



E-FAN-02-006

March 2002

Meals Offered by Tier 2 CACFP Family Child Care Providers—Effects of Lower Meal Reimbursements

A Report to Congress on the Family Child Care Homes Legislative Changes Study

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Abstract

The introduction of tiered reimbursement rates in 1997 did not substantially affect the food and nutrient composition of meals offered by Tier 2 providers in the Child and Adult Care Food Program (CACFP). The Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA) of 1996 mandated a tiered reimbursement structure designed to target benefits more narrowly to low-income children and called for a study of its effects on program participation and child nutrition. PRWORA reduced reimbursement rates for Tier 2 providers (providers who are not low-income themselves and do not live in low-income areas). According to our 1999 study, Tier 2 providers neither cut back on meals and snacks served nor offered less nutritious foods, despite initial concerns about how Tier 2 providers would react to the reduced rates. Tier 2 meals have not compromised the overall goal of the CACFP meal component requirements: to provide a mix of foods that make an important contribution to a child's major nutritional needs.

Acknowledgements

The authors are indebted to the many CACFP child care providers who completed our surveys and allowed meal observers into their homes. We also thank the parents who consented to the observations. Other Abt Associates contributors to the report include K. P. Srinath, who designed the sampling and weighting procedures; Diane Stoner, who directed the surveys of providers; Patty Connor, the nutritionist who coordinated coding and data entry for the menu survey; Shao-hsun Keng and Patrick Johnson, who assisted with the modeling applications; Eileen Fahey and Jan Nicholson, who led the production effort; Mary Kay Fox, our internal technical reviewer; and Joan McLaughlin, Abt project director for the initial phase of the study. ERS and FNS reviewers provided extremely valuable comments, especially on econometric and nutrition issues. Linda Ghelfi, serving as the ERS technical officer, provided invaluable guidance, support, and feedback throughout the study.

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Executive Summary

The introduction of tiered reimbursement rates in 1997 did not substantially affect the food and nutrient composition of meals offered by Tier 2 family child care providers in the Child and Adult Care Food Program (CACFP). The Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA) of 1996 mandated a tiered reimbursement structure—designed to target benefits more narrowly to low-income children—and called for a study of its effects on program participation and on meals offered to children. The PRWORA reduced reimbursement rates for Tier 2 providers (providers who are not low-income themselves and do not live in low-income areas). According to our 1999 study, Tier 2 providers neither cut back on meals and snacks served nor offered less nutritious foods, despite initial concerns about how Tier 2 providers would react to the reduced rates. Tier 2 meals have not compromised the overall goal of the CACFP meal component requirements: to provide a mix of foods that make an important contribution to a child’s major nutritional needs.

In accord with the PRWORA mandate, the U.S. Department of Agriculture (USDA) contracted with Abt Associates Inc. to conduct the *Family Child Care Homes Legislative Changes Study*. This report, one of several prepared as part of the study, presents findings pertaining to the effect of the legislative changes on the number and nutritional quality of meals and snacks offered to children participating in CACFP family child care homes. It is based on menu records and on-site meal observation of a nationally representative sample of 542 Tier 2 CACFP homes in 1999, together with comparable data from a 1995 study.

The CACFP and Tiering

The CACFP is a Federal program, administered by USDA, that helps provide meals and snacks in participating child care and adult day care facilities. Providers of care are reimbursed at fixed rates for the qualifying meals they serve.

Seeking to focus CACFP benefits more narrowly on low-income children, the PRWORA established a two-tier structure of meal reimbursement rates for family child care homes. Homes that are located in low-income areas or operated by persons with incomes at or below 185 percent of the Federal poverty guidelines are designated as Tier 1. Meal reimbursement rates for Tier 1 homes are comparable with the rates that existed for all CACFP homes before PRWORA. Family child care homes that do not meet the low-income criteria are designated as Tier 2. Tier 2 homes receive lower reimbursements, although they can be reimbursed at Tier 1 rates for children whose household income is at or below 185 percent of the poverty guideline.

Tiering cut meal reimbursements almost in half for those providers classified as Tier 2. In fiscal year 1999, Tier 2 homes received meal reimbursements averaging \$177 per month (including some meals reimbursed at the Tier 1 rates). Had they been reimbursed at the Tier 1 rates for all meals, their monthly reimbursements would have averaged \$326.

It was unknown how Tier 2 providers would respond to the lower reimbursement rates. One possibility was that providers would reduce their food expenditures by offering fewer meals and snacks, or by serving smaller portion sizes, less costly foods, or a less varied menu. Such strategies might in turn reduce the quantity or quality of the foods and nutrients provided to children.

To address these hypotheses, the study examined meals and snacks offered by Tier 2 family child care home providers in 1999. It considered the frequency with which meals and snacks are offered, the extent to which they comply with CACFP requirements regarding the types of food to be served, and their nutritional content.

Overall, based on comparisons with a group of family child care homes from a 1995 study, and controlling for those characteristics that determine tier, we find that reimbursement tiering did not have a substantial effect on the quantity or nutritional quality of meals offered in the CACFP. Although some patterns suggest minor menu adjustments that could reflect an attempt to control costs, these have little impact on the overall nutrient profile of meals and snacks offered.

Meals Offered

Virtually all Tier 2 CACFP providers offer lunch, and around 95 percent offer breakfast and an afternoon snack. Over half offer a morning snack, but relatively few offer supper (14 percent) or an evening snack (5 percent). Two meal-snack combinations are particularly common: breakfast, lunch, and one snack, usually in the afternoon; and breakfast, lunch, and both the morning and afternoon snacks.¹ More than 80 percent of providers offer one of these two combinations.

Each type of meal and snack was offered by about the same proportion of Tier 2 providers in 1999 as by providers in 1995, controlling for factors used in determining providers' tier status.² Estimated differences between the years were small and no meal or snack was served significantly less often in 1999.

Compliance with CACFP Meal Component Requirements

To qualify for CACFP reimbursement, meals and snacks must contain specified minimum amounts of some or all of four major meal components included in the CACFP meal pattern: milk; fruits, vegetables, and juices; bread and bread alternates such as cereal; and meat and acceptable meat alternates. Lunches must include all four components, breakfasts must include all but meat, and snacks must include any two of the four.

The vast majority of Tier 2 meals and snacks in 1999 met the meal pattern requirements. More than 90 percent of all breakfasts, lunches, and morning and afternoon snacks complied. Over 80 percent

¹ The CACFP reimburses providers for only three of these four eating occasions per child per day. However, at virtually all meals and almost 90 percent of snacks at least one child is present whose meal is eligible for reimbursement.

² The 1999 study includes only Tier 2 providers, while the 1995 study was representative of all CACFP family child care providers at the time. To separate the effect of tiering from the effect of the different study populations in 1995 and 1999, the analysis controls for two factors used in assigning tier status: the provider's income and the proportion of children in the provider's census block group who live in low-income households.

of suppers and evening snacks did so. Compliance rates were generally not significantly different for Tier 2 meals in 1999 than for meals offered by providers in 1995, controlling for tier-related characteristics. The exception was the compliance rate for the morning snack, which was significantly higher in 1999.

Variety of Foods Served

CACFP meals seldom offer more than a single food item within a meal component (except that lunches, as required by program regulations, nearly always include two foods within the fruit-vegetable-juice category). Substantial variety occurs across days of the week, however. The average Tier 2 provider's weekly lunch menu, for example, features nine different fruits or vegetables, five different meats or meat alternates, and three different bread or bread alternates.

Most measures of variety show little difference between Tier 2 providers in 1999 and similar providers in 1995. Nonetheless, a few small but statistically significant differences in the particular meal components offered could represent menu adjustments made in an effort to control costs. Tier 2 providers less frequently offered meat and meat alternates at breakfast, and smaller proportions of snacks included more than a single kind of fruit, vegetable, or juice. These differences may reflect responses to the lower Tier 2 reimbursement rates, although that interpretation cannot be proven. In any event, the differences in the overall menu pattern are quite small and do not appear to have created any substantial reductions or improvements in the nutritional benefits of the CACFP.

Food and Nutrient Composition of Meals Offered

CACFP regulations do not establish nutrient-based standards for meals or snacks. The required meal components, however, are aimed at contributing substantively to children's major nutritional needs. The nutrients and food components examined in this study were selected on the basis of previous CACFP research, priorities established for the National School Lunch and School Breakfast Programs, and national nutrition guidance. We examine nutrient quantities as a percent of the *Recommended Dietary Allowances* (RDAs) for food energy and five key nutrients: protein, vitamin A, vitamin C, calcium, and iron. Useful benchmarks for these nutrient measures come from the school-based programs, which call for breakfast to provide at least one-fourth of the RDA, and for lunch to provide at least one-third of the RDA. We compare the total fat and saturated fat content of the meals with the current *Dietary Guidelines for Americans* goals of no more than 30 percent of food energy from total fat and less than 10 percent of energy from saturated fat. The study also examines the percent of energy from carbohydrate and the total amounts of sodium and cholesterol in the meals. Benchmarks for these measures of nutritional quality come from the National Research Council's *Diet and Health* report. Recommendations are for at least 55 percent of total food energy from carbohydrate, no more than 2,400 milligrams (mg.) of sodium per day, and no more than 300 mg. of cholesterol per day.

The analyses summarized below assess the nutrients supplied by breakfasts, lunches, morning snacks, and afternoon snacks offered to children 1-12 years of age in CACFP homes.³ They also examine the total nutrient contributions from the two predominant combinations of meals and snacks:

³ Benchmarks for fat, saturated fat, carbohydrate, cholesterol, and sodium are applied only to meals offered to children ages 3-12.

breakfast, lunch, and either the morning or afternoon snack; and breakfast, lunch, and both the morning and afternoon snacks. Other meals and combinations occur too seldom to be analyzed.

Breakfast. Most Tier 2 providers in 1999 offered breakfasts that supplied at least one-fourth of the RDA for the key nutrient measures; they also were consistent with the *Dietary Guidelines* and National Research Council's (NRC) recommendations for other measures of nutritional quality.⁴ There are two exceptions. Food energy was typically provided at less than one-fourth of the RDA. And about half of the providers offered breakfasts with more than 10 percent of energy from saturated fat, while the recommendation is for less than 10 percent.

The breakfasts offered by Tier 2 providers in 1999 differed little in nutrient content from those offered by similar providers in 1995, controlling for provider income and location. The only statistically significant increases seen were in the mean percentage of the RDA and the percentage of providers offering at least one-fourth of the RDA for food energy. Despite somewhat less frequent offerings of meat and meat alternates at breakfast, there was no reduction in the total or saturated fat content, but most providers met the *Dietary Guidelines* recommendation for total fat in both 1999 and 1995.

Lunch. Comparisons against the benchmarks for lunch yield mixed results. Large majorities of Tier 2 providers in 1999 offered lunches with at least one-third of the RDA for protein, vitamins A and C, and calcium, and that were consistent with the *Diet and Health* report's recommendation for cholesterol. However, most providers' lunches supplied less than one-third of the RDA for food energy and iron, and most lunches were above the recommended ranges for fat and saturated fat as a percent of food energy and for sodium. Lunches generally fell short of the goal for more than 55 percent of energy from carbohydrate.

The lunches offered by Tier 2 providers in 1999 were more likely to meet the RDA benchmarks for food energy and vitamin C than lunches offered by similar providers in 1995. More Tier 2 menus in 1999 included high sodium condiments (such as ketchup), hot dogs, processed cheese (primarily American cheese), and breaded fried foods (such as chicken nuggets).

Snacks. Morning and afternoon snacks were quite similar in terms of the foods commonly offered and their nutrient profile. Both contributed around one-third of the RDA for protein and vitamin C, on average, and 10 to 20 percent of the RDA for food energy and other key nutrients. Although recommendations for the various macronutrients as a percent of food energy are meant to apply to a

⁴ While *Dietary Guidelines* and NRC recommendations are intended to apply to average total daily food intake rather than specific meals, it is common practice in child nutrition research to examine the contributions of particular meals, such as breakfast and lunch, to daily goals. For example, nutrition standards for the National School Lunch Program and School Breakfast Program include the quantitative *Dietary Guidelines* recommendations for fat and saturated fat. And USDA-sponsored research on these programs usually includes comparisons with NRC recommendations for carbohydrate, sodium, and cholesterol.

24-hour period rather than small eating occasions like snacks, the average observed values fall within the daily recommended ranges for all but saturated fat.⁵

Snacks offered by Tier 2 providers in 1999 show several statistically significant differences from those offered by providers in 1995. Some differences reflect larger portions, such as increases in food energy in both morning and afternoon snacks. In the opposite direction, Tier 2 providers in 1999, relative to similar providers in 1995, supplied significantly less vitamin A in afternoon snacks. This reflects reductions in the frequency with which milk and fresh vegetables are offered in the afternoon snack.

Meal and Snack Combinations. Tier 2 providers offering breakfast, lunch, and either morning or afternoon snack provided a nutrient package that includes, on average, more than 100 percent of the RDA for protein, vitamin A, and vitamin C, and more than two-thirds of the RDA for food energy, calcium, and iron. Providers offering the other common combination—breakfast, lunch, and both morning and afternoon snacks—supplied somewhat larger quantities of all nutrients, including more than 100 percent of the RDA for calcium.

Less positively, the average percentage of food energy from saturated fat is about 13 percent for both meal combinations, while average daily recommendations call for less than 10 percent. Total sodium levels also seem high relative to food energy. For the combination of breakfast, lunch, and morning and afternoon snacks, average sodium levels amount to more than 85 percent of the recommended daily limit of 2400 mg.

For the combination of breakfast, lunch, and two snacks, food energy was the only measure significantly higher for Tier 2 providers in 1999 than for similar providers in 1995. The one-snack combination showed no 1995-99 differences for any of the nutrient measures.

Nutritional Aspects of Meals Offered by Former CACFP Providers

Another question raised as part of the *Family Child Care Homes Legislative Changes Study* concerns the nutrition provided in meals and snacks offered by family child care providers who left the CACFP around the time tiering was implemented, but continued to provide child care. This group is estimated to amount to about 5,500 providers nationwide in 1999. The study examined the frequency with which these providers offer meals and snacks and selected nutritional characteristics of the meals and snacks.

Compared with Tier 2 providers still participating in the CACFP in 1999, the former providers show few differences that could be attributed to participation in the CACFP (or to reimbursement tiering). Former providers were somewhat less likely to offer breakfast and snacks than Tier 2 homes, although it is not clear whether this is related to CACFP participation or to differences in operating hours. The data suggest that while the foods offered by former CACFP providers differ somewhat from Tier 2 providers' offerings, the nutritional quality of the meals is basically the same. Because

⁵ Young children may have limited capacity for food consumption at meals and need to rely on snacks to meet their nutrient requirements. For some children snacks may just contribute to overconsumption. No specific proportions of recommended daily levels of nutrients have been suggested as goals for child nutrition programs serving snacks. The analysis describes the contribution of these eating occasions to total daily nutrient recommendations. It is important to be able to evaluate the potential for CACFP snacks to enhance or detract from the mostly positive nutrient profile based on breakfast and lunch.

the study sample of former providers was quite small (59 providers), the evidence on this group is not as strong as for the rest of the findings in this report and should be interpreted with caution.

Meals Offered by Tier 2 CACFP Family Child Care Providers: Effects of Lower Meal Reimbursements

Introduction

The Child and Adult Care Food Program (CACFP) is a Federal program supporting nutritious meals and snacks in participating child care and adult day care facilities. It is administered by the Food and Nutrition Service (FNS) of the U.S. Department of Agriculture (USDA). Under CACFP, care providers receive a fixed reimbursement per meal served, with different reimbursement rates for different types of meals, such as breakfasts and lunches.

The Personal Responsibility and Work Opportunity Reconciliation Act of 1996 (PRWORA) changed the meal reimbursement structure for family child care homes. The law established two tiers of reimbursement rates, with higher rates applying to homes in low-income areas or operated by low-income persons. The intent of these changes to the CACFP was to target program benefits mainly to low-income children.

The law also called for a study of how the new meal reimbursement structure affected CACFP family child care homes, their sponsoring organizations, and the families of children participating in the program. This report describes the food and nutrient content of meals and snacks offered to children in CACFP family child care homes receiving the lower rates of reimbursement and the effect of reimbursement tiering on these measures of nutritional quality. The report is one in a series of reports on the *Family Child Care Homes Legislative Changes Study*, which was carried out by Abt Associates Inc. under contract to the U.S. Department of Agriculture, Economic Research Service.¹

¹ Other reports in the series include a summary report (Hamilton *et al.*, FANRR-22) and examinations of the effect of tiering on sponsors (Bernstein and Hamilton, E-FAN-02-003), participating providers (Zotov *et al.*, E-FAN-02-004), households with children in CACFP family child care (Crepinsek *et al.*, E-FAN-02-005), and trends in the number of providers participating in the CACFP (Hamilton *et al.*, E-FAN-02-002).

Description of the Child and Adult Care Food Program

The CACFP reimburses child care providers for qualifying meals served. Reimbursement is limited to a maximum of two meals and one snack or one meal and two snacks per day.² The program operates in nonresidential day care facilities including child care centers, after-school-hours child care centers, family and group child care homes, and some adult day care centers.³ In fiscal year 1999, the child care component of the program served an average of 2.5 million children daily at an annual cost of \$1.6 billion. Thirty-six percent of these children (959,181) were served through family child care homes at a cost of \$668 million or 42 percent of total program expenditures. The CACFP is administered at the Federal level by FNS, an agency of USDA. State agencies generally oversee the program at the local level.

When the program was first established by Congress in 1968 under Section 17 of the National School Lunch Act (42 U.S.C. 1766), participation was limited to center-based child care in areas where poor economic conditions existed. Beginning in 1976, family child care homes became eligible to participate provided that they meet existing State licensing requirements where these are imposed, or obtain approval from a State or local agency. In addition, homes must be sponsored by a nonprofit organization that assumes responsibility for ensuring compliance with Federal and State regulations and that acts as a conduit for meal reimbursements.

Initially, reimbursement rates for meals and snacks served in homes, like those served in centers, were based on a means test of the family incomes of individual children.⁴ Providers complained that the means test was overly burdensome and too invasive for their relationship with the families for whom they provided child care. In addition, sponsors claimed that meal reimbursements were insufficient to cover their administrative costs and allow for adequate reimbursement to the homes.⁵ As a consequence, very few homes participated in the program—fewer than 12,000 in December 1978.

The 1978 Child Nutrition Amendments (P.L. 95-627) incorporated wide-ranging changes to the program with the purpose of expanding participation, particularly among family child care homes. Most significantly, the 1978 Amendments eliminated the means test for family child care homes. In

² Prior to enactment of the Personal Responsibility and Work Opportunity Reconciliation Act of 1996 (P.L. 104-193), CACFP centers were allowed to claim reimbursement for an additional meal or snack for children in care eight or more hours per day.

³ As of July 1999, the CACFP also provides reimbursements for meals and snacks served to eligible children in homeless shelters. Eligibility for the child care portion of the CACFP is limited to children age 12 and under.

⁴ Three categories of reimbursement were established for participating homes, corresponding to family incomes of participating children of: 125 percent or less of the applicable Federal poverty guideline for households of a given size; 126 to 195 percent of the poverty guideline; and more than 195 percent of the poverty guideline.

⁵ Meal reimbursements generated by participating homes were paid directly to the sponsoring agency. The sponsor was permitted to deduct administrative costs before passing the remaining reimbursement on to the providers.

addition, the Amendments separated the reimbursement of sponsors' administrative costs from the meal reimbursement for family child care homes.⁶

In the years following the elimination of the means test, the family child care component of the CACFP grew tremendously. At the same time, it increasingly became a program serving higher-income children. The *Early Childhood and Child Care Study*, conducted in 1995, reported that over 190,000 homes were participating in the program, and more than 75 percent of the children served in these homes were from families with incomes above 185 percent of the Federal poverty guideline.⁷

CACFP Meal-Pattern Requirements

From its inception, the goal of the CACFP has been to support the provision of nutritious meals to children while in child care. To this end, USDA established minimum requirements for the meals and snacks⁸ offered by participating child care providers. The CACFP meal-pattern requirements are designed to ensure that meals and snacks are nutritionally well-balanced and supply the kinds and amounts of food required to make a reasonable contribution to children's daily energy and nutrient needs. The meal pattern specifies foods (meal components) to be offered at each meal and snack as well as minimum portion sizes for children of different ages: 1-2 years; 3-5 years; and 6-12 years.⁹ The CACFP meal-pattern requirements for children age 1-12 years are summarized in Exhibit 1. In addition to the meal pattern, USDA makes available to CACFP providers a variety of guidance materials to assist in planning meals that are appealing, age-appropriate, and nutritious.

The Legislative Changes Implemented in 1997

As part of the PRWORA, Congress acted to refocus the family child care component of the CACFP toward low-income children. PRWORA changed the reimbursement structure for the family child care component of the program to target benefits more specifically to homes serving low-income children. The new rate structure for family child care homes took effect July 1, 1997.

Under the new reimbursement structure, family child care homes located in low-income areas have reimbursement rates that are similar to the rates that existed for all family child care homes before PRWORA. A low-income area is defined operationally as either an elementary school attendance area in which at least half of the enrolled children are eligible for free or reduced-price school meals, or a 1990 census block group where at least half of the children lived in families with incomes at or below 185 percent of the poverty guideline. Homes where the provider's own income is at or below 185 percent of the poverty guideline have the same reimbursement structure as homes located in low-income areas. Homes meeting any one of these criteria are referred to as Tier 1 homes.

⁶ Other changes included the establishment of alternative procedures for approving homes and the provision of startup and expansion funds for family child care sponsors. Also, income eligibility thresholds for child care centers were changed from 125 and 195 percent of the poverty guideline to 130 and 185 percent.

⁷ Glantz *et al.*, 1997.

⁸ Regulations refer to mid-morning, mid-afternoon, and evening (nonsupper) eating occasions as "supplements." For simplicity, this report uses the more common term of "snacks."

⁹ USDA also specifies a meal pattern for infants (birth-12 months). 7 CFR Ch. II, Part 226.20.

Exhibit 1
Child Care Meal Pattern for Children

Meal Components	Ages 1-2	Ages 3-5	Ages 6-12
Breakfast – Select all 3 components			
Milk, Fluid	½ cup	¾ cup	1 cup
Fruit, Vegetable, or Fruit or Vegetable Juice ¹	¼ cup	½ cup	½ cup
Bread/Bread Alternate ²			
Bread or	½ slice	½ slice	1 slice
Cornbread, biscuits, rolls, muffins ³ or	½ serving	½ serving	1 serving
Cereal: Cold dry ⁴ or	¼ cup or ⅓ oz	⅓ cup or ½ oz	¾ cup or 1 oz
Hot cooked or	¼ cup	¼ cup	½ cup
Cooked pasta or noodles or grains	¼ cup	¼ cup	½ cup
Lunch and Supper – Select all 4 components			
Milk, Fluid	½ cup	¾ cup	1 cup
Vegetable(s) and/or Fruit(s) ⁵	¼ cup total	½ cup total	¾ cup total
Bread/Bread Alternate ²			
Bread or	½ slice	½ slice	1 slice
Cornbread, biscuits, rolls, muffins ³ or	½ serving	½ serving	1 serving
Cooked pasta or noodles or grains	¼ cup	¼ cup	½ cup
Meat/Meat Alternate			
Meat, poultry, fish, ⁶ or cheese or	1 oz	1½ oz	2 oz
Eggs (large) or	1	1	1
Cooked dry beans or peas or	¼ cup	⅜ cup	½ cup
Peanut/other nut or seed butters or	2 tbsp	3 tbsp	4 tbsp
Nuts and/or seeds ⁷ or	½ oz=50%	¾ oz=50%	1 oz=50%
Yogurt ⁸	4 oz or ½ cup	6 oz or ¾ cup	8 oz or 1 cup
Supplement – Select 2 of the 4 components			
Milk, Fluid	½ cup	½ cup	1 cup
Fruit, Vegetable or Fruit or Vegetable Juice ^{1,9}	½ cup	½ cup	¾ cup
Bread/Bread Alternate ²			
Bread or	½ slice	½ slice	1 slice
Cornbread, biscuits, rolls, muffins ³ or	½ serving	½ serving	1 serving
Cereal: Cold dry ⁴ or	¼ cup or ⅓ oz.	⅓ cup or ½ oz	¾ cup or 1 oz
Hot cooked or	¼ cup	¼ cup	½ cup
Cooked pasta or noodles or grains	¼ cup	¼ cup	½ cup
Meat/Meat Alternate			
Meat, poultry, fish ⁶ or cheese or	½ oz	½ oz	1 oz
Eggs (large) or	½	½	1
Cooked dry beans or peas or	⅓ cup	⅓ cup	¼ cup
Peanut/other nut or seed butters or	1 tbsp	1 tbsp	2 tbsp
Nuts and/or seeds or	½ oz	½ oz	1 oz
Yogurt ⁸	2 oz or ¼ cup	2 oz or ¼ cup	4 oz or ½ cup

¹ Fruit or vegetable juice must be full-strength.

² Bread, pasta or noodle products, and cereal grains shall be whole-grain or enriched. Cornbread, biscuits, rolls, muffins, etc., must be made from whole-grain or enriched meal or flour. Cereal must be whole-grain or enriched or fortified.

³ Serving sizes for specific bread/bread alternates are published separately in FNS guidance materials for providers.

⁴ Either volume (cup) or weight (ounce), whichever is less.

⁵ Two servings of fruits and/or vegetables fulfill the lunch or supper requirement. Full-strength fruit or vegetable juice may be counted to meet up to one half of this requirement.

⁶ A serving consists of the edible portion of cooked lean meat or poultry or fish.

⁷ No more than one-half of the total meat/meat alternate requirement may be met with nuts or seeds. Nuts or seeds must be combined with another meat/meat alternate to fulfill the lunch or supper requirement. One ounce of nuts or seeds is equal to 1 ounce of the edible portion of cooked lean meat or poultry or fish.

⁸ Yogurt may be plain or flavored, unsweetened or sweetened.

⁹ Juice may not be served to fulfill the supplement requirement when milk is served as the only other component.

All other homes are reimbursed at substantially lower rates. This latter group of homes, referred to as Tier 2 homes, includes those that are neither located in a low-income area nor operated by a low-income provider. Tier 2 homes can receive the higher Tier 1 reimbursement rates for meals served to children from families with incomes at or below 185 percent of the poverty guideline.

The new reimbursement structure cut CACFP reimbursements almost in half for Tier 2 family child care homes. The applicable rates in 1999, when the data were collected for this study, are shown in Exhibit 2. In fiscal year 1999, Tier 2 homes received meal reimbursements averaging \$177 per month (including some meals reimbursed at the Tier 1 rates). Had they been reimbursed at the Tier 1 rates for all meals, their monthly reimbursements would have averaged \$326.

The new CACFP meal reimbursement structure changed the economics of family child care for those homes classified as Tier 2. Unless the providers could raise fees or reduce expenses, the reduced reimbursement revenue would translate into a lower net income from the business. Higher fees, longer hours, and taking on more children have all been suggested as possible responses of providers; these are addressed in a separate report (Zotov *et al.*, E-FAN-02-004). Another possible provider response would be to reduce meal costs by serving fewer meals, reducing the amount of food served at a meal, or adjusting menus to emphasize less costly food. The question of whether the reduction in reimbursements for Tier 2 providers has affected the types and nutritional adequacy or quality of meals served to children in Tier 2 family child care homes is the subject of this report.

The Family Child Care Homes Legislative Changes Study

After mandating changes in the CACFP reimbursement structure, the PRWORA also called for a study of the effects of those changes. A number of questions were posed about effects on CACFP sponsors, participating family child care homes, and the families served by those homes. USDA accordingly designed, and contracted with Abt Associates Inc. to implement, the *Family Child Care Homes Legislative Changes Study*.

Exhibit 2
Meal Reimbursement Rates by Tier^a
July 1, 1998 - June 30, 1999

Meal	Tier 1 Rate	Tier 2 Rate	Difference between Tier 2 and Tier 1	
			Amount	Percentage
Breakfast	\$0.90	\$0.34	-\$0.56	-62.2%
Lunch/Supper	1.65	1.00	-0.65	-39.4
Supplement (snack)	0.49	0.13	-0.36	-73.5

a Reimbursement rates are higher in Alaska and Hawaii.

The *Family Child Care Homes Legislative Changes Study* involved extensive data collection with nationally representative samples of family child care homes, their sponsors, and the parents of children they serve. A multistage probability sampling approach was used. Twenty States were selected in the first stage. A sample of sponsors was drawn within each of the selected States, and the sampled sponsors provided lists of the family child care homes they sponsor. A sample of family child care homes was then drawn from each sponsor's list. In the final sampling stage, a subsample of the family child care homes was used to draw a sample of households whose children were in the care of those providers. The sample design is described in more detail in Appendix A.

Conducted in January-August 1999, the data collection included two elements that are the principal data sources for this report:

- A sample of Tier 2 providers completed a **menu survey**, in which they recorded information on all food items included in meals and snacks offered to children age 1-12¹⁰ during a five-day period. The survey sample included 741 Tier 2 providers eligible for the study, of whom 542 provided a complete menu survey for 3 to 5 days.
- For a subsample of 97 Tier 2 providers, **meal observations** conducted by field interviewers measured the portion sizes of food items served to children on 2 of the 5 days covered by the menu survey. Information from this subsample of providers was used to validate items recorded in the menu surveys for these homes and to impute portion sizes for items recorded in all of the menu surveys.

Appendix B contains sample pages of the menu survey and meal observation instruments.

As is often the case in analysis of survey data, nonresponse and the potential for nonresponse bias call for caution in interpreting the results. The response rates for the menu survey and meal observation survey were 73 percent and 42 percent, respectively. Compound response rates, which take into account the 96-percent response rate of CACFP sponsors in providing lists of providers for sampling, are somewhat lower. Nonresponse analyses, presented in Appendix A, did not reveal any meaningful patterns of nonresponse bias. Nonetheless, the possibility of bias cannot be completely ruled out.

The report also uses some data from an **operations survey of family child care providers**, which was administered to the Tier 2 providers who completed the menu survey and also to a sample of 576 Tier 1 providers. A more detailed analysis of this survey, which covers numerous aspects of the providers' experience in the CACFP, is presented in a separate report (Zotov *et al.*, E-FAN-02-004).

Because of the complex structure of the samples, survey responses must be weighted in order to portray distributions in the overall population appropriately. All percentages, means, and other distributional statistics presented in this report have been weighted using procedures described in Appendix A. Tables also show the unweighted number of observations on which the statistics are based. Standard errors and significance tests are estimated with correction for the complex sample design.

¹⁰ The menu survey did not request information on foods and formula offered to infants less than 1 year. Previous research suggested that this was too infrequent to provide a sample size large enough for separate analyses, and the types of foods offered to infants are too different to warrant combining them with other age groups.

Additional elements of the *Family Child Care Homes Legislative Changes Study* include a self-administered **survey of family child care sponsors**, a telephone **household survey** of parents of children in Tier 1 and Tier 2 homes, and an **operations survey of former CACFP providers**. Analyses of these data sets are presented in the following reports: Bernstein and Hamilton, E-FAN-02-003; Crepinsek *et al.*, E-FAN-02-005; and Zotov *et al.*, E-FAN-02-004.

Analysis Approach and Limitations

The analysis presented in this report has two principal objectives:

- Describe characteristics of the meals and snacks offered in Tier 2 CACFP family child care homes in 1999.
- Determine, to the extent possible, how tiering affected these meals and snacks.

To learn about the effect of tiering, we compare data on the Tier 2 meals and snacks offered in 1999 with the meals and snacks offered by CACFP providers in 1995, as measured in the *Early Childhood and Child Care Study*. The data collection strategy for the present study was essentially identical to that used in the earlier study, which makes it possible to compare the data for the two time periods.

Two factors make it difficult to draw inferences about the effect of tiering, however. First, the menu survey and meal observations in 1999 were conducted only for Tier 2 providers, while the 1995 study represented all CACFP providers participating at that time. Second, it is not possible to identify clearly that subset of the 1995 providers who would have been classified as Tier 2 had tiering existed. Data are available for two of the three criteria used in tier classification: the provider's income relative to the poverty guideline, and the percent of children in the provider's census block group living in low-income households. These two factors are strongly but not perfectly correlated with providers' tier status in 1999.¹¹ By including these factors as covariates in regression analyses, we can examine the differences between meals and snacks offered by Tier 2 providers in 1999 and those offered by reasonably similar providers in 1995. (The statistical approach is described in more detail in Appendix D.)

We did not attempt to limit the 1995 sample to those providers who would have been Tier 2 had they been classified in 1995, for two reasons. First, as described above, we were doubtful of our ability to identify those providers. Second, the gains in statistical power from using the entire sample of 1995 providers, rather than just those that were higher income and served higher-income children, were considerable. These gains were obtained in the portion-size models by assuming that the same general relationships held between portion sizes and characteristics of foods, menus, etc. for the entire 1995 sample and the 1999 sample, with tiering-related variables (provider and neighborhood income) simply shifting the relationship. In the nutrition outcomes models, we obtained the gains by assuming that the tiering-related variables were related in a smooth fashion to measures (such as percent of *Recommended Dietary Allowances* (RDA) for food energy in lunches offered), rather than that there was a sharp break in these relationships for Tier 1 versus Tier 2 households.

¹¹ The third criterion used in tier classification, the percent of children in the elementary school serving the provider's location that are certified to receive free or reduced-price meals, was not available for a sufficient number of providers in the sample.

A two-stage modeling approach was used in estimating tiering effects on nutrient quantities. The first stage used the subsample of providers for whom meal observations were conducted to estimate a model of portion sizes. This model was used to impute portion sizes to all foods recorded on the menus of the full sample of providers who responded to the menu survey. Nutrient quantities, which were determined by both what was offered and how much was offered, were analyzed in the second-stage model. The standard errors in the second-stage model were adjusted to take into account the prediction error inherent in the imputed portion size values. This adjustment resulted in larger standard errors, and hence fewer statistically significant differences, than would be estimated from the second-stage model alone. The adjustment had no qualitative effect on the findings, however. With or without the adjustment, most of the significant differences are in the direction of larger nutrient quantities in 1999 rather than in 1995.

Differences between groups are reported in the text as statistically significant if they have a less than 5-percent probability of arising by chance. Some disciplines conventionally consider differences to be significant if their probability of arising by chance is less than 10 percent. Accordingly, differences that would be significant at the 10-percent level but not the 5-percent level are noted, but indicated as ($p < 0.10$). Differences that are significant at the 5-percent level or better are simply reported as statistically significant. In the tables, three levels of statistical significance are noted, 1-percent, 5-percent, and 10-percent.

It is important to note that tiering is not the only logically possible cause of differences observed between Tier 2 providers in 1999 and similar providers in 1995. Such differences could be caused by:

- Changes over time in the preferences and behaviors of CACFP providers, parents, and children.
- Changes in the composition of providers participating in the CACFP. Compositional changes could occur as a result of tiering—for example, low-margin providers classified as Tier 2 might leave the child care business—or could be caused by demographic or economic changes unrelated to tiering.
- The lower reimbursement rates introduced by tiering.

Given these multiple possible causes, any differences (or lack of difference) between meals and snacks offered by Tier 2 providers in 1999 and similar providers in 1995 must be interpreted with caution.

Meals and Snacks Offered by Tier 2 Providers

One concern raised about tiering was the possibility that Tier 2 providers would respond to the reduction in reimbursement rates by cutting back on the number of meals and snacks they offer. This section reviews information pertinent to that hypothesis and finds no evidence of such cutbacks.

The analysis uses two data sources. The first is the menu survey, which was carried out with nationally representative samples of 542 Tier 2 family child care homes in 1999 and 501 family child care homes in 1995.¹² The second source is provider operations questionnaires administered in 1995 and 1999 to essentially the same samples plus, in 1999, a sample of 576 Tier 1 homes.¹³ The menu survey is generally our preferred data source on nutritional issues, because it provides more detailed information on the meals offered during the week in which food and nutrient content was measured. Because the menu survey does not provide information for Tier 1 providers, data from the questionnaire are used when available to make comparisons of meals offered and hours of operation between Tier 1 and Tier 2 homes.

Proportion of Tier 2 Providers Offering Specific Meals and Snacks

Nearly all Tier 2 homes in the 1999 sample offered lunch, afternoon snack, and breakfast on all or some of the days for which menus were recorded.¹⁴ Lunch was virtually universal, with 96 percent of providers offering it on all days and another 2 percent on some days (Exhibit 3). Breakfast and afternoon snack were each recorded by about 90 percent of providers every day and by another 5-6 percent on some days.

Among the other meals and snacks, only the morning snack was common. About half of the providers offered a morning snack. Only 14 percent of providers recorded any instances of offering supper, and just 5 percent offered any evening snacks.

The multivariate analysis does not suggest that Tier 2 providers responded to the lower reimbursement rate by offering fewer meals. The proportion of Tier 2 providers in 1999 offering each meal did not differ significantly from the proportion of similar providers (resembling them in tier-related characteristics) offering the same meal in 1995. The estimated differences between 1999 and 1995 are not significant at the 5-percent level, are relatively small (5 percentage points or less), and include a mixture of increases and decreases in the proportion of providers offering a meal.

¹² Providers were asked to record their menus for a complete 5-day week. Some providers operate fewer than 5 days a week, and some failed to complete the menu for some days. Only providers who submitted menus for at least 3 days were included in the analysis. A total of two Tier 2 providers in 1999 and seven providers in 1995 were excluded.

¹³ In both 1999 and 1995, some providers who responded to the operations questionnaire did not respond to the menu survey. Thus the questionnaire sample of 1999 Tier 2 homes includes 595 providers, while the 1995 questionnaire sample consists of 532 providers.

¹⁴ Analyses are based on all CACFP age groups combined (1-2, 3-5, and 6-12).

Exhibit 3
Percentage of Providers Offering Specified Meals and Snacks During a Sample Week Based on Recorded Menus

	Tier 2 1999	Difference 1999-95^a
Breakfast offered	94.6%	5.2%
All days	89.3	3.6
Some days	5.3	0.4
Breakfast not offered	5.4	-5.2
Morning snack offered	56.4	4.5
All days	49.2	2.6
Some days	7.2	2.0
Morning snack not offered	43.6	-4.5
Lunch offered	98.6	-0.9
All days	96.2	0.6
Some days	2.4	-1.0
Lunch not offered	1.4	0.9
Afternoon snack offered	95.6	-0.7
All days	89.5	-1.5
Some days	6.2	0.8
Afternoon snack not offered	4.4	0.7
Supper offered	13.6	-4.4
All days	9.8	-5.0
Some days	3.8	0.5
Supper not offered	86.4	4.4
Evening snack offered	5.1	4.4*
All days	3.3	3.2*
Some days	1.8	1.0
Evening snack not offered	94.9	-4.4*
Unweighted sample	542	1,043

^a Differences between values for Tier 2 providers in 1999 and estimated values for similar providers in 1995 were calculated using regression. The technique is described in Appendix D. Each category's difference was calculated separately, so differences for "all days" and "some days" do not necessarily add to differences in the meal/snack "ever offered."

Significance levels:

* = .10

** = .05

*** = .01

This conclusion is supported by a second source of data on the meals offered by providers. In addition to recording their menus, providers were asked to fill out a questionnaire that included the question: "Which meals and snacks are you now serving?" This question provides a somewhat different perspective than the menu, as the provider is expected to identify the meals she *customarily* offered. Moreover, unlike the menu, the questionnaire was completed by Tier 1 as well as Tier 2 providers in 1999. Thus we have a direct comparison between the two tiers as well as a comparison with the population of 1995 providers.

The proportion of Tier 1 and Tier 2 providers reporting that they offer particular meals and snacks is quite comparable for all of the daytime eating occasions: breakfast, morning snack, lunch, and afternoon snacks (Exhibit 4). Substantially more Tier 1 than Tier 2 providers reported offering supper and evening snacks, but this principally reflects a difference in operating hours. When the shorter operating schedules of many Tier 2 homes were taken into account, comparable proportions of Tier 1 and Tier 2 providers that have later operating hours offered supper and evening snacks.

The comparison of Tier 1 and Tier 2 responses shows no sign that Tier 2 providers are offering fewer meals, and the same is true for the comparison of 1999 with 1995. The proportions of providers offering the daytime meals are practically identical, and the evening snack is offered by significantly more providers in 1999.

Exhibit 4
Proportion of CACFP Providers Offering Specified Meals and Snacks in 1995 and 1999 Based on Provider Responses to Questionnaire

	1999		Difference Tier 2- Tier 1 ^a	All Providers		Difference 1999-95 ^a
Meals/Snacks	Tier 1	Tier 2		1995	1999	
Percentage of Providers						
Breakfast	91.1%	96.1%	5.0%*	90.8%	92.8%	2.0%
Morning Snack	58.0	58.6	0.8	56.4	58.2	1.8
Lunch	96.9	99.0	2.1*	98.1	97.6	-0.5
Afternoon Snack	95.8	96.6	0.8	96.6	96.0	0.6
Supper	49.9	20.5	-29.4***	31.7	40.3	8.6
Evening Snack	21.2	7.6	-13.6***	9.3	16.8	7.5**
Unweighted sample	575	594		482	1,169	

^a Regression estimate. See Appendix D.

Significance levels:

* = .10

** = .05

*** = .01

Meal Combinations Commonly Offered by Tier 2 Providers

Exhibit 5 shows the most common combinations of meals and snacks that Tier 2 providers offered in 1999, based on their recorded menus. For this analysis, each provider is considered to offer only one meal combination, with the assigned combination being the one that is offered on at least 3 of the recorded days.¹⁵

Four-fifths of all Tier 2 providers offered one of two common meal combinations. About 43 percent offered breakfast, lunch, and either the morning or (usually) the afternoon snack, and 39 percent offered breakfast, lunch, and both the morning and afternoon snacks. Supper was most commonly offered by providers who were also offering breakfast and lunch, but these combinations were relatively rare. A total of 9 percent of providers offer breakfast, lunch, supper, and one or more snacks. All other combinations were rare, recorded by no more than 5 percent of the providers. There were no statistically significant differences in the proportions of Tier 2 providers in 1999 offering the combination of breakfast, lunch, and morning and afternoon snacks or breakfast, lunch, and morning or afternoon snack compared with similar providers in the 1995 sample.¹⁶

Exhibit 5	
Proportion of Tier 2 Providers Offering Various Meal and Snack Combinations in 1999	
Meal and Snack Combination	Percentage of Providers
Breakfast, lunch, 1 snack ^a	42.6%
Breakfast, lunch, 2 snacks ^a	38.0
Breakfast, lunch, supper, 2 snacks	4.5
Lunch, 2 snacks	3.6
Breakfast, lunch, supper, 3 snacks	2.4
Breakfast, lunch, supper, 1 snack	1.8
Lunch, 1 snack	1.2
Breakfast, lunch	1.0
Supper, 1 snack	0.2
Other combinations	3.6
No single combination offered for 3 days	1.2
Unweighted sample	542
^a Morning and afternoon snacks only.	

¹⁵ One percent of providers (unweighted n=5) did not record the same meal combination on at least 3 days.

¹⁶ Based on regression analysis, as described in Appendix D. Only the two common meal combinations were tested for 1995-99 difference.

Compliance with CACFP Requirements and Variety of Foods Offered

Although Tier 2 providers apparently did not respond to lower meal reimbursement rates by reducing the number of meals they offered, they might take other actions to control their meal costs. One possibility is that they would offer fewer types of food. Because CACFP regulations call for certain classes of food to be offered at each meal, cutting back on the number of foods offered could mean that some meals would fail to meet the meal-pattern requirements. Or, even if they meet the requirements, the meals might offer less variety to the children who receive care in CACFP family child care homes.

The analysis finds no indication that the proportion of meals meeting CACFP meal-pattern requirements was affected by tiering. Compliance rates for Tier 2 meals in 1999 were very high and not statistically different from compliance rates of providers in 1995, controlling for characteristics that determine tier. The analysis also reveals very little difference in the variety of foods offered. Nonetheless, a few differences in the items offered in particular meals could reflect minor menu adjustments by providers interested in controlling costs.

Compliance with Meal Component Requirements

CACFP regulations pose minimum requirements for the types and amounts of food that must be included in each meal and snack qualifying for reimbursement, as described in the Introduction to this report. The requirements are specified, by CACFP age group, in terms of four meal components: fluid milk; fruits, vegetables, and full-strength juices; bread and bread alternates; and meat and meat alternates.¹⁷ A qualifying lunch or supper must include all four components with two servings from the fruit-vegetable-juice group. Breakfast must include servings of all components except meat or meat alternates (a meat or meat alternate is recommended but not required). Qualifying snacks must include at least two of the four components.

To determine providers' compliance with the requirements, the analysis identified the meal components that were included in each meal. For example, the 542 Tier 2 providers who completed menu surveys in 1999 recorded a total of nearly 2,100 breakfasts. Each of these breakfasts was later coded as complying or not complying with the meal component requirements for the appropriate CACFP age group. (Providers sometimes offered a different breakfast to children of different ages.) A breakfast was considered compliant if the provider offered all three of the required components (milk; a fruit, vegetable, or full-strength juice; and a bread or bread alternate).¹⁸

The vast majority of meals offered in Tier 2 homes in 1999 complied with the meal component requirements, as shown in Exhibit 6. Over 90 percent of all breakfasts, lunches, and morning and

¹⁷ Full-strength juice is a fruit or vegetable juice containing 100 percent juice. Bread alternates include whole-grain or enriched pasta, noodle products, and cereal grains, and biscuits, rolls, muffins, cornbread, etc. made with whole-grain or enriched or fortified flour. Meat alternates are defined in the CACFP regulations as poultry, fish, cheese, eggs, dry beans or peas, peanut butter, nuts, seeds, and yogurt.

¹⁸ This analysis does not include a determination of whether the amount offered was in compliance with the requirement. The amount offered was measured in meal observations, which were conducted for only a subsample of providers.

afternoon snacks were found to be in compliance. Supper and evening snack showed compliance rates of over 80 percent.¹⁹ These compliance rates are quite consistent across CACFP age groups, as indicated in Exhibit 6 by the similarity of the pattern for meals offered to children aged 3-5, the largest group served, and the pattern for all age groups served by the provider.

Providers were asked to record all meals and snacks offered to children in their care, regardless of whether or not they submitted a reimbursement claim. Since the CACFP reimburses providers for up to three eating occasions per child per day, theoretically meals or snacks served to children who are in care all day are not all reimbursed. This raises the question of whether some meals and snacks, particularly those served later in the day, should be held to the CACFP meal-pattern standard. To address this issue, analyses were conducted on the subsample of 1999 Tier 2 providers for whom the number of children served each meal and snack (meal observation sample) was known.²⁰

Exhibit 6
Percentage of Meals Complying with CACFP Meal-Pattern Requirements

	Meals Offered to Children Aged 3-5			All Meals Offered	
	Unweighted sample ^a	Tier 2 1999	Difference 1999-95 ^b	Tier 2 1999	Difference 1999-95 ^b
Breakfast	3,975	97.3%	1.1%	97.3%	2.3%*
Morning snack	2,192	96.5	4.7*	96.8	5.4**
Lunch	4,483	91.9	3.2	91.5	3.4
Afternoon snack	4,148	95.3	-0.4	95.3	-0.1
Supper	746	82.3	4.1	82.3	3.2
Evening snack	158	90.9	1.3	85.5	12.5

^a Sample for the number of meals offered to 3-5-year-olds, 1999 and 1995 combined.

^b Regression estimate. See Appendix D.

Significance levels:

* = .10

** = .05

*** = .01

¹⁹ Although the numbers of sampled providers offering supper and evening snack are relatively small, these high rates are supported by examination of the 95-percent confidence intervals of the estimates. The lower bounds of the intervals were 70 percent for all evening snacks offered, and 76 to 77 percent for all suppers offered and for suppers and evening snacks offered to 3-5-year-olds.

²⁰ Some children's meals and snacks were not observed because their parents did not give consent, however this was a very small proportion of the total number of children cared for by providers on the observation days.

The proportion of child meals/snacks served that are reimbursable and the proportion of provider meals/snacks served that involve one or more reimbursable child meals were estimated. The assumptions involved were (1) providers always claim reimbursement for the maximum number of eligible meals and snacks for all children in care, and (2) when children are in care for more than three meals/snacks, the meals or snacks reimbursed are those where the reimbursement rate is the highest (e.g., lunch/supper rates are higher than breakfast rates, and breakfast rates are higher than snack rates). Since it was not possible to know which of the three possible snacks were likely to be claimed for reimbursement, morning, afternoon, and evening snacks were pooled.

The analysis suggests that providers should be aiming to meet the CACFP meal-pattern requirements at all meals and snacks offered. It is relatively rare that providers would be serving a meal or snack for which they do not receive any reimbursement. Virtually all breakfasts, lunches, and suppers served to children by Tier 2 providers were reimbursable, as indicated in Exhibit 7.²¹ A surprisingly large proportion of snacks (83 percent) were also reimbursable. On average, all breakfasts, lunches, and suppers and nearly 90 percent of snacks are served to at least one child whose meal/snack would have been reimbursable. While it is possible the assumption that providers always claim every eligible meal they serve may be incorrect, it seems likely that this would be common practice.

The analysis provides no evidence that lower reimbursement rates made Tier 2 providers less likely to offer compliant meals or snacks. Compliance rates are similar to the rates for similar providers in 1995 (Exhibit 6). In fact, the analysis indicates that morning snacks offered by Tier 2 providers in 1999 had a significantly higher compliance rate, for all age groups served by the provider, than those offered by similar providers in 1995. This difference does not appear to be related to changes in the meal-pattern requirements between the two time periods.²²

Exhibit 7
Proportion of Tier 2 Meals and Snacks Likely to be Reimbursed

	Unweighted sample ^a	Proportion of Child Meals Reimbursable	Unweighted sample ^a	Proportion of Provider Meals Reimbursable
Breakfast	628	97.3%	169	99.6%
Lunch	742	100.0	183	100.0
Supper	69	100.0	21	100.0
All snacks	1,069	82.9	270	89.5

^a Sample for number of meals offered to all age groups combined (1-2, 3-5, and 6-12-year-olds).

²¹ This analysis does not consider compliance with meal-pattern requirements as a criteria for being “reimbursable,” only whether or not the meals and snacks fall within the three-meal/snack-per-day limit for CACFP reimbursement.

²² See discussion of creditable and noncreditable foods and minimum required portion sizes in 1995 versus 1999 in Appendix C.

Meal Components Offered

The influence of the CACFP meal-pattern requirements on the composition of meals offered can be seen clearly in Exhibit 8.²³ Nearly all meals include at least one food item from each of the required meal components at breakfast and lunch. At lunch, where two items from the fruit-vegetable-juice category are required, nearly all meals meet this requirement. Providers may offer any two of the four components at snacks, and the proportion of snacks including each component ranges from 83-90 percent for bread and bread alternates to 21-27 percent for meat and meat alternates. Meat and meat alternates are not required at breakfast and are comparatively rare, appearing in just 11 percent of breakfasts.

Tier 2 meals in 1999 included largely the same meal components as those offered by similar providers in 1995, but a few statistically significant differences exist. Somewhat fewer afternoon snacks in 1999 included meat or meat alternates, and somewhat more breakfasts and snacks contained bread or bread alternates. For both of these meals, fewer Tier 2 providers offered any meat or meat alternates over the course of a week than similar providers in 1995.

These effects, though not large, could conceivably reflect a response to tiering. Some providers may have attempted to control costs by cutting back on meats and meat alternates (e.g., sausage, cheese, eggs, peanut butter) at breakfast, since these are not required by the CACFP meal pattern. Similarly, some providers may have substituted bread and bread alternates at snack for the potentially more expensive meat and meat alternates.

The 1999-95 differences in meal components offered at breakfast and afternoon snack may also reflect general trends in the American diet, regardless of tiering. Unfortunately, there are no national data yet available on children's diets in 1995 and 1999. Although U.S. dietary guidance places greater emphasis on grains and less on meat (e.g., Food Guide Pyramid, *Dietary Guidelines for Americans*), these messages did not change between 1995 and 1999.

Variety of Foods Offered

Because the CACFP meal-pattern requirements are designed to ensure adequate nutrition, the high compliance rates indicate that CACFP providers were offering children a good mix of the major classes of foods. Although CACFP regulations pose no further requirements for variety, providers may offer multiple items within a particular component category and are encouraged to vary the menus for particular components over the course of the week.

Relatively few providers offer more than a single food item within a given meal component, except to meet the requirement for two fruits or vegetables at lunch (Exhibit 8). The greatest amount of variety within particular meal components occurs at lunch, when, for each component, about a fifth of all meals include more than one item (and more than two for fruits and vegetables). In addition, 11 percent of breakfasts and 5-7 percent of snacks include more than one item in the fruit-vegetable-juice group. Practically no meals include more than a single type of milk, so these data are not shown for this meal component.

²³ Supper and evening snack are omitted from this analysis. Because only a small proportion of providers offer them, the sample sizes are small.

Exhibit 8
Frequency with which Major Meal Components Are Offered and Variety Within Meal Components

	Meals Offered to Children Aged 3-5			
	Breakfast		Lunch	
	Tier 2 1999	Difference 1999-95 ^a	Tier 2 1999	Difference 1999-95 ^a
Milk				
% of meals with milk offered	98.9%	0.1%	98.9%	2.1%
Fruit, Vegetables, or Juice				
% of meals with at least 1 offered ^b	98.4	0.1	94.6	1.2
% with more than 1 offered ^b	10.6	1.8	19.8	-0.7
% of providers offering any in week ^b	100.0	0.0	100.0	0.0
<i>Mean different items offered in week (if at least 1)^b</i>	3.8	0.0	8.6	-0.1
Bread and Bread Alternates				
% of meals with at least 1 offered	100.0	1.2***	98.4	0.5
% with more than 1 offered	10.9	-2.0	21.4	2.2
% of providers offering any in week	100.0	0.0	100.0	0.0
<i>Mean different items offered in week (if at least 1)</i>	3.4	0.0	3.2	0.1
Meat and Meat Alternates				
% of meals with at least 1 offered	10.5	-4.4*	99.3	-0.3
% with more than 1 offered	1.1	0.3	20.9	2.7
% of providers offering any in week	34.2	-13.4**	100.0	0.0
<i>Mean different items offered in week (if at least 1)</i>	1.3	0.0	5.0	0.1
Unweighted sample	180-2,093	370-3,975	483-2,305	919-4,483

^a Regression estimate. See Appendix D.

^b For lunch, read "at least 2" or "more than 2." The minimum requirement at lunch is two fruits or vegetables.

Significance levels:

* = .10

** = .05

*** = .01

continued...

Exhibit 8 (continued)
Frequency with which Major Meal Components Are Offered and Variety Within Meal Components

	Snacks Offered to Children Aged 3-5			
	Morning Snack		Afternoon Snack	
	Tier 2 1999	Difference 1999-95 ^a	Tier 2 1999	Difference 1999-95 ^a
Milk				
% of meals with milk offered	48.9%	8.2%	44.9%	-4.2%
Fruit, Vegetables, or Juice				
% of meals with at least 1 offered ^b	64.3	-9.3	65.4	-1.2
% with more than 1 offered ^b	4.5	-4.2**	6.5	-3.5**
% of providers offering any in week ^b	94.5	-4.0*	96.5	1.2
<i>Mean different items offered in week (if at least 1)^b</i>	2.7	-0.2	2.6	-0.3**
Bread and Bread Alternates				
% of meals with at least 1 offered	83.1	4.0	83.9	7.0***
% with more than 1 offered	0.3	-0.5	1.1	0.3
% of providers offering any in week	96.9	-0.7	99.3	-0.2
<i>Mean different items offered in week (if at least 1)</i>	2.6	0.3*	2.6	0.2
Meat and Meat Alternates				
% of meals with at least 1 offered	21.1	-4.6	27.0	-7.2***
% with more than 1 offered	1.1	1.1*	1.8	0.6
% of providers offering any in week	59.9	-9.9	71.2	-9.2**
<i>Mean different items offered in week (if at least 1)</i>	1.4	0.0	1.7	0.0
Unweighted sample	153-1,158	302-2,192	331-2,153	650-4,148

^a Regression estimate. See Appendix D.

^b For lunch, read "at least 2" or "more than 2." The minimum requirement at lunch is two fruits or vegetables.

Significance levels:

* = .10

** = .05

*** = .01

CACFP meals do offer substantial variety over the week, however. A week of lunch menus, for example, features an average of nine different foods in the fruit-vegetable-juice category, five different meats or meat alternates, and three different breads or bread alternates. The weekly breakfast menu includes four different fruit-vegetable-juice items and three different breads or bread alternates. Snacks average three different items in two components: fruit-vegetable-juice and bread or bread alternate.

The variety in menus offered by 1999 Tier 2 providers differs little from that offered by similar providers in 1995. The weekly number of different items within a meal component category shows only one significant difference—a small reduction in the average number of different fruit-vegetable-juice items offered at afternoon snack. No significant differences were found in the number of items per component at breakfast or lunch, nor for bread and bread alternates or meat and meat alternates at snacks. However, the proportion of morning and afternoon snacks including more than a single fruit, vegetable, or juice (likely an extra serving over and above the CACFP requirement) was somewhat lower for Tier 2 providers in 1999 than for similar providers in 1995. Again the difference is small but consistent with the hypothesis that some Tier 2 providers may have adjusted their menus in an effort to control costs.

Food and Nutrient Composition of CACFP Tier 2 Breakfasts

This and subsequent sections examine in more detail the food and nutrient composition of meals and snacks offered in Tier 2 family child care homes. The analysis is motivated by the hypothesis that Tier 2 providers might adjust to their lower reimbursement rates by offering meals of lesser nutritional quality than they would otherwise have offered.

Three kinds of information bearing on this issue are presented. First, foods most commonly offered in each meal or snack by Tier 2 providers are examined. Second, the average food energy and nutrient content of the meals and snacks offered are compared with nutrition standards established for USDA's school meal programs and additional dietary recommendations promulgated in *Dietary Guidelines for Americans* and the National Research Council's *Diet and Health* report. To the extent that meals offered in Tier 2 homes deviate substantially from these benchmarks, this could be a matter for concern even if reimbursement tiering played no role. Third, the extent to which the food and nutrient composition of Tier 2 meals in 1999 differs from the composition of meals offered by similar providers in 1995 is estimated, using the multivariate approach described in the Introduction and Appendix D of this report.

All food and nutrient measures describe what is *offered* to children rather than what is actually *served* or *consumed*.²⁴ Food served and consumed is typically less than food offered, as individual children may not accept or eat everything they are offered. Some children may get second helpings and, although these were considered in the estimates of portion size²⁵, food consumption was not measured in this study. Findings are therefore indicative of the potential contribution of CACFP meals and snacks to children's daily food and nutrient needs.

The analyses reported here show that Tier 2 breakfasts in 1999 largely met the nutrient-based benchmarks established for this study. Two exceptions are total food energy and the percent of energy from saturated fat. Less than one-fifth of providers offered breakfasts that met one-fourth of the RDA for food energy, and about half offered breakfasts that exceeded the *Dietary Guidelines* recommended level of food energy from saturated fat.

Tier 2 providers in 1999 generally offered breakfasts that differed little from those offered by providers in 1995, controlling for characteristics that determine tier status. The data do not suggest that Tier 2 providers responded to lower reimbursement rates by reducing the nutritional quality of the breakfasts they offered.

²⁴ The only data available for the full sample of Tier 2 providers are contained in the menu survey, which indicates what the provider made available but not how the children responded. For example, if a provider records turnips on the menu, we consider turnips to be offered. Some children may refuse to have turnips put on their plate or may not eat some or all of the turnips, but these behaviors are not known or estimated.

The amount "offered" is the average portion size served to or taken by the average child, based on meal observations conducted in a subsample of Tier 2 homes. Appendix C describes the analytic approach used in determining the nutrient content of meals and snacks offered.

²⁵ While it is possible that second helpings are provided to only some children in a provider's care, the meal observation method used in the 1995 study did not identify "seconds" as such. To maintain comparability, the same procedure was used for the meal observations conducted in 1999.

Benchmarks Used to Evaluate Nutrient Content

The nutrients selected for analysis in the remaining sections of this report were based on the analyses presented in the *Early Childhood and Child Care Study*. They include the nutrient and food components identified as priorities for public health monitoring by the Joint Nutrition Monitoring Evaluation Committee (JNMEC) of the U.S. Departments of Health and Human Services and Agriculture (1995) and those targeted by USDA in ongoing efforts to improve the nutritional quality of meals offered in all Child Nutrition programs.²⁶ CACFP regulations and guidance materials provide general menu planning and nutrition guidelines for meals and snacks offered under the program, but specific nutrition standards have not been established.²⁷ For the purposes of this study, it was therefore necessary to define a set of nutrient-based benchmarks that could be used to evaluate the relative nutritional quality of meals and snacks offered in CACFP family child care homes.

Three sources of benchmarks for evaluating the nutrient content of meals and snacks offered in family child care homes were identified (Exhibit 9). Since 1995, the National School Lunch Program (NSLP) and the School Breakfast Program (SBP) have been required to provide, in meals offered over a school week, one-third and one-fourth of the RDAs (National Research Council, 1989a),²⁸ respectively, for total food energy (calories) and key nutrients (protein, vitamin A, vitamin C, iron, and calcium) needed by growing children.²⁹ Separate RDAs have been established for several child age and gender groups: 1-3 years, 4-6 years, 7-10 years, and, separately for boys and girls 11-14 years of age. Since the 3-5 and 6-12 CACFP age groups are not contained within those age-specific

²⁶ There are two exceptions. Dietary fiber was not included as there is no scientific consensus about optimal fiber intake, therefore no standard for comparison. And, although included in the 1995 study, protein as a percentage of food energy was omitted from the analyses presented here. The total protein content of the menus is addressed.

²⁷ The CACFP meal patterns are designed for planning meals and snacks that make a substantive contribution to children's major nutritional needs.

²⁸ The RDAs are currently being replaced with new standards—*Dietary Reference Intakes* (DRIs). DRIs were not available for all nutrients examined in this report when the analyses were run, and DRIs have not yet been incorporated into nutrition standards for any of USDA's Child Nutrition programs. Therefore, we have not used DRIs as benchmarks for evaluating the nutrient composition of CACFP meals. The Institute of Medicine (IOM, 2000) recommends using Estimated Average Requirements (EAR) instead of RDAs to assess the prevalence of inadequate nutrient intakes among individuals in a group. This value is set lower than the RDA which represents an intake level that exceeds the requirements of 97 to 98 percent of individuals in a group. Using the EAR should reduce the chance of overestimating the prevalence of nutrient inadequacy for groups. Using the EAR as the benchmark in the 1995-99 comparisons of nutrient content of meals offered in child care homes would probably have shown larger proportions of providers meeting the standard for any nutrient in both years. In any event, the study findings with respect to the effect of tiering on the nutrient composition of Tier 2 provider meals are unlikely to change whether based on DRIs or RDAs.

²⁹ 7CFR, parts 210 and 220.

Exhibit 9
Benchmarks Used in Evaluating CACFP Meals and Snacks

Nutrient	Benchmark
Nutrition Standards for the NSLP and SBP^a	
Food energy, protein, vitamin A, vitamin C, calcium, and iron	Breakfast: One-fourth of the RDA ^b Lunch: One-third of the RDA ^b
Nutrients included in the <i>Dietary Guidelines</i> for Americans^c	
Total fat	≤ 30% of total calories
Saturated fat	< 10% of total calories
National Research Council <i>Diet and Health</i> Recommendations^d	
Carbohydrate	> 55% of total calories
Sodium ^d	Breakfast: ≤ 600 mg Lunch: ≤ 800 mg
Cholesterol ^d	Breakfast: ≤ 75 mg Lunch: ≤ 100 mg

^a 7 CFR, parts 210 and 220. Program regulations also include goals for breakfasts and lunches that are consistent with the 1990 Dietary Guidelines recommendations for fat and saturated fat.

^b National Research Council, 1989a.

^c U.S. Departments of Health and Human Services and Agriculture, 2000.

^d National Research Council, 1989b. Standards used for cholesterol and sodium are adapted from recommendations for maximum daily intake.

RDA ranges, comparing the food energy and nutrient content of meals offered with RDAs required the calculation of age-weighted RDA values. (See Appendix C for a discussion of these calculations.)

In addition to the RDAs, NSLP and SBP meals must conform to the recommendations of the *Dietary Guidelines for Americans* (U.S. Departments of Health and Human Services and Agriculture, 1990), in particular, the limitations on the percentages of energy from total fat (no more than 30 percent of food energy) and saturated fat (less than 10 percent of food energy). The National Research Council's *Diet and Health* report (1989b) (NRC recommendations) is the basis for recommendations for cholesterol (no more than 300 mg. per day). It also recommends limiting total sodium levels to 2,400 mg. per day (equivalent to 6 grams of salt) and maintaining carbohydrate at more than 55 percent of total food energy.

Current recommendations for fat, saturated fat, cholesterol, sodium, and carbohydrate apply to all healthy children age 2 and older. In keeping with these recommendations, quantitative benchmarks for the percent of energy from energy-supplying macronutrients (total fat, saturated fat, and carbohydrate) as well as cholesterol and sodium are applied only to the meals and snacks offered to children in the 3-5 and 6-12 CACFP age groups.

The *Dietary Guidelines* and NRC recommendations are intended to apply to average total daily food intake. It is generally permissible in nutrition research to examine the nutrient contribution of major meals such as breakfast and lunch, averaged over several days, to daily goals. The assumption made

is that meals that meet the goals increase the likelihood that total daily intake will meet the goals. In this study we present the average nutrients in breakfasts, lunches, snacks, and common combinations of meals and snacks offered over 3-5 days relative to all of the selected benchmarks of nutritional quality. Where possible, daily nutrient recommendations are expressed as one-fourth of the goal at breakfast and one-third of the goal at lunch, consistent with the school meal program nutrition standards for these meals. Since no such proportions of daily goals have been suggested for Child Nutrition programs serving snacks, it is not possible to examine the proportion of providers offering snacks or common combinations of meals and snacks that are consistent with daily recommendations.³⁰ We do, however, present the mean nutrient content of snacks and common combinations of meals snacks offered, so that their relative contribution to daily recommendations can be evaluated.

Finally, it is important to recognize that *CACFP family child care homes are not required to offer meals or snacks that meet the school meal program nutrition standards or any other quantitative nutrient recommendations*. The benchmarks used in this report were selected solely to facilitate interpretation of the data.

Foods Offered in CACFP Breakfasts

Exhibit 10 summarizes the foods most commonly offered to children aged 3-5 at breakfast, including foods in the three required meal component categories and other, noncreditable, foods.³¹ Breakfast menus differ very little across the three age groups (1-2, 3-5, and 6-12). The 3-5 age group, which is the largest, is used for illustrative purposes. Figures in the exhibit are the percent of all observed breakfasts that included the food item or group.³² This may be interpreted as the percent of CACFP breakfasts offered nationwide on any given day that include the specified food. Only food items or groups offered in at least 5 percent of all breakfasts are listed.³³

³⁰ There are no widely accepted standards for snacks because snacks are considered to be supplementary and, *on an individual basis*, are not expected to make major contributions to children's daily nutrient intake. For this reason it was also not possible to define RDA-based benchmarks for snacks or for the total complement or common combinations of meals and snacks offered.

³¹ Noncreditable foods are foods that do not contribute to satisfying the CACFP meal pattern for a particular meal (e.g., condiments, meat or meat alternates at breakfast, juice drinks).

³² Menus were obtained for 3-5 days for each provider. A given provider might offer breakfast on none, some, or all of the menu days. Five breakfasts were recorded for most providers, which means that most providers contribute five observations to this analysis. The number of included breakfasts for a single provider ranges from three to five. Breakfasts offered on 1 or 2 days are excluded from the analysis.

³³ This criterion is applied separately to 1999 and 1995 data. Any food offered in at least 5 percent of breakfasts in either period is included in the exhibit.

Exhibit 10
Share of Breakfasts Containing Foods Commonly Offered to Children Aged 3-5^a

Meal Component/Food	Tier 2 1999	Difference 1999-95^b
Percentage of Breakfasts in which Item is Offered		
Milk	98.9%	0.1%
White, 2%	54.3	1.7
White, whole	34.2	10.7*
White, skim	5.6	-0.4
White, no further specification ^c	0.7	-26.0***
Fruits and Juices	97.8	0.4
<i>Any fresh, canned, or dried fruit</i>	66.6	1.2
<i>Any fresh fruit</i>	49.7	1.2
Banana	25.0	0.2
Orange	7.2	0.6
Apple	7.1	0.7
<i>Any canned fruit</i>	13.6	0.9
Applesauce	5.6	0.5
<i>Any juice</i>	40.0	1.1
Orange/grapefruit juice	22.9	1.8
Apple juice	10.6	1.1
Breads and Bread Alternates	100.0	1.2***
Cold cereal	43.3	1.8
Pancakes, waffles, French toast	23.1	2.6
White bread, rolls	18.9	-3.3
Hot cereal	8.7	-2.5
Noncreditable Foods^d		
<i>Meat/meat alternates</i>	10.5	-4.4*
Eggs	6.7	-1.5
<i>Other noncreditable</i>	52.0	-1.8
Syrup, honey	22.4	3.6**
Sugar	8.2	2.0
Jelly	4.7	-1.2
High-fat condiments ^e	29.6	-3.0
Unweighted sample	2,093	3,975

a Includes only foods offered in at least 5 percent of daily breakfast menus, in either 1995 or 1999.

b Regression estimate. See Appendix D.

c Menu survey did not include information on the fat content of milk.

d Foods that do not contribute to satisfying the CACFP meal pattern.

e Butter, margarine, cream cheese, and other high-fat toppings.

Significance levels:

* = .10

** = .05

*** = .01

One may roughly describe a “typical” CACFP breakfast as including the most commonly offered food in each of the three required categories. The typical Tier 2 breakfast in 1999 would thus consist of milk (white, 2-percent fat), a banana or orange juice, and cold cereal.

The analysis indicates that the foods that Tier 2 providers offered for breakfast in 1999 differed little from the foods that similar providers offered in 1995, especially for the three required categories of food.

Milk. Just over half of all breakfasts included white, 2-percent fat milk. White whole milk was next most common, offered in about one-third of breakfasts. Skim milk was offered in only about 6 percent of breakfasts, and flavored milks were rarely offered at breakfast. Milk patterns do not differ meaningfully from the patterns for similar providers in 1995.³⁴

Fruits, Vegetables, and Juices. Two-thirds of breakfasts included some kind of fresh, canned, or dried fruit. The most common example was bananas, which were offered in 25 percent of breakfasts. Fruit juice was offered at 40 percent of breakfasts, most commonly orange or grapefruit juice (23 percent) and apple juice (11 percent). None of these patterns changed significantly from 1995.

Bread and Bread Alternates. Cold cereal is the most frequently offered food in this group, appearing in 43 percent of all breakfasts. Pancakes, waffles, and French toast are also common, as are white bread and rolls (23 percent and 19 percent, respectively). No particular foods in this group differ significantly in their serving frequency from those offered in 1995, but bread and bread alternates as a group show a small but statistically significant increase in 1999.

Noncreditable Foods. About 11 percent of CACFP breakfasts included a food that would be classified as a meat or meat alternate, most commonly eggs. Foods in this category may have been offered less frequently by Tier 2 providers in 1999 than by similar providers in 1995 ($p < 0.10$). As discussed in the section above on meal components, this may reflect an effort on the part of some Tier 2 providers to reduce food costs without compromising compliance with CACFP regulations.

Just over half of CACFP breakfasts included some other form of noncreditable food, most commonly condiments. Syrup or honey, offered in 22 percent of breakfasts, were significantly more common in 1999 than in 1995.

³⁴ The increase in the estimate for whole milk ($p < 0.10$) appears to result from the fact that a substantial proportion of milk observations in 1995 did not specify the type of milk, while less than 1 percent of milk observations in 1999 had no further specification.

Nutrient Content of CACFP Breakfasts Relative to RDAs

Tier 2 providers in 1999 offered breakfasts that provide, on average, more than 25 percent of the 1989 RDA for all nutrients examined, with the exception of food energy (Exhibit 11).³⁵ For all age groups combined, the average breakfast supplies three-fourths of the RDA for vitamin C, over half of the RDA for protein and vitamin A, and over one-third of the RDA for calcium and iron.³⁶ Mean iron content is strongly influenced by the frequency with which enriched or fortified cereals are offered; for example, such cereals account for 65 percent of the iron in breakfasts offered to the 3-5 age group (data not shown). For food energy, the average breakfast provides about one-fifth of the RDA. These patterns are roughly consistent across age groups.³⁷

The analysis indicates that the Tier 2 breakfasts offered in 1999 provide significantly more food energy than those offered by similar providers in 1995. Although the difference is small—less than 2 percent of the RDA—it is statistically significant for breakfasts offered to children aged 3-5, the largest age group served, and for all age groups served by the provider.³⁸ There were no significant differences in the mean percentage of RDA for other key nutrients in breakfasts offered by Tier 2 1999 providers and similar providers in 1995.

³⁵ In contrast to the RDAs for other nutrients, recommended energy allowances (REAs) represent the *average* needs of individuals in a group rather than an upper level of requirement variability among individuals (National Research Council, 1989a). For ease in presentation, we refer to the REAs as RDAs throughout this report.

³⁶ “All ages” refers to the overall mean percent of RDA across the particular age group(s) served by each provider.

³⁷ As age increases, there is a tendency for the percent RDA for calories, protein, and vitamin A to decrease and the percent RDA for vitamin C, calcium, and iron to increase. This is because the magnitude of the change in RDA for each age group differs among nutrients relative to the change in estimated portion sizes. For example, while the average increase in portion sizes is about 13 percent for both breakfast and lunch, the RDA for vitamin A is 42 percent higher for children in the 6-12 group than children in the 3-5 group. Conversely, the RDA for vitamin C is only 6 percent higher for the 6-12 group than the 3-5 group.

³⁸ The increase in total food energy does not appear to be due to the significant increase in whole milk in 1999. Differences in milk offerings in the two time periods account for only 0.2 of a percentage point of the difference in food energy.

Exhibit 11
Mean Percentage of RDA Offered at Breakfast

	Age 1-2		Age 3-5		Age 6-12		All Ages	
	Tier 2 1999	Difference 1999-95 ^a	Tier 2 1999	Difference 1999-95 ^a	Tier 2 1999	Difference 1999-95 ^a	Tier 2 1999	Difference 1999-95 ^a
Total energy	22.2%	0.9%*	21.2%	1.5%***	19.8%	1.1%*	21.4%	1.5%***
Protein	62.9	-0.1	54.4	1.5	44.1	-1.5	56.4	1.8
Vitamin A	61.7	6.0	62.9	4.4	51.1	1.0	59.7	4.6
Vitamin C	69.3	-0.2	79.2	2.8	86.9	2.4	74.9	0.4
Calcium	34.4	0.1	37	0.7	37.5	-1.1	36.4	0.6
Iron	34.0	3.3	41.1	2.0	45.7	-2.8	39.1	1.1
Un-weighted sample	412	759	441	830	231	458	499	929

^a Regression estimate. See Appendix D.

Significance levels:

* = .10

** = .05

*** = .01

Percent of Providers Offering at Least One-Fourth of the RDA at Breakfast

Most Tier 2 providers in 1999 offered breakfasts with at least one-fourth of the RDA for all nutrients except food energy (Exhibit 12). Over 97 percent offered breakfasts that supply at least one-fourth of the RDA for protein, vitamin A, and calcium; over 90 percent offered breakfasts that met this benchmark for vitamin C; and 77 percent offered breakfasts that met this benchmark for iron (for all age groups combined). Far fewer providers—about 15 percent overall and just 6 percent for 6-12 year olds—offered one-fourth of the RDA for food energy at breakfast.

Despite the relatively low percentage of providers whose breakfasts contained one-fourth of the RDA for food energy in 1999, significantly more Tier 2 providers in 1999 met this threshold for the 3-5 age group than did similar providers in 1995. The effect amounts to an additional 8 percent of providers offering breakfasts with one-fourth of the RDA for energy for this age group.

Exhibit 12
Percentage of Providers Offering at Least One-Fourth of the RDA at Breakfast

	Age 1-2		Age 3-5		Age 6-12		All Ages	
	Tier 2 1999	Difference 1999-95 ^a	Tier 2 1999	Difference 1999-95 ^a	Tier 2 1999	Difference 1999-95 ^a	Tier 2 1999	Difference 1999-95 ^a
Total energy	18.5%	5.8%	13.0%	8.2%***	6.3%	1.8%	14.7%	5.1%
Protein	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0
Vitamin A	99.2	1.3	99.3	0.3	97.0	3.1	98.6	2.5
Vitamin C	91.4	0.8	92.1	-2.0	94.9	0.4	91.6	-3.7
Calcium	97.1	-2.8	98.2	0.7	98.6	1.2	98.0	1.2
Iron	73.4	10.9	80.8	-2.3	82.5	-9.6	76.8	-2.6
Un-weighted sample	412	759	441	830	231	458	499	929

^a Regression estimate. See Appendix D.

Significance levels:

* = .10

** = .05

*** = .01

Nutrient Content of CACFP Breakfasts Relative to *Dietary Guidelines* and NRC Recommendations

Tier 2 breakfasts offered to children aged 3-12 are largely consistent with the *Dietary Guidelines* and NRC recommendation benchmarks applied in this study. The average provider offered breakfasts that met these recommendations for the percent of energy from fat and carbohydrate, as well as falling under the recommended maxima for cholesterol and sodium (Exhibit 13).

The partial exception to this pattern concerns the percent of energy from saturated fat for which the recommended level is less than 10 percent. The estimates for the percent of energy from saturated fat in breakfasts offered to 3-5 year olds and 6-12 year olds are 10.4 and 9.8 percent, respectively. Neither of these estimates are significantly different from 10 percent. (The 95-percent confidence interval for this estimate falls across the 10-percent boundary for both groups.)

The Tier 2 providers in 1999 offered breakfasts with essentially the same levels of fat, saturated fat, and carbohydrate, as a percentage of food energy, as breakfasts offered by similar providers in 1995. The mean amounts of cholesterol and sodium offered did not differ significantly between the two years.

Exhibit 13**Mean Nutrient Levels Relative to *Dietary Guidelines* and NRC Recommendations Offered at Breakfast^a**

		Age 3-5		Age 6-12	
	Recommendation	Tier 2 1999	Difference 1999-95 ^b	Tier 2 1999	Difference 1999-95 ^b
Percent of food energy from:					
Fat (%)	≤ 30%	22.0%	0.1%	21.6%	0.5%
Saturated fat (%)	<10%	10.4	0.0	9.8	0.0
Carbohydrate (%)	> 55%	66.5	0.5	67.4	0.2
Cholesterol (mg)	≤ 75 mg	52.9	8.5	57.9	8.9
Sodium (mg)	≤ 600 mg	460.1	45.1	538.3	44.1
Unweighted sample		441	830	231	458

^a Note that the *Dietary Guidelines* and NRC recommendations are only applicable to children beginning at 2 years of age and older. This analysis is limited to breakfasts offered to children 3-5 and 6-12, the only CACFP age groups for which the standards fully apply.

^b Regression estimate. See Appendix D.

Significance levels:

* = .10

** = .05

*** = .01

Percent of Providers Meeting the *Dietary Guidelines* and NRC Recommendations at Breakfast

A large majority of Tier 2 providers offered breakfasts that meet most of the *Dietary Guidelines* and NRC recommendations, as shown in Exhibit 14. For children aged 3-5 and 6-12, at least 90 percent of providers met the recommendations for the percentages of energy from fat and carbohydrate, and around 80 percent offered breakfasts with cholesterol and sodium in the recommended range. A lower proportion, but still at least half of all providers, offered breakfasts for which the percentage of food energy from saturated fat was within the recommended range.

The percentages of Tier 2 providers meeting the *Dietary Guidelines* and NRC recommendations in 1999 vary little from the percentages for similar providers in 1995. This is true for children in both the 3-5 and 6-12 age group.

Exhibit 14
Percentage of Providers Meeting *Dietary Guidelines* and NRC Recommendations at Breakfast^a

	Age 3-5		Age 6-12	
	Tier 2 1999	Difference 1999-95 ^b	Tier 2 1999	Difference 1999-95 ^b
Percent of food energy from:				
Fat	90.4%	-1.4	92.8	-0.4%
Saturated fat	50.7	6.4	57.7	5.1
Carbohydrate	94.6	-1.8	96.7	-0.1
Cholesterol	78.5	-5.9	79.2	-5.3
Sodium	87.4	-5.4	78.3	-6.5
Unweighted sample	441	830	231	458

^a Note that the *Dietary Guidelines* and NRC recommendations are only applicable to children beginning at 2 years of age and older. This analysis is limited to breakfasts offered to children 3-5 and 6-12, the only CACFP age groups for which the recommendations fully apply.

^b Regression estimate. See Appendix D.

Significance levels:

* = .10

** = .05

*** = .01

Food and Nutrient Composition of CACFP Tier 2 Lunches

This section continues the examination of the nutritional characteristics of meals and snacks offered to children in CACFP family child care homes. It examines the food and nutrient composition of lunches in Tier 2 homes in 1999 and compares them with the composition of lunches offered by similar providers (resembling them in tier-related characteristics) in 1995.

Tier 2 providers in 1999 generally offered lunches that supply at least one-third of the RDA for most nutrient measures, the exceptions being food energy and iron. Relatively few providers, however, offered lunches that met the *Dietary Guidelines* recommendations for fat and saturated fat or the NRC recommendations for carbohydrate and sodium.

Comparison of the nutrient profile of Tier 2 1999 lunches with those offered by similar providers in 1995 revealed several significant differences, but none that appear to reflect an impact of the reduced reimbursement rate. Most of the significant differences reflect increases in nutrient levels, which result mainly from a general tendency toward larger portion sizes in 1999. In addition to the larger portions, changes in the specific foods offered at lunch led to some changes in the nutrient profile.

Foods Offered in CACFP Lunches

Lunches that qualify for CACFP reimbursement must include two or more servings of fruit, vegetables, or full-strength juice, plus at least one serving of the other three major meal components: milk, bread or bread alternate, and meat or meat alternate. Practically all Tier 2 lunches in 1999 met this broad requirement, as indicated earlier. Exhibit 15 contains a more detailed description of the foods offered to children aged 3-5 within each meal component category.

Milk. As at breakfast, the most common type of milk offered is white, 2-percent fat milk. It is offered in just over half of all lunches. Whole milk is offered in about one-third of the lunches, and no other kind of milk makes up more than a small percent of the total. The 1999 Tier 2 pattern shows no important difference from the pattern of similar providers in 1995.³⁹

Fruits and Juices. Nearly 9 out of 10 lunches contained a fruit or, less frequently, a fruit juice. Fresh fruits and canned fruits appeared in 46 and 40 percent of the 1999 lunches, respectively. Apples, bananas, grapes, and oranges were the most common fresh fruits, while peaches, pears, applesauce, and fruit cocktail led the list of canned fruits. The fruits in Tier 2 lunches in 1999 were quite like those offered by similar providers in 1995, although applesauce was a bit less common and fresh fruit ($p < 0.10$) slightly more common in 1999.

³⁹ As Exhibit 14 indicates, the 1995 data contain many observations of milk whose exact type was not specified. Such observations were rare in the 1999 data and the difference probably accounts for the higher proportion of whole milk observations in 1999 ($p < 0.10$).

Exhibit 15
Share of Lunches Containing Foods Commonly Offered to Children Aged 3-5^a

	Tier 2 1999	Difference 1999-95^b
Percentage of Lunches in which Item is Offered		
Milk	98.9%	2.1%
White, 2%	52.9	-0.6
White, whole	33.1	9.9*
White, 1%,1.5%	7.1	3.0
White, skim	5.6	-0.3
White, no further specification ^c	0.6	-28.7***
Fruits and Juices	87.0	4.1
<i>Any fresh, canned, or dried fruit</i>	86.4	3.8
<i>Any fresh fruit</i>	46.1	6.6*
Apple	14.1	-0.4
Banana	8.3	0.4
Grapes	7.3	1.2
Orange	5.7	-0.7
<i>Any canned fruit</i>	39.9	-3.2
Peaches	9.9	0.0
Pears	8.9	1.7
Applesauce	8.6	-4.1**
Fruit cocktail	6.8	-1.1
Vegetables	92.9	2.6
Potatoes, fried	14.6	2.7
Green beans, cooked	13.4	0.8
Corn	12.9	0.0
Tomatoes, cooked	12.5	3.0**
Peas	7.9	0.2
Broccoli, cooked	4.0	-1.1
Potatoes, mashed, scalloped	4.0	-1.1
Vegetables in mixed dishes	3.4	-1.5
<i>Any raw vegetables</i>	28.8	0.3
Carrots, raw	14.0	0.7
Lettuce, salad mix	6.7	0.3
Bread and Bread Alternates	98.4	0.5
White bread, rolls	60.0	-2.0
Pasta	19.9	1.2
Breading on nuggets, sticks	14.3	3.2**
Tortillas, taco shells, pizza crust	7.7	-0.4
Rice	4.3	-0.6

continued...

Exhibit 15 (continued)**Share of Lunches Containing Foods Commonly Offered to Children Aged 3-5^a**

	Tier 2 1999	Difference 1999-95^b
Meat and Meat Alternates	99.3	-0.3
Cheese, not low-fat	20.4	1.8
Hot dogs	11.9	2.4**
Chicken-Turkey, fried	9.3	2.5**
Peanut butter, nuts	8.0	0.2
Chicken-Turkey, roasted	7.1	-1.9
Ham	6.6	1.5
Beef, ground	6.1	-2.6**
Fish, fried, processed	6.0	0.0
Fish, canned	4.5	-0.6
Cheese in mixed dishes	13.3	1.1
Beef in mixed dishes	10.8	1.2
Noncreditable Foods^d	57.5	5.1
High-fat condiments ^e	34.7	-1.7
Low-fat condiments ^f	20.1	7.1***
Jelly	6.7	0.3
Unweighted sample	2,305	4,483

^a Includes only foods offered in at least 5 percent of meals, in either 1995 or 1999.

^b Regression estimate. See Appendix D.

^c Menu survey did not include information on the fat content of milk.

^d Foods that do not contribute to satisfying the CACFP meal pattern.

^e Butter, margarine, salad dressing, mayonnaise, gravy, cream cheese, and other high-fat toppings.

^f Low-fat salad dressing, low-fat mayonnaise, ketchup, mustard, pickles, and other low-fat toppings.

Significance levels:

* = .10

** = .05

*** = .01

Vegetables. Tier 2 providers in 1999 offered a vegetable in 93 percent of all lunches. The most common vegetables were fried potatoes, raw carrots, green beans, corn, and cooked tomatoes (mainly in the form of tomato sauce)—each offered in 13-15 percent of lunches. Raw vegetables appeared in 29 percent of lunches but were much less common than cooked vegetables. No striking differences from 1995 are observed, although cooked tomatoes show a small but statistically significant increase.

Bread and Bread Alternates. By far the most common food item in this group is white bread or rolls, appearing in 60 percent of Tier 2 lunch menus in 1999. Pasta is a distant second, at 20 percent, and third is the breading found in dishes such as chicken nuggets and fish sticks (14 percent). The latter category shows a small but statistically significant increase since 1995.

Meat and Meat Alternates. At least one meat or meat alternate was offered in virtually all lunches in Tier 2 homes in 1999 (99 percent). Cheese, offered in 20 percent of lunches, was the most common and hot dogs were second, at 12 percent. Differences from 1995 were not large, but statistically significant increases occurred for hot dogs and fried chicken or turkey, while ground beef was offered significantly less frequently. Each of these differences represented changes in only 2-3 percent of the lunches.

Noncreditable Foods. Over half of CACFP lunches include some noncreditable items, usually condiments. High-fat condiments, such as bread spreads (mayonnaise, butter, and margarine), salad dressings, and gravy, are offered in more than one-third of lunches. Low-fat condiments, such as ketchup, are in one-fifth of the menus. A significantly larger proportion of Tier 2 providers in 1999 offered low-fat condiments than similar providers in 1995—in fact, this was the largest estimated difference between the 2 years for any single food category. Because many of the low-fat condiments are high in sodium, this turns out to be one source of the increase in sodium levels discussed below.

Nutrient Content of CACFP Lunches Relative to RDAs

The average Tier 2 lunch in 1999 provided more than one-third of the RDA for protein, vitamin A, vitamin C, and calcium (Exhibit 16). For food energy and iron, the average falls somewhat short of one-third of the RDA (29 percent and 26 percent, respectively, when averaged across all age groups). Protein and vitamin A levels are far above the one-third of RDA benchmark, at more than 100 percent and 75 percent, respectively.

This pattern is roughly consistent across age groups, but some variations can be seen. Levels of total food energy, protein, and vitamin A in Tier 2 lunches represent a somewhat smaller proportion of the RDA for older children than for younger children. The pattern is reversed for vitamin C, calcium, and iron, with older children offered lunches with slightly higher proportions of the RDA than younger children. As noted for the breakfast analysis, the main reason for this finding is the disproportionate change in the RDA values relative to the change in portion sizes with increasing

Exhibit 16
Mean Percentage of RDA Offered at Lunch

	Age 1-2		Age 3-5		Age 6-12		All Ages	
	Tier 2 1999	Difference 1999-95	Tier 2 1999	Difference 1999-95	Tier 2 1999	Difference 1999-95	Tier 2 1999	Difference 1999-95
Food energy	30.8%	1.7%**	28.8%	2.1%***	27.2%	1.6%**	29.4%	2.1%***
Protein	114.5	2.8	100.1	4.5	85.2	1.2	104.5	4.9
Vitamin A	78.6	1.6	74.5	-0.9	61.2	-4.0	74.7	1.0
Vitamin C	45.2	5.0	48.4	6.6**	53.4	6.9	47.3	5.1*
Calcium	39.2	1.1	42.5	1.4	44.0	0.3	41.4	1.1
Iron	22.8	1.0	26.6	1.5*	31.4	1.7	25.5	0.9
Un-weighted sample	446	842	483	931	165	358	527	1,013

^a Regression estimate. See Appendix D.

Significance levels:

* = .10

** = .05

*** = .01

age. (There is over 90 percent agreement in the foods offered to each age group when more than one group is served.)

The finding for iron warrants further discussion. The major sources of iron in Tier 2 lunches are enriched breads and grains and mixed dishes that contain enriched grains (e.g., macaroni and cheese, pizza, and burritos). Meats (ground beef, in particular) and vegetables (including legumes) contribute two-thirds to three-quarters as much iron as grain-based items. The smaller contribution of iron from lunches relative to breakfasts is due entirely to the frequent offering of enriched and fortified cereals at breakfast. It is unclear whether Tier 2 lunches should be considered “low” in iron content. As reported previously, Tier 2 providers in 1999 were meeting meal-pattern requirements for the major types of foods offered at lunch. It is possible that a one-third RDA benchmark for this nutrient at lunch is inappropriate given the suggested portion sizes, but the analysis required to confirm this hypothesis would be beyond the scope of this study.⁴⁰ Recall that CACFP providers are not required to offer lunches that provide one-third of the RDA.

Tier 2 providers in 1999 offered lunches with significantly larger amounts of food energy than the lunches offered by similar providers in 1995. A significant increase in the mean percent of RDA for vitamin C was observed for children aged 3-5, but not for children aged 1-2 or 6-12. Other than a small increase in the mean percentage of the RDA for iron in lunches offered to 3-5-year-olds ($p < 0.10$), no other 1999-95 differences were found.

The 1999-95 differences stem in large part from a general tendency to serve larger portions of food in 1999 than 1995. Portion sizes were measured by on-site observers who visited a subsample of the family child care homes included in the menu survey.⁴¹ Multivariate analyses were then used to estimate portion sizes for all menus for each kind of food, controlling for factors such as the number of children and meals offered, provider income, and characteristics of the provider’s location (region, urban/rural, and proportion of low-income children).

The portion size analyses found that Tier 2 providers in 1999 offered significantly larger portions than similar providers in 1995 for three of ten major types of food (meats, breads, and nonmilk beverages). The estimated effects were not statistically significant for most other types of food.

A further analysis was conducted to separate the influence of portion sizes from that of menu choices and other factors in creating the 1995-99 differences in nutrient quantities offered. This analysis indicates, for all nutrient measures, that the 1995-99 differences are less positive (and mostly nonsignificant) when the effects of portion size are removed.

⁴⁰ An analysis conducted for the 1995 study, however, indicated that the mean percentage of RDA for iron in CACFP lunches was lower for each age group when the CACFP minimum portion sizes were used in place of estimated portion sizes. The differences ranged from 4 percent for the 6-10 age group to 10 percent for 1-2 year olds (Abt Associates Inc., unpublished data).

⁴¹ For more information on the meal observations and portion size analysis methodology, see Appendix C.

Percent of Providers Offering at Least One-Third of the RDA at Lunch

Over three-quarters of Tier 2 providers in 1999 offered lunches that supplied, on average, at least one-third of the RDA for protein, vitamin A, calcium, and vitamin C (Exhibit 17). Only 20 percent met this benchmark for food energy, and just 9 percent offered lunches with one-third of the RDA for iron. As discussed above, these goals may not be appropriate for CACFP lunches. Still the small proportion of providers offering one-third of the RDA for iron at lunch, especially to preschool children, is potentially worrisome.⁴² Iron deficiency is the single most prevalent nutrient deficiency in the United States, and young children are considered to be one of the groups most at risk. In the 1994-96, 1998 CSFII, less than half of 1-2-year-olds and two-thirds of 3-5-year-olds met their RDA for iron in all meals and snacks combined (USDA, 1999).

Significantly more Tier 2 providers in 1999 met the one-third of RDA benchmark for food energy in lunches offered to 3-5-year-olds and for all age groups served than did similar providers in 1995. This result is consistent with the significant increase in the average amount of energy in lunches offered as shown in Exhibit 16. Across all age groups the increase in the percentage of providers offering lunches with one-third of the RDA for energy is about 10 percent.

Exhibit 17
Percentage of Providers Offering at Least One-Third of the RDA at Lunch

	Age 1-2		Age 3-5		Age 6-12		All Ages	
	Tier 2 1999	Difference 1999-95 ^a	Tier 2 1999	Difference 1999-95 ^a	Tier 2 1999	Difference 1999-95 ^a	Tier 2 1999	Difference 1999-95 ^a
Total energy	29.3%	13.1%*	12.8%	7.3%**	6.3%	-1.4%	19.1%	9.6%**
Protein	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0
Vitamin A	98.7	3.6	94.7	-4.4	89.5	3.5	96.0	6.8
Vitamin C	73.3	12.3	77.4	15.3	85.3	14.0	76.0	10.7
Calcium	88.1	2.3	93.8	0.2	93.8	-4.5	91.8	2.0
Iron	3.6	2.0	7.8	3.2	33.3	13.0	8.5	3.2
Un-weighted sample	446	842	483	931	165	358	527	1,013

^a Regression estimate. See Appendix D.

Significance levels:

* = .10

** = .05

*** = .01

⁴² As discussed for all nutrients in footnote 28, if the new EAR benchmarks for iron had been used, a much larger proportion of providers would have been found to be offering lunches that meet that lower benchmark for iron. The iron values in the RDAs are 10 mg. for both 1-3-year-olds and 4-8-year-olds while those values in the EARs are 3 mg. for 1-3-year-olds and 4.1 mg. for 4-8-year-olds.

Nutrient Content of CACFP Lunches Relative to *Dietary Guidelines* and NRC Recommendations

The average lunch offered by Tier 2 providers in 1999 did not meet the *Dietary Guidelines* or NRC recommendations for any of the nutrient measures except cholesterol, as shown in Exhibit 18. The average values for lunches offered to children aged 3-5 and 6-12 were similar and well above the recommendations for the percent of energy from fat and saturated fat, and below the recommendation for the percent of energy from carbohydrate. The average amount of sodium was also above the recommended maximum for both age groups.

The situation with regard to these recommendations appears to have worsened somewhat between 1995 and 1999. Average values for the percent of energy from saturated fat in lunches offered for the 3-5 and 6-12 age groups are significantly higher for Tier 2 providers in 1999 than for similar providers in 1995. The mean percent of energy from fat was also slightly higher for the 3-5 age group ($p < 0.10$). Both of these increases were small (1 percentage point or less). Average sodium levels increased by almost 20 percent, climbing well above the NRC benchmark, although this result was not statistically significant.

Because the increase in sodium levels was substantial and consistent across age groups, additional analyses were conducted. The increased sodium levels result partly from the general increase in portion sizes described earlier, but menu choices also played a role. No single food appears to account for the difference, but contributions came from increases in the proportion of lunches including ketchup, hot dogs, processed cheese, and fried breaded meats.

Exhibit 18

Mean Nutrient Levels Relative to *Dietary Guidelines* and NRC Recommendations Offered at Lunch^a

		Age 3-5		Age 6-12	
	Recommendation	Tier 2 1999	Difference 1999-95 ^a	Tier 2 1999	Difference 1999-95 ^a
Percent of food energy from:					
Fat (%)	≤ 30%	37.0	1.0*	37.3	0.9
Saturated fat (%)	<10%	15.4	0.7**	15.2	0.8**
Carbohydrate (%)	> 55%	46.2	-0.3	45.9	-0.5
Cholesterol (mg)	≤ 100 mg	59.4	4	71.4	11.2
Sodium (mg)	≤ 800 mg	936.4	131.8	1,132.6	183.5
Unweighted sample		483	931	165	358

^a Note that the *Dietary Guidelines* and NRC recommendations are only applicable to children beginning at 2 years of age and older. This analysis is limited to lunches offered to children 3-5 and 6-12, the only CACFP age groups for which the recommendations fully apply.

^b Regression estimate. See Appendix D.

Significance levels:

* = .10

** = .05

*** = .01

Percent of Providers Meeting the *Dietary Guidelines* and NRC Recommendations for Lunch

As would be expected from the above patterns, few Tier 2 providers meet any of the benchmarks based on the *Dietary Guidelines* and NRC recommendations, with the exception of the recommendation for cholesterol. A large majority meet the recommended maximum for cholesterol (86 percent for children aged 6-12 and 93 percent for ages 3-5), as shown in Exhibit 19. Fewer than 10 percent of providers meet any of the other recommendations, except that 23 percent of providers offer 3-5-year-olds lunches that are within the recommended range for sodium.

There were no significant differences in the proportion of Tier 2 providers in 1999 offering lunches meeting the *Dietary Guidelines* and NRC recommendations for fat, saturated fat, carbohydrate, cholesterol, and sodium compared with similar providers in 1995. This pattern would not be unexpected given the very small and/or nonsignificant increases in average levels for these nutrients, as described earlier.

Exhibit 19
Percentage of Providers Meeting *Dietary Guidelines* and NRC Recommendations at Lunch^a

	Age 3-5		Age 6-12	
	Tier 2 1999	Difference 1999-95 ^a	Tier 2 1999	Difference 1999-95 ^a
Percent of food energy from:				
Fat	7.1%	-2.0%	5.4%	-5.1%
Saturated fat	1.5	-2.4	4.17	1.2
Carbohydrate	2.6	1.1	5.0	2.6
Cholesterol	93.0	-5	86.3	-7.5
Sodium	23.4	-36.3	7.1	-22.4
Unweighted sample	483	931	165	358

^a Note that the *Dietary Guidelines* and NRC recommendations are only applicable to children beginning at 2 years of age and older. This analysis is limited to lunches offered to children 3-5 and 6-12, the only CACFP age groups for which the recommendations fully apply.

^b Regression estimate. See Appendix D.

Significance levels:

* = .10

** = .05

*** = .01

Food and Nutrient Composition of CACFP Tier 2 Snacks

CACFP family child care providers may offer three different types of snacks: morning, afternoon, and evening. (For any one child, however, providers may receive reimbursement for only two meals and one snack or one meal and two snacks in a given day.) The afternoon and morning snacks, offered in 96 percent and 56 percent of Tier 2 homes, respectively, in 1999, are by far the most common. Because only 5 percent of homes offer an evening snack, the present analysis is limited to morning and afternoon snacks.

Snacks are not expected to contribute any specific proportion of the RDA. The analyses presented below therefore describe the average percent of RDA without comparing providers with any specific benchmark. Similarly, the nutrition benchmarks drawn from the *Dietary Guidelines* and NRC recommendations are not typically applied to small eating occasions, such as snacks, which may consist of only one or two foods. For this reason, the analysis presents only mean nutrient levels, for descriptive purposes, on these aspects of the nutrient profile. Information on the nutrient content of snacks is needed to help gauge the extent to which the snacks are likely to contribute to or detract from the recommended patterns over the full day.

The analysis shows that morning and afternoon snacks are quite similar in terms of the foods commonly offered and in their nutrient profile. Both morning and afternoon snacks offer, on average, nearly one-third of the RDA for protein and vitamin C, and 10 to 20 percent of the RDA for food energy, vitamin A, calcium, and iron. The average snack provides a level of total fat that is likely to contribute positively to achievement of the *Dietary Guidelines* overall average daily recommendation, but, like lunch, contributes more than the recommended percent of food energy from saturated fat. The average Tier 2 snacks are consistent with NRC recommendations for the percent of food energy from carbohydrate. Snacks contribute very little cholesterol, on average, and sodium levels do not exceed the relative contribution to daily recommendations from energy and other nutrients.

Snacks offered by Tier 2 providers in 1999 show several statistically significant differences from those offered by similar providers (resembling them in characteristics that determine tier) in 1995. Most notably, the afternoon snack provided less vitamin A in 1999. Both snacks contributed slightly more food energy than in 1995.

Foods Offered in CACFP Snacks

Snacks qualifying for CACFP reimbursement must include food items in any two of the four meal components: milk; fruit, vegetables, or full-strength juice; bread or bread alternate; and meat or meat alternate. Exhibit 20 shows the specific foods offered to children aged 3-5 in at least 5 percent of all morning or afternoon snacks.

Exhibit 20
Share of Snacks Containing Foods Commonly Offered to Children Aged 3-5^a

	Morning Snack		Afternoon Snack	
	Tier 2 1999	Difference 1999-95 ^b	Tier 2 1999	Difference 1999-95 ^b
Percentage of Snacks in which Item Is Offered				
Milk	48.9%	8.2%	44.9%	-4.2%
White, 2%	25.2	4.7	25.5	-1.9
White, whole	18.5	7.4	13.9	6.5**
White, not further specified ^c	0.1	-18.4***	0.1	-23.5***
Fruits and Juices	61.8	-10.2	62.9	0.8
<i>Any fresh, canned, or dried fruit</i>	30.8	-0.5	27.7	-3.9
<i>Any fresh fruit</i>	24.4	1.2	20.4	-3.8
Banana	8.1	2.0	4.4	-0.7
Apple	7.6	-0.2	8.6	-2.2
<i>Any canned fruit</i>	4.8	0.4	(d)	(d)
<i>Any juice</i>	34.8	-10.2	39.8	4.6
Apple juice	15.2	-9.3**	18.1	-0.8
Grape juice	7.4	3.6	8.4	4.3**
Orange/grapefruit juice	6.9	-2.9	5.7	-0.2
Juice blends, noncitrus	4.8	-1.4	7.3	0.6
Vegetables	(d)	(d)	3.4	-3.0**
<i>Any raw vegetables</i>	(d)	(d)	2.5	-3.6***
Bread and Bread Alternates	83.1	4.0	83.9	7.0***
Crackers	38.6	-2.9	42.6	2.7
White bread, rolls	13.0	0.6	10.2	-0.2
Cookie	7.6	3.3**	13.7	2.2
Muffins, sweet bread	6.3	1.1	4.6	-1.0
Cold cereal	5.2	-0.3	(d)	(d)
Meat and Meat Alternates	21.1	-4.6	27.0	-7.2***
Peanut butter, nuts	7.0	-1.8	10.7	-5.4***
Cheese, not low-fat	6.3	-5.0**	9.9	-3.3**
Yogurt	5.5	2.6	(d)	(d)
Noncreditable Foods^e	17.4	1.5	14.8	-1.2
High-fat condiments ^f	12.8	2.6*	6.6	-0.1
Unweighted sample	1,158	2,192	2,153	4,148

^a Includes only foods offered in 5 percent of snacks, in either 1995 or 1999 (computed separately for morning and afternoon snacks).

^b Regression estimate. See Appendix D.

^c Menu survey did not include information on the fat content of milk.

^d Fewer than 5 percent of snacks contain this food.

^e Foods that do not contribute to satisfying the CACFP meal pattern.

^f Butter, margarine, cream cheese, and other high-fat toppings.

Significance levels:

* = .10

** = .05

*** = .01

Milk. Slightly less than half of both morning and afternoon snacks include milk. White, 2-percent fat milk is most common for snacks, as it is for breakfast and lunch. No important difference is seen between Tier 2 providers in 1999 and similar providers in 1995.⁴³

Fruit, Juice, and Vegetables. Just under two-thirds of both morning and afternoon snacks include a fruit, vegetable, or juice. Most snacks offer either a fruit juice or a fruit, with juice being slightly more common. Apple juice is the most frequently offered juice, while bananas and apples lead the list of fruits. Patterns for Tier 2 providers in 1999 paralleled those for similar providers in 1995, with three exceptions. The 1999 snacks were less likely to offer apple juice in morning snack, more likely to offer grape juice in afternoon snack, and less likely to offer raw vegetables in afternoon snack.

Bread and Bread Alternates. Over 80 percent of Tier 2 morning and afternoon snacks in 1999 included bread or bread alternates. Crackers, by far the most common type of food in this category, were offered in 39 percent of morning snacks and 43 percent of afternoon snacks. Tier 2 afternoon snacks in 1999 were significantly more likely to include a bread or bread alternate than were snacks offered by similar providers in 1995. The specific foods offered within the category, however, differed little between the two years for either the morning or the afternoon snack.

Meat and Meat Alternates. This was the least common of the four creditable meal components in both morning and afternoon snacks, included in 21 percent and 27 percent of snacks, respectively. Typical foods in this group were peanut butter, cheese, and yogurt. Meats and meat alternates of any kind—and specifically peanut butter and cheese—were significantly less likely to be part of the afternoon snack offered by Tier 2 providers in 1999 than by similar providers in 1995. The same pattern exists for morning snacks, but the difference for peanut butter is not statistically significant.

Noncreditable Foods. Relatively few morning or afternoon snacks—less than one fifth—included noncreditable foods. High-fat condiments, such as cream cheese, butter, and margarine were the most common types of food in this category, and were offered somewhat more often in 1999 than in 1995 with the morning snack ($p < 0.10$).

Nutrient Content of Snacks Offered Relative to RDAs

The nutrient profiles for morning and afternoon snacks are quite similar, as might be expected from the similarities in the types of foods offered. Both morning and afternoon snacks contribute about 15 percent of the RDA for food energy and at least 10 percent of the RDA for the five nutrients considered here, as shown in Exhibit 21. The percentages are considerably higher for protein and vitamin C; morning and afternoon snacks each supply close to one-third of the RDA for these two nutrients.

A few nutrient measures show statistically significant differences between the Tier 2 1999 snacks and those offered by similar providers in 1995. The most striking difference is a reduction in vitamin A for all age groups in the afternoon snack and for 6-12-year-olds in the morning snack. Other effects include a small increase in iron for afternoon snacks offered to all ages ($p < 0.10$) and a small but statistically significant increase in food energy for all age groups in both snacks.

⁴³ As with breakfast and lunch, the 1995 menu survey had numerous observations of milk whose characteristics were not further specified. The 1999 survey had far fewer such observations, which accounts for the observed difference in whole milk in the afternoon snack.

The reduction of vitamin A in the afternoon snack in 1999 probably stems from the reduced frequency with which that snack included milk and vegetables, such as fresh carrots. The increase in food energy in both morning and afternoon snacks probably reflects larger portion sizes in 1999 relative to 1995.

Exhibit 21
Mean Percentage of RDA Offered at Snacks

	Age 1-2		Age 3-5		Age 6-12		All ages	
	Tier 2 1999	Difference 1999-95 ^a	Tier 2 1999	Difference 1999-95 ^a	Tier 2 1999	Difference 1999-95 ^a	Tier 2 1999	Difference 1999-95 ^a
Morning Snack								
Total energy	14.6%	1.2%**	13.5%	1.1%**	13.8%	1.4%**	14.0%	1.2%**
Protein	34.9	2.8	30.1	2.5	26.5	0.7	32.0	3.3
Vitamin A	20.3	-0.9	18.6	-2.6	14.4	-9.3**	19.6	-1.6
Vitamin C	29.3	-9.5	30.9	-7.3	33.7	-5.1	31.6	-7.5
Calcium	17.8	2.3	19.4	2.3	20.7	1.2	18.9	2.4
Iron	12.5	0.7	14.0	0.4	16.2	-0.5	13.7	0.2
Un-weighted sample	240	429	244	460	78	154	275	511
Afternoon Snack								
Total energy	15.5%	1.1%**	14.6%	1.2%***	14.6%	0.9%**	15.0%	1.2%***
Protein	36.3	-1.5	31.7	-0.2	27.8	-2.6	33.0	-0.1
Vitamin A	17.0	-7.3*	17.9	-5.5**	14.7	-7.7**	17.1	-6.0**
Vitamin C	28.3	-0.7	28.8	-1.0	32.2	-4.4	29.9	-2.1
Calcium	16.9	-1.6	18.8	-0.7	20.9	-2.3	19.0	-0.9
Iron	11.1	0.8	13.4	0.9	16.0	1.1	13.2	0.9*
Un-weighted sample	409	774	455	874	273	554	496	955

^a Regression estimate. See Appendix D.

Significance levels:

* = .10

** = .05

*** = .01

Nutrient Content of Snacks Relative to *Dietary Guidelines* and NRC Recommendations

The average nutrient makeup of snacks offered to children age 3-12 is consistent with the *Dietary Guidelines* and NRC recommendations for the percent of food energy from fat and carbohydrate, respectively (Exhibit 22). An average of 11-12 percent of food energy comes from saturated fat, however, which exceeds the daily recommendation for less than 10 percent. Cholesterol ranges from 5 to 7 percent of the recommended daily limit of 300 mg., with slightly higher levels in the morning than the afternoon snack. The average sodium content of snacks offered amounts to 10-14 percent of the recommended daily limit (2,400 mg.).

Exhibit 22
Mean Nutrient Levels Relative to *Dietary Guidelines* and NRC Recommendations Offered in Snacks^a

		Age 3-5		Age 6-12	
	Daily Recommen- dation	Tier 2 1999	Difference 1999-95 ^a	Tier 2 1999	Difference 1999-95 ^a
Morning Snack					
Percent of food energy from:					
Fat (%)	≤ 30%	27.1	2.3**	28.2	2.2
Saturated fat (%)	<10%	11.2	1.0	11.6	1.0
Carbohydrate (%)	> 55%	63.7	-2.4	62.7	-1.7
Cholesterol (mg)	≤ 300 mg	17.6	1.6	21.9	-1.2
Sodium (mg)	≤ 2,400 mg	237.5	23.2	305.3	35.1
Unweighted sample		244	460	78	154
Afternoon Snack					
Percent of food energy from:					
Fat (%)	≤ 30%	28.7	-1.3	29.2	-1.5
Saturated fat (%)	<10%	11.4	-0.6	11.4	-0.7
Carbohydrate (%)	> 55%	62.1	2.0*	61.9	2.8*
Cholesterol (mg)	≤ 300 mg	15.5	0.9	17.6	-0.7
Sodium (mg)	≤ 2,400 mg	267.2	21.6	337.5	28.6
Unweighted sample		455	874	273	554

^a Note that the *Dietary Guidelines* and NRC recommendations are only applicable to children beginning at 2 years of age and older. This analysis is limited to snacks offered to children 3-5 and 6-12, the only CACFP age groups for which the recommendations fully apply.

^b Regression estimate. See Appendix D.

Significance levels:

* = .10

** = .05

*** = .01

The differences between Tier 2 snacks in 1999 and snacks offered by similar providers in 1995 are mostly small and mixed in direction. Morning snacks offered to children aged 3-5 in 1999, relative to those offered in 1995, supply a significantly higher percentage of food energy from fat. Afternoon snacks show almost the opposite pattern, although the difference is not statistically significant. Afternoon snacks offered by Tier 2 providers in 1999 supply a slightly higher percentage of food energy from carbohydrate ($p < 0.10$ for children aged 3-5 and 6-12). Tier 2 providers in 1999 offered, on average, 10 percent more sodium than similar providers in 1995 in both snacks for both age groups, but this result was not statistically significant.

Nutrient Composition of Two Combinations of CACFP Tier 2 Meals and Snacks

Although CACFP family child care homes offer many different combinations of meals and snacks, two combinations are the most common by far. About 43 percent of providers offer breakfast, lunch, and either the morning or afternoon snack, most often the afternoon snack. Another 38 percent offer breakfast, lunch, and both the morning and afternoon snacks.⁴⁴ (These are referred to as the “one-snack combination” and the “two-snack combination,” respectively.) All other combinations are offered by fewer than 5 percent of providers.

This section describes the total food energy and nutrient contribution of these two combinations of meals and snacks. Note that one cannot simply assume that the total nutrient values for a combination of meals and snacks will be equal to the sum of the average nutrient values shown previously for the individual meals and snacks. For example, a provider who is offering breakfast, lunch, and afternoon snack may offer a larger breakfast than a provider who offers both morning and afternoon snacks as well as the two main meals.

For this analysis, each provider was coded according to the combination of meals and snacks offered each day to children in each of the three CACFP age categories.⁴⁵ For each age group, only providers who offered the same combination for at least 3 days of the menu survey were included in the analysis.⁴⁶ Total daily nutrients were then averaged across all the days on which the provider offered that combination of meals and snacks. The resulting figures represent the average total nutrients that would be offered to a child in the provider’s care for the full operating day for that age group.

As discussed earlier, no guidelines exist as to how much of each nutrient measure should be provided in a full CACFP operating day, nor how much should be in either combination of meals and snacks. Therefore, as in the previous section, data for the cumulative energy and nutrient content of the meal combinations are presented as a percent of the RDA or relative to the daily limits expressed in *Dietary Guidelines* and NRC recommendations, but individual providers are not compared with any specific nutrient benchmarks.

The analysis indicates that both meal combinations offer at least two-thirds of the RDA for all dietary components measured here and over 100 percent for most components. The nutrient composition of the meal combinations is within or near most of the daily thresholds specified in the *Dietary Guidelines* and NRC recommendations, but exceeds the recommended percent of food energy from saturated fat.

⁴⁴ Providers can be reimbursed for two meals and one snack or two snacks and one meal per child per day. Given that over three-quarters of children under age 6 in CACFP homes are in care for 8 hours or more per day (Crepinsek *et al.*, E-FAN-02-005), it is likely that a substantial proportion of children are consuming all meals and snacks offered under this combination and the provider is not being reimbursed for one of them.

⁴⁵ A provider may offer different combinations to different age groups during the same day. This most often occurs when older children are not present for morning snack.

⁴⁶ Only 1 percent of providers did not offer the same combination for at least 3 days to at least one age group.

Tier 2 providers offering the two-snack combination in 1999 supplied significantly more food energy than providers with similar tier-related characteristics offering the same combination in 1995. Point estimates for both combinations consistently showed more sodium in 1999 than 1995, but the increase was not statistically significant.

Nutrient Content of Meal and Snack Combinations Relative to RDAs

Both of the most common meal and snack combinations provide—for all three age groups—a very substantial portion of the RDA for food energy and all of the nutrients examined (Exhibit 23). More than 100 percent of the RDA for protein, vitamin A, and vitamin C is supplied by both combinations. The two-snack combination offers more than 100 percent of the RDA for calcium as well. At least two-thirds of the RDA is provided for all other nutrients.⁴⁷ The two-snack combination offers more of each nutrient than the one-snack option, which would be the expected result of having one additional eating occasion.

It is interesting to note that the total nutrient content of each meal and snack combination is nearly equal to the sum of the previously reported averages for individual meals. For children aged 3-5, for example, the combination with breakfast, lunch, and two snacks (morning and afternoon) provides 80 percent of the RDA for food energy, while adding together the averages for the individual averages for breakfast, lunch, and morning and afternoon snack would yield a total of 78 percent. Thus it appears that the nutrients supplied in any one meal or snack are not strongly influenced by the combination of other meals that the provider offers during the day, at least for these two major groups of providers.

Comparing Tier 2 providers in 1999 with similar providers in 1995 yields slightly different results for the two meal combinations. For providers offering the one-snack combination there is virtually no difference between 1999 and 1995. For the two-snack combination, however, Tier 2 providers in 1999 supplied significantly more food energy for children aged 1-2 and for all age groups combined. Apparently the food energy increases seen earlier for the individual meals tend to be concentrated among providers who offer breakfast, lunch, and both morning and afternoon snacks.

⁴⁷ As noted for the breakfast and lunch analyses, the large age group differences in the mean percentage of RDA for iron, for example, are related to disproportionate differences in the RDA values relative to estimated portion sizes.

Exhibit 23**Mean Percentage of RDA Offered by Two Meal and Snack Combinations**

	Age 1-2		Age 3-5		Age 6-12		All Ages	
	Tier	Difference	Tier	Difference	Tier	Difference	Tier	Difference
	2	1999-95 ^a	2	1999-95 ^a	2	1999-95 ^a	2	1999-95 ^a
	1999		1999		1999		1999	
Breakfast, Lunch, and One Snack^b								
Total energy	67.7%	0.7%	63.9%	2.0%	63.4%	1.5%	65.5%	1.9%
Protein	214.7	-4.2	185.4	-1.2	161.1	-9.4	194.3	-0.6
Vitamin A	157.1	-3.0	155.1	-0.9	127.0	-11.7	151.5	-2.0
Vitamin C	132.2	-5.4	143.1	-1.3	198.1	47.7	144.2	-0.8
Calcium	90.5	-3.1	99.1	-1.1	106.7	-6.4	96.4	-2.2
Iron	66.3	2.2	78.0	0.0	97.0	-1.9	75.8	0.2
Un-weighted sample	209	396	224	426	66	138	257	488
Breakfast, Lunch, and Two Snacks^b								
Total energy	84.8%	9.9%**	79.6%	10.1%*	77.1%	9.9%	81.8%	10.3%**
Protein	247.8	16.8	216.5	18.6	182.0	9.2	230.3	21.3
Vitamin A	174.2	6.0	170.8	-5.8	140.4	-20.0	169.8	-3.4
Vitamin C	181.7	5.8	196.3	6.6	190.6	-24.3	191.5	1.2
Calcium	109.8	10.3	119.3	12.4	124.3	11.2	116.1	10.5
Iron	81.8	9.6	97.9	8.1	109.0	4.7	90.8	5.2
Un-weighted sample	147	245	142	254	45	71	168	300

^a Regression estimate. See Appendix D.

^b Morning and afternoon snacks only.

Significance levels:

* = .10

** = .05

*** = .01

Nutrient Content of Meal and Snack Combinations Relative to *Dietary Guidelines* and NRC Recommendations

Both of the most common meal and snack combinations offer a nutrient profile that approximates the *Dietary Guidelines* goal for the percent of food energy from total fat and the NRC recommendation for percent of energy from carbohydrate (Exhibit 24). In both of these cases, the average for children aged 3-5 and aged 6-12 is within the recommended range or fairly close to the recommended level for that nutrient.

The picture is less favorable for saturated fat. The percent of energy from saturated fat, at about 13 percent in both meal combinations, exceeds the daily recommendation of less than 10 percent. This result is particularly driven by the nutrient composition of lunch, the largest meal in the combinations, which averaged over 15 percent of food energy from saturated fat.

Exhibit 24
Mean Nutrient Levels Relative to *Dietary Guidelines* and NRC Recommendations Offered by Two Meal and Snack Combinations^a

		Age 3-5		Age 6-12	
	Daily Recommen- dation	Difference		Difference	
		Tier 2 1999	1999-95 ^b	Tier 2 1999	1999-95 ^b
		Breakfast, Lunch, and One Snack ^c			
Percent of Food Energy from:					
Fat (%)	≤ 30%	30.8	0.6	32.0	1.4
Saturated fat (%)	<10%	13.0	0.4	13.0	0.6
Carbohydrate (%)	> 55%	55.7	-0.1	55.1	-0.6
Cholesterol (mg)	≤ 300 mg	119.4	2.9	174.2	37.6
Sodium (mg)	≤ 2,400 mg	1,644.1	124.9	2,108.6	212.3
Unweighted sample		224	428	66	143

Breakfast, Lunch, and Two Snacks ^c					
Percent of Food Energy from:					
Fat (%)	≤ 30%	30.7	0.8	30.9	-0.9
Saturated fat (%)	<10%	12.8	0.4	12.7	0.0
Carbohydrate (%)	> 55%	56.9	-0.1	57.2	1.2
Cholesterol (mg)	≤ 300 mg	157.9	29.9	171.7	25.9
Sodium (mg)	≤ 2,400 mg	1,962.0	346.2	2,299.2	427.7
Unweighted sample		142	255	45	73

^a Note that the *Dietary Guidelines* and NRC recommendations are only applicable to children beginning at 2 years of age and older. This analysis is limited to meals offered to children 3-5 and 6-12, the only CACFP age groups for which the recommendations fully apply.

^b Regression estimate. See Appendix D.

^c Morning and afternoon snacks only.

Significance levels:

* = .10

** = .05

*** = .01

Cholesterol and sodium, which are measured in absolute amounts, are naturally greater for the two-snack than the one-snack combination. The only exception is the amount of cholesterol in the meal combinations offered to children aged 6-12, which varies little.

Compared with the daily recommendation of 300 mg. of cholesterol, the combinations provide between 40 and 60 percent for children in the 3-5 and 6-12 age groups. For sodium, with a recommended daily limit of 2,400 mg., the percentages are higher. For children aged 6-12, the one-snack and two-snack combinations provide 88 percent and 96 percent of the suggested daily amount of sodium, respectively.

There were no statistically significant 1999-95 differences in nutrient measures relative to the *Dietary Guidelines* and NRC recommendations for either the one-snack or the two-snack combination. For both meal combinations, however, Tier 2 providers in 1999 offered foods containing 10-20 percent more sodium relative to foods offered by similar providers in 1995. This would be expected from the results for individual meals and snacks as increases in sodium were seen consistently and for all age groups. As noted previously, the increased sodium reflects a general increase in portion sizes as well as some menu shifts that have emphasized higher sodium foods, especially at lunch.

Nutritional Aspects of Meals Offered by Former CACFP Providers

One mandate of the *Family Child Care Homes Legislative Changes Study* was to examine nutritional aspects of the meals offered by providers who left the CACFP close to the time that tiering was implemented, but who continued to operate a child care business. It was hypothesized that some providers, particularly those who would be classified as Tier 2, might drop out of the CACFP because of reimbursement tiering. But it was not known whether providers operating these homes might offer fewer or less nutritious meals and snacks to children in their care without the economic and educational benefits of CACFP participation. The analyses presented in Appendix F provide some information bearing on the issue, but several caveats are important to consider in interpreting the results.

- First, the sample size for this analysis was unexpectedly small. This resulted from the rarity of continuing to provide child care by those who left the CACFP, the difficulty of finding those who left, and the unwillingness to participate in the study by many of those who were found. In another report in this series by Hamilton and colleagues (E-FAN-02-002), it is estimated that about 5,500 providers nationwide who left the CACFP during 1997 were still in the child care business and not participating in the CACFP at the time of our 1999 study. Even though there was no evidence of response bias, the small size of the sample and the low response rate pose more than the usual amount of uncertainty as to the generalizability of the findings.
- Second, although some of the providers who left the CACFP would have been classified as Tier 2, a substantial proportion meet the income and area poverty criteria for Tier 1 status. It is possible that any differences found between the former provider and 1999 Tier 2 samples reflect differences in characteristics of the provider groups rather than differences that relate to receiving CACFP meal reimbursements. (The sample was too small to further limit it to "Tier 2-like" providers.) Analysis of the operations survey reported in Zotov *et al.* (E-FAN-02-004) indicates that, at the time of the survey, the former CACFP providers tended to serve smaller numbers of children, to operate for fewer hours per day and days per week, and to offer fewer meals than the active CACFP providers. The former providers were also less likely to depend on child care as their primary source of income.
- In addition, screening data suggest that some providers who left the CACFP while continuing to operate their child care business took this action in response to the lower Tier 2 reimbursement rates. But many providers who dropped out of the program in 1997-98—and perhaps a majority of them—were not responding to tiering (Hamilton, *et al.*, E-FAN-02-002). Therefore, the findings of this analysis should not be interpreted as indicative of an effect of reimbursement tiering.

Despite the sample limitations, the analyses in Appendix F offer a valuable picture of the meals and snacks offered by former CACFP providers and their nutrient composition. The majority of former providers offered lunch and an afternoon snack. Most also offered breakfast, but fewer former providers offered this meal than current Tier 2 providers do. Former providers offered snacks somewhat less often during the week than current Tier 2 providers. This might reflect adjustments to the absence of CACFP reimbursements, but it is equally plausible that the providers who serve fewer meals are the most likely to leave the CACFP.

Most meals and snacks offered by former CACFP providers complied with CACFP meal-pattern requirements and offered substantial variety over a week, even though former providers no longer face CACFP requirements. This may reflect a continuing effect of the CACFP training and monitoring that providers received while still participating in the program. Compliance rates were somewhat lower for fruits and vegetables at breakfast and lunch, although a large proportion of former providers did offer fruits and vegetables in snacks. The former providers offered meat or meat alternates at breakfast more frequently than current Tier 2 providers. In general, these patterns seem to reflect the preferences of individual providers and children rather than any systematic cutting back on food costs to compensate for the loss of meal reimbursements.

The data suggest that while former CACFP providers offered somewhat different foods than Tier 2 providers, the nutritional quality of the meals is very similar. Analyses are based on a comparison of the foods in menus offered by the two groups of providers, but do not reflect any difference in portion sizes. No independent observations were made of portion sizes in meals offered by former CACFP providers, so food quantities were computed assuming they would be the same as in comparable Tier 2 homes.

Meals and snacks offered by former CACFP providers in 1999 largely met the RDA benchmarks and NRC recommendations used for this study, the exceptions being food energy and iron (lunches only). Few of the meals and snacks offered, however, were consistent with the *Dietary Guidelines* recommendations for saturated fat.

Based on recorded menus and comparisons with current Tier 2 providers, we cannot conclude that this group of former CACFP providers is offering nutritionally inferior meals or snacks. There is room for improvement in the meals provided in both Tier 2 and former CACFP homes, especially in the level of saturated fat. But there is no indication that tiering *per se* led to a decline in the nutrient content of meals offered to children in the care of providers who left the CACFP.

Conclusion

In an effort to focus the family child care component of the CACFP more closely on low-income children, the PRWORA reduced the level of meal reimbursement for Tier 2 providers. It was unknown how Tier 2 providers that remained in the program would respond to the reduced revenue from meal reimbursements. One possibility was that providers would cut back on food expenditures by offering fewer meals or snacks, or by serving smaller portions, less costly foods, or a less varied menu. If such adjustments occurred, they might in turn reduce the quantity or quality of the nutrition provided to children served by the program.

The analyses presented in this report make it clear that PRWORA had no substantial impact on the food and nutrient composition of meals offered in Tier 2 homes. Comparisons are between a nationally representative group of Tier 2 providers surveyed in 1999 and a sample of providers in 1995 surveyed using the same methods. Regression analyses were used to control for known tier-related differences between the two groups of providers. However, it is not possible to differentiate between the effects of lower reimbursement rates and trends over time in factors unrelated to tiering. Therefore, the differences (or lack of difference) found between meals offered by Tier 2 providers in 1999 and meals offered by similar providers in 1995 cannot be attributed entirely to tiering.

There is no evidence that Tier 2 providers responded to the reduced reimbursement rates by cutting back on the meals and snacks they served or by offering less nutritious foods. Most Tier 2 providers offered breakfast, lunch, and at least one snack, and no meal or snack was served less often in 1999 than by similar providers in 1995. Nine out of 10 of these meals are in compliance with CACFP meal component requirements, and Tier 2 meals meet or exceed the compliance rates and degree of variety achieved by providers in 1995. This is not particularly surprising as most providers who answered the operations survey said that following the meal pattern is not particularly burdensome. While some small differences in the particular components offered may represent an effort on the part of Tier 2 providers to control costs, these affect only foods offered above and beyond the required servings. Thus it is clear that Tier 2 meals have not compromised the overall goal of the CACFP meal component requirements—to provide a mix of foods that make an important contribution to children's major nutritional needs.

Because the CACFP does not impose nutrient-based standards or goals for meals and snacks, we could not directly assess the adequacy or appropriateness of the nutrient levels in the meals offered. Instead, benchmarks based on standards for the school meal programs and expert recommendations for health promotion that apply to children were used in describing the nutrient composition of Tier 2 meals and snacks. The new DRIs might have been appropriate benchmarks for this study, but they are not yet available for most of the nutrient measures examined here.

The nutrient analysis does not find that average meals and snacks offered by Tier 2 providers are of inferior nutritional quality because of tiering. Nonetheless, there is some room for improvement, as was the case before tiering.

Overall, Tier 2 providers offer a substantial proportion of children's RDAs for food energy, protein, vitamins A and C, calcium, and iron; only snacks showed any reductions relative to providers in 1995, and these were few. If DRIs had been available, results would likely have been even more positive, as the recommended standards for assessing groups are set lower than the RDAs.

Less positively, the average lunch provides more than the *Dietary Guidelines* and NRC's recommended maxima for total fat, saturated fat, and sodium. The average percentage of food

energy from saturated fat exceeds the *Dietary Guidelines* recommendation for all meals and snacks offered, although this did not change with tiering.

Tier 2 providers offered a nutrient package with more food energy and sodium than providers in 1995, a result of serving larger portions and more high sodium foods, respectively. Offering larger quantities of food would not logically be a consequence of tiering, and may represent a general trend unrelated to the CACFP. Unfortunately, no national data are yet available to determine whether typical portion sizes outside the CACFP have also increased between 1995 and 1999, although this type of analysis could be done with the 1994-96 and 1998 CSFII data.

One obvious concern with the program offering an increasing amount of food energy is the implication for the growing problem of obesity among children.⁴⁸ However, when children's consumption habits are taken into account, it appears that the level of energy provided is within the recommended range. For example, the two most commonly offered combinations of CACFP meals and snacks provide, on average, between 63 and 85 percent of children's recommended energy allowance. Most children are in CACFP family child care enough hours that they receive all of the meals and snacks provided under one of these combinations. Data on foods and amounts actually consumed were not collected in 1999, but the 1995 *Early Childhood and Child Care Study* found that children typically consume only three-quarters to 80 percent of the energy in the meals and snacks offered to them by CACFP family child care providers. Applying this to the amounts of food energy offered in 1999, children in Tier 2 homes would be likely to consume about half of their daily energy requirements from the breakfast-lunch-one snack meal combination and two-thirds from the breakfast-lunch-two snack combination. Making the assumptions that children are offered roughly the same amount of food energy at supper as lunch (30 percent of RDA), and that the .75-.80 factor for consumption also applies to meals consumed outside of CACFP care, the total proportion of energy RDA likely to be consumed by children in Tier 2 homes ranges from 74 to 90 percent. This leaves reasonable leeway for any additional snacks, especially for the one-snack combination.

Although energy intake is just one of the contributors to the obesity problem, the analysis presented here does not suggest any disproportionate contribution of food energy from CACFP meals, on average. Of course, some children may consume too much and some too little relative to their energy needs. Additional research would be needed to obtain the necessary information on children's food consumption and activity levels, both in and outside of Tier 2 CACFP care, in order to determine if they were at greater risk of obesity.

As mentioned above, this analysis did not address tiering's effect on the dietary intake of children participating in the CACFP, as the study collected no data on food consumption. No conclusions can be drawn about total daily intakes, which would include meals consumed outside of CACFP child care. If the relationships between nutrients offered and nutrients consumed that were found in the 1995 study still apply, the proportion of energy derived from saturated fat in meals consumed in CACFP care is likely to exceed recommendations. The level of iron provided in lunches may also need to be monitored. Family child care providers may need additional guidance on the types of food needed to provide adequate levels of iron, especially in lunches, while lowering the saturated fat content of all meals and snacks offered.

Although we conclude that tiering had little effect on nutritional aspects of Tier 2 CACFP meals, many questions about the CACFP remain unanswered:

⁴⁸ The prevalence of overweight children (ages 6-11) has almost doubled in the past 20 years (CDC, 2000).

- How do meals and snacks offered by Tier 2 providers compare with homes receiving higher level of meal reimbursements during the same time period (i.e., Tier 1 homes)?
- How do portion sizes offered in former CACFP homes compare with those observed in Tier 2 homes?
- Is the CACFP meal pattern designed to provide a similar level of nutrients relative to the RDAs at breakfast and lunch as the nutrition guidelines for school meals, or are these unrealistic goals?
- Should providers be trained to serve different foods to younger and older children because of different nutrient requirements?

Further research would be needed to address these issues.

References

Other Reports in this Series

- Bernstein, Lawrence S. and William L. Hamilton, *Sponsoring Organizations in the CACFP: Administrative Effects of Reimbursement Tiering*, USDA-ERS, E-FAN-02-003, March 2002. [<http://www.ers.usda.gov/publications/efan02003/>]
- Crepinsek, Mary Kay, Linda M. Ghelfi, and William L. Hamilton, *Households with Children in CACFP Child Care Homes: Effects of Meal Reimbursement Tiering*, USDA-ERS, E-FAN-02-005, March 2002. [<http://www.ers.usda.gov/publications/efan02005/>]
- Hamilton, William L., Nancy R. Burstein, and Mary Kay Crepinsek, *Reimbursement Tiering in the CACFP: Summary of the Family Child Care Homes Legislative Changes Study*, USDA-ERS, FANRR-22, March 2002. [<http://www.ers.usda.gov/publications/fanrr22/>]
- Hamilton, William L., Eric M. Stickney, Nancy R. Burstein, and Lawrence S. Bernstein, *Family Child Care Home Participation in the CACFP: Effects of Reimbursement Tiering*, USDA-ERS, E-FAN-02-002, March 2002. [<http://www.ers.usda.gov/publications/efan02002/>]
- Zotov, Natasha, Shao-hsun Keng, and William L. Hamilton, *Family Child Care Providers in the CACFP: Operational Effects of Reimbursement Tiering*. USDA-ERS, E-FAN-02-004, March 2002. [<http://www.ers.usda.gov/publications/efan02004/>]

Additional References

- Centers for Disease Control and Prevention, National Center for Health Statistics. "Overweight Children and Adolescents 6-17 years of age, According to Age, Race, Sex, and Hispanic Origin, Selected Periods, 1963-65 through 1988-94," online table at <http://www.cdc.gov/nchs/fastats/overwt.htm>, 2000.
- Fox, Mary Kay, Frederic B. Glantz, Lynn Geitz, and Nancy Burstein, *Early Childhood and Child Care Study: Nutritional Assessment of the CACFP*, Alexandria, VA: U.S. Department of Agriculture, Food and Consumer Service, 1997.
- Glantz, Frederic B., David T. Rodda, Mary Jo Cutler, William Rhodes, and Marion Wrobel. *Early Childhood and Child Care Study: Profile of Participants in the CACFP*, Final Report, Vol.1, Alexandria, VA: U.S. Department of Agriculture, Food and Consumer Service, 1997.
- Institute of Medicine, Food and Nutrition Board, *Dietary Reference Intakes: Applications in Dietary Assessment*, Washington, DC: National Academy Press, 2000.
- National Research Council, *Recommended Dietary Allowances*, 10th edition, Washington, DC: National Academy Press, 1989a..
- National Research Council, *Diet and Health: Implications for Reducing Chronic Disease Risk*. Washington, DC: National Academy Press, 1989b.

U.S. Department of Agriculture, Agricultural Research Service, *Food and Nutrient Intakes by Children 1994-96, 1998*, online at <http://www.barc.usda.gov/bhnrc/foodsurveypdf/scs-all.pdf>, 1999.

U.S. Departments of Health and Human Services and Agriculture, *Nutrition and Your Health: Dietary Guidelines for Americans*, Fifth edition, Washington, DC: U.S. Government Printing Office, 2000.

Appendix A

Sampling and Weighting Procedures

The *Family Child Care Homes Legislative Changes Study* involved several surveys, including surveys of sponsors, current CACFP providers, former CACFP providers, and parents of children currently served by CACFP providers. For current Tier 2 and former CACFP providers, the study included an *operations survey* and a *menu survey*. A *meal observation* data collection was conducted in a random subsample of current Tier 2 homes. Most of the analyses presented in this report focus on nutritional aspects of meals offered as measured in the menu survey, with portion sizes imputed from the more limited meal observations. The sample design for these surveys and the weighting procedures used in the analysis are described below. The sampling and weighting for other surveys are discussed in other reports in this series. Appendix F, which examines the menu survey of former CACFP providers, describes the sample for that survey.

Sample

The sample universe for the *Family Child Care Homes Legislative Changes Study* consisted of family child care sponsors, family child care homes, and families of children participating in the CACFP. A nationally representative sample of 20 States was selected, with probability proportional to the size of each State's share of CACFP family child care home reimbursements.¹ All selected State agencies agreed to participate in the study and provided lists of the CACFP sponsors in their State. Sponsors were also selected within States with probability proportional to size, based on the number of homes sponsored.²

Each selected sponsor was asked for a list of the family child care homes sponsored, including three groups of homes: Tier 1 homes active (i.e., receiving CACFP reimbursement) in January 1998; Tier 2 homes active in January 1998; and all homes active in January 1997.³ Sample frames for current Tier 1 and Tier 2 providers were defined to include all homes active in January 1998. Within each sponsor's list of homes in each tier, a random sample was drawn. The base number of providers to be selected from each sponsor's list was constant across sponsors within each tier (four for Tier 1, six for Tier 2); if the total on the sponsor's list was equal to or less than the base number, all were selected.⁴

¹ Four States were included with certainty (California, Michigan, Minnesota, and Texas).

² Sponsors were sampled with replacement, meaning that a sponsor could be selected more than once.

³ Homes received tier designations only when tiering was implemented in July 1997.

⁴ The number selected depended on the number of times the sponsor was selected (i.e., if the sponsor was selected twice, double the base number would be selected from the sponsor's list).

A sample of 300 sponsors was selected within the 20 States, comprising a representative sample of the 1,165 sponsors active in the country.⁵ Of the selected sponsors, 289 supplied lists of current and former providers, for a response rate of 96.3 percent. From these lists, 1,134 Tier 2 providers were selected for menu survey participation, of whom 393 were found to be ineligible for study. The primary reasons for ineligibility were that the provider left the CACFP or changed tier status; a few providers were deceased by the time of the survey. The menu survey was completed by 542 Tier 2 providers, for an estimated response rate among eligibles of 73.1 percent.⁶

Of the 387 providers selected for meal observation (one-third of the Tier 2 sample), 159 were found to be ineligible. Providers were ineligible if they no longer participated in the CACFP, changed tier, were deceased, or cared only for infants less than 1 year old. The 97 participating providers who allowed meal observations represented an estimated response rate of 42.5 percent.

In multistage sampling, it is sometimes useful to consider the compound response rate, which is the product of the response rates at each sampling stage. In the present instance, the compound response rates are 70.4 percent for providers completing the menu survey and 40.9 percent for completed meal observations.

Weighting

For producing population-based estimates of means and proportions of characteristics relating to providers, each respondent provider received a sampling weight. These weights combined the basic weight reflecting the probability of selection of the provider with an adjustment for unit nonresponse. The resulting weighted data yield estimates for all providers in the population.

The overall provider weight was obtained as the product of the State weight, the conditional sponsor weight (adjusted for nonresponse), and the conditional provider weight (adjusted for nonresponse), which is based on the conditional probability of selecting a provider given that the sponsor and the State have been selected.

Basic Sponsor Weights

A preliminary first step in determining provider weights was calculation of *sponsor weights*. As described above, a sample of sponsors was selected in each of the 20 States selected in the first stage. Therefore, the overall probability of inclusion of a sponsor is the inclusion probability of the State in which the sponsor is located multiplied by the probability of including the sponsor in the sample, given that the State was selected.

Sponsor weights were computed as follows:

1. Let W_i represent the weight for the i th selected State. $i = 1, 2, 3, 4, \dots, 19, 20$. $W_i = 1$ for States selected with certainty. For the 16 noncertainty States, W_i is the inverse of the State's probability of selection. The probability of selection was proportional to the size of the State, with total CACFP reimbursements for family child care homes being the measure of size.

⁵ A total of 311 were selected, but 11 were not eligible because they had left the CACFP.

⁶ This calculation assumes that all nonrespondents not known to be ineligible for participation in the study were eligible. If five providers who supplied fewer than 3 menus and were dropped from the analysis are included, the response rate increases to 73.3 percent.

2. Let W_{ij} be the weight for the j th selected sponsor in the i th State. We have

$$W_{ij} = W_i \cdot W_{j/i}$$

where $W_{j/i}$ is the conditional weight of the j th sponsor given that the i th State has been selected.

We now determine $W_{j/i}$. Let the number of sponsors in the i th State be S_i . Let the number selected in the sample be s_i . Let the number of providers belonging to the j th sponsor in the i th State be P_{ij} .

- In 12 States, all sponsors in the State were included in the sample with certainty. In these States, we have

$$W_{j/i} = 1.$$

Therefore, the overall sponsor weight in these States is $W_{ij} = W_i$.

- The sponsors in the other eight States were selected with probability proportional to the number of providers and **with replacement**. Therefore, the same sponsor can get selected more than once. Let r_{ij} be the number of times ("hits") the j th sponsor gets selected in the i th State. The conditional weight for these sponsors is

$$W_{j/i} = \frac{r_{ij} \cdot P_i}{n_i \cdot P_{ij}}$$

where n_i is the total number of sponsor hits in the i th State and $P_i = \sum_{j=1}^{S_i} P_{ij}$ is the total number of providers.

The overall basic sampling weight for the j th sponsor in the i th State is given by:

$$W_{ij} = W_i \cdot W_{j/i}.$$

Adjustment for Nonresponse at the State and Sponsor Levels

There is no nonresponse at the State level.

For sponsor nonresponse adjustment, assume that s_i^* sponsors respond to the survey out of the s_i sponsors selected in the i th State. Then the nonresponse adjustment to the weights of the responding sponsors is

$$A_i = \frac{\sum_{j=1}^{s_i} W_{ij}}{\sum_{j=1}^{s_i^*} W_{ij}}.$$

The nonresponse adjusted conditional weight is given by

$$W_{ji}^a = W_{ji} A_i.$$

The overall nonresponse adjusted basic sampling weight is given by

$$W_{ij}^a = W_i W_{ji}^a.$$

This weight was used in sponsor tabulations.

Basic Provider Weights

In calculating provider weights, two changes were made to the conditional sponsor weight that was determined above for sponsor tabulations. Since we selected a sample of providers for each “hit” of the sponsor, for computing the conditional weight of the sponsor for getting the provider weights, we did not include r_{ij} the number of hits. Also, the adjustment for nonresponse of the sponsor was different than done for the sponsor weights used for sponsor characteristics. This was because the number of sponsors giving the list of providers for selection was slightly different from the number of sponsors responding to the survey. The number of providers in the responding group and the number in the nonresponding group were also different.

We first describe the nonresponse adjustment to the sponsor weight.

The conditional sponsor weight for provider tabulations is

$$W_{ji}^p = \frac{P_i}{P_{ij}}.$$

Let the number of sponsors submitting provider lists be s_i^{**} out of the s_i selected. Then the nonresponse adjustment to the sponsor weight is

$$A_i^* = \frac{\sum_{j=1}^{s_i} W_{ij} P_{ij}}{\sum_{j=1}^{s_i^{**}} W_{ij} P_{ij}}$$

and the adjusted sponsor weight is

$$W_{j/i}^b = W_{j/i}^p A_i^*$$

The overall sponsor weight is given by

$$W_{ij}^b = W_i W_{j/i}^b$$

This sponsor weight was used for all provider tabulations.

For the selection of providers from a selected sponsor, we stratified the providers by Tier 1, Tier 2, and dropout (former providers). Let P_{ijk} denote the number of providers in the k th stratum ($k = 1, 2, 3$).

Let p_{ijk} be the number of providers selected. Then the basic conditional weight for the l th selected provider in the k th stratum belonging to the j th sponsor in the i th State is

$$W_{l/ijk} = \frac{P_{ijk}}{p_{ijk}}$$

Adjustment for Provider Nonresponse

If out of p_{ijk} providers in the sample, only p_{ijk}^* respond, the nonresponse-adjusted conditional provider sampling weight is

$$W_{l/ijk}^a = \frac{P_{ijk}}{p_{ijk}^*} W_{l/ijk}$$

The overall provider weight is

$$W_{ijkl}^a = W_i^a W_{j/i}^b W_{l/ijk}^a$$

This weight was used for all provider tabulations in the report. To take account of the complex sampling structure, weighted regressions and all variances were estimated using SUDAAN software. The analysis of portion sizes, which controlled for a large number of provider characteristics, used unweighted regressions.

Other multivariate analyses reported here use weighted (linear or nonlinear) regressions to estimate tiering effects, weighting each observation in inverse proportion to its probability of being included in the sample. Unweighted regressions use sample variances and covariances to estimate the regression parameters for the sample (and for the hypothetical population for which it is a random sample). In sampling-weighted regression, the weights are used to estimate the population values of these variances and covariances, and the population parameter estimates are derived from these. Because sampling weights normally increase the error of estimate (unlike weighting associated with generalized least squares), unweighted estimates are preferred when they can be assumed to be unbiased. For example, if the population regression is correctly specified and the sampling probabilities are completely determined by the included variables, then the unweighted regression will yield unbiased estimates of the regression coefficients. When these conditions cannot be satisfied, as is the present case, sampling weights are commonly used to correct for differences in sampling rates, despite the associated increase in errors of estimate. Sometimes, for example, sampling rates are defined in terms of sparsely sampled categories, with category samples too small to allow them to be represented by dummy variables. In other cases, sampling rates are functions of measured characteristics, which may be added to the regression; however, the estimates then depend on correct specification of the functional form for these added characteristics. Finally, the requirement concerning the correctness of the original specification is quite stringent. In our case, for example, a regression may be misspecified in ways that make it quite sensitive to differences in sampling rates but still offer adequate controls for characteristics associated with tier when applied to a common population.

Nonresponse Bias

The possibility of nonresponse bias—that is, important differences between sample members who respond to the survey and those who do not—deserves consideration in any sample survey. With compound response rates in the range of 41 to 70 percent, the potential for bias is significant. A series of analyses was therefore performed to assess the extent of any bias.

The analyses are necessarily based on those few items of information that are known for the nonresponding as well as the responding providers. These are the number of children enrolled in the home (as reported on the sponsor list) and the provider's location. The latter is represented in the analysis as the percent of homes in each census region (Northeast, South, Midwest, and West).

The analysis compared the mean or percent for all selected sample members and the mean or percent for those responding to the survey. The difference can be viewed as the extent to which the respondents over- or under-represent the specified characteristics of the original sample. As a guide to the importance of the difference, we use a one-sample t-test; that is, we compare the mean of the respondents with the mean of the total sample, taking into account the standard error of the mean of the respondents (but treating the full-sample mean as a constant). The data are unweighted in this

analysis because sampling weights were not computed for nonrespondents. The analysis was carried out separately for the menu survey and meal observation samples. Both samples include only Tier 2 providers.

The results, shown in Exhibits A.1 and A.2 , generally show small differences between the responding providers and the sample frame from which they were drawn. In both samples, the responding Tier 2 providers had somewhat more enrolled children, on average, than the sample selected, although the difference approaches statistical significance only for the menu survey ($p < 0.10$). There is also some tendency for the Northeast region to be over-represented, the West region to be under-represented among menu survey respondents, and the Midwest to be under-represented among meal observation respondents. None of these regional differences are statistically significant, however.

Exhibit A.1
Comparison of Tier 2 Providers Responding to the Menu Survey to Sample Selected

	Respondents	Original Sample	Difference Respondent-Original	Respondent Standard Error	p-value
Mean number of children enrolled	8.9	8.5	0.4	0.24	0.08
Percent of providers that are in region:					
Northeast	25.4%	22.8%	2.6	1.91	0.16
South	21.4	21.8	-0.4	1.8	0.84
Midwest	25.2	24.6	0.6	1.9	0.73
West	27.9	30.9	-3.0	1.96	0.13

Exhibit A.2**Comparison of Tier 2 Providers with Completed Meal Observations to Sample Selected**

	Respondents	Original Sample	Difference Respondent- Original	Respondent Standard Error	p-value
Mean number of children enrolled	9.3	8.5	0.8	0.62	0.19
Percent of providers that are in region:					
Northeast	28.1%	22.7%	5.4	4.61	0.24
South	21.9	21.4	0.5	2.42	0.91
Midwest	19.8	24.6	-4.8	4.09	0.24
West	30.2	31.3	-1.1	4.71	0.82

Appendix B

Menu Survey and Meal Observation Record

Included in this appendix are:

- The instructions for completing the Menu Survey and completed samples of the menu recording forms for one day (Monday) of the survey week. A separate Menu form was provided for each meal (breakfast, lunch, supper). Morning, afternoon, and evening snacks were recorded on a single form.
- The instructions for the Food You Prepared form and a sample completed form. Providers were asked to complete this form for each food item made from scratch or assembled from two or more ingredients.
- A sample of the meal observer's data recording forms. The Serving Size Measurement Form was used to determine the average weight or volume of a reference serving (portion) of each menu item offered by the provider. One menu item measurement form is shown. The observers actually had forms that could record four menu item measurements on a page, and the observers could use as many pages as were necessary to measure all items served at the specified meal or snack. The Meal Observation Form was then used during the meal service to tally the number of reference servings of each item served to or taken by each child. The observer entered a '1' in the "served" column for each full portion the child was served or took and entered a fraction, such as $\frac{1}{2}$, for each partial serving of a full portion the child was served or took. After the meal service, the observer summed the entries in the 'served' column and entered the sum in the 'total' column.

Note: The sample completed forms were handwritten when given to the providers along with the blank forms because they would be filling their forms out by hand. The samples are typewritten in this report for ease of printing. Some of the forms have been reformatted to fit this report's format.



Family Child Care Homes Legislative Changes Study

MENU SURVEY

For Meals and Snacks Served:

Monday / /
 month day year

through

Friday / /
 month day year

Abt toll-free number: 1-800-244-4135

[Attach ID Label]

Public reporting burden of this collection of information is estimated to average 162 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. An agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a currently valid OMB control number. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to: Department Clearance Officer, OIRM, AG Box 7630, Washington, DC 20250.

MENU SURVEY

Use this booklet to describe all the foods and drinks you serve to children in your care during the week noted on the front cover.

Please do not be alarmed by the size of the booklet. You will use the booklet for five days, filling in a few pages each day as you prepare and serve meals and snacks. You will probably not need to use all of the pages in the booklet, but there are extra pages for people who might need them.

This booklet has been divided into six sections. The first five sections are for menus for each day of the week. Each daily section includes menu pages for breakfast, lunch, supper, and snacks. The last section of the booklet contains pages for foods you prepare from a recipe. General guidelines for completing this survey are given below. There are more detailed instructions and examples of completed pages at the beginning of each section. The yellow pamphlet, called the **FOOD DESCRIPTION GUIDE**, will also help you with the survey.

If you have any questions or need assistance in completing the survey, now or at any time, you may call our toll-free number: 1-800-244-4135. We would be happy to answer your questions and to help you in any way we can.

Someone from Abt Associates will be calling you soon to make sure you received the survey and to answer any questions you may have before you begin filling it out.

Thank you very much for your help with this important study.

How to Complete this Survey

1. Before you begin, read all of the instructions and look over the sample menu pages in the MONDAY section of the booklet.
2. Each day, fill out the *Menu* pages in the section of the booklet marked with the name of that day: Monday, Tuesday, Wednesday, Thursday, or Friday. Use these pages to write down **all the foods and drinks you serve to children for each meal and snack**.
3. Use the *Food You Prepared* pages to tell us more about **foods you prepare from a recipe when the recipe is readily available**.
4. Remember to follow the instructions at the beginning of each section and on each page of the booklet.
5. When the week is over and you have completed the survey, please check your very important work. Then mail the completed *Menu Survey* to Abt Associates Inc. in the postage-paid envelope provided.

MENUS FOR MONDAY

Use the pages in this section to write down all the foods and drinks you served to children in your care on Monday. A sample of a completed *Menu* page can be found on the back of these instructions.

How to Fill in the *Menu* Pages

1. **Each page** asks about **one meal or snacks**. If you do not serve that meal or snack, check (✓) the "Do not serve..." box in the upper right corner. Leave that page or part of the page blank.
2. For every meal and snack that you do serve, please fill in the chart to tell us what you served on Monday. Follow the instructions at the top of each column:

What Did You Serve?

- Write the names of all the foods and drinks you served for that meal or snack.
- Use a separate line for each food, and skip a line or two between each food.
- If you served a hot or cold sandwich, write the name of the sandwich on one line, then list each part of the sandwich on the lines below.

Please Describe Each Food

- Describe each food and drink in detail. Include the brand name whenever possible. The **FOOD DESCRIPTION GUIDE** shows the kinds of information we need you to write in this column.
- Be sure to note the cooking method, salt, and the types of fat used in preparation or added before serving the food.
- Use as many lines as you need to describe each food.

Did You Prepare the Food or Was it Ready-to-Eat (or Drink)?

- Check (✓) one box for each food and drink you list to tell us **whether you prepared the food yourself or whether the food was ready-to-eat (or drink)**.

PREPARED MYSELF: Foods you make from scratch by combining two or more foods or ingredients. For example: cookies you made, rice you cooked, or a sandwich you made.

- If you have a recipe, or can easily tell us what ingredients you used in foods you prepared yourself, please fill out a page in the **Food You Prepared** section located at the back of the booklet behind Friday's menus.

READY-TO-EAT: Foods and drinks that need little or no preparation on your part or can be eaten **as is**. For example: hot dogs, frozen dinners, apple juice made from frozen concentrate, or packaged cookies.

To Which Age Groups Did You Serve this Food?

- Check the boxes to tell us the ages of the children served each food or drink.

SAMPLE

MENU FOR BREAKFAST

Check this box if you
☐ do not serve Breakfast.

Today's date: 6 / 1 / 98
 month day year

Abt Staff Use Only <i>Please do not write in this column.</i>	What Did You Serve? <i>List all foods and drinks.</i>	Please Describe Each Food • Include brand name, cooking method, salt, and type of fat used, if applicable. • Check the FOOD DESCRIPTION GUIDE pamphlet for additional instructions.	Did you Prepare the Food or was it Ready-To-Eat? <i>Check one box for each food. Follow instructions in the Food You Prepared section.</i>		To Which Age Groups Did You Serve the Food or Drink? <i>Check the box(es) for each age group served this food.</i>			
			Prepared Myself	OR Ready-to-Eat	1-2 Years	3-5 Years	6-12 Years	
BREAKFAST								
	cereal	Cherrios, General Mills		✓	✓			
	sugar	white		✓	✓			
	milk	2%, white, Hood		✓	✓			
	juice	orange, Minute-Maid, made from frozen concentrate		✓	✓			
	banana	fresh, sliced		✓	✓			

SAMPLE

MENU FOR LUNCH

Check this box if you
☐ do not serve Lunch.

Today's date: 6 / 1 / 98
month day year

Abt Staff Use Only Please do not write in this column.	What Did You Serve? <i>List all foods and drinks.</i>	Please Describe Each Food • Include brand name, cooking method, salt, and type of fat used, if applicable. • Check the FOOD DESCRIPTION GUIDE pamphlet for additional instructions.	Did you Prepare the Food or was it Ready-To- Eat? <i>Check one box for each food. Follow instructions in the Food You Prepared section.</i>		To Which Age Groups Did You Serve the Food or Drink? <i>Check the box(es) for each age group served this food.</i>		
			Prepared Myself	OR Ready- to-Eat	1-2 Years	3-5 Years	6-12 Years
LUNCH							
	Sandwich	Peanut butter & jelly	✓		✓	✓	
	Peanut butter	Skippy, smooth					
	Jelly	Welch's grape					
	Bread	Wonder, white					
	Carrot sticks	Raw, plain		✓		✓	
	Pears	Del Monte, diced, canned in light syrup		✓	✓	✓	
	Milk	2%, white, Hood		✓	✓	✓	
	Peas and carrots	Del Monte, canned, heated		✓	✓		

SAMPLE

MENU FOR SUPPER

Check this box if you
☐ do not serve Supper.

Today's date: 6 / 1 / 68
month day year

Abt Staff Use Only <i>Please do not write in this column.</i>	What Did You Serve? <i>List all foods and drinks.</i>	Please Describe Each Food • Include brand name, cooking method, salt, and type of fat used, if applicable. • Check the FOOD DESCRIPTION GUIDE pamphlet for additional instructions.	Did you Prepare the Food or was it Ready-To-Eat? <i>Check one box for each food. Follow instructions in the Food You Prepared section.</i>		To Which Age Groups Did You Serve the Food or Drink? <i>Check the box(es) for each age group served this food.</i>		
			Prepared Myself	OR Ready-to-Eat	1-2 Years	3-5 Years	6-12 Years
SUPPER							
	Meatloaf	Homemade, plain	✓		✓		✓
	Mashed potatoes	Made with 2% milk, margarine, salt and pepper	✓		✓		✓
	Corn	Canned, Del Monte, boiled		✓	✓		✓
	Milk	2%, white, Hood		✓	✓		✓
	Pudding	Jello Pudding Cup, chocolate		✓	✓		✓
	Bread	Pepperidge Farm, 100% whole wheat		✓	✓		✓
	w/ margarine	Shedd's, whipped, soft		✓	✓		✓

☐ Check this box if you do not serve Morning Snack.

☐ Check this box if you do not serve Afternoon Snack.

☐ **serve Afternoon Snack.**
Check this box if you do not

☒ Check this box if you do not serve Evening Snack.

Meals Offered by Tier 2 CACFP Family Child Care Providers / E-FAN-02-006

FOOD YOU PREPARED

Use a *Food You Prepared* page for any food you checked as "Prepared Myself" on the *Menu* pages and for which you can easily tell us the recipe. This includes food you made from scratch or by combining two or more foods or ingredients. (The exception is sandwiches which can be fully described on the *Menu* pages.) A sample of a completed *Food You Prepared* page is shown on the back of these instructions.

How to Fill in the *Food You Prepared* Pages

1. **Name of food.** Write the name of the food in the space provided at the top of the page. Please **use the same name** you used on the *Menu* page.
2. **Number of servings prepared.** Write the number of servings you made on this line.
3. **Size of each serving.** Write the **size** of one serving in this space. For example: 1/2 cup, 4 oz, or 1 brownie.
4. **When was food served?** Check the box (✓) beside the meal or meals at which the food was served. Write in the dates the food was served during the survey week.
5. Fill in the chart following the instructions at the top of each column:

What Ingredients or Foods Did You Use?

- List **all** ingredients and foods by name on separate lines. Include everything you used—salt, pepper and other spices, added fats like butter, margarine, mayonnaise, and oil, pan drippings, water, and stock.

How Much Did You Use?

- Show the amount of each ingredient or food you used. Be sure to write both *the number and the type of measurement*.

<i>Examples:</i>	2 Tbsp (mayonnaise) 2 tsp (salt) 4 oz (shredded cheese)	2 pounds (lb) (ground beef) ¾ cup (cooked rice) 1 quart (qt) (milk)
------------------	---	---

- If you use an ingredient that is not measured, write down *how much or how many* you used. If possible, tell us whether the item was small, regular (medium), or large.

<i>Examples:</i>	1 large (carrot) 1/2 large (green pepper) 15 (crackers) (saltine size)	3 small (bananas) 2 regular slices (bread) 8 squares (graham crackers)
------------------	--	--

Please Describe Each Ingredient or Food

- Use this column to describe each ingredient or food in detail. Look for the ingredient or food in the **FOOD DESCRIPTION GUIDE** to see the kinds of information to write. We also need to know whether it was: *raw or cooked? shredded, chopped, sliced, grated, crushed, or whole?*

Preparation and Cooking Method

- Answer questions 1 and 2 if they apply to the food you prepared.

FOOD YOU PREPARED SAMPLE

Please fill in one of these pages for any food you made from scratch or by combining two or more foods or ingredients, for example, chili, tuna salad, mashed potatoes, salads, pancakes, and homemade cookies.

Name of food Banana Bread
Please use same name you used on the Menu page.

When was food served?
Check all that apply and indicate date(s) served.

Number of servings prepared 12

Size of each serving 1 slice
Examples: 1/2 cup, 4 oz, 1 cup, 3 Tbsp

Date(s) served:

☐ Breakfast _____
☐ Lunch _____
☐ Supper _____
☒ Snack 6/1/98

What Ingredients or Foods Did You Use? <i>List <u>all</u> ingredients and foods.</i>	How Much Did You Use? <i>Examples: 2 tsp, 1/2 cup, 1 lb, 4 oz</i>	Please Describe Each Ingredient or Food • Was it raw or cooked? shredded, chopped, sliced, crushed, or whole? • Check the FOOD DESCRIPTION GUIDE pamphlet for additional instructions.
Butter	1/2 cup	regular, salted
Sugar	1 cup	white
Eggs	2	large, whole, fresh
Bananas	3	mashed
Flour	2 cups	white, all purpose
Baking Soda	1 tsp.	
Salt	1 tsp.	regular
Walnuts	1/4 cup	chopped

PREPARATION AND COOKING METHOD

1. If cooked, what cooking method did you use? (Check one)

☒ Bake/roast ☐ Stir fry ☐ Pan fry/sauté
☐ Broil/grill ☐ Deep fry ☐ Other (specify): _____

2. If you prepared meat (beef, pork, chicken, turkey, etc.), did you: (Check all that apply)

a. Trim the visible fat? ☐ Yes ☐ No ☐ No visible fat to trim
b. Drain fat after cooking? ☐ Yes ☐ No ☐ No fat to drain
c. Remove bone before serving? ☐ Yes ☐ No ☐ No bone to remove
d. Remove skin before serving? ☐ Yes ☐ No ☐ No skin to remove



**Family Child Care Homes
Legislative Changes Study**

MEAL OBSERVATION RECORD

For Meals and Snacks Served:

____/____/____
month day year

and

____/____/____
month day year

Collected by: _____

Provider ID: ____ - ____ - ____

SERVING SIZE MEASUREMENTS FORM

DAY: (circle one) MON TUE WED THU FRI

CHILD CARE NAME: _____

DATE: ____/____/____

Month Day Year

MEAL: (circle one)

BREAKFAST

MORNING SNACK

LUNCH

AFTERNOON SNACK

SUPPER

EVENING SNACK

Menu item or component:

Reference Serving:

Weights or volumes
of samples:

#1 _____ grams/foz

#2 _____

#3 _____

#4 _____

#5 _____

Total weights/volumes

_____ grams/foz

Divide by 5 =

Average weight/volume
of full portion

_____ grams/foz

MEAL OBSERVATION FORM

CHILD CARE NAME: _____

ID: _____

MEAL: (circle one)

Breakfast

Lunch

Dinner

Morning Snack

Afternoon Snack

Evening Snack

DAY: (circle one) MON TUE WED THU FRI

AGE RANGE: _____

DATE OF MEAL: ____/____/____

Foods Served	grams/ FOZ	Reference Serving	ID: Child 1		ID: Child 2		ID: Child 3	
			Served	Total	Served	Total	Served	Total
Foods Served	grams/ FOZ	Reference Serving	ID: Child 4		ID: Child 5		ID: Child 6	
			Served	Total	Served	Total	Served	Total

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:

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:

$$\text{TYPICAL}_{ijk} = \exp (b_0 + \sum_i b_{1i} \text{MINOR}_i + \sum_j \sum_k b_{2jk} (\text{AGEGROUP}_j \times \text{MEALTYPE}_k)),$$

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 offered⁶
- 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.

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 urban⁷, 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

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

Appendix D

Estimating Impacts of Tiering on Nutrient Measures

The central purpose of the analysis was to estimate the effect of lower reimbursement for Tier 2 providers on the nutrient composition of the meals and snacks they offer. This analysis was carried out within strata defined by the meal (breakfast, lunch, morning snack, and afternoon snack) and by the age of the children to whom the meal is offered (1-2, 3-5, and 6-12). Within each stratum the unit of analysis was the provider, with the provider's value for any nutrient calculated as the amount of the nutrient offered at the specified meal to children of the specified age, averaged over all of the days on which the provider reported serving that meal to children of that age (typically 5 days).

The sample comprised providers who completed the menu survey: Tier 2 providers in 1999 and all providers in 1995. Regression models were estimated for all nutrients in all strata. Logistic regression was used for dichotomous nutrient measures (e.g., whether a provider offered lunches to 3-5-year-olds that supplied at least one-third of the RDA for food energy). Sample weights were incorporated using SAS-callable SUDAAN (PROC REGRESS and PROC RLOGIST).

Estimation of tiering effects is complicated by the fact that the amount of any nutrient that the provider offers—i.e., the dependent variable—is determined by what foods the provider places on the menu and by what portion sizes the provider offers. The foods on the menu were recorded independently by each provider. Portion sizes, however, were observed for only a subsample of providers and were therefore imputed on the basis of the characteristics of the provider, the meal, the provider's location, and other factors described above (Appendix C). In estimating the standard error of the tiering effect, it is necessary to take into account the variance associated with the portion size estimation process as well as the variance in the model of nutrient measures itself. This appendix describes the method used to estimate this combined variance.

The appendix contains four sections. The first describes the basic problem, the second uses two simplified examples to illustrate the main features of our estimation approach, and the final two sections describe the estimators that were actually used, their errors of estimate, and the way in which these errors were estimated.

Introduction

We set out to estimate models of the form:

$$(1) \quad E(y_i | x_i) = x_i' \beta$$

where

y_i = the amount of some specified nutrient included in the meals offered by the i th provider (e.g., the percent of RDA for food energy in lunches for children aged 3-5), and

x_i = a vector of provider characteristics, including a dummy for the observation year, a measure of the provider's household income relative to the Federal poverty guideline, and the percent of children in the provider's census block group in 1990 living in households with incomes at or below 185 percent of the poverty guideline.

The coefficient of interest is the coefficient for the observation year, which is interpreted as estimating the effect of the difference in reimbursement plus the effect of any general changes in CACFP providers' menus or portion sizes between 1995 and 1999. The other covariates represent two of the three criteria used in assigning providers to Tier 1 or Tier 2. (The third factor, the low-income status of the provider's elementary school attendance area, was not measured in available data.)

The value of y_i is computed based on the nutrient content of various foods that were served by providers. Nutrient content is measured relative to the nutrient being considered. It may be expressed in either absolute or relative terms (e.g., grams of fat or percent of RDA for calcium). Total nutrient content reflects the nutrients per unit and the portion sizes of all of the foods offered by a provider. We observe menus for several types of meals (breakfast, lunch, snacks) offered to children of various ages on each of several days of the week. Portion sizes and relative nutrients per unit of foods offered will differ depending on the age of the child and the type of meal. In addition, nutrient content is sometimes analyzed in terms of subsets of meals—for example, lunches or meals offered to children in a certain age range.

The equation for y_i is:

$$(2) \quad y_i = \sum_{t \in T_0} \sum_{j=1}^m \left(w_{tj} a_{itj} d_{itj} \right)$$

where

t = an index running over the total set of meals, which is defined by all possible combinations of a meal's type (breakfast, lunch, snack), the day of the week on which it was served, and the age of the child to whom it was served;

T_0 = the set of meals included in the measure;

m = the total number of foods;

w_{tj} = the amount of the nutrient that is provided by a unit of the j th food when served in the t th meal;

d_{itj} = a variable that indicates whether the i th provider included the j th food in its menu for the t th meal; and

a_{itj} = the amount of the j th food offered by the i th provider if the j th food is included in the menu for the t th meal.

Estimation of Equation (1) was complicated by the fact that we observed menus for the entire sample, but only obtained information on portion sizes, (and thus only observed y) for a subsample. We could have estimated β using only the subsample for which we had complete information. We increased the precision of our estimates by using a two-stage procedure. The first stage used the subsample to estimate food amounts (including the effects of tier on amounts). These estimates, combined with the observed menus, allowed us to create estimated y 's for the entire sample. The second stage estimated overall effects for the entire sample based on the estimated y 's.

This two-stage procedure reduces the errors of estimate by using the information on menus for the entire sample. At the same time, it does require some additional steps to estimate standard errors, described in this appendix. The overall effects estimated in the second stage reflect the observed differences in menus weighted by the estimated portion amounts. The second stage regression estimates the error associated with chance fluctuations in observed menus. The potential error associated with errors in estimating portion amounts has to be estimated separately and added to the second stage regression estimate.

The estimators involved are discussed in the third and last sections of this appendix. These involve a variety of nonlinear functions and are not always transparent. The next section uses two simpler specifications to illustrate the basic structure of the procedure.

Two Illustrative Examples

Two examples illustrate the procedure used to estimate β . The first illustrates the basic approach of sequential estimation, using the subsample to estimate amounts and then the entire sample to estimate β . The second illustrates the use of auxiliary variables in estimating amounts.

Example 1: A Log-Linear Specification For A Multiplicative Model

The definition of y_i in Equation (2) is complicated by the fact that it involves sums over a large number of possible menu items. We can, of course, rewrite Equation (2) as a simple product:

$$(3) \quad y_i = \bar{a}_i \cdot m_i$$

where

$\bar{a}_i$ = the average portion size (measured in nutrient units) served by the i th provider, and

m_i = the number of menu items offered by the i th provider.

We did not use this specification, because we would expect $\bar{a}_i$ to depend on the composition of the menu: a sequential procedure that used the subsample to estimate $\bar{a}_i$ and the entire sample to estimate m_i would throw away the information on the menu composition that is available for the entire sample. Even so, the specification of Equation (3) does provide a straightforward illustration of the estimation process.

Say that we had adopted the specification of Equation (3) and, in addition, replaced the specification of Equation (1) with a multiplicative model:

$$\begin{aligned}
\{\ln(\bar{a}_i)\} &= X\beta_a + \varepsilon_a \\
\{\ln(m_i)\} &= X\beta_m + \varepsilon_m \\
(4) \quad \{\ln(y_i)\} &\equiv \{\ln(\bar{a}_i)\} + \{\ln(m_i)\} \\
&= X(\beta_a + \beta_m) + (\varepsilon_a + \varepsilon_m) \\
&= X\beta + \varepsilon
\end{aligned}$$

where, as throughout this appendix, $\{\cdot\}$ is used to indicate a column vector of the indicated elements, so that

$\{\ln(y_i)\}$ = the column vector whose i th element is $\ln(y_i)$.

We have information on m_i for the entire sample and information on $\bar{a}_i$ for only a subsample. Given the specification of Equation (4), we could, of course, estimate each component of β separately:

$$\begin{aligned}
(5) \quad \hat{\beta}_a &= (X_1'X_1)^{-1} X_1'\{\ln(\bar{a}_i)\} & \hat{\beta}_a &\sim [\beta_a, \sigma_a^2(X_1'X_1)^{-1}] \\
\hat{\beta}_m &= (X'X)^{-1} X'\{\ln(m_i)\} & \hat{\beta}_m &\sim [\beta_m, \sigma_m^2(X'X)^{-1}]
\end{aligned}$$

where the subscripted X indicates the matrix for the subsample of observations used in the first stage estimation (those for which amounts are observed). Assuming that the two errors are independent, our estimate of β would then be distributed as follows:

$$(6) \quad \hat{\beta} = \hat{\beta}_a + \hat{\beta}_m \sim [\beta, \sigma_a^2(X_1'X_1)^{-1} + \sigma_m^2(X'X)^{-1}]$$

Alternatively, we could obtain the same estimate of β by using the subsample estimate of β_a from Equation (5) to estimate $\ln(y_i)$ for the entire sample, and then regressing this estimated $\ln(y_i)$ on x . Form :

$$(7) \quad \{\ln(\tilde{y}_i)\} = \{\ln(m_i)\} + X\hat{\beta}_a$$

and then regress $\{\ln(\tilde{y}_i)\}$ on x :

$$(8) \quad \hat{\beta} = (X'X)^{-1} X'\{\ln(\tilde{y}_i)\} = \hat{\beta}_m + \hat{\beta}_a$$

The two procedures yield the same estimates of β . However, the regression of Equation (8) underestimates the error of estimate. The estimated error term for the second stage regression of $\ln(\tilde{y}_i)$ on x_i only includes ε_m :

$$(9) \quad \hat{\varepsilon}_2 = \left[I - X(X'X)^{-1}X' \right] \{ \ln(\tilde{y}_i) \} = \left[I - X(X'X)^{-1}X' \right] \varepsilon_m$$

Accordingly, the estimated variance from the second stage regression will be:

$$(10) \quad \hat{V}_2(\hat{\beta}) = \hat{\sigma}_m^2 (X'X)^{-1}$$

whereas the actual error from Equation (6) is:

$$(11) \quad V(\hat{\beta}) = \sigma_a^2 (X_1'X_1)^{-1} + \sigma_m^2 (X'X)^{-1}$$

We can estimate the actual variance by combining the regression estimate with the estimated error variance from the first stage regression of $\ln(a_i)$ in Equation (5):

$$(12) \quad \hat{V}(\hat{\beta}) = \hat{V}_2(\hat{\beta}) + \hat{\sigma}_a^2 (X_1'X_1)^{-1} = \hat{V}_2(\hat{\beta}) + \hat{V}(\hat{\beta}_a)$$

The size of the correction may be indicated by considering the case in which the subsample with information on amounts is a random sample of the overall sample. In this case, we would expect that

$$(13) \quad (X_1'X_1) \approx \frac{n_1}{n} (X'X)$$

so that we might approximate the variance of Equation (12) by:

$$(14) \quad \hat{V}(\hat{\beta}) \approx \left[1 + \left(\frac{n}{n_1} \right) \frac{\hat{\sigma}_a^2}{\hat{\sigma}_m^2} \right] \hat{V}_2(\hat{\beta}) = \left[\hat{\sigma}_m^2 + \left(\frac{n}{n_1} \right) \hat{\sigma}_a^2 \right] (X'X)^{-1}$$

Example 2: Adding Auxiliary Variables

As described in the next section, the actual estimation procedure used auxiliary variables in the prediction of amounts. Our illustrative specification is now:

$$(15) \quad \begin{aligned} \{ \ln(m_i) \} &= X\beta_m + \varepsilon_m \\ \{ \ln(a_i) \} &= (X \quad Z) \begin{pmatrix} \gamma_x \\ \gamma_z \end{pmatrix} + \varepsilon_a \end{aligned}$$

The z 's are endogenous. Thus, in the specification for $\ln(y_i)$:

$$(16) \quad \{\ln(y_i)\} = X\beta + \varepsilon$$

β reflects the combination of the direct effects of x and its effect in determining z :

$$(17) \quad \beta = \beta_m + \gamma_x + G\gamma_z \quad \text{where } E(Z|X) = XG$$

The intermediate variable $\ln(\tilde{y})$ is now:

$$(18) \quad \{\ln(\tilde{y}_i)\} = \{\ln(m_i)\} + (X \quad Z) \begin{pmatrix} \hat{\gamma}_x \\ \hat{\gamma}_z \end{pmatrix}$$

or, substituting from Equation (15) and Equation (17),

$$(19) \quad \{\ln(\tilde{y}_i)\} = X\beta + \tilde{\varepsilon}$$

where

$$(20) \quad \tilde{\varepsilon} = (X \quad Z) \begin{pmatrix} \hat{\gamma}_x - \gamma_x \\ \hat{\gamma}_z - \gamma_z \end{pmatrix} + \varepsilon_m + (Z - XG)\gamma_z$$

The estimator for β from the regression of $\ln(\tilde{y})$ on x is:

$$(21) \quad \begin{aligned} \hat{\beta} &= (X'X)^{-1} X' \{\ln(\tilde{y}_i)\} \\ \hat{\beta} &\sim \left[\beta, (X'X)^{-1} X' \text{Var}(\tilde{\varepsilon}) X (X'X)^{-1} \right] \end{aligned}$$

We can characterize the variance of $\tilde{\varepsilon}$ in terms of the components from Equation (20)¹:

¹ In general, if we take the expectation of some variable, η , over two sets of variables, a and b , then

$$E(\eta) = E_a[E_{b|a}(\eta)]$$

and

$$\text{Var}(\eta) = \text{Var}_a[E_{b|a}(\eta)] + E_a[\text{Var}_{b|a}(\eta)]$$

$$(22) \quad V(\hat{\beta}) = (X'X)^{-1} X' [V_1(\tilde{\varepsilon}) + V_2(\tilde{\varepsilon})] X (X'X)^{-1}$$

where

$$(23) \quad \begin{aligned} V_1(\tilde{\varepsilon}) &= \text{Var}_{\hat{\gamma}} \left[E_{(\varepsilon_m, z | \hat{\gamma})}(\tilde{\varepsilon}) \right] = \text{Var}_{\hat{\gamma}} \left[\begin{pmatrix} X & XG \end{pmatrix} \begin{pmatrix} \hat{\gamma}_x - \gamma_x \\ \hat{\gamma}_z - \gamma_z \end{pmatrix} \right] \\ V_2(\tilde{\varepsilon}) &= E_{\hat{\gamma}} \left[\text{Var}_{(\varepsilon_m, z | \hat{\gamma})}(\tilde{\varepsilon}) \right] = E_{\hat{\gamma}} \left[\text{Var}_{(\varepsilon_m, z | \hat{\gamma})}(\varepsilon_m + (Z - XG)\gamma_z) \right] \end{aligned}$$

The variance associated with the second component is estimated by the second stage $\ln(\tilde{y})$ regression (for which $\hat{\gamma}$ is fixed)²:

$$(24) \quad \hat{V}_2(\hat{\beta}) = \hat{\sigma}_2^2 (X'X)^{-1}$$

The variance associated with the first component is given by:

$$(25) \quad \begin{aligned} V_1(\hat{\beta}) &= (X'X)^{-1} X' \left[\text{Var}_{\hat{\gamma}} \left[\begin{pmatrix} X & XG \end{pmatrix} \begin{pmatrix} \hat{\gamma}_x - \gamma_x \\ \hat{\gamma}_z - \gamma_z \end{pmatrix} \right] \right] X (X'X)^{-1} \\ &= [I, \quad G] \text{Var}(\hat{\gamma}) \begin{bmatrix} I \\ G' \end{bmatrix} \end{aligned}$$

² The error term in Equation (1) is given by:

$$\varepsilon = \varepsilon_m + \varepsilon_a + (Z - XG)\gamma_z$$

If ε_a is assumed to be homoskedastic, then assuming that ε is homoskedastic implies that the remaining error vector is also homoskedastic – that is,

$$\varepsilon_m + (Z - XG)\gamma_z \sim [0, \sigma_{\varepsilon}^2 I]$$

This assumption is not as remarkable as it may seem. Whether or not specification of a homoskedastic error for Equation (16) seems reasonable is unlikely to depend on an assumption that there are no omitted variables. If a homoskedastic error for the amount equation also seems reasonable, then homoskedasticity of $[\varepsilon_m + (Z - XG)\gamma_z]$ is also reasonable.

The subsample regression provides an estimate of $\text{Var}(\hat{y})$, and we could use either the full sample or the subsample value of $(X'X)^{-1}X'Z$ to estimate G . $\text{Var}(\hat{y})$ is:

$$(26) \quad V(\hat{y}) = \sigma_a^2 \begin{bmatrix} X_1'X_1 & X_1'Z_1 \\ Z_1'X_1 & Z_1'Z_1 \end{bmatrix}^{-1}$$

If we use the subsample to estimate G , then the estimate for Equation (25) becomes:

$$(27) \quad \begin{aligned} \hat{V}_1 &= \begin{bmatrix} I, & (X_1'X_1)^{-1}X_1'Z_1 \end{bmatrix} \text{Var}(\hat{y}) \begin{bmatrix} I \\ Z_1'X_1(X_1'X_1)^{-1} \end{bmatrix} \\ &= (X_1'X_1)^{-1} \begin{bmatrix} X_1'X_1 & X_1'Z_1 \end{bmatrix} \text{Var}(\hat{y}) \begin{bmatrix} X_1'X_1 \\ Z_1'X_1 \end{bmatrix} (X_1'X_1)^{-1} \\ &= \hat{\sigma}_a^2 (X_1'X_1)^{-1} \end{aligned}$$

Our estimate for the variance of the estimated β is like that of Equation (12):

$$(28) \quad \hat{V}(\hat{\beta}) = \hat{V}_2(\hat{\beta}) + \hat{\sigma}_a^2 (X_1'X_1)^{-1}$$

Note, however, that unlike Equation (12), the second term in Equation (28) is not equal to the estimate of $\text{Var}(\hat{y}_x)$:

$$(29) \quad \hat{V}(\hat{y}_x) = \hat{\sigma}_a^2 \left(X_1' \left(I - Z_1(Z_1'Z_1)^{-1}Z_1' \right) X_1 \right)^{-1}$$

This reflects the fact that the effects of the x 's includes their effects on the expected values of the z 's for each provider. We either need to calculate $(X_1'X_1)^{-1}$ or use the approximation of Equation (13).

Results for the Actual Specification

The actual estimation procedure parallels that described in the previous section. We specified the a_{ij} as a multiplicative function of provider, meal, and food characteristics. Estimation was carried out separately for each of 10 groups of items. Thus the final specification for items in the k th group was:

$$(30) \quad a_{ij} = \exp(z'_{kij} \gamma_k) (\eta_{k1i} \eta_{k2ij}) \text{ for } j \in J_k$$

where

a_{ijt} = the amount of the j th food offered by the i th provider if the j th food is included in the menu for the t th meal;

z_k = the vector of variables used in the portion size equation for the k th food group;

z_{kitj} = the value of the z_k vector for the j th food served by the i th provider for the t th menu;

η_{k1}, η_{k2} = provider level and item level multiplicative errors, respectively; and

J_k = the set of foods included in the k th group.

The nature of the z 's is not essential to what follows. However, it may still be useful to note that the z_k vector includes provider characteristics (including tier), items relating to specific foods, such as external values for both the standard and usual portion sizes for the item given the age of the child to whom it was served, and items related to the type of meal, number of foods offered in the meal, number of meals served in a day. Some of the variables in the z_k vector have the same value for every food and menu served by the i th provider; some have values that only depend on the food; some have values that vary with food and the meal index.

It will simplify notation somewhat if we define an intermediate variable that combines estimated amounts and per unit nutrient weights. Define

$$(31) \quad r_{ijt} = w_{tj} \exp(z'_{kitj} \gamma_k) \text{ for } j \in J_k$$

where

r_{ijt} = the expected nutrient yield obtained from the j th food if it is served by the i th provider as part of the t th menu with characteristics z_{kitj} ;

w_{tj} = the amount of the nutrient provided by a unit of the j th food when served in the t th meal; and

γ_k and z_{kitj} = as in Equation (30).

Note that the expectation represented by r_{ijt} is conditional on the food being served in the circumstances represented by the z 's. The estimated nutritional content of foods from the k th group served by the i th provider is given by:

$$(32) \quad \tilde{y}_{ik} = \sum_{t \in T_0} \sum_{j \in J_k} \hat{r}_{ijt} d_{ijt}$$

where

$\tilde{y}_{ik}$ = the estimated nutritional content of foods from the k th group served by the i th provider;

T_0 = the set of meals included in the measure (as discussed in connection with Equation (2));

$\hat{r}_{ijt}$ = the estimated value of r_{ijt} , obtained from Equation (31), using the estimated values of γ_k ; and

d_{ijt} = a dummy variable indicating that the j th food was part of the t th meal offered by the i th provider.

Likewise, the estimate of the amount supplied by the i th provider from all foods is:

$$(33) \quad \tilde{y}_i = \sum_k \tilde{y}_{ik}$$

Following the specification of Equation (1), β is estimated from the weighted regression of $\tilde{y}$ on a set of provider characteristics, x :

$$(34) \quad \hat{\beta} = (X'PX)^{-1} X'P\tilde{y}$$

where

P = a diagonal matrix of sampling weights.

Recall that y_i is defined by

$$(35) \quad y_i = \sum_{t \in T_0} \sum_{j=1}^m \left(w_{tj} a_{ijt} d_{ijt} \right)$$

The expected value of y_i given x_i can be developed in terms of a sequence of conditional expectations:

$$(36) \quad \begin{aligned} E(y_i | x_i) &= E_{(d, z | x)} \left[E_{(a | d, z, x)} \left(\sum_{t \in T_0} \sum_j w_{tj} a_{ijt} d_{ijt} \right) \right] \\ &= E_{(d, z | x)} \left[\sum_{t \in T_0} \sum_j r_{ijt} d_{ijt} \right] \end{aligned}$$

Given consistent estimates of γ_k , $\hat{r}_{ijt}$ will be a consistent estimate of r_{ijt} , and $\tilde{y}_i$ will be a consistent estimate of $\sum \sum (r_{ijt} d_{ijt})$ —the expected value of y_i given x_i , the d_{ijt} 's, and the z_{kitj} 's (the bracketed expression in the second line of Equation (36)). The regression of $\tilde{y}_i$ on x_i will accordingly provide consistent estimates of β , and the estimated error of estimate from that regression will reflect random fluctuations in the d_{ijt} 's and z_{kitj} 's around their expected values given x_i . The variance of estimate of β will consist of this variance plus the variance associated with the error of estimate of $\hat{r}_{ijt}$:

$$(37) \quad V(\hat{\beta}) = V_1(\hat{\beta}) + V_2(\hat{\beta})$$

where

$V(\hat{\beta})$ = the variance of $\hat{\beta}$;

$V_1(\hat{\beta})$ = the variance associated with the error of estimate of the $\hat{\gamma}_k$'s; and

$V_2(\hat{\beta})$ = the variance given the value of the $\hat{\gamma}_k$'s, which is the variance estimated in the second stage regression.

The asymptotic error of estimate of β that is associated with the error of estimate of $\hat{r}_{ijt}$ is obtained from the asymptotic approximation to the $\tilde{y}_k$'s. The first order approximation to $\tilde{y}_{ik}$ is given by:

$$(38) \quad \begin{aligned} \tilde{y}_{ik} &\approx \left(\tilde{y}_{ik} \Big|_{\hat{\gamma}=\gamma} \right) + \left(\frac{\partial \tilde{y}_{ik}}{\partial \hat{\gamma}_{ik}} \Big|_{\hat{\gamma}=\gamma} \right) (\hat{\gamma}_k - \gamma_k) + R_{ik} \\ &= \sum_{t \in T_0} \sum_j r_{itj} d_{itj} + \sum_{t \in T_0} \sum_j r_{itj} z'_{kitj} (\hat{\gamma}_k - \gamma_k) + R_{ik} \end{aligned}$$

where R_{ik} is a remainder term. Because $\hat{r}_{ijt}$ is a differentiable function of $\hat{\gamma}_k$, and $\hat{\gamma}_k$ is a consistent estimator of γ_k , we can ignore the remainder term in deriving the asymptotic distribution³. Dropping the remainder term from Equation (38) and rewriting it in terms of the vector, $\tilde{y}_k = \{\tilde{y}_{ik}\}$ gives:

$$(39) \quad \tilde{y}_k \approx \left(\tilde{y}_k \Big|_{\hat{\gamma}=\gamma} \right) + \left(\frac{\partial \tilde{y}_k}{\partial \hat{\gamma}_k} \Big|_{\hat{\gamma}=\gamma} \right) (\hat{\gamma}_k - \gamma_k)$$

The asymptotic variance component of the estimate of β associated with the error of estimate for the $\hat{\gamma}_k$'s is estimated by:

$$(40) \quad \hat{V}_1 = (X'PX)^{-1} X'P \left[\sum_k \left(\frac{\partial \tilde{y}_k}{\partial \hat{\gamma}_k} \right) Var(\hat{\gamma}_k) \left(\frac{\partial \tilde{y}_k}{\partial \hat{\gamma}_k} \right)' \right] PX (X'PX)^{-1}$$

where

$Var(\hat{\gamma}_k)$ = the variance-covariance matrix of the estimated γ_k 's, and

³ Because $\hat{r}_{ijt}$ is a differentiable function of $\hat{\gamma}_k$, the behavior of $\tilde{y}_{ik}$ is dominated by the first two terms of Equation (38) when $(\hat{\gamma}_k - \gamma_k)$ is small (that is, as $(\hat{\gamma}_k - \gamma_k)$ goes to zero, the ratio, $R_{ik}/(\hat{\gamma}_k - \gamma_k)$ also goes to zero). Because $\hat{\gamma}_k$ is a consistent estimator of γ_k , we know that for large enough samples, $\hat{\gamma}_k$ will be arbitrarily close to γ_k with probability arbitrarily close to one.

$\left(\frac{\partial \tilde{y}_k}{\partial \hat{\gamma}_k} \right)$ = an n by s_k matrix of partial derivatives, where

n = the number of providers (observations) in the second stage equation used to estimate β ;

s_k = the number of variables in the portion-size equations for the k th food group; and

the (i,h) th term for the matrix of partial derivatives is given by:

$$(41) \quad \left(\frac{\partial \tilde{y}_k}{\partial \hat{\gamma}_k} \right)_{ih} = \sum_{t \in T_0} \sum_{j \in k} \hat{r}_{itj} d_{itj} z_{kitjh}$$

where

z_{kitjh} = the value for the j th food served by the i th provider in the t th menu of the h th variable used to predict portion size for foods in the k th group.

Further Results for the Actual Specification

The dependent variable, y , sometimes involved ratios such as food energy from fat as a proportion of total food energy offered. In other cases, the dependent variable involved a dichotomous outcome, such as did or did not provide adequate amounts of some nutrient, for which effects were estimated using logits. Each of these is briefly discussed below.

Ratios. A ratio variable would be estimated as:

$$(42) \quad \tilde{y}_i = \frac{\tilde{y}_{Ai}}{\tilde{y}_{Bi}}$$

where the numerator and denominator followed the form of Equation (32) and Equation (33), but with nutrient weights and food indicator variables appropriate to the nutrients included in A or B , respectively. Thus, for example,

$$(43) \quad \hat{r}_{Aitj} = w_{Aitj} \exp(z'_{kitj} \hat{\gamma}_k) \text{ for } j \in J_k$$

and

$$(44) \quad \tilde{y}_{Aik} = \sum_{t \in T_0} \sum_{j \in J_k} \hat{r}_{Aitj} d_{Aitj}$$

Note that the same $\hat{\gamma}_k$'s are used for both $\tilde{y}_{Aik}$ and $\tilde{y}_{Bik}$. This is likely to reduce the effect of errors in estimating $\hat{\gamma}_k$. For regressions involving such ratio dependent variables, the first stage error term is

given by Equation (40), but the partial derivatives reflect the fact that $\tilde{y}_i$ is a ratio of terms involving $\hat{\gamma}_k$:

$$(45) \quad \frac{\partial \tilde{y}_{ik}}{\partial \hat{\gamma}_k} = \frac{1}{\tilde{y}_{Bi}} \frac{\partial \tilde{y}_{Aik}}{\partial \hat{\gamma}_k} + \frac{\tilde{y}_{Ai}}{(\tilde{y}_{Bi})^2} \frac{\partial \tilde{y}_{Bik}}{\partial \hat{\gamma}_k}$$

so that :

$$(46) \quad \left(\frac{\partial \tilde{y}_{ik}}{\partial \hat{\gamma}_k} \right)_{ih} = \sum_{t \in T_0} \sum_{j \in J_k} \left\{ \left[\frac{\hat{r}_{Aitj} d_{Aitj}}{\tilde{y}_{Bi}} - \frac{\tilde{y}_{Ai}}{(\tilde{y}_{Bi})^2} (\hat{r}_{Bitj} d_{Bitj}) \right] z_{kitjh} \right\}$$

where

$$(47) \quad \tilde{y}_{Ai} = \sum_k \tilde{y}_{Aik} \text{ and } \tilde{y}_{Bi} = \sum_k \tilde{y}_{Bik}$$

Dichotomous Variables. Dichotomous variables were defined by expressions such as:

$$(48) \quad \tilde{\delta}_i = \begin{cases} 1 & \text{if } \tilde{y}_i \geq y_c \\ 0 & \text{otherwise} \end{cases}$$

where

$\tilde{y}_i$ = as in Equation (33); and

y_c = some criterion value.

Weighted logits were then estimated based on the specification:

$$(49) \quad \text{Prob}(\delta_i = 1 | x_i) = F(x_i' \beta)$$

where $F(\cdot)$ is the logistic distribution function, and

$$(50) \quad \delta_i = \tilde{\delta}_i \Big|_{\hat{\gamma}=\gamma} = \begin{cases} 1 & \text{if } E(y_i | d, z) \geq y_c \\ 0 & \text{otherwise} \end{cases}$$

The FOC for the weighted logits are:

$$(51) \quad X'P(\tilde{\delta} - \hat{F}) = 0$$

where

$$\tilde{\delta} = \{\tilde{\delta}_i\}; \text{ and}$$

$$\hat{F} = \{F(x'_i\hat{\beta})\}.$$

Using the first order approximation for F , the asymptotic expansion for the estimated β is:

$$(52) \quad (\hat{\beta} - \beta) \approx (X'D_{PF}X)^{-1}X'P(\tilde{\delta}_i - F(x'_i\beta))$$

where

$$(53) \quad D_{PF} = \text{DIAG}\{P_i F(x'_i\beta)(1 - F(x'_i\beta))\}$$

We want to estimate $F(x'_i\beta)$ —the probability that $\delta_i = 1$. We in fact estimate:

$$(54) \quad \begin{aligned} \text{Prob}(\tilde{\delta}_i \geq 1) &= \text{Prob}(\tilde{y}_i \geq y_c) \\ &\approx \text{Prob}\left(E(y_i|d, z) \geq \left[y_c - \sum_k \left(\left(\frac{\partial \tilde{y}_{ik}}{\partial \hat{\gamma}_k}\right)(\hat{\gamma}_k - \gamma_k)\right)\right]\right) \\ &\approx F(x'_i\beta) - \left[F(x'_i\beta)(1 - F(x'_i\beta))\sum_k \left(\left(\frac{\partial \tilde{y}_{ik}}{\partial \hat{\gamma}_k}\right)(\hat{\gamma}_k - \gamma_k)\right)\right] \end{aligned}$$

The additional error term is estimated by:

$$(55) \quad \hat{V}_1 = \sum_k \left\{ (X'D_{PF}X)^{-1}X'D_{PF}\left(\frac{\partial \tilde{y}_k}{\partial \hat{\gamma}_k}\right)\text{Var}(\hat{\gamma}_k)\left(\frac{\partial \tilde{y}_k}{\partial \hat{\gamma}_k}\right)'D_{PF}X(X'D_{PF}X)^{-1} \right\}$$

where

$$\left(\frac{\partial \tilde{y}_k}{\partial \hat{\gamma}_k} \right) = \text{as in Equation (41)}.$$

Appendix E

Effect on Nutrient Estimates of Using Different Nutrient Databases

This report of the *Family Child Care Homes Legislative Changes Study* addresses the question of whether the food and nutrient composition of meals offered to children in CACFP family child care has changed since tiering was implemented. To ensure comparability of data for the two analysis periods, 1999 meal data were collected using essentially the same instruments that were used in the 1995 *Early Childhood and Child Care Study*. In addition, the same version of the University of Texas' Food Intake and Analysis System (FIAS 2.3) was selected for coding and nutrient analysis as was used for the earlier study. Despite the availability of a newer version (FIAS 3.98), it was felt that using FIAS 2.3 would allow the cleanest comparisons of the 1999 Tier 2 menu data with the 1995 menu data—that is, the comparisons would not be affected by technical differences between the old and new databases.¹ However, using FIAS 2.3 might not yield the best possible point-in-time estimates of the food and nutrient content of the 1999 menus, a limitation that has been acknowledged in Appendix C of this report. For this reason, a substudy was conducted to examine the differences between the older and newer versions of the nutrient database and the implications for nutrition-related findings of the study.

The first section of this appendix describes the methodology used to estimate the effect of a change in nutrient database on the nutrient composition of meals offered by a subsample of Tier 2 providers in 1999. It includes a description of the sample and procedures for applying the new database and analyzing the results. The subsequent sections include a summary of results and conclusions.

Methodology

Nutrient databases are updated periodically to reflect real changes in the nutrient composition of foods and to make improvements in the quality of the data. Real changes in food products most often occur when manufacturers change their ingredient formulation, for example, to lower the fat content or to increase iron content of a food. Many of the changes, however, are due to new foods in the marketplace, improved analytic techniques, and a better understanding of common food practices. All of these changes hold the potential for influencing nutrient analysis results, although the direction and magnitude of the differences for a particular research application cannot be predicted without conducting analyses such as those described below. There does not seem to be a single, standard method for determining whether differences in nutrient estimates derived from different nutrient analysis systems are nutritionally important. Therefore, several methods were used here.

¹ It is important to note that neither the FIAS 2.3 nor the newer FIAS 3.98 database were completely appropriate for comparing 1995 and 1999 results, because the two databases differ in two respects. First, there are some *time-independent* differences that simply represent improvements in measurement and would be equally applicable to 1995 and to 1999. An example would be adjustments to gram weights for ingredients in particular ethnic foods based on better understanding of the foods (but not on changes in the foods themselves). Second, some differences are *time-sensitive*, reflecting changes in common food formulation practices between 1995 and 1999 (such as the reduction in fat content of many packaged foods). Ideally, one would like to compare 1995 with 1999 nutrient values by holding the time-independent elements of the database constant and allowing the time-sensitive ones to vary. Because this option was not available, the second-best approach was to hold both the time-independent and the time-sensitive elements constant, which was accomplished by using the FIAS 2.3 database for both periods.

The basic approach was to re-analyze a subsample of the Tier 2 1999 menu surveys with the newer version of the FIAS database (FIAS 3.98) and compare results with the FIAS 2.3 estimates for the same subsample. The analysis is based on calculating the mean nutrient content under both databases for all providers in the subsample. It is limited to the *nutrient composition* of meals and snacks offered; a change in nutrient database was not expected to have any effect on findings regarding foods offered. Nutrient estimates were expected to differ, however, given the nature of the changes to the FIAS system between versions 2.3 and 3.98 and preliminary evidence of differences for some nutrients.²

Sample

A simple random sample of 200 Tier 2 providers who completed a menu survey in 1999 was selected. Four cases were omitted from the analysis: one that was later determined to be ineligible for the main study analysis; one because the menu survey was completed for fewer than 3 days; and two because the providers served only supper and/or evening snack, meals which were not included in the database comparison. The size of the sample was based on the statistical power necessary to detect a difference of 2 percentage points or more in the mean percentage of calories from fat offered at lunch (80-percent power at 5-percent level of significance). Exhibit E.1 shows the sample sizes and percentage of providers in the subsample offering each type of meal and snack. The distribution of meals and snacks offered by providers in the subsample is very similar to the distribution for all 1999 Tier 2 providers in the study.

Coding and Analysis

Senior nutritionists at Abt Associates reviewed the coding rules, default entries, and decision rules used to enter the menu surveys in FIAS 2.3 and revised them as necessary for use with FIAS 3.98. Two nutrition coders were trained on the new features of the FIAS 3.98 system and new coding rules. The coders then entered the subsample of menu surveys using FIAS 3.98. Quality control procedures were the same as for entry of menu surveys for the main study.

² Database documentation from the University of Texas indicated the addition of approximately 700 new foods. These included vegetables, margarines and spreads, fast-food sandwiches, home-prepared soups, ethnic foods in many food groups, and foods modified to be lower in fat, sodium, or sugar. Some foods' nutrient values and gram weights were updated, and standard recipes were revised to reflect current food consumption and food preparation practices.

Prior to collecting the 1999 data, Abt nutritionists performed a simple database comparison of the nutrient values for 67 of the most common foods in menus offered by 1995 family child care providers. We found that nutrient values for 40 percent of the individual *foods* varied by 20 percent or more when calculated with FIAS 2.3 vs. FIAS 3.98. Nutrient differences for a hypothetical *menu*, however, were much smaller in magnitude.

Exhibit E.1**Percentage of Tier 2 Provider Subsample Offering Specified Meals and Snacks During a Sample Week Based on Recorded Menus**

	Percentage of Providers Offering Meal/Snack to Children			
	Age 1-2	Age 3-5	Age 6-12	All Ages
Breakfast	92.7%	89.3%	77.1%	91.8%
Morning snack	52.1	47.2	21.1	49.5
Lunch	98.2	94.9	48.6	95.4
Afternoon snack	90.9	92.7	89.0	92.3
Supper	10.9	14.0	16.5	14.8
Evening snack	3.6	3.4	4.6	5.1
Unweighted sample	165	178	109	196

Portion size estimates for the database comparison subsample of Tier 2 menus were derived in the same manner as the menus analyzed with FIAS 2.3 (described in Appendix C). However, since the new database consists of 8-digit rather than 7-digit food codes and also includes new foods, some additional work was required. The appropriate portion sizes were remapped to the specific food codes that appeared in the subsample of menus coded with FIAS 3.98. After portion sizes were assigned to each menu, the mean energy and nutrient estimates for the observation days were calculated using the new nutrient database.

Estimates were developed for total food energy plus all 10 nutrients included in the main analysis of the menu survey. The mean energy and nutrient content was compared—for breakfasts, lunches, and afternoon snacks for the 1999 subsample—with results obtained for the same Tier 2 homes using the FIAS 2.3 database. Separate analyses were conducted for each CACFP age group for which sufficient observations were available and for all ages combined.

Results

Comparison of the Nutrient Content of Breakfasts, Lunches, and Afternoon Snacks Relative to RDA

Exhibit E.2 shows, for each database, the mean percentage of RDA at breakfast, lunch, and afternoon snack. There were few substantive differences in the values across the three CACFP age groups (1-2, 3-5, and 6-12 years), so results are shown for all age groups combined. The largest difference between the FIAS 2.3 and 3.98 databases was a drop in the percentage of RDA for vitamin C at lunch of approximately 7 percentage points. The next largest change was an increase of about 3 percentage points in the percent of RDA for iron at breakfast. There were virtually no database-related differences in the mean percentage of RDA at afternoon snack.

Exhibit E.2**Mean Percentage of RDA Offered at Breakfast, Lunch, and Afternoon Snack: 1999 Tier 2 Subsample^a**

	Breakfast			Lunch			Afternoon Snack		
	FIAS 2.3	FIAS 3.98	Difference	FIAS 2.3	FIAS 3.98	Difference	FIAS 2.3	FIAS 3.98	Difference
Food energy	21.1%	21.3%	0.2%	28.8%	28.8%	0.0%	15.3%	15.5%	0.2%
Protein	55.4	53.5	-1.9	99.7	98.4	-1.3	33.3	32.8	-0.5
Vitamin A	58.5	59.8	1.3	68.5	66.4	-2.2	19.6	19.3	-0.3
Vitamin C	70.3	68.5	-1.8	48.1	41.5	-6.7	29.8	30.3	0.4
Calcium	35.7	34.1	-1.6	39.3	38.5	-0.8	19.7	19.2	-0.4
Iron	37.0	40.3	3.4	24.8	25.1	0.3	13.6	14.0	0.4
Un-weighted sample	180	180		187	187		181	181	

^a All age groups combined (1-2, 3-5, and 6-12-year-olds).

With both databases, the percent of RDA exceeds the benchmark of one-third of the RDA for vitamin C at lunch and one-fourth of the RDA for iron at breakfast. The small increases in the percent of RDA for these nutrients translate to a decrease of 15 percent (range of 15-18 percent) of providers meeting the RDA benchmark for vitamin C at lunch and an increase of about 9 percent (range of 5-13 percent across age groups) meeting the RDA benchmark for iron at breakfast (Exhibit E.3). Although the majority of providers still meet the lunch benchmark for vitamin C, this finding suggests that the FIAS 2.3 estimates in this report probably overstate the true proportion of providers meeting the RDA benchmark for vitamin C at lunch. Conversely, an even larger proportion of providers meet the RDA benchmark for iron at breakfast than FIAS 2.3 estimates suggest.

To investigate the source of the vitamin C difference, an analysis was conducted to identify the foods offered in lunch menus with the largest differences in vitamin C content between the two databases. Surprisingly, hot dogs, corn dogs, and prepackaged deli ham were the most important sources of the different values. For example, 100 grams of hot dog contributed 20 milligrams (mg.) of vitamin C in the FIAS 2.3 analysis and 0 mg. in the FIAS 3.98 analysis. The newer database reflects the discovery that not all vitamin C measured in these foods is ascorbic acid, the active form of the vitamin. In the older database, erythroate, which is present in these foods as a preservative, was counted in the total vitamin C value. Erythroate, however, loses its vitamin C activity before the food is eaten.³

³ Personal communication with Dr. Juliet Howe at the Nutrient Data Laboratory, USDA, Agricultural Research Service, Beltsville Human Nutrition Research Center, October, 2000.

Exhibit E.3**Percentage of Providers Offering At Least One-Fourth RDA at Breakfast and One-Third RDA at Lunch: 1999 Tier 2 Subsample^a**

	Breakfast			Lunch		
	FIAS 2.3	FIAS 3.98	Difference	FIAS 2.3	FIAS 3.98	Difference
Food energy	14.3%	15.9%	1.6%	17.2%	16.3%	-0.8%
Protein	100.0	100.0	0.0	100.0	100.0	0.0
Vitamin A	98.1	98.7	0.6	88.2	86.7	-1.5
Vitamin C	90.3	90.3	0.0	75.9	61.0	-15.0
Calcium	99.6	94.1	-5.4	86.0	84.7	-1.4
Iron	75.2	84.2	9.1	8.0	7.8	-0.2
Unweighted sample	180	180		187	187	

^a All age groups combined (1-2, 3-5, and 6-12-year-olds).

A similar analysis of the increase in the iron content of breakfasts indicates that the difference is due primarily to a change in the iron values for a single brand of corn flakes cereal, oatmeal, waffles, and pancakes. The iron values for these foods are 2 to 5 times higher in the FIAS 3.98 database, most likely reflecting changes in the level of iron fortification and/or the amount of enriched grain in the product.

Comparison of the Nutrient Content of Breakfasts, Lunches, and Afternoon Snacks Relative to *Dietary Guidelines* and NRC Recommendations

The mean percentage of food energy from fat, saturated fat, and carbohydrate and the mean sodium and cholesterol values for breakfasts, lunches, and afternoon snacks offered by the subsample of 1999 Tier 2 providers were calculated, with both FIAS 2.3 and FIAS 3.98. The analysis is limited to the 3-5 and 6-12 age groups since *Dietary Guidelines* and NRC recommendations are only intended to apply to children age 2 and above.

The findings presented in Exhibit E.4 show that there were no important differences between the two nutrient databases for any of these nutrient measures for breakfast and lunch; results for afternoon snack are not shown but also indicate no database-related differences. The percentage of energy from fat, saturated fat, and carbohydrate varies by less than one percentage point for both the 3-5 and 6-12 age groups. Mean sodium values drop by 3-14 mg. at breakfast and lunch (2 percent or less) with the newer database. Cholesterol values fall by an average of 5-7 mg. (10-12 percent) at breakfast across both age groups. The change in cholesterol is the largest in magnitude and seems to be related primarily to the lower cholesterol content of pancakes, waffles, and muffins in FIAS 3.98 compared with the FIAS 2.3 database. Since mean levels of the nutrient measures examined here were all within the *Dietary Guidelines* and NRC recommended ranges with FIAS 2.3, the newer database would likely have no effect on this finding for the 1999 Tier 2 meals and snacks.

Exhibit E.4**Mean Nutrient Levels Relative to *Dietary Guidelines* and NRC Recommendations Offered at Breakfast and Lunch: 1999 Tier 2 Subsample^a**

		Breakfast			Lunch		
	Daily Recommendation	FIAS 2.3	FIAS 3.98	Difference	FIAS 2.3	FIAS 3.98	Difference
Percent of food energy from:		Meals Offered to Children Age 3-5					
Fat	≤ 30%	22.3	23.1	0.8	35.5	35.5	0.0
Saturated fat	<10%	10.4	9.7	-0.7	14.7	13.9	-0.8
Carbohydrate	> 55%	66.1	66.4	0.3	48.2	48.3	0.1
Cholesterol	≤ 300 mg	53.8	48.5	-5.3	50.4	48.3	-2.1
Sodium	≤ 2,400 mg	477.2	467.6	-9.6	891.9	885.3	-6.5
Unweighted sample		159	159		169	169	
Percent of food energy from:		Meals Offered to Children Age 6-12					
Fat	≤ 30%	21.8	22.6	0.8	37.8	37.8	0.0
Saturated fat	<10%	9.8	9.0	-0.8	15.8	15.0	-0.8
Carbohydrate	> 55%	67.2	67.4	0.2	45.3	45.3	0.0
Cholesterol	≤ 300 mg	58.5	51.8	-6.7	69.5	66.8	-2.7
Sodium	≤ 2,400 mg	553.3	550.7	-2.6	1,103.0	1,089.0	-13.8
Unweighted sample		84	84		53	53	

^a Note that the *Dietary Guidelines* and NRC recommendations are only applicable to children beginning at 2 years of age and older. This analysis is limited to meals offered to children 3-5 and 6-12, the only CACFP age groups for which the recommendations fully apply.

Exhibit E.5 shows the proportion of providers meeting the *Dietary Guidelines* and NRC recommendation benchmarks for breakfasts and lunches offered to children 3-5 and 6-12, for the two databases. Despite the very small differences between databases in the mean percentage of energy from fat and saturated fat and the mean amount of sodium, there are some changes in the proportions of providers that meet the benchmarks at breakfast and lunch. The findings vary somewhat by age group. For meals offered to the 3-5 age group, 9 percent more Tier 2 providers are meeting the recommendation for saturated fat and 6 percent more meet the recommendation for sodium at breakfast when the newer database is used.⁴ Although the majority of providers still meet the benchmark for percent of energy from fat at breakfast, approximately 4 percent fewer meet the goal when FIAS 3.98 is applied. While less fat and saturated fat are contributed by pancakes, waffles, and some doughnuts

⁴ The benchmark used in this study for sodium at breakfast is one-fourth of the recommended daily maximum of 2,400 mg., or 600 mg.

Exhibit E.5
Percentage of Providers Meeting *Dietary Guidelines* and NRC Recommendations at Breakfast and Lunch: 1999 Tier 2 Subsample^a

		Breakfast			Lunch		
	Daily Recommendation	FIAS 2.3	FIAS 3.98	Difference	FIAS 2.3	FIAS 3.98	Difference
Meals Offered to Children Age 3-5							
Percent of food energy from:							
Fat	≤ 30%	87.8	84.0	-3.9	17.5	15.5	-2.1
Saturated fat	<10%	52.1	61.1	9.0	6.4	7.8	1.4
Carbohydrate	> 55%	92.0	92.6	0.6	8.7	9.2	0.5
Cholesterol	≤ 300 mg	72.8	74.7	2.0	98.0	98.6	0.6
Sodium	≤ 2,400 mg	77.2	82.9	5.7	31.4	32.9	1.5
Unweighted sample		159	159		169	169	
Meals Offered to Children Age 6-12							
Percent of Food Energy from:							
Fat	≤ 30%	84.2	82.4	-1.9	3.2	2.6	-0.6
Saturated fat	<10%	63.6	68.8	5.2	0.6	3.2	2.6
Carbohydrate	> 55%	88.7	96.7	8.0	5.0	4.4	-0.6
Cholesterol	≤ 300 mg	67.8	71.4	3.6	96.3	96.3	0.0
Sodium	≤ 2,400 mg	70.6	70.6	0.1	8.1	13.0	4.9
Unweighted sample		84	84		53	53	

^a Note that the *Dietary Guidelines* and NRC recommendations are only applicable to children beginning at 2 years of age and older. This analysis is limited to meals offered to children 3-5 and 6-12, the only CACFP age groups for which the recommendations fully apply.

served at breakfast when the newer database is used, 2-percent fat milk, oatmeal, and biscuits contribute more fat than they did with FIAS 2.3. More providers meet the benchmark for sodium at breakfast because of the lower sodium content of some cooked and ready-to-eat cereals in FIAS 3.98 relative to 2.3. The differences in the mean cholesterol content of breakfasts do not affect the proportion of providers meeting the recommended level for this nutrient.

With the exception of percent of energy from saturated fat, nutrient differences due to the database follow a somewhat different pattern for the analysis of meals offered to children 6-12 years of age (Exhibit E.5). More providers (about 5 percent) offer lunches that meet the sodium benchmark with FIAS 3.98 compared with FIAS 2.3, but this represents only a couple of providers as the number offering lunch to this age group is small (unweighted n=53). Changes in the FIAS 3.98 databases are also reflected in the proportion of providers that meet the recommendation for percent of energy from carbohydrate (an increase of 8 percent) at breakfast.

Most Tier 2 providers meet the *Dietary Guidelines* and NRC recommendation benchmarks for all nutrient measures in breakfasts offered. If FIAS 3.98 had been used, even more Tier 2 providers might be meeting the saturated fat recommendation for breakfasts offered to both the 3-5 and 6-12 age groups. It is difficult to make any inferences about the main analysis based on the difference in the proportion of providers meeting sodium recommendations at lunch for 6-12 year olds given the small sample; very few providers meet the benchmark with either database.

Conclusions

An analysis of the mean energy and nutrient content of breakfasts, lunches, and afternoon snacks offered by a representative sample of 196 Tier 2 providers was conducted to compare the FIAS 2.3 nutrient database with the newer 3.98 version. It was expected that, if differences were large enough, they could lead to substantively different conclusions regarding the nutrient composition of CACFP Tier 2 meals in 1999 and possibly the estimated 1995-99 differences due to tiering. The analyses presented in this appendix provide little evidence that differences between the databases affect the conclusions drawn about the nutrient composition of CACFP Tier 2 meals in 1999. There are three exceptions: (1) the FIAS 2.3 estimates in this report probably overstate the true proportion of providers meeting the RDA benchmark for vitamin C at lunch, (2) they may understate the percentage of providers meeting the RDA for iron at breakfast, and (3) the proportion of providers meeting the *Dietary Guidelines* recommendation for saturated fat at breakfast is probably understated. There are no database-related differences that affect 1999 Tier 2 results for afternoon snacks.

None of the observed differences would affect conclusions about the effect of tiering. Some might lead to greater estimated differences between 1995 and 1999. However, this applies only to the nutrients whose FIAS values changed because of new product formulation, as was the case for iron and saturated fat. If we applied the FIAS 3.98 values to the 1999 data, and the FIAS 2.3 values for 1995, we would see larger proportions of the providers in 1999 than 1995 meeting the benchmark levels of these nutrients. This would reflect the effect of manufacturers' changes in food product formulation, however, and not an effect of tiering.

Appendix F

Survey of Former CACFP Providers: Meals and Snacks Offered and Their Nutrient Content

One component of the *Family Child Care Homes Legislative Changes Study* was designed to examine the experiences of CACFP providers who left the program shortly before or after tiering was implemented. It was hypothesized that many providers who were (or who expected to be) classified as Tier 2 might drop out of the CACFP but continue to operate a child care business. Policy-makers were concerned about the possibility that, without the CACFP meal reimbursement and training, providers operating these homes might offer fewer or less nutritious meals and snacks to children in their care.

The study was therefore designed to include a three-part survey of these former providers: (1) a self-administered survey of their current operating characteristics and reasons for leaving the CACFP (the *operations survey*), (2) a week-long record of foods and beverages the providers offered at each meal and snack (the *menu survey*), and (3) on-site *meal observations* of actual portion sizes served by a subsample of providers. The samples for these surveys would consist of providers who were active in the CACFP in January 1997, who were not on the program roster in January 1998, and who were providing care and still not participating in the CACFP at the time of the survey in the summer of 1999.

As it turned out, the number of providers who left the CACFP but remained in the child care business was far less than anticipated. Of those providers who left the CACFP between January 1997 and January 1998, only 10 percent were still in the child care business and not participating in the CACFP at the time of the survey (spring-summer 1999). The majority (66 percent) had stopped providing child care and 24 percent turned out to be “temporary exits” who were once again active in the CACFP at the time of the survey. (These findings are discussed further in Hamilton *et al.*, E-FAN-02-002).

Because of the small percentage of former providers who were still operating a child care business but not in the CACFP, the operations survey and the menu survey each obtained fewer than 100 respondents. (The meal observation survey, which was to be based on a subsample of the respondents, was not implemented after it became clear that there would be too few responses for a meaningful analysis.) We therefore consider the results of these surveys to have limited generalizability and do not present a full analysis of the data.

Despite their limited sample size, the surveys provide a useful picture of a group of providers who left the CACFP but continued to operate family child care businesses. This appendix therefore summarizes data from the menu survey of former CACFP providers. Data from the former provider operations survey are examined in Zotov *et al.*, E-FAN-02-004.

Sample Design and Nonresponse

The sample design for the survey of former CACFP providers was parallel to that described in Appendix A for the survey of active CACFP providers. The first two sampling stages (States and sponsors) were identical for the active and former providers.

When sponsors submitted their lists of Tier 1 and Tier 2 homes active in January 1998, which became the sample frames for the active provider surveys, they were also asked to submit a list of all providers active in January 1997. The 1997 and 1998 lists were compared to identify providers who left the CACFP between January 1997 and January 1998. It was hypothesized that most providers who left the CACFP because of tiering would do so during this period, which bracketed the tiering implementation date of July 1, 1997.

A sample of 300 sponsors was selected within the 20 States.¹ Of the selected sponsors, 289 supplied lists of 1998 and 1997 providers, and 280 of these had at least one 1997 provider meeting the definition required for inclusion in the survey, for a response rate of 93.3 percent.² Within the list of dropout homes constructed for each sponsor, a random sample of five was drawn (for sponsors with five or fewer dropouts, all were drawn).³ This process resulted in a sample of 1,971 former providers.

Telephone “screening interviews” were attempted with these providers. The purpose of the screening interview was to determine the current status of the provider and, for those still providing care but not in the CACFP, to recruit them for the operations and menu surveys.

The former provider’s current status was determined for 1,275 providers, or 64.6 percent of the sample, through the telephone screening survey. This includes five individuals who were not actually interviewed, but who were determined to have moved or died. In-person screening was then attempted for a subsample of 195 of the 701 providers who could not be reached by telephone. Of these, current status was determined for 123, or 63.1 percent (including 16 who had either moved or died). The remaining former providers could not be reached or definitively located.

Among the respondents reached in the telephone screener survey, 153 were determined to be eligible for the operations and menu surveys.⁴ Of those, 59 provided usable responses to the menu survey. This represents a response rate of 38.6 percent among those determined eligible. It represents a

¹ A total of 311 were selected, but 11 were not eligible because they had left the CACFP.

² The data submitted by sponsors do not always allow us to distinguish between a sponsor who had no homes leave the CACFP between January 1997 and January 1998 and a sponsor who provided insufficient data to identify these homes. For this calculation, we take the conservative approach of assuming that these 11 sponsors are all nonrespondents with regard to the list of 1997 providers. If we assume that none of them actually had any dropouts, the response rate would be 96.3 percent.

³ The number of dropouts selected depended on the number of times the sponsor was selected (i.e., if the sponsor was selected twice, 10 dropouts rather than 5 would be selected from the sponsor’s list).

⁴ Eleven providers were considered eligible for the operations survey but not for the menu survey because they did not serve any meals or snacks to children in their care.

response rate of 33.5 percent among all members of the original sample estimated to be still providing care but not in the CACFP.⁵

It is sometimes useful in multistage samples to consider the compound response rate, which is the product of the response rates at each stage. The compound response rate for the screening survey is 66.2 percent, based on the sponsor response rate of 93.3 percent and a 70.9 response rate within the provider sample.⁶ The menu survey compound response rate is 31.3 percent, based on the sponsor response rate of 93.3 percent and the response rate of 33.5 percent within the former provider sample.

Because the compound response rate is low enough to raise concerns about nonresponse bias, we compared the responding former providers with nonrespondents on those dimensions that are known for both groups. This analysis was necessarily limited because the only information available for nonrespondents was their location and the characteristics of the sponsors upon whose list the former providers appeared. The analysis showed that the responding providers were distributed across the four census regions in almost exactly the same proportion as the overall sample that was drawn; the percent of respondents in each region was within 2 percentage points of the percent of the sample. The sponsors of responding former providers tended to be slightly larger and to sponsor slightly greater numbers of Tier 2 homes; the average number of homes sponsored was 4.5 percent greater for the respondents' sponsors, and the average percentage of sponsored homes that are Tier 2 was 8.3 percent greater for respondents. None of the differences were statistically significant in a one-sample *t*-test comparing the mean of the respondents with the mean of the total sample, taking into account the standard error of the mean of the respondents but treating the mean of the overall sample as a constant. (The data are unweighted in this analysis because sampling weights were not computed for nonrespondents.)

The sample weighting procedures, which are the same for former providers as active providers, are described in Appendix A. All means, percentages, and other distributional statistics described below use weighted data. Tables show the unweighted number of observations on which the statistics are based. Significance tests and measures of variability are adjusted for the complex sample design using SUDAAN software.

Nutritional Aspects of Meals Offered by Former CACFP Providers

This analysis describes the meals and snacks offered by a select group of former CACFP child care homes—those active in CACFP in January 1997 but not in January 1998 and still not at the time of the survey. These providers represent approximately 5,500 providers nationwide who were operating child care homes without CACFP meal reimbursements in 1999 but presumably had some period of CACFP training and monitoring prior to January 1998. The analysis provides little evidence that the former providers offer meals and snacks of suboptimal nutritional quality. Some meals are offered less frequently than in homes operated by Tier 2 providers, but it is unclear whether this is related to the CACFP or to a difference in hours of operation between the two groups.

⁵ Among all subsample members whose status was determined, 3.4 percent were still providing child care and not in the CACFP. Applying this percentage to the 696 sample members whose status was not determined by the telephone survey yields an estimate of 23 providers. This is added to the 153 determined by the telephone survey to be still providing child care but not in the CACFP.

⁶ Responses for the telephone and in-person surveys are summed in this response rate.

The principal source of data for the analysis is the menu survey, completed by a sample of 59 former CACFP providers. The menu survey asked for information on all food items included in meals and snacks offered to children age 1-12 during a specified 5-day period. (This was the same instrument that was administered to Tier 2 providers. See Appendix B.) Portion sizes were imputed from meal observations conducted with a subsample of Tier 2 providers, as described in Appendix C. Comparisons are based on data from the menu survey of 542 Tier 2 CACFP providers, the subject of the main report.⁷

Meals and Snacks Offered by Former CACFP Providers

One concern raised about providers leaving the CACFP was the possibility that they might cut back on the number of meals and snacks they offer to children in care to offset the loss of meal reimbursements. The sections below review data relevant to that hypothesis and find some reduction in the proportion of former providers offering certain meals and snacks on a daily basis relative to active Tier 2 providers during the same time period. It is unclear whether the differences are related to leaving the CACFP or to a difference in the hours of operation between the two groups of providers.

The vast majority of former CACFP providers in the 1999 sample offered lunch, with 90 percent of providers offering it on all days (Exhibit F.1).⁸ About three-fourths offered breakfast, and most (85 percent) offered an afternoon snack, on at least some of the days for which menus were recorded. Among the other meals and snacks, only the morning snack was common, offered in just over half of the former CACFP homes. Very few providers recorded an instances of offering supper or an evening snack (unweighted n=5 and 2 providers, respectively).

Using Tier 2 CACFP participants during the same time period as a benchmark, the analysis suggests that significantly fewer former CACFP providers in 1999 offered breakfast than Tier 2 providers. Almost 20 percent fewer former providers offered breakfast everyday compared with Tier 2 providers, and those who did offered it did so on fewer days during the week. This finding may well be related to the shorter operating day for former CACFP homes relative to Tier 1 and Tier 2 homes in 1999, which is discussed in detail in another report (Zotov *et al.*, E-FAN-02-004). It seems unlikely that providers would have children in care during early morning hours and not feed them, although it is possible that providers ask parents to bring their children to child care after breakfast or to send food with their child from home, perhaps to help reduce expenses. For some providers, not offering breakfast may be a response to the loss of CACFP meal reimbursements, but we have no way of testing this possibility.

⁷ Data presented in a separate report show that not all providers that left the CACFP between January 1997 and January 1998 would have been classified as Tier 2 had tiering been in effect (Hamilton *et al.*, E-FAN-02-002). A more ideal comparison group might have been a sample of both Tier 1 and Tier 2 providers, but the menu survey was not administered to active Tier 1 providers.

⁸ Based on all CACFP age groups combined (1-2, 3-5, and 6-12).

Exhibit F.1
Proportion of Former CACFP Providers Offering Specified Meals and Snacks During the Sample Week

	Former Providers 1999	Tier 2 1999	Difference Former - Tier 2
Breakfast offered	75.3%	94.6%	-19.3%**
All days	70.4	89.3	-18.9**
Some days	4.9	5.3	-0.4
Breakfast not offered	24.7	5.4	19.3**
Morning snack offered	54.1	56.4	-2.3
All days	31.7	49.2	-17.5*
Some days	22.4	7.2	15.2
Morning snack not offered	45.9	43.6	2.3
Lunch offered	92.2	98.6	-6.5*
All days	90.0	96.2	-6.3
Some days	2.2	2.4	-0.2
Lunch not offered	7.9	1.4	6.5*
Afternoon snack offered	84.9	95.6	-10.7
All days	73.0	89.5	-16.5*
Some days	12.0	6.2	5.8
Afternoon snack not offered	15.1	4.4	10.7
Supper offered	8.0	13.6	-5.6
All days	4.5	9.8	-5.3*
Some days	3.5	3.8	-0.3
Supper not offered	92.0	86.4	5.6
Evening snack offered	3.3	5.1	-1.8
All days	0.7	3.3	-2.6**
Some days	2.6	1.8	0.8
Evening snack not offered	96.7	94.9	1.8
Unweighted sample	59	542	601

Significance levels:

* = .10

** = .05

*** = .01

Lunch may have been offered by fewer former providers than Tier 2 providers ($p < 0.10$), but more than 9 out of 10 former providers offered this meal. While there are no important differences in the proportions of former and Tier 2 providers offering morning and afternoon snacks or supper, former providers offered them somewhat less frequently over the course of a week ($p < 0.10$). The estimated difference in the proportion of former and Tier 2 providers offering an evening snack everyday is statistically significant, but represents only a handful of providers.

Common Meal Combinations

Exhibit F.2 shows the most common combinations of meals and snacks offered by former CACFP providers in 1999, based on their recorded menus.⁹ The most common meal combination, offered by nearly half of former providers, includes breakfast, lunch, and either the morning or the afternoon snack. The breakfast-lunch-afternoon snack combination is most typical.

Two other meal and snack combinations were offered by a meaningful proportion of former CACFP providers. About 15 percent offered lunch and either a morning or afternoon snack. Another 13 percent offered the combination of breakfast, lunch, and both morning and afternoon snacks. All other combinations were rare, recorded by no more than 5 percent of the providers.

Former CACFP providers in 1999 were significantly less likely to offer the combination of breakfast, lunch, and morning and afternoon snacks and more likely to offer lunch and just one snack than Tier 2 providers. These differences are consistent with shorter operating hours and might reflect an effort to cut back on the expense of serving meals and snacks to help compensate for the loss of meal reimbursements. Alternatively, these may simply be characteristics of the types of providers that tend to leave CACFP while remaining in the child care business.

⁹ For this analysis, each provider is considered to offer only one meal combination, with the assigned combination being the one that is offered on at least 3 of the recorded days. Only one provider did not record the same meal combination on at least 3 days.

Exhibit F.2
Proportion of Former and Tier 2 Providers Offering Various Meal and Snack Combinations in 1999 (All Age Groups)

Meal and Snack Combination	Former Providers 1999	Tier 2 1999	Difference Former - Tier 2
Breakfast, lunch, 1 snack ^a	47.7	42.6	4.8%
Breakfast, lunch, 2 snacks ^a	12.8	38.1	-25.2***
Breakfast, lunch, supper, 2 snacks	2.2	4.5	-2.3
Lunch, 2 snacks	4.3	3.6	0.7
Breakfast, lunch, supper, 3 snacks	1.3	2.4	-1.0
Breakfast, lunch, supper, 1 snack	0.0	1.8	-1.8**
Lunch, 1 snack	14.9	1.2	13.7**
Breakfast, lunch	5.1	1.0	4.1
Supper, 1 snack	1.0	0.2	0.4
Other combinations	9.0	3.5	5.4
No combination served for 3 days	2.4	1.2	1.3
Unweighted sample	59	542	601

^a Morning and afternoon snacks only.

Significance levels:

* = .10

** = .05

*** = .01

Compliance with CACFP Meal-Pattern Requirements

CACFP regulations pose minimum requirements for the types and amounts of food that must be included in each meal and snack qualifying for reimbursement.¹⁰ While former CACFP participants are no longer held to these standards, most would at one time have been trained and monitored for compliance with the CACFP meal-pattern requirements. The analysis below uses the meal-pattern requirements as a benchmark for evaluating the quality of meals offered by former CACFP providers with respect to important categories of foods and the degree of variety of foods offered within those categories.¹¹ A comparison is also made with compliance rates achieved by Tier 2 providers participating in the CACFP in 1999. While there is some evidence of noncompliance with CACFP

¹⁰ CACFP meal-pattern requirements vary by age group and are described in the Introduction section of this report.

¹¹ The analysis does not include a determination of whether the amount offered was in compliance with the CACFP requirement. The amount offered was measured in meal observations, which were conducted for only a subsample of Tier 2 providers and none of the former CACFP providers.

requirements for specific meal components, most former providers offered compliant meals with a good mix of items within each meal component.

The majority of snacks offered in former CACFP homes in 1999 complied with CACFP meal-pattern requirements. Compliance rates were somewhat higher for snacks than for meals, as shown in Exhibit F.3. Compliance rates varied little across age groups; data are shown for meals offered to all age groups served. Approximately 90 percent of morning and afternoon snacks were found to be in compliance. The rates for breakfast and lunch were 70 percent and 63 percent, respectively. Supper and evening snack showed compliance rates of about 80 percent, although these are based on very few meals.

Compared with Tier 2 providers in 1999, compliance rates for breakfasts and lunches offered by former providers were significantly lower. These differences are fairly substantial (almost 30 percent lower than Tier 2 providers for each meal) but, as noted above, a majority of former providers still offered breakfasts and lunches that were consistent with CACFP requirements.

Morning snacks were also more likely to be noncompliant ($p < 0.10$), but the difference was much smaller and, again, the vast majority of former CACFP providers offered compliant snacks. It is not known whether leaving the CACFP increases the likelihood that family child care providers will offer noncompliant meals or snacks or whether providers who offer noncompliant meals are more likely to be among those who leave the program.

Exhibit F.3

Percentages of Former and Tier 2 CACFP Providers' Meals Complying with CACFP Meal-Pattern Requirements for All Age Groups

	Former Providers		Tier 2 Providers		Difference Former - Tier 2
	Un-weighted sample ^a	Percent	Un-weighted sample ^a	Percent	
Breakfast	195	69.4%	2,393	97.3%	-27.9%***
Morning snack	125	89.4	1,304	96.8	-7.4*
Lunch	233	62.8	2,535	91.5	-28.6***
Afternoon Snack	251	91.6	2,373	95.3	-3.7
Supper	28	79.3	417	82.3	-3.1
Evening snack	12	80.7	148	85.5	-4.8

^a Number of meals/snacks.

Significance levels:

* = .10

** = .05

*** = .01

Meal Components Offered

Exhibit F.4 illustrates the particular CACFP meal components included in meals and snacks offered by former providers.¹² The primary source of noncompliance at breakfast and lunch is the fruit-vegetable-juice component. Almost 30 percent of breakfasts omitted the required one serving from this food category, and 10 percent of providers offered no fruit or vegetable at breakfast over the course of a week. At lunch, where two items from the fruit-vegetable-juice category are required, one-fourth of former provider meals failed to meet this requirement. On the other hand, former providers offered fruit, vegetables, or juice in about two-thirds of snacks. This is essentially the same frequency with which this component was included in snacks offered by Tier 2 providers, as described in the main part of this report.

Nearly all breakfasts and most lunches (84 percent) offered in former CACFP homes include milk. In the absence of CACFP requirements, some providers may have offered an alternative beverage at lunch in place of milk. This behavior could help control food costs, depending on the item substituted (e.g., water, juice drinks). It might also reflect a desire to cater to children's preferences. Milk was provided in about half of morning and afternoon snacks, but food items from the bread/bread alternate component were the most common in both snacks and at breakfast and lunch. Interestingly, a substantial percentage of breakfasts (22 percent) included a meat or meat alternate—a component that is not required by the CACFP meal pattern and is typically associated with higher food costs.

Variety of Foods Offered

Although CACFP regulations pose no requirements for variety, providers may offer multiple items within a particular component category and are encouraged to vary the particular food items offered over the course of the week. With the possible exception of fruit and vegetables at breakfast and lunch, there is little evidence that former providers limited choice or variety over the week in the meals or snacks offered relative to Tier 2 providers in 1999.

Relatively small proportions of former CACFP providers offered more than one food item within a particular meal component, except for those who offered two fruits or vegetables at lunch (Exhibit F.4).¹³ The greatest amount of variety within meal components occurred at lunch, especially for bread and bread alternates where about one-fifth of all meals included more than one item. Another 13 percent of lunches included more than two servings of fruits and vegetables, and 17 percent offered more than one meat or meat alternate. Ten percent or fewer breakfasts included more than the required number of items in each meal component category. Fruit, vegetables, or juice were more common at morning snacks, where more than 20 percent include more than one item from this category.

¹² Supper and evening snack are omitted from this analysis. Because only a few providers offer them, the sample sizes are small.

¹³ Practically no meals include more than one type of milk, so these data are not shown for this meal component.

Exhibit F.4
Frequency of Major Meal Components and Variety within Meal Components in Meals Offered by Former CACFP Providers

	Breakfast	Lunch	Morning snack	Afternoon snack
Milk				
% of meals with milk offered	95.2	83.5	44.2	57.5
Fruit, Vegetables, or Juice				
% of meals with at least 1 offered ^a	71.3	75.5	69.8	64.1
% with more than 1 offered ^a	9.7	13.2	21.7	4.5
% of providers offering any in week ^a	89.2	100.0	100.0	97.1
Mean different items offered in week (if at least 1) ^a	3.0	7.7	3.5	2.7
Bread and Bread Alternates				
% of meals with at least 1 offered	99.6	94.4	73.4	73.5
% with more than 1 offered	6.9	19.7	0.6	0.0
% of providers offering any in week	100.0	100.0	99.1	100.0
Mean different items offered in week (if at least 1)	3.4	3.5	2.4	2.5
Meat and Meat Alternates				
% of meals with at least 1 offered	21.5	96.2	25.3	22.3
% with more than 1 offered	9.2	17.4	1.1	0.0
% of providers offering any in week	89.3	100.0	71.1	63.3
Mean different items offered in week (if at least 1)	1.6	4.6	1.5	1.5
Unweighted sample	195	233	125	251

^a For lunch, read "at least 2" or "more than 2." The minimum CACFP requirement at lunch is two fruits or vegetables.

Meals in former CACFP homes do show a substantial degree of variety over the course of a week. A week of lunch menus features an average of eight different foods in the fruit-vegetable-juice category, four from the bread/bread alternates, and five different meat/meat alternates. The weekly breakfast menu includes three different fruit-vegetable-juice items and bread/bread alternates, and two different items from the meat/meat alternate component.

Compared with Tier 2 menus, former providers offered one fewer fruit-vegetable-juice item in a week at both breakfast and lunch (data not shown). However, they may have offered a greater variety of fruit-vegetable-juice items in morning snacks, over the week, relative to Tier 2 providers ($p < 0.10$).

Nutrient Composition of Meals and Snacks Offered by Former CACFP Providers

This section examines the nutrient content of meals and snacks offered in former CACFP family child care homes and compares them with the composition of meals offered by Tier 2 providers in 1999. The analysis is motivated by the hypothesis that providers who leave the CACFP might adjust to the loss of meal reimbursements by serving less nutritious meals and snacks than they would have under the program. As noted earlier, portion sizes were not measured directly for former providers, but are estimated from data for active 1995 and 1999 providers.

Results show that meals and snacks offered by former CACFP providers in 1999 generally met the RDA benchmarks and NRC recommendations used for this study, the exceptions being food energy and iron in lunches. Few of the meals and snacks offered, however, were consistent with the *Dietary Guidelines* recommendations for saturated fat. The nutrient profile of former CACFP provider meals and snacks is very similar to that of active Tier 2 providers. The data do not suggest that providers who left the CACFP were serving meals and snacks of lesser nutritional quality than providers receiving some meal reimbursements in the program or that providers changed their menus after leaving the CACFP.

Nutrient Content of Breakfasts Relative to RDAs, Dietary Guidelines, and NRC Recommendations

Former CACFP providers in 1999 offered breakfasts that provided, on average, substantially more than the 25 percent of the RDA benchmark for all nutrients examined, with the exception of food energy (Exhibit F.5). For children aged 3-5, the average breakfast supplied about 90 percent of the RDA for vitamins A and C, over half of the RDA for protein and iron, and over one-third of the RDA for calcium. For food energy, the average breakfast provided about one-fifth of the RDA. This is essentially the level of food energy young children are consuming in breakfasts nationally (USDA, 1999).

Breakfasts offered to children aged 3-5 in former CACFP homes were largely consistent with the *Dietary Guidelines* and NRC recommendation benchmarks applied in this study. The average provider offered breakfasts that met these recommendations for the percentage of energy from fat and carbohydrate, as well as falling under one-fourth of the daily recommendation for cholesterol and sodium. The exception to this pattern concerns the percent of energy from saturated fat for which the average estimate exceeds the recommended level of less than 10 percent of energy from saturated fat by almost 2 percentage points.

In breakfasts offered by former CACFP providers, the mean percentage of RDA for vitamin A and iron was greater ($p < 0.10$) than the comparable figures for Tier 2 providers. The differences may be due to a somewhat higher frequency of offering fortified ready-to-eat cereal at breakfast (data not shown).¹⁴ Breakfasts offered by former providers also included significantly more sodium and less carbohydrate as a percentage of energy than Tier 2 providers. And although not statistically different, the former providers' breakfasts contained, on average, about 25 percent more cholesterol. Despite those differences, both groups of providers offered breakfasts in which all nutrient measures were within the recommended ranges.

¹⁴ Bacon and breakfast sausage (noncreditable items) were also offered more frequently by former CACFP providers than Tier 2 providers and might have contributed to higher point estimates for the fat and cholesterol content of the breakfasts, as well as the higher sodium levels.

Nutrient Content of Lunches Relative to RDAs, Dietary Guidelines, and NRC Recommendations

The average lunch in former CACFP homes in 1999 provided more than one-third of the RDA for protein, vitamin A, vitamin C, and calcium for children aged 3-5 (Exhibit F.5). The protein level is far above the one-third of RDA benchmark, at more than 90 percent. For food energy and iron, the average falls somewhat short of this benchmark at 28 percent and 25 percent of the RDA, respectively. This finding is of some concern given the small proportions of providers meeting the RDA benchmark for these nutrient measures (less than 10 percent; data not shown).

Lunches offered by former providers to children aged 3-5 did not meet the *Dietary Guidelines* or NRC recommendations for any of the nutrient measures except cholesterol. The average values for lunches offered were well above the recommended maxima for the percent of energy from fat and saturated fat and below the recommended minimum for the percent of energy from carbohydrate. The average amount of sodium was also above one-third of the recommended daily level.

Exhibit F.5

Nutrient Composition of Meals and Snacks Offered by Former CACFP Providers to Children Ages 3-5

		Breakfast		Lunch		Morning snack		Afternoon snack	
	Daily Recommendation	Former providers	Difference from Tier 2	Former providers	Difference from Tier 2	Former providers	Difference from Tier 2	Former providers	Difference from Tier 2
% of RDA for:									
Food energy	100%	21.4	0.2	27.9	-0.9	14.6	1.1	15.0	0.4
Protein	100%	59.9	5.5	92.6	-7.2	31.4	1.4	31.9	0.3
Vitamin A	100%	87.8	24.9*	64.2	-10.3	23.7	5.1	19.3	1.4
Vitamin C	100%	94.5	15.3	51.2	2.8	35.2	4.4	25.2	-3.6
Calcium	100%	37.6	0.6	39.8	-2.7	19.2	-0.2	21.1	2.3
Iron	100%	55.0	13.9*	25.1	-1.5	13.0	-1.0	11.5	-1.9
% of food energy from:									
Fat	≤30%	25.1	3.0	35.7	-1.2	26.7	-0.4	29.5	0.8
Saturated fat	<10%	11.6	1.0	14.9	-0.5	11.0	-0.2	12.6	1.2*
Carbohydrate	>55%	62.1	-4.1**	48.3	2.1	65.4	1.8	61.6	-0.5
Milligrams of:									
Cholesterol	≤ 300	73.4	20.6	52.0	-7.4	16.4	-1.2	19.1	3.6
Sodium	≤ 2,400	529.3	68.8**	873.4	-63.1	239.9	2.4	237.6	-29.6
Unweighted sample		31		42		25		45	

Significance levels:

* = .10

** = .05

*** = .01

The lunches offered by former providers were very similar in nutrient composition to those offered by Tier 2 providers in 1999. The analysis found no statistically significant differences for food energy or other key nutrients as a percentage of RDA. Former providers and current Tier 2 providers were equally as likely to fall short of meeting the *Dietary Guidelines* and NRC recommendations at lunch.

Nutrient Content of Snacks Relative to RDAs, Dietary Guidelines, and NRC Recommendations

Snacks are not expected to contribute any specific proportion of the RDA or *Dietary Guidelines* and NRC recommendations. Information on the nutrient content of snacks is presented, however, because it is useful to assess the extent to which snacks are likely to contribute to or detract from the recommended patterns over the full day. Because only a few former CACFP homes in the sample offered an evening snack, the present analysis is limited to morning and afternoon snacks.

The nutrient profiles for morning and afternoon snacks offered to children aged 3-5 in former CACFP homes were quite similar. Both morning and afternoon snacks offered about 15 percent of the RDA for food energy and from 12-35 percent of the RDA for the key nutrients considered here (Exhibit F.5). The percentages are highest for protein and vitamin C; morning and afternoon snacks each supplied between one-fourth and one-third of the RDA for these two nutrients.

The average nutrient makeup of snacks offered is consistent with the *Dietary Guidelines* and NRC recommendations for the percent of food energy from fat and carbohydrate, respectively. An average of 11-13 percent of food energy comes from saturated fat, however, which exceeds the recommendation for less than 10 percent for the day. Both morning and afternoon snacks supplied, on average, 5-6 percent of the recommended daily limit of 300 mg. of cholesterol and 10 percent of the recommended daily limit of 2,400 mg. of sodium.

There was only a single difference approaching statistical significance between the former CACFP providers' snacks and those offered by Tier 2 providers in 1999. Former providers offered afternoon snacks with a slightly higher percentage of food energy from saturated fat than Tier 2 providers ($p < 0.10$).