)
Coefficients in Regression Models of Portion Size for Major Food Groups

	Noncreditable Food Group			
	Beverages	**Desserts**	**Condiments**	**Other Noncreditable**
Intercept	4.8903***	-0.133	0.2313	0.2904
1999 Tier 2	0.3288**	0.1253	0.1028	0.2029
Log of CACFP standard				
Log of typical amount offered		0.8434***	0.8643***	0.8187***
Snack for 1-2-year-olds				
Snack for 3-5-year olds				
Whole milk				
Skim milk				
Flavored milk				
Whole chocolate milk				
Other flavored milk				
Juice				
French fries				
Eggs				0.4341***
Cheese				-0.4126
Peanut butter				-0.7268***
Percent of course constituted by food		0.2676		
Number of meat items offered	0.1401**		-0.0619	-0.3812**
Number of bread items offered	-0.1926***		-0.1175**	
Number of fruit items offered	0.097	-0.3247***		0.2238*
Number of vegetable items offered		-0.4130***	0.1702***	0.2238

continued...

Exhibit C.1 (continued)
Regression Models of Portion Size for Major Food Groups

	Noncreditable Food Group (continued)			
	Beverages	**Desserts**	**Condiments**	**Other Noncreditable**
Milk offered	-0.4203***	0.2673**	-0.2151***	
Number of extra items offered	0.2729**			
Average attendance			0.0161	
Number of eating opportunities			-0.5736	
Caregiver's years of experience				
Weekly fee for fulltime care			0.0021**	
Weekly fee unknown/ NA			0.2875**	
Provider's income as percent of Federal poverty level		0.0005	0.0004	
Provider's income unknown		0.6002	0.0369	
Urban		-0.5087**	-0.1151	-0.3193**
Percent black in neighborhood			0.3225	
Percent Hispanic in neighborhood				
Northeast	0.0076	0.165	-0.1468	-0.1411
South	0.1076	0.7287**	0.0137	-0.1832
West	-0.2487	0.5057**	-0.0491	-0.1994
Percent low-income children in neighborhood				

NA = Not applicable

Significance levels:
* = .10
** = .05
*** = .01

Coefficients on some of the other explanatory variables vary in sign across equations. In some cases, the patterns indicate that some foods tend to be complements or substitutes for others. For example, when additional meat items are offered, the portion sizes of meats and meat alternatives and of mixed entrées are *smaller*, while the portion sizes of beverages are *larger*. Other coefficient patterns are simply descriptions: providers in urban areas tend to serve larger portions of mixed entrées and smaller portions of desserts, while providers who charge higher weekly fees tend to serve larger portions of breads and condiments, but smaller portions of vegetables and mixed entrées.

Statistically significant coefficients on the Tier 2 variable were found for three major food groups, indicating that Tier 2 providers in 1999 offered significantly larger portions than similar providers in 1995. The food groups and coefficients are:

- Meat: 14.5 percent
- Bread: 11.7 percent
- Beverages: 32.9 percent

The estimated increases in portion sizes from these models drive the findings on the nutrient content of meals. We may therefore ask whether it is possible that these effects are a statistical artifact rather than a real shift over time. Two possible explanations for the observed effects are differences in portion size measurement and omitted variables in the regression models.

With regard to measurement, we note that identical protocols and training procedures were used in 1995 and 1999. In the same vein, the same data base, FIAS 2.3, was used for nutrient calculations, even though a newer version was available. With regard to omitted variables, it is possible in principle that some unmeasured characteristic of providers is correlated with Tier 2 membership and associated with larger portion sizes. If so, the effect of this characteristic would be confounded with the effects of tiering. While this possibility cannot be ruled out, we are unable to think of what such a characteristic might be.

To give a concrete notion of the sorts of differences that exist in the data *before* regression adjustment, examples are given in Exhibit C.2 below of specific food items in the meat and meat alternate group that were offered to 3-5-year-olds at lunch or dinner/supper in both 1995 and 1999. The list below includes the dozen minor food groups (combinations of similar 7-digit FIAS codes) that were observed at least twice in each year. Of the 12, 7 were offered in larger average portion sizes in 1999; 3 were offered in larger average portion sizes in 1995; and the remaining 2 were offered in portion sizes that differed by less than a gram between 1995 and 1999.

In 8 of the 10 models, the amount typically eaten by children was a powerful explanatory variable, with an elasticity ranging from 0.56 (mixed entrées) to 0.86 (condiments). For example, if children typically eat 10 percent larger portions of chicken salad than of tuna salad at meals, then servings of chicken salad in CACFP homes would tend to be 5.6 percent greater than servings of tuna salad, controlling for other factors. Other characteristics of the foods and menus that were important in several models included the CACFP standard portion size (positive effect on portion sizes), percent of course constituted by the food (positive effect), number of items that were offered in the same food group (negative effect), and items offered in other food groups (usually negative effect, but positive for some combinations such as milk with desserts and milk with bread and bread alternates, including cereal).

Exhibit C.2
Mean Portion Sizes of Selected Meat/Meat Alternates in 1995 and 1999

Food Item	Weighted Mean Portion Size, in Grams		Combined Sample Size
	1995 All Providers	1999 Tier 2 Providers	
Cheese: Cheddar, Colby	13.6	24.6	14
Cheese: Processed, American/Cheddar	26.3	25.5	34
Chicken nuggets	56.5	57.2	51
Chicken, breast, floured/breaded/batter-baked/ fried	78.3	30.0	7
Chicken, part not specified, floured/breaded/ batter-baked/fried	18.0	88.6	7
Fish stick/fillet, not further specified	32.5	51.8	44
Hot dog	57.0	47.2	56
Ground beef or patty (including pork patty)	32.9	48.5	11
Ham, smoked or cured	41.0	30.0	10
Meat loaf	49.1	68.8	9
Peanut butter (including almond butter)	18.5	20.1	25
Turkey, light meat (including not further specified and wing)	32.2	44.6	14

Calculation of Nutrient Measures from Menu Data and Portion Size Estimates

The portion size models generate two types of output: (1) parameter coefficients for the fixed effects, and (2) predicted values for the observation sample.

To impute portion sizes to the menu sample, the estimated parameters were applied to the characteristics of the menu item (e.g., age group of child, meal type, minor food group, etc.) with two exceptions. First, 1999 CACFP standards are used in all imputations. The imputed portion sizes thus represent our best estimate of what we would have observed when these menus were offered, if the 1999 portion size standards had been in effect. We acknowledge that compositional changes in the menus associated with changes in the standards (e.g., yogurt creditable for lunch in 1999 but not 1995) are not captured. Second, for providers who were in the menu sample, we add in the estimated random provider effect (obtained by comparing the within-sample predicted values with predicted values based on fixed effects only).

Given the portion sizes for each food, FIAS (version 2.3) was used to calculate the corresponding amounts of food energy and 10 micronutrients and macronutrients: protein, carbohydrate, fat, saturated fat, vitamin A, vitamin C, calcium, iron, cholesterol, and sodium.

The following nutrient summaries were calculated for each provider:

- *Total nutrient content* of each daily meal and snack offered, separately for each CACFP age group served; and

- *Average nutrient content* of meals and snacks offered during the sample week, by age group.

The average nutrient content of each age-group-specific meal or snack offered was compared with the nutrient benchmarks selected for the study, outlined in the breakfast section of this report. Next, an overall average was computed for each provider by averaging across all age groups served.

Weighted RDAs for each CACFP age group were calculated separately for 1995 and 1999 based on the age distribution of children as reported in the household survey. RDAs are defined for groups that differ from the CACFP age groupings: children aged 1-3, 4-6, and 7-10; boys aged 11-14; and girls aged 11-14. The weighted RDA for food energy or a given nutrient that was applied to menus for 6- 12-year-olds in 1995, for example, was calculated as

$$\sum_{i=1}^{4} (p_i \times RDA_i),$$

where i=1 to 4 corresponding to the four RDA age/sex groups: 4-6-year-olds, 7-10-year-olds, 11-12-year-old girls, and 11-12-year-old boys;
RDA_i is the Recommended Dietary Allowance for age/sex group i;
p_1 is the proportion of 6-12-year-olds in CACFP in 1995 who were 6 years old;
p_2 is the proportion of 6-12-year-olds in CACFP in 1995 who were 7-10- years old; and
p_3 and p_4 are each one-half of the proportion of 6-12-year-olds in CACFP in 1995 who were 11-12-years old.

Measures such as percent of calories from fat were calculated at the provider level averaged over the week, counting each day's menu equally. For example, if lunch on Monday comprised 250 calories of which 100 were from fat, and lunch on Tuesday comprised 350 calories of which 100 were from fat, then the average percentage of calories from fat for lunches would be calculated as

$\left[\frac{1}{2} \times [(100/250) + (100/350)]\right] \times 100 = 34.3\%.$