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Maternal Employment and Children's Nutrition

Volume I, Diet Quality and the Role of the CACFP

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Abstract

Compared with children of nonworking mothers, children of full-time working mothers have lower overall HEI (Healthy Eating Index) scores, lower intake of iron and fiber, and higher intake of soda and fried potatoes, even after taking into account differences in maternal and other family characteristics. Nutritional differences between children of part-time working mothers and children of nonworking mothers were more sensitive to maternal and family characteristics, with no clear pattern of nutritional differences emerging. This study analyzed differences in nutrition outcomes among children whose mothers work full time, part time, and not at all, and the role USDA's Child and Adult Care Food Program (CACFP) plays in meeting the nutrition needs of participating children, especially those whose mothers work.

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Executive Summary

Labor force participation among women in the United States has increased dramatically over the past three decades. A majority of women with children are now employed outside the home. At the same time, there is evidence from national surveys that children's diets are less healthful than they should be, and that children are becoming increasingly overweight. Economic theory suggests that families in which mothers work outside the home must trade off the advantages of greater income against the disadvantages of less time for home food production and supervision of children's activities. This tradeoff may result in positive, negative, or no net impacts on children's nutritional well-being.

Although considerable research has been done on the relationship between maternal employment and breastfeeding, few studies to date have investigated the relationships between mother's work status and other child nutrition outcomes. Using extant data from nationally representative samples of children and their mothers in the mid-1990s, this study was conducted to explore the relationships between maternal employment and direct measures of children's nutrition, such as diet quality and weight status. It also considered the potential mediating effects of participation in USDA's food assistance programs, particularly the Child and Adult Care Food Program (CACFP), and other nutrition-related outcomes (e.g., meal skipping, household food expenditures, and food sufficiency). Direct measures of children's nutrition are discussed in this volume. Other nutrition-related outcomes are discussed in Volume II.

The study objectives concerned differences in nutrition outcomes among children age 0 to 17 years whose mothers work full-time, part-time, and not at all, and the role the CACFP serves in meeting the nutrition needs of participating children, especially those whose mothers are working. This report presents what has been learned with regard to these issues and discusses some implications for policy decisions. The project was carried out in cooperation with the U.S. Department of Agriculture (USDA), Economic Research Service.

Children's Diet Quality

Previous studies of the association between maternal employment and children's nutrient intake did not find negative effects, although they were limited to preschoolers age 2 to 5 years (Johnson *et al.*, 1992a and 1992b). For this study, no *a priori* hypotheses were formed with regard to mother's work status and children's diet quality. The loss of home production time and the gain in income were expected to work in opposite directions, with the net effect unknown.

Although it is naturally of interest to determine whether maternal employment causes children's nutrition outcomes to be better or worse, it is also important for policymakers to know whether children of working mothers have better or worse nutrition outcomes, regardless of the cause. For example, a greater percentage of black women than Hispanic women work. Some child nutrition outcomes may be affected by cultural factors associated with ethnicity. If families with working mothers tend to fare worse on some outcomes for whatever reason, policymakers will want to ensure that they have appropriate access to food assistance programs and nutrition education.

This study found evidence of a **negative** association between mother's employment status and children's diet quality. The analysis compared children whose mothers work (both full- and part-time) to children with homemaker mothers, overall and for subgroups based on child age, family

income, and the presence of other adults in the household. Measures of diet quality included the Healthy Eating Index (HEI) (total and component scores), intake of food energy, iron, zinc, and dietary fiber, and consumption of soft drinks, added sugars, and fried potatoes. Key findings are that:

- Children of full-time working mothers have lower overall HEI scores (poorer diet quality) than children whose mothers are homemakers. This appears to be the net outcome of strong negative results for 5- to 8-year-olds, and weaker positive results for preschoolers (ages 2 to 4) and children in single-adult households. Differences in HEI scores across employment groups do not significantly affect the relative proportions of children with "good" or "poor" HEI diet ratings.
- On some individual components of the HEI, children of full-time working mothers score lower by eating less grain, fruit, and variety of foods than homemakers' children eat. On other components, they score higher than children of homemakers by eating more vegetables and less total and saturated fat.
- Infants and children up to age 5 consume significantly more food energy relative to requirements if their mothers work full-time *versus* not at all. This raises the question of whether the higher HEI scores among this group of children are the result of excess food intake overall, putting them at greater risk for overweight.
- School-age children of full-time working mothers have lower iron and dietary fiber intakes, on average, than their counterparts with homemaker mothers. The only group for which this is particularly worrisome is teenage girls, whose intakes fall below recommended levels, and for whom maternal employment has substantial negative effects.
- Soda consumption in excess of 8 ounces per day is seen more frequently among children with working mothers than children whose mothers do not work. The differences are greatest for 5- to 8-year-olds and children in single-adult households. Children of full-time working mothers are also the least likely to avoid drinking soda altogether.
- A significant association between maternal full-time employment and children's fried potato consumption was observed, but the differences amount to only one- to two-tenths of a serving.

Multivariate Analysis of Child Nutrition Outcomes

Children of working mothers differ in many ways from children of homemaker mothers: with regard to race/ethnicity, mother's age and education, household resources, and other factors. The observed differences in child nutrition outcomes reported above might be due in part or in whole to these factors.

Although this study is unable to attribute causation, we conclude that it is plausible to relate most of the differences in children's diet quality to maternal employment status *per se*, at least in the case of full-time employment. A regression analysis that controlled for differences in household circumstances, including maternal demographics and employment and occupation of other adult household members, did not substantially alter the pattern of differences among the employment groups. Furthermore, supplementary analyses on a limited sample for which data were available on maternal nutrition knowledge and attitudes found that consideration of these characteristics also did not change the results. Thus, the great majority of the striking differences seen in child nutrition

outcomes by maternal employment status appears to be due to employment *per se*, rather than being explained by differences in the households. These differences include, for children of full-time working mothers, lower overall HEI scores, especially among children age 5 to 8; lower intake of iron, especially among children age 5 to 12 and teenage girls; lower intake of fiber, especially among children age 5 to 12; higher intake of soda, especially among children age 5 to 8; and higher intake of fried potatoes, especially among children age 2 to 8.

Evidence of negative differences for children of part-time working mothers was scattered and fragmentary. There were no negative differences in the bivariate analyses for all ages combined, and the only significant regression-adjusted difference for all ages combined was increased consumption of fried potatoes. The results for particular age groups associated with part-time maternal employment were more likely to gain or lose statistical significance between the bivariate and multivariate analyses, indicating that the differences in composition were more important for part-time working *versus* homemaker mothers than for full-time working *versus* homemaker mothers. (Examples of such differences are that full-time working mothers are relatively more likely to be black, whereas homemaker mothers are relatively more likely to be Hispanic; that of the three groups, part-time working mothers tend to have the most and homemaker mothers the least formal education; and that estimated earnings from other household members are greatest on average among households with part-time working mothers and least among households with homemaker mothers.)

Other Nutrition-Related Outcomes[1]

Income relative to poverty tends to be higher in households with working mothers. Consequently these households are less likely to participate in the means-tested food assistance programs, the Special Supplemental Nutrition Program for Women, Infants and Children, the Food Stamp Program (WIC), and the School Breakfast Program (SBP). (Although SBP is in principle available to children of all incomes, in practice it predominantly serves low-income children.) National School Lunch Program participation, in contrast, is higher among children of working mothers.

The effects of greater income among households of working mothers is also seen in their greater expenditures on food per adult male equivalent; and their higher levels of food sufficiency. The effects of time pressures are seen in working mothers' reduced participation in meal planning, shopping, and food preparation; in the increased prevalence of morning meal skipping by teenage girls; and the heavier reliance on away-from-home food sources.

This study also found that children of full-time working mothers spend more time watching TV and videos than children of homemakers. The frequency of engaging in vigorous exercise, however, does not differ across employment groups. Among 12- to 14-year olds, children with full-time working mothers are at significantly greater risk of overweight (Body Mass Index above the 85th percentile) than children whose mothers are homemakers.

Unfortunately, available data on exercise level were self-reported and obtained only from older children (12 to 17 years). In addition, reliable data on weight status were not available for children under

[1] Results of analyses exploring the relationships between mothers' work and children's eating patterns, household food acquisition and sufficiency, participation in food assistance programs, and children's physical activity and weight status can be found in Volume II of this report.

12 years old. The possibility that maternal employment is related to the physical activity level and risk of overweight for younger children cannot be ruled out.

Role of the Child and Adult Care Food Program

The great majority of working mothers at all income levels relies on non-parental child care, especially for infants and young children (Tout *et al*., 2001). The CACFP is a federal program, administered by the USDA, that subsidizes nutritious meals and snacks served to children in participating child care facilities. It is thus the food assistance program most directly targeted to children of working mothers. The ability of CACFP to mediate any negative effects of maternal employment on children's diets is related to the quality of the meals and snacks actually consumed, and their relative contribution to participants' nutritional needs for the full day. This study marks the first analysis of both the in-care and out-of-care components of CACFP participants' 24-hour dietary intake using a national sample. However, the sample response rate for the 24-hour recall was low, 41 percent. Although a comparison of respondents and nonrespondents did not suggest that the results are invalid, the possibility of bias remains.[2] The USDA Food and Nutrition Service therefore recommends that analysis of these data should not be considered as representative of CACFP participants or of the impact of the program.

Contribution of CACFP to Children's Diets

This analysis was intended to be descriptive, providing estimates of children's average consumption of food energy and key nutrients over 24 hours and from CACFP meals and snacks. Results are reported for all CACFP children age 1 to 10 and by type of child care facility (e.g., family child care homes, Head Start, child care centers). CACFP appears to make an important and positive contribution to participating children's intake of key nutrients. Continued efforts to educate providers and provide tools to assist them in serving lower fat, lower sodium meals and snacks seem warranted.

Findings suggest that:

- CACFP participants' daily levels of food energy, protein, vitamins A and C, calcium, iron, and zinc meet or exceed Recommended Dietary Allowances. The one exception is 6- to 10-year-old children in child care centers, whose average daily food energy intake falls below the recommended level (87 percent of 1989 Recommended Energy Allowance (REA)).
- Meals and snacks consumed in CACFP care make a substantial and positive contribution to the daily food energy and nutrient requirements of toddlers and preschool children (36 to 47 percent for food energy and 45 to more than 100 percent for the other nutrients). This does not vary appreciably with the type of CACFP care.
- School-age children consume a smaller share of their daily nutrition needs from CACFP than younger children. This is consistent with the relatively few hours they spend in child care (typically 3 hours per day). For some nutrients (e.g., food energy and iron), the CACFP contribution for 6- to 10-year-olds is less if they are cared for in child care

[2] Percentages of food energy consumed by the 24-hour recall children and other children observed while eating in CACFP facilities were very similar (see Appendix D). It is, however, possible that nonrespondents have systematically different out-of-CACFP-care dietary-intake patterns than respondents.

centers *versus* family child care homes. This can be explained by the higher likelihood that 6- to 10-year-olds are offered breakfast and lunch in homes than in centers, where they are more likely to receive snacks (Fox *et al.*, 1997).

- CACFP participants age 3 to 10, like other children their age (USDA/ARS, 1999), fall short of meeting the *Dietary Guidelines* recommendations for fat and saturated fat, and consume more sodium and less carbohydrate than the National Research Council's *Diet and Health* recommendations. Regardless of the type of care, the diets of both preschool and school-age participants meet daily recommendations for cholesterol and dietary fiber.
- CACFP meals and snacks do not contribute disproportionately to participants' daily intake of fat, saturated fat, or sodium, relative to total food energy. They do, however, provide more than the recommended level of saturated fat (about 13 percent of food energy).

Comparison of Diet Quality: CACFP Children of Working Mothers and Not-in-Care Children of Nonworking Mothers

To look more closely at the role of CACFP for 1-to-5 year-old children with working mothers, nutrition outcomes were compared to those of not-in-care children of nonworking mothers. This analysis suggests that the CACFP is making a positive contribution to the diets of preschool children with working mothers. Participants are estimated to have better diets than children cared for by their own mothers who do not work outside the home. In addition, the detrimental relationships between mother's full-time work and preschool children's overconsumption of soda and added sugars seem to be ameliorated for those in CACFP care. CACFP participation alone, however, does not appear to lessen the negative relationship between maternal employment and excess food energy and sodium intake. Findings suggest:

- Both part-day (4 or less hours) and full-day (more than 4 hours) CACFP participants with working mothers have higher quality diets, based on the HEI, than not-in-care children of homemakers. This result persists after controlling for demographic characteristics of the children and their households. Differences in overall diet quality are due mainly to greater fruit and milk consumption, and lower total fat intake among CACFP participants.
- A larger share of CACFP participants with working mothers consumes "good" diets and fewer have "poor" diets relative to not-in-care children of homemakers.
- CACFP children in full-day care are more likely to consume in excess of 110 percent of the 1989 REA than not-in-care children of homemakers (mean of 105 percent). Regardless of hours in care, however, CACFP participants are also less likely to have food energy intakes **below** recommended levels than other children.
- Not surprisingly, given CACFP meal pattern requirements, CACFP participants with working mothers consume less soda and other soft drinks than not-in-care children of homemakers. They also consume less added sugar from this source, and if in care more than 4 hours per day, less added sugar from all sources.
- Although there were no differences in fried potato consumption, CACFP participation was associated with greater consumption of vegetables other than fried potatoes.

Differences between groups are generally larger for children in CACFP more hours per day and among children in low-income households, suggesting the target population in particular is benefiting from the program.

Note that this study does not prove that CACFP is what makes the difference in children's diets. Although an analysis controlling for compositional differences between the samples of children and their families confirmed the findings of better diet quality among CACFP participants, the possibilities of selection effects or low survey response bias cannot be ruled out. Nevertheless, the findings are interesting and worth pursuing further, ideally with a prospective, experimental design.

Chapter 1
Introduction

The fraction of women in the United States who participate in the labor force has increased dramatically over the last few decades. According to the U.S. Bureau of Labor Statistics, employment among all women rose from 43 percent to 60 percent between 1970 and 2001. Currently as many as 78 percent of married women with school-age children (age 6 to 17), and 63 percent of married women with infants and preschoolers (under age 6), are employed outside the home (U.S. Census Bureau, 2002). Employment rates are even higher for single mothers. This high level of labor force participation raises questions about how households with working mothers cope with increased time constraints—in particular, changes they may make in the provision of food or supervision of children, how food and nutrition assistance programs figure in their lives, and the subsequent effects on children's health and well-being.

This report presents findings from a study to explore issues pertaining to mothers' employment and children's nutrition. The study uses data from two extant sources to address the following research questions:

1. How do key nutrition outcomes differ among children whose mothers work full-time, part-time, and not at all?
2. How much of this difference remains when underlying differences among the groups of households are taken into account?
3. What role does the Child and Adult Care Food Program (CACFP) serve in meeting the nutritional needs of children in child care?
4. How do nutrition outcomes compare between children of working mothers in CACFP and children of non-working mothers who are not in care?

The conceptual framework for the research, data sources, and analysis approach are described below. A brief review of the empirical literature on the topic is also included in this chapter.

Conceptual Framework

Mothers' employment status has potential implications for virtually all aspects of children's growth and development, and nutrition outcomes are no exception. The quality of children's diets and their subsequent physical health may depend significantly on whether and how much their mothers work outside the home. On the one hand, employed mothers may have less time available to supervise their children's activities and to prepare their meals. On the other hand, the additional income they bring into the household may help to ensure a stable supply of high quality food. The net effects on children's well being are likely to vary depending on the presence of other adults in the household, the household's income net of the mother's earnings, and the age of the child. Use of child care and participation in the U.S. Department of Agriculture's (USDA) food assistance programs may mediate the effects of maternal employment on children's health and nutrition.

The exploration of relationships between maternal employment and children's nutrition outcomes is based on time allocation theory. A vast literature exists on this topic, stemming from Gary Becker's seminal article (1965). The essence of the theory is that within a household, adult members allocate their time among market work, home production, and leisure (non-work time) so as to maximize household well-being. This well-being depends on the goods that can be obtained by combining the income from market work with the labor from home production, as well as on leisure. An implication is that, inasmuch as husbands typically have higher earning potential than their wives, couples in which both partners do not work full-time will usually choose to have the wife rather than the husband stay home with the children or work part-time, even if men's and women's personal preferences for market work *versus* home production are the same. "Household well-being" is clearly an abstraction from the well-being of the individuals, and more sophisticated models consider the balance of power within the household that determines the resources (including leisure) ultimately going to each member.[3]

A recent literature review by Olmstead and Weathers (2001) notes that individuals can respond to time constraints by four general strategies: domestic outsourcing (e.g., purchasing prepared meals, hiring a cleaning service); time-deepening (multi-tasking, speeding up non-market work); time-pooling (trading off tasks with other adults within or outside the household); and doing without (sleeping less, allowing the house to become untidy). Each of these strategies has clear advantages and drawbacks.

The availability of household services on the market has acquired central importance as a modification to the classic Becker model. Oppenheimer (1997) notes that specialization within a nuclear family is a risky strategy because of the possibility of job loss or illness. Each partner engaging in both household work and market employment offers flexible protection against these risks. Households can reach a higher material standard of living if both partners work and home production is largely outsourced.

In this study, the maternal employment decision is taken as given, rather than examining how it is determined by husbands' and wives' earnings potentials and preferences. The theory provides the insight that working mothers trade off the advantages of greater income against the disadvantages of less time for home production (including food purchasing, food preparation, and supervision of children's activities) and less free time. Although families may be presumed to have made the choices that best suit them overall (including perhaps the mother's desire to work outside the home), these choices may have positive or negative impacts on particular aspects of children's well-being.

Direct measures of children's nutritional status (e.g., food and nutrient intake), as well as other nutrition-related outcomes (e.g., food assistance program participation, risk of overweight, food

[3] Another variation on the model is to distinguish between maintenance activities (eating, sleeping) and leisure *per se*. Although this distinction focuses attention on the valid point that a minimum of non-work time is required for survival, it does not add further to our understanding of time pressures, because adults are typically free to allocate their free time between these two areas without implications for other family members. Reducing market or non-market work time, in contrast, may require intrafamilial negotiation.

sufficiency) are included in the analysis of the relationship of mothers' work with child nutrition outcomes.[4] For some child nutrition outcomes, hypotheses about the causal effects of maternal employment are unambiguous, other things equal. For other outcomes, the loss of home production time and the gain in income work in opposite directions, with the net effect unknown. These hypotheses are discussed below.

Expected Negative Effects of Maternal Employment

On the assumption that no caretaker would be more motivated than the child's mother to supervise the child's **activities**, we anticipate that children in non-parental care or self-care might snack more, perhaps on less healthful foods, watch more television, and be less physically active than their counterparts, other things equal. The income/time trade-off made by working mothers would be expected to lead to increased reliance on **prepared foods** (e.g., frozen entrées) and **carry-out** items, which are typically higher in fat and sodium, and possibly lower in fiber, than meals cooked at home. In addition, the means-tested Food and Nutrition Assistance Programs (FNAPs) dampen the effects of maternal earnings on nutrition outcomes, both because households may lose eligibility (or may be eligible for reduced benefits), and because participation may be less convenient for working mothers. Thus, to the extent that participation in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) and the Food Stamp Program (FSP) improve children's nutrition, the advantages will be less available to children of working mothers.[5]

Expected Positive Effects of Maternal Employment

The higher income of families with working mothers should lead to increased **food expenditures** and a higher-quality diet in those dimensions that might be constrained by lack of income. **Food security** can also be expected to improve. Furthermore, participation in CACFP may dampen any negative effects of maternal employment on children's food intake in the mother's absence. In addition, maternal employment might increase children's participation in the School Breakfast Program (SBP) and the National School Lunch Program (NSLP)[6]—not for the advantage of free or reduced-price meals, but for the convenience. If the meals offered are of high nutritional quality, then like CACFP these programs may also dampen some negative effects of maternal employment on child nutrition.

Unclear Effects of Maternal Employment

The overall effect of maternal employment on children's **dietary patterns and diet quality** is hard to predict. Although some aspects of diet quality related to income might be improved (e.g., more fresh fruits and vegetables), other aspects related to the caregiver's time availability might be worsened (greater use of prepared foods and carry-out). Diet patterns such as skipping meals and frequency of

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[4] It should be noted that the nutritional implications of mother's employment do not end with children's food intake, energy balance, and food sufficiency. More distal outcomes include dental caries, biochemical indicators of nutritional status, cognitive development, and physical growth. Outcomes like these are not discussed in this report because they were not measured in the available data sets.

[5] An additional domain in which maternal employment is likely to have negative consequences is breastfeeding initiation and duration. This study does not include breastfeeding among the child nutrition outcomes examined, because a vast literature already exists on the topic.

[6] Data necessary to examine the relationship between maternal employment and participation in the Summer Food Service Program (SFSP) were not available for this project.

meals and snacks could also be either improved or worsened, because of increased financial resources on the one hand and reduced supervision on the other. Risk of **overweight** likewise might be affected either way. Although higher quality food and stable household food supplies could help control children's weight, lack of maternal supervision of meals and snacks and of physical activities, combined with more convenience foods and carry-out, might make overweight and obesity more likely.

Review of Literature

Although considerable research has been done on the relationship between maternal employment and breastfeeding, only a small number of studies have explored the effects of maternal employment on other child nutrition outcomes. These studies have primarily examined children's nutrient intake. Overweight and maternal attitudes toward child nutrition have been studied as well. A literature review conducted by Johnson *et al*. in 1993 concluded that although the study of the field is limited, maternal employment does not have negative consequences for preschool children's dietary intakes. Recent work by Anderson and colleagues (2002), however, suggests that mothers who worked full-time since their children's birth are more likely to have overweight children. The findings of studies published within the last decade or so are summarized below and in Exhibit 1.1.

Nutrient Adequacy and Over-Consumption

Johnson and colleagues (1992a) looked at measures of nutrient adequacy and nutrient over-consumption in a sample of 2- to 5-year-old children from the 1985 Continuing Survey of Food Intakes of Individuals (CSFII). Using both bivariate and multivariate analysis techniques, they found that maternal employment status was not correlated with any of the diet quality measures examined. The authors conclude that maternal employment has no detrimental effect on young children's diets. They also note several limitations of the study, including non-response, attrition, and lack of employment data at all but the initial point of dietary data collection.

Addressing the same issues using the 1987 to 1988 Nationwide Food Consumption Survey (NFCS), Johnson *et al*. (1992b) similarly found that maternal employment did not affect the diet quality of 2- to 5-year-old children. Further, this study found no evidence of relationships between maternal employment and diet quality for different levels/values of mothers' education, age, presence of male head of household, race, number of children under 5 years old, age of child, or number of meals eaten away from home. This study did find that children of full-time and part-time working mothers ate more meals at schools and child care centers than children whose mothers were not employed. Non-response was substantial for the NFCS.

Horton and Campbell (1991) used data from the 1984 Family Food Expenditure Survey (urban households in Canada) to find that maternal employment is associated with higher rates of restaurant-food consumption and higher costs per calorie of home-prepared food. The authors also find that full-time maternal employment is negatively associated with household nutrient availability (which combines expenditure and nutrient variables), with no evidence showing that increased income from maternal employment was being related to increased expenditures on basic needs. The authors concede, however, the limitations of their use of food expenditures rather than complete information on specific foods eaten.

Exhibit 1.1

Summary of Studies of Maternal Employment and Child Nutrition Outcomes

Study	Measures	Sample	Data Collection Method
Godwin and McIntosh (1997)	• Children's body fat percentages • Intake of vitamin B_{12}	Pilot study of Texas 14-15 year-olds (*n*=54)	Venipuncture, step test, anthropometrics, 24-hour diet and activity recalls, two-day diet and activity records
Johnson/JADA (1992a)	• Nutrient adequacy • Nutrient over-consumption	1985 Continuing Survey of Food Intakes of Individuals (*n*=216)	Four nonconsecutive days of 24-hour diet recalls during a one-year period
Johnson/Pediatrics (1992b)	• Nutrient adequacy • Nutrient over-consumption	1987-88 National Food Consumption Survey (*n*=442)	Three-day average of one 24-hour recall and two days of food records
Horton and Campbell (1991)	• Nutrient availability • Costs per calorie	1984 Family Food Expenditure Surveys (urban households in Canada) (*n*=5,188)	Household survey of two weeks of family eating habits
Gillespie and Achterburg (1989)	• Mothers' attitudes about the importance of nutrition	Families in upstate New York (*n*=520)	Mail questionnaire (returned by 74%)
Anderson, Butcher and Levine (2002)	• Children's body mass index (BMI) • Television viewing • Food energy, nutrient, and food consumption	National Longitudinal Survey of Youth, 1986 to 1996 (*n*=6,894), supplemented with 1988 to 1994 (NHANES III) (*n*=4,073) and 1994 to 96, 1998 CSFII (*n*=7,388)	Height and weight measurements, and 24-hour diet recalls

Other Outcomes

A recent study by Anderson, Butcher, and Levine (2002) examined the relationship between maternal employment and childhood overweight. Mother-child data from three sources were used: the National Longitudinal Survey of Youth, the Third National Health and Nutrition Examination Survey (NHANES III), and the 1994 to 1996 and 1998 CSFII. Descriptive findings indicate that fast food consumption is higher among children whose mothers work, but no differences were seen in energy intake, TV viewing, or levels of overweight. Based on econometric models, the authors report a positive relationship between the intensity of maternal employment and child overweight. The effect was most notable for white children in more economically advantaged families.

Godwin and McIntosh (1997) relate parental employment to adolescents' various physical and nutritional outcomes using data from a pilot study in Texas. The authors found that daughters' body fat percentages and intake of vitamin B_{12} was predicted by both the work history and the "work preoccupation" of mothers. Specifically, mothers who showed greater desire to work weekends or bring work home were more likely to have daughters with high body fat and low intake of vitamin B_{12}. The studies also showed sons' food energy, carbohydrate, and fat—particularly saturated fat—intake, to be predicted by their mothers' "work schedule irregularity and commitment."

Gillespie and Achterburg (1989) examined how maternal employment related to parental attitudes about the importance of nutrition. Using responses to a questionnaire mailed to families in upstate New York, the authors found that families in which the mother was employed part-time placed the higher importance on nutrition than those in which the mother was employed full-time or not at all.

Data Sources

The main sources of data for this study were two national surveys conducted in the mid-1990s: (1) the Continuing Survey of Food Intakes by Individuals, including the Diet and Health Knowledge Survey, and (2) the Early Childhood and Child Care Study. Each of these data sets is described below.

Continuing Survey of Food Intakes by Individuals

The CSFII and the Diet and Health Knowledge Survey (DHKS) are conducted by the Agricultural Research Service (ARS) of USDA. The CSFII was conducted over three years (1994 to 1996) and again in 1998. During 1994 to 1996, all household members were eligible for selection as a sample person. In 1998, sample persons were restricted to household members aged 0 to 9 (the CSFII Supplemental Children's Survey). Low-income individuals (income at or below 130 percent of the federal poverty guideline) were oversampled in all survey years.

CSFII data provide summary information for the household, demographic information for each household member (collected from the reference person), employment information, and detailed dietary intake information for sample persons (a random sample of household members). Two nonconsecutive days of dietary intake data were collected for almost all sample persons using in-person 24-hour recalls.[7] Thus, information is available on a variety of aspects of children's nutrition, including eating

[7] For infants and children under 6 years of age, a parent or knowledgeable caregiver is asked to provide the information, and for children 6 to 12 years, the child is interviewed with adult assistance.

patterns, food and nutrient intake, and diet quality. Other related variables available from the CSFII include measures of:

- Physical activity level
- Overweight and obesity[8]
- Participation in food assistance programs
- Responsibility for meal planning, food purchasing, and food preparation
- Food expenditures
- Food sufficiency.

The CSFII includes individual participation in WIC, the NSLP, and the SBP as well as household participation in the FSP.

The DHKS was administered, primarily by telephone, to a random subsample of sample persons aged 20 years or older who completed the CSFII (only one person per household was selected). The survey (42 questions and 140 potential variables) asked about the respondents' nutrition knowledge, attitudes, and behaviors. A main focus was concepts related to the *Dietary Guidelines for Americans* (USDA/DHHS, 1995) and USDA's Food Guide Pyramid (USDA, 1992). Information was also captured on awareness and beliefs in the relationship between diet and health, self-assessment of diet quality, use of food labels, and food-related behaviors (e.g., whether skin is removed from chicken).

Early Childhood and Child Care Study

The Early Childhood and Child Care Study (ECCCS) was a study of the CACFP sponsored by the Food and Nutrition Service of USDA (Glantz *et al*., 1997; Fox *et al*., 1997). It described the institutions and children that participate in CACFP. The study was also designed to:

- Examine the nutrient content of meals **offered** to children while in care;
- Examine the nutrient content of meals **consumed** by children while in care; and
- Assess the **contribution to the total diet** of foods consumed while in care.

Information was collected from nationally representative samples of sponsoring agencies, participating child care sites (child care centers; Head Start centers; and family child care homes), and children and their parents. The data were collected between January and June 1995, a time period roughly comparable to the 1994 to 1996 CSFII. At that time, the USDA Food and Nutrition Service (FNS) elected not to analyze the information on out-of-care consumption due to the low, 41-percent response rate on this portion of the study. FNS recommends that analyses of these data should not be considered as representative of the population of CACFP participants or of the impact of the program. It appears to us, however, that this information could make a significant contribution to our understanding of the role of the CACFP—one source of food eaten away from home upon which working mothers rely. An analysis of non-response was conducted as part of this study and results are presented in Appendix D.

[8] Although obesity is a topic of much concern, parent-reported heights and weights for children younger than 12 are notably unreliable, with height too often reported at 6-inch intervals, such as 18, 24, 30, and 36 inches. With the analysis aiming to include all children 0 to 17 years old, obesity was not among the nutrition outcomes we could measure for all children. Results for children age 12 to 17 are provided in volume II of this report.

In the ECCCS, each participating child care provider was assigned a target week during the field period. Three interrelated data collection activities took place during the target week: (1) a menu survey, (2) meal observations, and (3) dietary recall interviews. The menu survey, completed by providers for the target week, collected detailed information on the foods **offered** to children while in care. To gather information on what the children consumed in the child care setting, meal observations were conducted on two nonconsecutive days by trained data collectors.[9] To obtain information on food consumed by children outside of the child care setting (on the observation days), dietary recalls were conducted with parents by telephone. A household interview was also conducted with the parents of participating children at this or a later time.

Two days of complete dietary recall data are available for just under one half of respondent children; the remaining children's parents completed only the first recall. The information collected is similar to that provided in the CSFII, although meal times were not captured making it difficult to define eating occasions consistently across the data sets. Nutrients and the availability of USDA food codes allow for the construction of a number of diet quality variables, including Food Guide Pyramid servings and Healthy Eating Index (HEI) scores. Information on mothers' employment is also available, allowing the distinction to be made between homemakers and mothers' who are employed or in school.

Analytic Approach

Research Question #1: How do nutrition outcomes differ among children whose mothers work full-time, part-time, and not at all?

Children of working mothers may have better or worse nutrition outcomes than their counterparts either because their mothers work, or because working mothers differ in other ways from non-working mothers (e.g., they may tend to have more formal education, may be more likely to be single parents, or may have varying nutrition knowledge or attitudes). The analysis sample for addressing this research question comprises children living in households that participated in the CSFII whose mothers (or mother-equivalents) were either employed or homemakers. A child is a household member aged 0 to 17 years, excluding reference persons (heads of household), their spouses, and their partners. A mother/mother equivalent, or "maternal female", is a female member of the child's household, aged 15 to 59 years and at least five years older than the child, who has the closest familial relationship to the child. In the great majority of cases, this person is the child's biological mother. In some cases she may, however, be the child's stepmother, foster mother, older sister, aunt, or grandmother, or the unmarried partner of the child's father.[10] Although the term "mother" is used for brevity, this should be understood as synonymous with the more precise term "maternal female."

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[9] Prior to each meal and snack, observers weighed or measured reference portions of each food to be offered. During meal time, observers recorded the amount of food each child received and the amount of food left on the child's plate. Food consumed was then calculated as the difference.

[10] It is not always possible to tell the exact relationship between the child and the "mother", because the CSFII reports only household members' relationship to the reference person (RP), not their relationships to each other. Thus if the RP is male, a child of the RP may either be the biological child or stepchild of the RP's spouse. Appendix A details the procedures used to determine child-maternal female dyads in the CSFII.

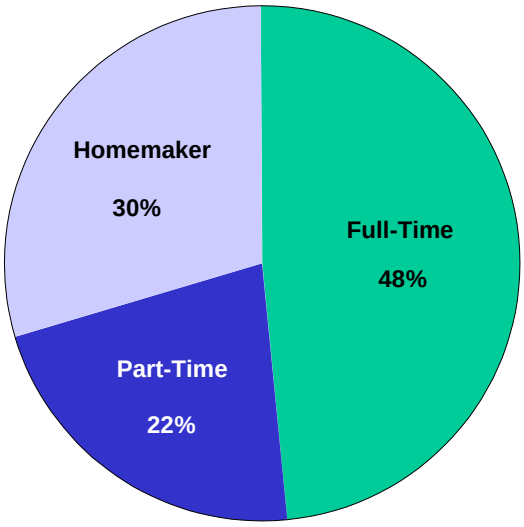
The final sample comprises 15,344 child-maternal female dyads in 7,190 households. In these dyads:

- 10,116 children were randomly selected as CSFII sample persons for collection of dietary intake data (including children only up to age 9 in the Supplemental Children's Survey); and
- 1,517 children's mothers were randomly selected to participate in the DHKS.

Within the dyads, mothers were classified as full-time employed, part-time employed, or homemaker. The distinction between the first two categories is determined based on reported hours per week "usually" worked, or if necessary, by hours worked last week: 1 to 34 (part-time) *versus* 35 or more (full-time). Women who did not work because they were keeping house are considered homemakers. Because the focus of this analysis is comparing the nutrition outcomes of children of working *versus* nonworking mothers, children whose mothers were unemployed or in school were dropped from the sample. Nearly half (48 percent) of the sample children's mothers worked full time, over a quarter (30 percent) were homemakers, and the remainder (22 percent) worked part time (Exhibit 1.2).

Exhibit 1.2

Employment Status of Sample Children's Mothers



Child nutrition outcomes such as food and nutrient intake were analyzed for mother-child dyads in which children were sample persons in the CSFII. **Household nutrition outcomes** (including FSP participation and food sufficiency) were analyzed (in volume II) for all dyads, regardless of sample person status. **Maternal nutrition knowledge and attitudes** were analyzed for those dyads in which the mother was a sample person and was administered the DHKS.

Outcomes for children of mothers who work full-time and part-time were compared with outcomes for children of nonworking mothers (homemakers), and the differences were tested for statistical significance. In addition to comparisons for the entire analysis sample, comparisons were also performed for subgroups, as appropriate for the particular outcomes, based on the following characteristics:

- Age of child
- Household income relative to federal poverty level
- Presence of another adult in the household.

Because younger children's mothers are less likely to work, all tabulations were age-weighted. Thus, when comparing outcomes among maternal employment categories, the distribution of children's age is held constant.

Research Question #2: How do dietary outcomes differ among children whose mothers work full-time, part-time, and not at all, after taking account of underlying differences in the populations?

Further analysis is conducted of the relationship between maternal employment and selected nutrition outcomes, namely, direct measures of children's dietary intake. These measures include the HEI and its components, food energy, intake of iron, zinc, and dietary fiber, and several foods of special interest (soda, added sugar, fried potatoes). Although it is not possible to establish causation,[11] it is at least possible to use multivariate analysis (logistic and least squares regression) to determine the relationship net of the influences of some basic characteristics that may vary with maternal employment, namely:

- mother's age
- mother's race/ethnicity
- mother's education
- household size/composition
- mother's nutritional knowledge
- mother's nutritional attitudes
- other adult household members' earnings
- region of country
- urban *versus* rural residence

Maternal nutrition knowledge and attitudes are included on the above list because they are particularly interesting as potential determinants of children's dietary outcomes. They are assumed neither to cause nor to be caused by maternal employment. They may however be correlated with maternal employment because of common antecedents—some of which (education, race/ethnicity) are included in the analysis, and others of which (general attitudes, temperament) are not. A design feature of the CSFII is that information was collected on maternal nutrition knowledge and attitudes for only a small fraction of children for whom dietary data are available (around 15 percent). In

[11] Causal inferences cannot be drawn because there may be unmeasured characteristics that affect both maternal employment and children's nutrition outcomes, such as the mother's attitudes toward women's appropriate roles.

Appendix C, a few key models on the restricted sample have been estimated with and without these variables.

Earnings of other adult household members are not measured directly in the CSFII. Information is available, however, on the usual hours of employment and occupation of each household member. This information was used to construct a rough index of "basic household income" (earnings of adults other than the mother), using median weekly full-time earnings by occupation and sex in 1996 as determined by the Current Population Survey (CPS) (U.S. Census Bureau, 1997).[12]

Several intervening factors may also affect dietary outcomes, such as participation in the FSP and WIC. These are not included in the models because they are not causally prior to maternal employment. Whether the mother works affects household income, and therefore affects eligibility for these programs. Program participation thus cannot be "held constant" while maternal employment status varies.

One regression model was estimated for each outcome, with the effects of full-time and part-time maternal employment allowed to vary by age of child. The form of the model (shown for a continuous variable) is:

$$y_i = \sum_g b_{1g} \times age_{ig} + \sum_g b_{2g} FT_i \times age_{ig} + \sum_g b_{3g} PT \times_i age_{ig} + \sum_k b_{4k} \times Z_{ik} + \varepsilon_i$$

Here y_i is the outcome for child i; FT_i and PT_i are indicators that the child's mother works full-time and part-time, respectively; age_{ig} is an indicator that child i is in age group g (1 to 2 years, 3 to 4 years, 5 to 8 years, etc.), Z_{ik} is the value of characteristic k for child i, and $\mathbf{g}_i$ is the residual.[13] The components of the b_2 vector represent the estimated effects of mothers' full-time employment on the outcome for children in each age group relative to children of non-working mothers in the same age group, and similarly the components of the b_3 vector represent the estimated effects of mothers' part-time employment on children by age group, relative to children of nonworking mothers.

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[12] The great majority (over 90 percent) of "other adults" in these households who were working, reported working full-time, i.e., 35 hours a week or more. The remaining adults were assigned a fraction of the appropriate weekly earnings based on their usual hours divided by 40. For individuals with missing hours, the hours values were filled in using a randomly selected "donor" observation in the same occupation. For individuals with missing or "other" occupations, full-time earnings values were filled in using a randomly selected "donor" observation with the same hours status (full-time or part-time).

Clearly this measure is only a rough proxy for the desired measure. The median earnings figures used are not exactly appropriate for this population because they are based on all employed adults—not just those in households with dependent children. In addition, earnings within an occupation vary by education, region, age, and many other factors. Still, this variable gives some information about differences in household resources net of the mother's potential earnings that are associated with having no other adults present, or no other working adults, *versus* having a father in the house who is a full-time professional or a full-time service worker.

[13] The 16 variables are included in this set of indicators: the child's mother is under 30, age 40 or older, non-Hispanic black, Hispanic, of other non-white race/ethnicity, lacking a high school diploma/GED, with post-secondary education, and with unknown level of education; the numbers of adults and children in the household; an index of other adults' earnings; indicators for Midwest, Northeast, and West regions (South is excluded); and indicators for central city and other urban areas (rural is excluded).

Research Question #3: What role does the CACFP appear to serve in meeting the nutritional needs of children in child care?

Not all children of working mothers are in child care, and not all children in child care have working mothers. Nonetheless, the correlation is strong. According to the 1997 National Survey of America's Families (NSAF), among children aged 0 to 5 whose "responding parent" (the person most knowledgeable about the child) was employed, 78 percent of those in lower income households and 85 percent in higher income households are in non-parental care. The corresponding proportions for children whose responding parent was not employed are 44 and 57 percent (Tout *et al*., 2001).[14] The child component of CACFP, which subsidizes qualifying meals and snacks for children in child care, is thus the nutrition assistance program most directly focused on children of working mothers.

Two major studies funded by USDA, the ECCCS and, more recently, the Family Child Care Homes Legislative Changes Study, have assessed the dietary quality of CACFP meals and snacks. Although no quantitative nutrition standards exist for the CACFP, both studies compared meals offered by CACFP providers to benchmarks established for the school meal programs. The earlier study also did the same comparisons for meals and snacks actually consumed by children in CACFP care. Findings from these and other studies of the CACFP raise the possibility that CACFP meals contribute more than their share of fat, saturated fat, and sodium and a less-than-adequate proportion of total carbohydrate relative to food energy intake (Crepinsek *et al*., 2002a; Fox *et al.*, 1997; Briley *et al*., 1993). On the other hand, they offer a substantial proportion of children's Recommended Daily Allowance (RDA) for food energy and key vitamins and minerals (Fox *et al*., 1997, Crepinsek *et al*., 2002a).

No national studies to date have evaluated the impact of the CACFP on children's dietary intake over a full 24-hour period (Glantz, 2003). Using hitherto unexamined data from the ECCCS, this study assesses the food energy and nutrient intake by children in CACFP settings in the context of their consumption during the rest of the day. Because the focus of this research question is CACFP as a whole, all child participants are included, regardless of maternal employment.

To examine the role the CACFP plays in meeting the nutritional needs of children in child care, ECCCS meal observation data for meals consumed in CACFP care were linked with dietary recall interview data on non-CACFP care intake for the same days. The analysis sample was CACFP children age 1 to 10 for whom information was available on meals consumed in both contexts. Tabulations place the food energy and nutrient intake from CACFP meals in the context of intake for the whole day. Although meal requirements for children are the same regardless of type of CACFP care setting, demographic characteristics differ. Findings are therefore presented separately for children in family child care homes, Head Start centers, and other types of child care centers.

Research Question #4: How do nutrition outcomes compare between CACFP-participating children of working mothers and not-in-care children of non-working mothers?

The CACFP may be deemed successful if it feeds children who need to be in care at least as well as children who do not need to be in care are fed by their own mothers. Diet quality, therefore, was

[14] Lower income families are those under 200 percent of the federal poverty guideline.

compared between children in CACFP care whose mothers are working or in school and not-in-care children whose mothers are full-time homemakers.[15]

The sample of children in CACFP was drawn from the ECCCS. The comparison group was children not in child care in the 1994 to 1996 CSFII data set whose mothers did not work (referred to from here on as 'not-in-care children of nonworking mothers'). The samples of children for this analysis were limited to children 1 to 5 years of age, the group for which CACFP and maternal employment were expected to have the most impact. For the CSFII sample, only data collected on weekdays were included (76 percent of the 1994 to 1996 interviews) to enhance comparability with the ECCCS. Diet quality measures were tabulated for CACFP participants by hours per day in child care, and for both the CACFP and CSFII samples by subgroups based on income and number of adults in the household. Differences in outcomes for participants with working mothers and not-in-care children of nonworking mothers were tested for statistical significance.

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”.

Overview of Report

The next two chapters of this report address Research Questions 1 and 2. Chapter 2 describes the simple relationships between mothers’ work status and direct measures of children’s nutrition (HEI scores and food and nutrient intake). Results of further analyses of the relationship between maternal employment and children’s nutrition using multivariate techniques are discussed in Chapter 3.

Chapter 4 presents findings from analyses of the contribution of CACFP to children’s diets (Research Question 3). It begins with a descriptive analysis of children’s food energy and nutrient intake from CACFP meals and snacks in the context of total intake over 24 hours. This is followed by results of comparisons of selected measures of diet quality between CACFP participants with working mothers and not-in-care children of nonworking mothers (Research Question 4).

Appendices A through C include information on the identification of maternal-child dyads in the CSFII, sampling weights, and detailed findings on the association of sample characteristics (including maternal nutrition knowledge and attitudes) with maternal employment status. A nonresponse analysis for the ECCCS 24-hour recalls is described in Appendix D, and Appendix E provides standard errors for selected analyses of these data.

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[15] For these analyses, children in CACFP care were excluded when their mothers were not working or in school. The reason for doing so is that CACFP care is not substituting for mothers’ care for these children; mothers’ care is in fact available. Conversely, excluded from the comparison group were children whose mothers worked or were in school, even if the children were not in care. Although mothers of school-aged children can forego nonparental care if they work or go to school part time, they are clearly under more time pressure than stay-at-home mothers. The most appropriate comparison appears to be between children who need to be in nonparental care and are served by CACFP with children who do not need to be (and are not) in nonparental care.

Volume II of this report presents results of additional analyses of the relationships between mothers' work status and children's other nutrition-related outcomes. That volume's four chapters examine children's eating patterns, household food acquisition and food sufficiency, participation in food assistance programs, and children's physical activity and weight status.

Chapter 2
Children's Nutrition Outcomes

The quality of children's diets can have consequences for physical growth, cognitive development, and health. Problems of both over- and under-consumption can increase children's risk for diet-related diseases later in life. One particularly worrisome trend is the increase in childhood overweight. Research shows that many children's diets fall short of meeting recommended dietary standards. Specifically, children fail to consume enough fruit and vegetables, but they consume too much fat, saturated fat, and sodium. Low intakes of vitamins and minerals are a particular problem among teenage girls. In addition, a substantial number of children consume large amounts of soda and fruit-flavored drinks that are high in added sugar (Gleason and Suitor, 2001).

The link between maternal employment and the nutritional quality of children's diets is difficult to predict. While some aspects of diet quality related to income might be improved (e.g., more fresh fruit and variety), other aspects related to the mother's time availability might be worsened (e.g., greater reliance on restaurant meals and prepared food). National dietary recommendations such as the *Dietary Guidelines for Americans* and USDA's Food Guide Pyramid provide guidance to help prevent nutritional problems in both children's and adults' diets. To the extent that maternal employment plays a role, additional or more targeted initiatives may be needed to improve the diet quality of this group of children.

This chapter describes relationships between mothers' employment and direct measures of children's nutrition. The HEI was selected as the primary measure of overall diet quality (Bowman *et al*., 1998). Several additional measures were included in order to address more specifically the dietary components that might be affected by maternal employment. The full set of outcomes measures used in the analysis is listed in Exhibit 2.1, and individual measures are further described in the sections that follow. All nutrition outcomes were examined for children age 2 to 17, the age range for which most dietary recommendations apply. In addition, infants and children 1 year of age are included in tabulations of food energy, iron, and zinc. Unless otherwise noted, two-day intake values were averaged before computing means and proportions across groups. All data were weighted to achieve national representation (see Appendix B).

The analyses show a pattern across most, but not all, indicators of diet quality whereby children whose mothers work full-time have less positive nutrition outcomes than children of nonworking mothers. Although statistically significant, differences for only some of these measures are nutritionally meaningful and only for some subgroups of children. Associations between maternal employment and children's nutrition outcomes include the following:

Exhibit 2.1

Measures Used in Comparisons of Children's Nutrition Outcomes

Outcome	Measure
HEI–overall	Score of 0-100
Components:	
Grain consumption	Score of 0-10
Vegetable consumption	Score of 0-10
Fruit consumption	Score of 0-10
Milk consumption	Score of 0-10
Meat consumption	Score of 0-10
Total fat intake as percent of energy intake	Score of 0-10
Saturated fat intake as percent of energy intake	Score of 0-10
Cholesterol intake	Score of 0-10
Sodium intake	Score of 0-10
Variety	Score of 0-10
Diet Quality Rating:[a]	
Good diet	Score above 80
Needs improvement	Score between 51 and 80
Poor diet	Score of 50 or below
Total food energy intake	Percent of 1989 REA Percent above 110 percent REA[b] Percent below 90 percent REA[b]
Iron intake	Percent of 2001 RDA
Zinc intake	Percent of 2001 RDA
Dietary fiber intake	Percent of "age plus 5" grams/day[c]
Soda consumption (includes diet)	Ounces per day
Other soft drink consumption (includes diet): Fruit drinks (not juice) Tea	Ounces per day
Added sugar intake: From soda and other soft drinks From all sources	Teaspoons per day
Vegetable consumption: Vegetables other than fried potatoes Fried potatoes	Servings per day

REA=Recommended Energy Allowance
RDA=Recommended Dietary Allowance

For groups, the 1989 REA represents the **average** energy requirements for individuals. In contrast, RDAs for other nutrients are high enough to meet the requirements of 97 to 98 percent of healthy individuals (NRC, 1989a).

a Developed by Kennedy *et al*., 1995.

b Arbitrary cutoff values used for group comparisons; not intended as a measure of adequacy of energy intake.

c American Health Foundation recommendation for adequate dietary fiber intake in children (Williams, 1995).

- With regard to overall diet quality, children of full-time working mothers have slightly lower HEI scores overall than children of homemakers. However, preschool-age children and children in single-adult households whose mothers work have higher HEI scores and are more likely to have a "good" diet than children of nonworking mothers.
- Poorer diet quality among children whose mothers work full-time tends to be associated with lower scores for consumption of grains and fruit, and for dietary variety. Where diet quality is better for children of working mothers, it is related to higher scores for vegetable consumption, and lower intake of total and saturated fat.
- Food energy intake is higher among infants and preschool children if their mother works full-time *versus* not at all. This is troublesome given the high levels of energy intake relative to the 1989 Recommended Energy Allowance (REA) for infants and young children overall (114 to 119 percent).
- Children of full-time working mothers have lower intakes of iron relative to children of nonworking mothers; they still, however, consume amounts that greatly exceed recommended levels (mean of 143 percent of 2001 RDA).
- Among teenage girls, maternal full-time work is related to intakes of iron, zinc, and dietary fiber below recommended daily levels. Parenthetically, the finding that almost half of teenage girls are consuming somewhat lower than the average requirement for food energy is also of concern.
- Dietary fiber intake is lower for school-age children whose mothers have full-time employment. Reduced consumption of fruit and grains and less dietary variety, as measured by components of the HEI, may be factors along with the greater frequency of eating out.
- Children of full-time working mothers are more likely to consume larger quantities of soda, especially in single adult households. They also consume more servings of fried potatoes, but the differences are too small to be nutritionally important.

Healthy Eating Index Score

The HEI provides a summary measure of diet quality by assessing how well an individual's diet meets the recommendations of USDA's Food Guide Pyramid (USDA, 1992) and the *Dietary Guidelines for Americans* (USDA/USDHHS, 1995). The HEI score is the sum of scores on 10 components, each of which relates to different aspects of a healthful diet. Component scores are based on consumption of the recommended number of servings of each of the five major Food Guide Pyramid food groups; intake of total fat, saturated fat, cholesterol and sodium; and a measure of dietary variety. An overall HEI score above 80 implies a "good" diet, an HEI score between 51 and 80 implies a diet that "needs improvement," and an HEI score less than 51 implies a "poor" diet (Kennedy *et al*., 1995). HEI component scores are computed proportionately to the recommended number of servings or amounts consumed. High HEI component scores indicate intakes close to recommended ranges or amounts; low component scores indicate less compliance with recommended ranges or amounts (Bowman *et al*., 1998).

The mean HEI score for all children in the CSFII sample is 66 out of 100 (Exhibit 2.2)[16]. Average scores are highest among preschool children, age 2 to 4 years (72), and lowest among teenage boys and girls, 13 to 17 years of age (61 to 62). With regard to individual components of the HEI, children tend to do best on scores for cholesterol and total fat intake, grain consumption, and dietary variety (7.3 to 8.5, out of 10). Preschool and younger schoolchildren (age 5 to 8 years) also score relatively well for milk and sodium (7.5 to 8.6). The lowest mean component score overall is for fruit consumption (4.6), which is especially low among teenage boys and girls (3.0 to 3.5). There is a trend toward improved HEI scores for fruit, total fat, saturated fat, and cholesterol with increasing household income, while scores for meat consumption are lowest among children with higher family incomes (over 185 percent of poverty).

Maternal employment is negatively associated with children's HEI score overall, but the direction of the association is reversed among preschoolers and those in single-adult households. Children of mothers working full-time have a slightly, but significantly lower mean HEI score than children of nonworking mothers (65 *versus* 67 percent; Exhibit 2.2). The lower score for children with full-time working mothers can be attributed to statistically lower component scores for fruit and grain consumption, and dietary variety. HEI scores are similar for children of part-time and homemaker mothers. These relationships are replicated for children age 5 to 12, those with family incomes over 185 percent of poverty, and those in multiple adult households. It does not appear that the higher income and education levels of full-time working mothers relative to homemakers (see Chapter 3), or the presence of other adults in the household, outweigh the effects time constraints may have on school-age children's dietary quality.

On the other hand, children 2 to 4 years of age with mothers who work (especially part-time) have slightly, but significantly **higher** HEI scores compared with children of homemakers (72 to 73 *versus* 71, $p < 0.10$ for full-time). Differences for children of part-time working mothers result from higher component scores for fruit consumption, and total fat, saturated fat, and cholesterol intake relative to children whose mothers do not work. Children whose mothers work full-time do notably better on scores for vegetable, saturated fat, and sodium intake. The higher total HEI scores for children of working mothers in single-adult households, relative to children of homemakers, are related to better scores for vegetable consumption, and fat, saturated fat, and cholesterol intake.

[16] HEI scores for the CSFII sample were obtained online from the Center for Nutrition Policy and Promotion (www.cnpp.usda.gov/hei9496data). Scores were only available separately for each day of dietary intake data. Therefore, overall and component scores were calculated as the average of Day 1 and Day 2 scores.

Exhibit 2.2

Mean HEI and Component Scores[a]

	Maternal Employment Status			
	Full-Time	**Part-Time**	**Homemaker**	**All Children**
All children				
Healthy Eating Index score	65.5***	67.0	66.7	66.1
Grain	7.3**	7.5	7.5	7.4
Vegetable	5.5**	5.3	5.2	5.4
Fruit	4.3***	4.9	4.7	4.6
Milk	6.6	6.9	6.7	6.7
Meat	5.9	5.7	5.9	5.8
Total fat	7.2	7.3	7.3	7.3
Saturated fat	5.8	5.9	5.9	5.9
Cholesterol	8.5	8.6	8.5	8.5
Sodium	6.9	6.9	6.9	6.9
Variety	7.6***	7.9	7.9	7.7
Maximum sample size	3,559	1,675	2,592	7,826
By age group				
2 to 4 years				
HEI score	72.2*	73.2***	71.4	72.1
Grain	8.0*	8.0	7.9	8.0
Vegetable	5.9***	5.4	5.3	5.6
Fruit	6.6	7.3***	6.7	6.8
Milk	7.3	7.5	7.4	7.4
Meat	6.1*	5.7	5.9	6.0
Total fat	7.4	7.7**	7.4	7.5
Saturated fat	5.6**	5.9***	5.3	5.6
Cholesterol	8.9	9.1**	8.9	8.9
Sodium	8.5**	8.7	8.7	8.6
Variety	7.9	7.9	7.9	7.9
Maximum sample size	1,824	895	1,542	4,261
5 to 8 years				
HEI score	66.7*	68.0	68.0	67.4
Grain	7.3**	7.6	7.6	7.4
Vegetable	5.2***	4.9	4.7	5.0
Fruit	4.7**	5.1	5.2	5.0
Milk	7.3***	7.8	7.7	7.5
Meat	5.5	5.4	5.5	5.5
Total fat	7.2	7.4	7.3	7.3
Saturated fat	5.6	5.5	5.6	5.6
Cholesterol	8.9	8.7	8.8	8.8
Sodium	7.6	7.6	7.6	7.6
Variety	7.5***	8.0	8.0	7.8
Maximum sample size	836	393	631	1,860
9 to 12 years				
HEI score	64.6**	65.5	66.7	65.4
Grain	7.2**	7.5	7.6	7.4
Vegetable	5.3	5.1	5.2	5.2
Fruit	3.7**	3.9	4.4	4.0

Exhibit 2.2

Mean HEI and Component Scores[a]

	Maternal Employment Status			
	Full-Time	**Part-Time**	**Homemaker**	**All Children**
Milk	6.7	7.0	6.8	6.8
Meat	5.8	5.7	5.8	5.8
Total fat	7.1**	7.2*	7.6	7.3
Saturated fat	5.8	6.0	6.1	5.9
Cholesterol	8.6	8.6	8.5	8.6
Sodium	6.4	6.2	6.3	6.3
Variety	7.9**	8.1	8.3	8.1
Maximum sample size	428	206	238	872
13 to 17 years, male				
HEI score	60.5	63.2	62.1	61.4
Grain	7.3	7.7	7.3	7.4
Vegetable	5.7	5.8	5.7	5.7
Fruit	2.6	3.4	3.3	3.0
Milk	6.3	6.6	5.9	6.3
Meat	6.8	6.4	6.6	6.7
Total fat	6.8	7.2	7.0	6.9
Saturated fat	5.9*	6.1	6.5	6.1
Cholesterol	7.0	7.6	7.6	7.3
Sodium	4.4	4.3	4.6	4.4
Variety	7.5	8.2	7.6	7.6
Maximum sample size	232	86	99	417
13 to 17 years, female				
HEI score	61.1	63.2	62.5	61.9
Grain	6.2	6.6	6.7	6.4
Vegetable	5.3	5.7	5.6	5.5
Fruit	3.3	4.2	3.3	3.5
Milk	4.4	4.7	4.9	4.5
Meat	5.3*	5.3	5.9	5.4
Total fat	7.4	7.3	7.0	7.3
Saturated fat	6.5	6.4	6.3	6.5
Cholesterol	8.8	8.8	8.5	8.8
Sodium	7.3	7.0	6.9	7.2
Variety	6.6**	7.3	7.3	6.9
Maximum sample size	239	95	82	416
By income category				
Under 130% of poverty				
HEI score	64.4	64.8	64.6	64.6
Grain	7.1	7.2	7.3	7.2
Vegetable	5.7**	5.5	5.3	5.5
Fruit	4.1	4.6	4.3	4.3
Milk	6.3	6.6	6.6	6.5
Meat	6.5	6.3	6.5	6.4
Total fat	6.9	6.6	6.8	6.8
Saturated fat	5.5	5.2	5.4	5.4
Cholesterol	7.9	8.2	7.9	8.0

Exhibit 2.2

Mean HEI and Component Scores[a]

	Maternal Employment Status			
	Full-Time	**Part-Time**	**Homemaker**	**All Children**
Sodium	7.0	6.8	6.9	6.9
Variety	7.5	7.7	7.6	7.6
Maximum sample size	822	431	1,051	2,304
130 to 185% of poverty				
HEI score	63.6	65.2	64.8	64.4
Grain	7.2	7.2	7.3	7.2
Vegetable	5.6**	5.3	5.0	5.4
Fruit	3.8*	4.3	4.3	4.1
Milk	6.5	6.5	6.4	6.5
Meat	6.2*	5.8	5.8	6.0
Total fat	6.7**	7.2	7.2	7.0
Saturated fat	5.3***	5.7	6.1	5.6
Cholesterol	8.2	8.1	8.3	8.3
Sodium	6.8	7.2	6.9	6.9
Variety	7.3	7.7	7.5	7.5
Maximum sample size	470	242	396	1,108
Over 185% of poverty				
HEI score	66.1***	68.1	68.6	67.1
Grain	7.3***	7.8	7.7	7.5
Vegetable	5.4	5.2	5.2	5.3
Fruit	4.5***	5.1	5.2	4.8
Milk	6.6**	7.1	7.0	6.8
Meat	5.6	5.4	5.5	5.5
Total fat	7.4**	7.6	7.7	7.5
Saturated fat	6.0	6.2	6.2	6.1
Cholesterol	8.7**	8.8	9.0	8.8
Sodium	6.9	6.8	7.0	6.9
Variety	7.6***	8.1	8.2	7.8
Maximum sample size	2,267	1,002	1,145	4,414
By number of adults				
One				
HEI score	65.3***	65.1**	62.5	64.7
Grain	7.2	7.3	7.4	7.2
Vegetable	5.8**	5.8*	5.1	5.7
Fruit	4.0	4.5	4.3	4.1
Milk	6.4	6.5	6.6	6.4
Meat	6.3	6.1	6.3	6.3
Total fat	7.1***	6.7	6.3	6.9
Saturated fat	5.8***	5.4*	4.7	5.5
Cholesterol	8.4	8.7**	8.0	8.4
Sodium	6.6	6.5	6.3	6.6
Variety	7.7	7.6	7.5	7.6
Maximum sample size	571	184	244	999

Exhibit 2.2

Mean HEI and Component Scores[a]

	Maternal Employment Status			
	Full-Time	**Part-Time**	**Homemaker**	**All Children**
Multiple				
HEI score	65.6***	67.2	67.1	66.4
Grain	7.3**	7.6	7.5	7.4
Vegetable	5.4	5.2	5.2	5.3
Fruit	4.4***	4.9	4.8	4.6
Milk	6.6	7.0*	6.7	6.7
Meat	5.8	5.6	5.8	5.7
Total fat	7.2*	7.4	7.4	7.3
Saturated fat	5.8	6.0	6.1	5.9
Cholesterol	8.5	8.6	8.6	8.6
Sodium	7.0	6.9	7.0	7.0
Variety	7.5***	8.0	8.0	7.7
Maximum sample size	2,988	1,491	2,348	6,827

a Range of scores for the HEI is 0 to 100; ranges for each component of the HEI are 0 to 10. The overall HEI score is the simple sum of the scores for each of the 10 components.

*** Statistically significant difference from children whose mothers are homemakers at the 1 percent level
** Statistically significant difference from children whose mothers are homemakers at the 5 percent level
* Statistically significant difference from children whose mothers are homemakers at the 10 percent level

Healthy Eating Index Diet Rating

Based on average total HEI scores, the diet quality of most children (83 percent) fell in the "needs improvement" range (Exhibit 2.3).[17] No more than 10 percent of children overall have either a "good diet" or "poor diet" rating, but this varies considerably by age group. Among 2- to-4-year-olds, a fairly substantial proportion of children have a good diet (25 percent), whereas very few teenagers do (less than 3 percent). Conversely, the share of children with a "poor diet" rating increases steadily with age; boys age 13 to 17 years are the most likely to have a poor diet (16 percent). Higher household income (over 185 percent of poverty) and the presence of multiple adults reduces the likelihood that children receive "poor" diet ratings.

No statistically significant differences in diet quality ratings were found among children with working and nonworking mothers overall. Among subgroups, however, a significantly larger share of children of full-time working mothers have poor diets if they are age 9 to 12 years, or in higher income or multiple adult households. These results reflect the patterns of lower HEI scores for these groups reported previously. The positive relationships between maternal employment and HEI scores among preschool children and children in single adult households are maintained in results of the analysis of HEI diet quality ratings. As shown in Exhibit 2.3, preschool children of working mothers are more likely to have good diets and less likely to have a diet that needs improvement than children whose mothers are homemakers.

[17] HEI scores were averaged over the two days of dietary data before assigning a diet quality rating.

Exhibit 2.3

HEI Diet Rating[a]

	Maternal Employment Status			
	Full-Time	**Part-Time**	**Homemaker**	**All Children**
All children				
Poor diet	8.7%	6.6%	7.2%	7.8%
Diet needs improvement	82.8	82.8	83.0	82.9
Good diet	8.5	10.5	9.8	9.3
Maximum sample size	3,559	1,675	2,592	7,826
By age group				
2 to 4 years				
Poor diet	3.1%	2.3%	3.2%	2.9%
Diet needs improvement	70.9**	70.8*	74.4	72.1
Good diet	26.0**	26.9**	22.4	24.9
Maximum sample size	1,824	895	1,542	4,261
5 to 8 years				
Poor diet	5.7%	2.6%*	5.2%	4.9%
Diet needs improvement	88.5	87.4	86.4	87.6
Good diet	5.8	10.1	8.4	7.5
Maximum sample size	836	393	631	1,860
9 to 12 years				
Poor diet	7.4%***	10.4%**	3.0%	6.9%
Diet needs improvement	87.8	83.2	87.3	86.6
Good diet	4.7	6.5	9.8	6.5
Maximum sample size	428	206	238	872
13 to 17 years, male				
Poor diet	17.6%	11.0%	16.2%	15.9%
Diet needs improvement	79.8	86.5	82.6	81.8
Good diet	2.6	2.5	1.2	2.3
Maximum sample size	232	86	99	417
13 to 17 years, female				
Poor diet	14.2%	8.8%	13.8%	12.9%
Diet needs improvement	84.0	87.2	82.2	84.4
Good diet	1.8	4.1	4.1	2.7
Maximum sample size	239	95	82	416
By income category				
Under 130% of poverty				
Poor diet	12.7%	11.0%	10.4%	11.4%
Diet needs improvement	79.6	80.4	82.8	81.1
Good diet	7.7	8.6	6.9	7.5
Maximum sample size	822	431	1,051	2,304
130 to 185% of poverty				
Poor diet	13.4%	5.2%**	11.1%	10.8%
Diet needs improvement	79.2	87.2*	80.6	81.3
Good diet	7.3	7.6	8.3	8.0
Maximum sample size	470	242	396	1,108

Exhibit 2.3

HEI Diet Rating[a]

	Maternal Employment Status			
	Full-Time	**Part-Time**	**Homemaker**	**All Children**
Over 185% of poverty				
Poor diet	6.9%**	5.4%	3.9%	5.9%
Diet needs improvement	84.3	82.9	83.9	83.9
Good diet	8.8**	11.7	12.2	10.2
Maximum sample size	2,267	1,002	1,145	4,414
By number of adults				
One				
Poor diet	9.9%**	9.0%**	16.9%	10.5%
Diet needs improvement	80.9	81.9	78.3	81.2
Good diet	9.2***	9.1*	4.8	8.4
Maximum sample size	571	184	244	999
Multiple				
Poor diet	8.4%*	6.6%	6.3%	7.4%
Diet needs improvement	83.2	82.9	83.4	83.2
Good diet	8.4*	10.5	10.3	9.4
Maximum sample size	2,988	1,491	2,348	6,827

a An HEI score over 80 implies a "good diet," an HEI score between 51 and 80 implies a diet that "needs improvement," and an HEI score less than 51 implies a "poor diet."

*** Statistically significant difference from children whose mothers are homemakers at the 1 percent level
** Statistically significant difference from children whose mothers are homemakers at the 5 percent level
* Statistically significant difference from children whose mothers are homemakers at the 10 percent level

Intake of Total Food Energy Intake and Selected Nutrients

It is possible for an individual to achieve a "good" HEI diet rating yet be consuming excessive levels of food energy, putting him or her at increased risk for overweight or obesity. This is because HEI scores for energy-bearing components are not adjusted in any way for intakes above the recommended levels. It was therefore important to examine separately the relationship between maternal employment and children's food energy intake.

In bivariate analyses of children's eating patterns (see Volume II, Appendix F), maternal employment was shown to be associated with increased reliance on restaurant meals. Large portions and the high fat content of many of these meals may contribute to excessive energy intake in children. On the other hand, these analyses also show that children whose mothers work are more likely to skip breakfast, which could result in less than adequate food energy consumption. To determine the relationship between maternal employment and children's energy intake, food energy, measured as a percent of the 1989 REA, is compared between children of working and nonworking mothers.

Early research on the HEI showed that correlations of HEI scores with individual nutrients are not particularly high for two of the nutrients critical to the diets of young children: iron and zinc (Kennedy *et al*., 1995). Both iron and zinc are considered important for growth and learning and

have been reported to be under-consumed by many children. For example, iron intake has been reported to fall below the 1989 RDA for many children under age 5 (USDA/ARS, 1999)[18], and among teenage girls who have the highest requirement (Gleason and Suitor, 2001). In addition, a substantial proportion of children of all ages may not consume enough zinc (USDA/ARS, 1999; Gleason and Suitor, 2001). For these reasons, iron and zinc intakes are examined here.[19]

Finally, the HEI may also under-represent dietary fiber intake since it does not reflect the higher fiber Food Guide Pyramid subgroups, such as whole grains and cooked dry beans and peas. Thus dietary fiber intakes are also assessed. Children of working and nonworking mothers' consumption of dietary fiber are compared in relation to the American Health Foundation's recommendation for "age plus five" grams per day (Williams, 1995).

Food Energy

Mean food energy intake exceeds the 1989 REA for all children combined at 109 percent (Exhibit 2.4). Only one fourth of children overall have energy intakes that fall within 10 percent of the average daily requirement, and a large proportion may be consuming too much.[20] Food energy intake relative to the REA is highest among (non-breastfed) infants, preschool children (ages 1 to 4), and teenage boys. Only teenage girls are consuming less food energy, on average, than their REA (mean of 96 percent). There is little variation in children's food energy intake by income or number of adults in the household.

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[18] The analyses of CSFII data that this is based on did not adjust for day-to-day variability in children's intakes and were based on the 1989 RDA rather than the Estimated Average Requirement (EAR), which was not available at the time. Both of these factors could have resulted in an overestimation of the proportion of children with inadequate iron intakes.

[19] Iron and zinc were examined for infants 7 to 11 months old and children 1 to 17 years old. Values are expressed in relation to the most recently available RDA values for these nutrients (Dietary Reference Intakes; IOM/FNB, 2001). There is currently no iron or zinc RDA for infants from birth through 6 months. Adequate Intake (AI) values have been established, but they are based on the average intake of these nutrients among breastfed infants. Because dietary intake data for the CSFII sample are only available for non-breastfed infants, the AI was not felt to be an appropriate reference standard, and infants age 0 to 6 months were excluded from the comparisons.

[20] Note that an assessment of the **adequacy** of children's food energy intake can only be made if day-to-day variability is removed and the distribution of usual intake is then compared to the average energy requirement; this analysis, however, was beyond the scope of this study. The expected effect of this type of adjustment would be to reduce the proportions of children with high or low energy intakes. New reference values for food energy have recently become available, i.e., Estimated Energy Requirements (EERs), but their application depends on knowing individuals' physical activity levels (IOM/FNB, 2002).

Exhibit 2.4

Food Energy Intake Relative to 1989 REA

	Maternal Employment Status			
	Full-Time	**Part-Time**	**Homemaker**	**All Children**
All children				
Mean percent of REA	109.0%	110.7%	109.3%	109.4%
Percent above 110% REA	42.2	43.4	41.8	42.3
Percent below 90% REA	34.0	27.7**	32.1	32.2
Maximum sample size	4,258	2,049	3,400	9,707
By age group				
0 to 11 months				
Mean percent of REA	121.4%**	120.9%	115.5%	119.1%
Percent above 110% REA	54.1	58.1	50.4	53.5
Percent below 90% REA	17.0	15.0	21.3	18.2
Maximum sample size	365	202	402	969
1 to 2 years				
Mean percent of REA	117.3%**	110.8%	112.3%	114.0%
Percent above 110% REA	42.4	43.2	48.1	48.8
Percent below 90% REA	24.7	26.3	28.3	26.5
Maximum sample size	716	355	803	1,874
3 to 4 years				
Mean percent of REA	118.3%*	118.8%	115.2%	117.4%
Percent above 110% REA	53.2	51.9	50.0	51.9
Percent below 90% REA	25.3	23.7	26.2	25.2
Maximum sample size	1,442	712	1,145	3,299
5 to 8 years				
Mean percent of REA	106.6%	106.8%	107.6%	106.9%
Percent above 110% REA	40.1	37.5	40.2	39.6
Percent below 90% REA	32.3	27.5	29.3	30.3
Maximum sample size	836	393	631	1,860
9 to 12 years				
Mean percent of REA	106.0%	111.9%	110.8%	108.8%
Percent above 110% REA	38.5	42.4	42.1	40.4
Percent below 90% REA	34.7	32.1	29.7	32.7
Maximum sample size	428	206	238	872
13 to 17 years, male				
Mean percent of REA	113.7%	115.3%	112.2%	113.7%
Percent above 110% REA	42.7	52.1	41.2	44.3
Percent below 90% REA	39.0	16.8***	40.0	34.6
Maximum sample size	232	86	99	417
13 to 17 years, female				
Mean percent of REA	93.9%	99.8%	96.6%	95.7%
Percent above 110% REA	29.1	34.4	29.3	30.3
Percent below 90% REA	52.3	40.6	44.7	48.2
Maximum sample size	239	95	82	416

Exhibit 2.4

Food Energy Intake Relative to 1989 REA

	Maternal Employment Status			
	Full-Time	**Part-Time**	**Homemaker**	**All Children**
By income category				
Under 130% of poverty				
Mean percent of REA	108.5%	112.8%	108.7%	109.3%
Percent above 110% REA	44.8	45.6	43.1	44.1
Percent below 90% REA	32.7	29.8	35.4	33.3
Maximum sample size	962	536	1,423	2,921
130 to 185% of poverty				
Mean percent of REA	114.3%	108.1%	111.0%	111.7%
Percent above 110% REA	46.0	40.3	47.6	45.0
Percent below 90% REA	29.3	27.5	30.0	29.5
Maximum sample size	575	296	546	1,417
Over 185% of poverty				
Mean percent of REA	108.1%	110.7%	109.2%	108.9%
Percent above 110% REA	40.8	43.4	39.3	41.0
Percent below 90% REA	35.4**	26.8	30.1	32.5
Maximum sample size	2,721	1,217	1,431	5,369
By number of adults				
One				
Mean percent of REA	109.1%	111.7%	111.7%	109.2%
Percent above 110% REA	43.0	43.9	46.7	42.9
Percent below 90% REA	31.8	28.2	31.9	31.9
Maximum sample size	635	213	324	1,172
Multiple				
Mean percent of REA	109.0%	110.7%	109.2%	109.4%
Percent above 110% REA	42.1	43.7	41.5	42.2
Percent below 90% REA	34.4	27.3**	32.0	32.3
Maximum sample size	3,623	1,836	3,076	8,535

*** Statistically significant difference from children whose mothers are homemakers at the 1 percent level
** Statistically significant difference from children whose mothers are homemakers at the 5 percent level
* Statistically significant difference from children whose mothers are homemakers at the 10 percent level

The analysis of children's food energy intake by mothers' employment status shows little to no difference overall. The one statistically significant difference suggests that children of mothers who work part-time are less likely to have average energy intakes below 90 percent of the REA than children of homemaker mothers (28 *versus* 32 percent).[21] This finding is mainly influenced by the relatively low proportion of teenage boys with part-time working mothers (17 percent) whose energy intakes fall below this threshold (Exhibit 2.5).[22] As shown in Appendix F, this group of children is

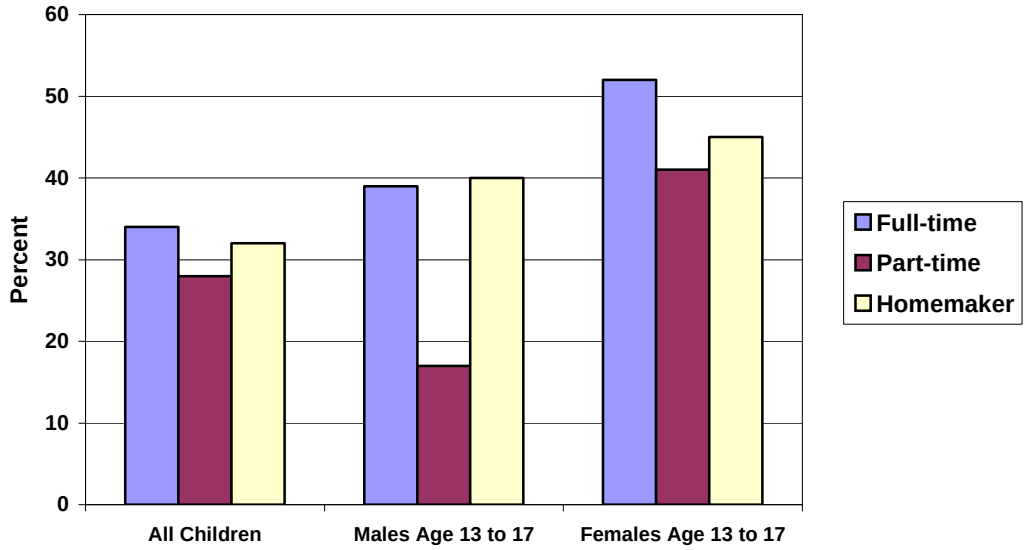
[21] The proportions of children with food energy intake above 110 percent or below 90 percent of REA were determined on a per-day basis, and then averaged.

[22] The 1989 REAs for males 11 to 14 and 15 to 18 years old are 2,500 and 3,000 calories per day, respectively (National Research Council, 1989a).

not as likely to skip midday and evening meals as other 13- to 17-year old boys, but the reason for this pattern is not clear. Children in multiple adult households are also significantly less likely to consume below 90 percent of the REA if their mothers work part-time *versus* not at all (28 *versus* 32 percent). There were no differences in total food energy intake across the three income groups.

Exhibit 2.5

Proportion of All Children and Teenagers With Mean Food Energy Intake Below 90 Percent of the 1989 REA, by Maternal Employment Status



The analysis also finds that, among infants and preschool children, those with mothers who work full-time consume significantly higher levels of food energy than children of homemakers (117 to 121 percent *versus* 112 to 116 percent of REA). The differences due to employment status are not as great, however, as the disparity between mean energy intake and daily requirements among all infants and preschool children. One explanation for this finding is that food intake may have been over-reported by mothers who were proxy respondents for these age groups.

Although maternal employment does not seem to play a consistent role in children's food energy intake, the fact that almost half of teenage girls are consuming less than 90 percent of the REA and an even larger share of infants and young children are consuming in excess of 110 percent of the REA is troubling.

Iron and Zinc

As shown in Exhibit 2.6, children's mean intakes of iron and zinc overall exceed the 2001 RDA by a large margin (150 and 166 percent of RDA, respectively). Although the group mean does not sufficiently reflect the proportion of individual children that have intakes below the average requirements, with values this high it seems reasonable to conclude that a substantial number of

children have adequate iron and zinc intakes.[23] The one exception might be 13- to 17-year old girls, where the group mean intake is much closer to the RDA, at 104 percent of RDA for iron and 105 percent of RDA for zinc. Children's intakes of iron and zinc, on average, do not vary much by household income or number of adults.

Exhibit 2.6

Mean Iron and Zinc Intake as a Percent of 2001 RDA

	Maternal Employment Status			
	Full-Time	**Part-Time**	**Homemaker**	**All Children**
All children				
Iron	142.8%***	156.6%	156.4%	149.2%
Zinc	164.1	170.3	168.0	166.5
Maximum sample size	4,337	2,069	3,284	9,690
By age group				
7 to 11 months				
Iron	155.5%	167.9%	148.4%	146.0%
Zinc	227.9	218.5	222.8	223.9
Maximum sample size	205	127	204	536
1 to 2 years				
Iron	151.7%	149.2%	151.2%	151.0%
Zinc	242.6	229.8**	244.1	240.8
Maximum sample size	716	355	803	1,874
3 to 4 years				
Iron	146.7%	157.4%	151.8%	150.8%
Zinc	224.1	233.5	225.5	226.6
Maximum sample size	1,442	712	1,145	3,299
5 to 8 years				
Iron	131.6%***	139.9%	141.8%	136.7%
Zinc	188.1	195.0	196.7	192.4
Maximum sample size	836	393	631	1,860
9 to 12 years				
Iron	166.2%**	181.7%	190.4%	176.5%
Zinc	181.9*	192.0	197.5	188.6
Maximum sample size	428	206	238	872
13 to 17 years, male				
Iron	179.6%	193.5%	169.3%	180.1%
Zinc	166.3	167.2	141.9	160.9
Maximum sample size	232	86	99	417

[23] Ideally, the usual intake distribution for these nutrients would be compared with EARs to determine the proportion of individuals with adequate or inadequate intakes. As noted previously, this analysis was beyond the scope of the project. The EARs are designed to meet the average nutrient requirements of half the individuals in a particular life stage (age-gender) group. In contrast, RDAs are set much higher. Even after adjusting for interindividual variability, the proportion of children with iron and zinc intakes above the EAR would likely be substantial.

Exhibit 2.6

Mean Iron and Zinc Intake as a Percent of 2001 RDA

	Maternal Employment Status			
	Full-Time	**Part-Time**	**Homemaker**	**All Children**
13 to 17 years, female				
Iron	94.0%***	111.5%	126.3%	104.3%
Zinc	99.7**	107.8	117.2	105.0
Maximum sample size	239	95	82	416
By income category				
Under 130% of poverty				
Iron	136.1%***	156.0%	150.3%	145.8%
Zinc	162.4**	176.6	174.8	170.2
Maximum sample size	955	534	1,349	2,838
130 to 185% of poverty				
Iron	153.6%	153.7%	157.3%	155.7%
Zinc	179.3**	178.5	163.8	175.8
Maximum sample size	588	308	519	1,415
Over 185% of poverty				
Iron	141.9%***	157.8%	159.8%	149.1%
Zinc	160.5	165.6	167.2	163.2
Maximum sample size	2,794	1,227	1,416	5,437
By number of adults				
One				
Iron	150.7%*	153.3%	168.3%	152.7%
Zinc	160.9	163.6	163.5	162.5
Maximum sample size	665	221	310	1,196
Multiple				
Iron	141.5%***	157.3%	155.2%	148.6%
Zinc	164.5	170.8	168.3	167.1
Maximum sample size	3,672	1,848	2,974	8,494

*** Statistically significant difference from children whose mothers are homemakers at the 1 percent level
** Statistically significant difference from children whose mothers are homemakers at the 5 percent level
* Statistically significant difference from children whose mothers are homemakers at the 10 percent level

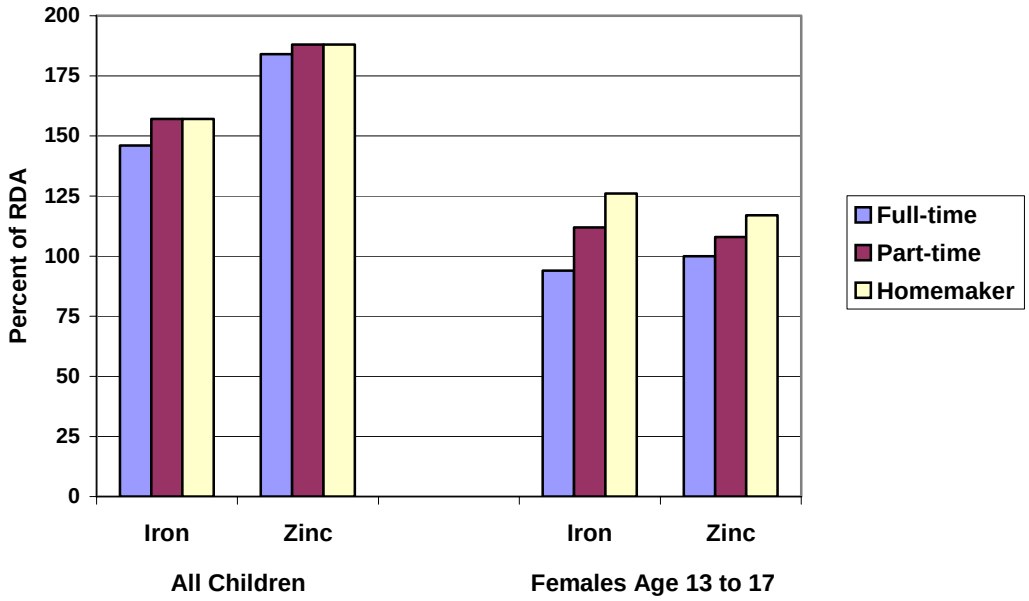
When children of all ages are combined, there appears to be a negative relationship between maternal employment and dietary iron for children whose mothers work full-time. Average iron intake among children whose mothers work full-time is 143 percent of RDA compared to 156 percent of RDA for children of both homemakers and part-time working mothers. The meaning of this finding is unclear however, since mean intake is well above the iron RDA for all three groups of children. The relationships for all children are similar for zinc, but not statistically significant.

Note that teenage girls whose mothers work full-time are the only group with average iron and zinc intakes at or below the RDA (94 and 100 percent of RDA, respectively) (Exhibit 2.7). This may reflect reduced supervision of meals on the part of full-time working mothers, along with reduced food intake overall due to the influence of social norms that value thinness for females more so than

for males. In addition, the increased reliance on eating away from home (Vol II, Chap. 1) may contribute to lower iron intake for this group since the iron density of foods away from home is lower than for foods obtained at home (Lin *et al*., 1999).

Exhibit 2.7

Mean Iron and Zinc Intake, Overall and Among Teenage Girls, by Maternal Employment Status



The relationship between maternal full-time employment and children's intake of iron and zinc is similar to findings overall across income groups and regardless of the number of adults in the household.

Dietary Fiber

Exhibit 2.8 shows that children's mean intake of dietary fiber almost meets the age-plus-5 grams per day recommendation (97 percent overall).[24] Average dietary fiber intake varies substantially, however, by age group. The pattern of reduced fiber intake with increasing age is similar to that for total food energy, although it varies disproportionately relative to recommended amounts. Among preschool children (age 2 to 4 years), average fiber intake greatly exceeds recommended levels (129 percent), but it falls short of recommendations for children age 9 to 17 (63 percent for teenage girls).

[24] New Dietary Reference Intake (DRI) values have been released for **total** fiber, which is defined as dietary fiber plus functional fiber. (Functional fiber consists of isolated or extracted nondigestible carbohydrates that have beneficial physiological effects, e.g., pectins and gums.) The AI values for children 2 to 17 years of age range from 19 to 38 grams total fiber per day (IOM/FNB, 2002). These values are substantially higher than previous fiber recommendations for children. The new reference values could not be applied to this analysis because total fiber was not assessed in the CSFII. Because functional fibers contribute a minor amount to the total fiber content of foods, however, the relationships between maternal employment and dietary fiber intake would not be expected to be altered.

There is little difference in children's dietary fiber intake across household composition and income subgroups.

Exhibit 2.8
Mean Dietary Fiber Intake as a Percent of Recommended Levels[a]

	Maternal Employment Status			
	Full-Time	Part-Time	Homemaker	All Children
All children				
Dietary fiber	94.9%***	97.9%	100.9%	97.2%
Maximum sample size	3,559	1,675	2,592	7,826
By age group				
2 to 4 years				
Dietary fiber	130.3%	129.3%	127.9%	129.2%
Maximum sample size	1,824	895	1,542	4,261
5 to 8 years				
Dietary fiber	102.9%***	106.3%	110.4%	106.1%
Maximum sample size	836	393	631	1,860
9 to 12 years				
Dietary fiber	85.4%***	88.9%*	97.4%	89.5%
Maximum sample size	428	206	238	872
13 to 17 years, male				
Dietary fiber	86.1%	86.1%	85.3%	85.9%
Maximum sample size	232	86	99	417
13 to 17 years, female				
Dietary fiber	58.1%**	68.1%	69.8%	62.6%
Maximum sample size	239	95	82	416
By income category				
Under 130% of poverty				
Dietary fiber	96.3%*	102.2%	100.6%	99.1%
Maximum sample size	822	431	1,051	2,304
130 to 185% of poverty				
Dietary fiber	96.7%*	88.6%***	102.2%	96.9%
Maximum sample size	470	242	396	1,108
Over 185% of poverty				
Dietary fiber	93.7%***	98.8%	101.5%	96.5%
Maximum sample size	2,267	1,002	1,145	4,414
By number of adults				
One				
Dietary fiber	93.9%	95.2%	92.8%	93.5%
Maximum sample size	571	184	244	999
Multiple				
Dietary fiber	95.1%***	98.3%	101.8%	97.8%
Maximum sample size	2,988	1,491	2,348	6,827

a Based on American Health Foundation recommendations for adequate dietary fiber intake in children of "age plus 5" grams per day (Williams, 1995).

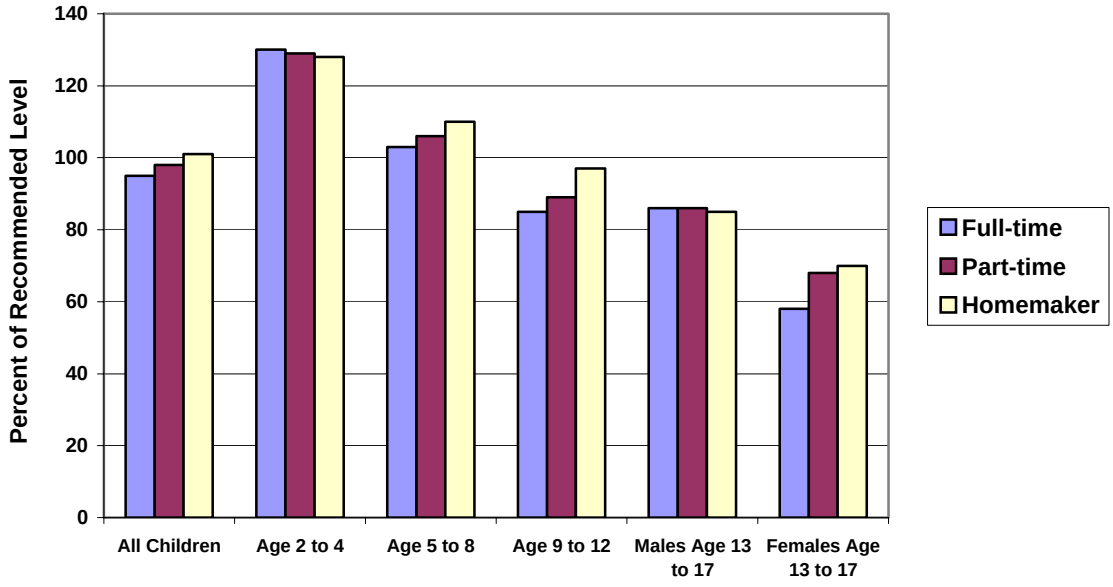
*** Statistically significant difference from children whose mothers are homemakers at the 1 percent level
** Statistically significant difference from children whose mothers are homemakers at the 5 percent level
* Statistically significant difference from children whose mothers are homemakers at the 10 percent level

Maternal full-time employment is associated with significantly lower dietary fiber intake overall (95 *versus* 101 percent of recommended level). Dietary fiber intake is slightly lower for children of part-time working mothers, but not significantly so. These relationships are fairly consistent across the age and income groups examined. The most important differences in dietary fiber intake are seen among children age 9 to 12 and teenage girls. Children of full-time working mothers in these groups consume significantly less fiber than children of homemakers (Exhibit 2.9), **and** dietary fiber intakes are considerably lower than recommended levels (85 and 58 percent, respectively).

Although mothers' employment status seems to make no difference for teenage boys, they also have lower than recommended intakes of dietary fiber (86 percent overall). These findings suggest a role for education on food sources rich in dietary fiber directed at school-age children as well as working mothers.

Exhibit 2.9

Dietary Fiber Intake, by Age Group and Maternal Employment Status



Consumption of Soft Drinks, Added Sugar, and Fried Potatoes

Children's consumption of soda and fruit-flavored drinks is high, especially older children's. These beverages are typically low in essential nutrients and are felt to contribute to the large proportion of food energy that children obtain from added sugar (Gleason and Suitor, 2001).[25] Furthermore, these aspects of children's diet quality may be affected by maternal employment. Reduced maternal supervision might lead to greater consumption of high sugar foods and beverages, as could increased reliance on fast food. On the other hand, USDA's child care (CACFP) and school meal programs (SBP/NSLP) typically provide milk and 100 percent fruit juice rather than soda, fruit-flavored drinks, or other sweetened beverages. To the extent that working mothers rely on these programs for a substantial portion of their children's food intake, their children may not be any more apt to consume large quantities of these foods than other children.

A question has also been raised as to whether the HEI score for the Food Guide Pyramid vegetable group may reflect a high intake of fried potatoes rather than a variety of lower fat, more nutrient-dense vegetables. Because intake of French fries may be associated with fast food, it was useful to compare children's intake of both fried potatoes and vegetables other than potatoes by maternal employment status.

Soda and Other Soft Drinks

Three categories were used to examine children's average daily intake of soda and other soft drinks:[26]

- None
- Up to 8 fluid ounces
- More than 8 fluid ounces

The serving size cut-point of 8 fluid ounces was selected to differentiate between moderate and high intakes of these beverages. It was based on the Food and Drug Administration (FDA) serving size for nutrition labeling (the amount customarily consumed by people age 4 and above) of soda and fruit drinks, and has been used in other studies.

About one fifth of all children consume more than one serving of soda per day, on average (Exhibit 2.10). This varies to a large extent by age, ranging from less than 10 percent of preschoolers to the high of 70 percent of teenage boys consuming this much soda per day. The frequency of consumption of other soft drinks (primarily fruit drinks) is similar (23 percent), but does not vary as widely with age as soda consumption (Exhibit 2.11). There is little difference in soda and other soft drink consumption by income or number of adults in the child's household.

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[25] Added sugars include sugar and sweeteners eaten separately or used as ingredients in processed or prepared foods. They do not include naturally occurring sugars such as the lactose in milk or the fructose in fruit (USDA, 1992).

[26] Includes regular and diet soda, sweetened carbonated water, and sugar- and artificially sweetened fruit drinks (not 100 percent fruit juice) and iced tea.

Exhibit 2.10

Daily Soda Consumption

	Maternal Employment Status			
	Full-Time	**Part-Time**	**Homemaker**	**All Children**
All children				
None	41.2%**	45.9%	46.1%	43.9%
Up to 8 ounces	36.3	34.8	34.9	35.4
More than 8 ounces	22.5**	19.3	19.0	20.7
Maximum sample size	3,559	1,675	2,592	7,826
By age group				
2 to 4 years				
None	47.4%**	54.7%	54.2%	51.5%
Up to 8 ounces	41.0	38.4	36.5	38.8
More than 8 ounces	11.6	6.9*	9.3	9.7
Maximum sample size	1,824	895	1,542	4,261
5 to 8 years				
None	39.9%	48.1%	42.7%	42.7%
Up to 8 ounces	38.9	36.8	40.5	39.0
More than 8 ounces	21.2*	15.1	16.8	18.3
Maximum sample size	836	393	631	1,860
9 to 12 years				
None	36.0%	28.4%*	36.0%	34.1%
Up to 8 ounces	23.9	30.8	30.1	27.2
More than 8 ounces	40.2	40.8	33.8	38.7
Maximum sample size	428	206	238	827
13 to 17 years, male				
None	17.7%	8.9%***	23.8%	16.9%
Up to 8 ounces	12.8	17.5	9.9	13.3
More than 8 ounces	69.5	73.6	66.3	69.8
Maximum sample size	232	86	99	417
13 to 17 years, female				
None	18.7%	21.1%	24.2%	20.4%
Up to 8 ounces	26.3	15.1*	28.3	24.1
More than 8 ounces	55.0	63.8	47.4	55.5
Maximum sample size	239	95	82	416
By income category				
Under 130% of poverty				
None	43.8%	45.4%	47.7%	45.8%
Up to 8 ounces	34.7	40.8	35.5	36.3
More than 8 ounces	21.5**	13.7	16.8	17.9
Maximum sample size	822	431	1,051	2,304
130 to 185% of poverty				
None	40.6%	43.0%	42.4%	41.7%
Up to 8 ounces	38.9	36.3	34.0	37.0
More than 8 ounces	20.5	20.7	23.6	21.3
Maximum sample size	470	242	396	1,108

Exhibit 2.10

Daily Soda Consumption

	Maternal Employment Status			
	Full-Time	**Part-Time**	**Homemaker**	**All Children**
Over 185% of poverty				
None	40.3%**	46.4%	46.2%	43.4%
Up to 8 ounces	36.0	31.8	34.8	34.5
More than 8 ounces	23.7**	21.8	19.0	22.1
Maximum sample size	2,267	1,002	1,145	4,414
By number of adults				
One				
None	39.5%***	41.6%**	58.4%	44.5%
Up to 8 ounces	34.2*	40.0**	25.8	33.0
More than 8 ounces	26.3***	18.4	15.8	22.4
Maximum sample size	571	184	244	999
Multiple				
None	41.5%	46.4%	44.9%	43.8%
Up to 8 ounces	36.7	34.1	35.8	35.7
More than 8 ounces	21.8	19.5	19.3	20.5
Maximum sample size	2,988	1,491	2,348	6,827

*** Statistically significant difference from children whose mothers are homemakers at the 1 percent level
** Statistically significant difference from children whose mothers are homemakers at the 5 percent level
* Statistically significant difference from children whose mothers are homemakers at the 10 percent level

With respect to maternal employment, there is a small but significant increase in the proportion of children consuming more than one serving of soda per day if the mother is working full-time *versus* not at all (22 *versus* 19 percent). There are also fewer children of full-time working mothers compared with homemakers who do not consume soda at all (41 *versus* 46 percent). Children with part-time working mothers resemble those with mothers who are homemakers with regard to soda consumption.

Similar trends are evident among some but not all age and income groups. The strongest relationship between maternal employment and soda consumption is seen among children in single adult households. Exhibit 2.12 illustrates that more children of single, working mothers consume both moderate (up to 8 ounces) and higher amounts (more than 8 ounces) of soda than children of single, non-working mothers. In addition, children with single homemaker mothers are significantly more likely not to consume soda at all than children whose mothers work either part-time or full-time (58 *versus* 40 to 42 percent).

Exhibit 2.11

Daily Consumption of Soft Drinks Other Than Soda[a]

	Maternal Employment Status			
	Full-Time	**Part-Time**	**Homemaker**	**All Children**
All children				
None	39.4%	44.0%	41.0%	41.0%
Up to 8 ounces	37.3	33.9	35.5	35.9
More than 8 ounces	23.3	22.0	23.4	23.1
Maximum sample size	3,559	1,675	2,592	7,826
By age group				
2 to 4 years				
None	38.0%	49.7%**	42.3%	42.1%
Up to 8 ounces	40.7	33.0*	37.3	37.8
More than 8 ounces	21.3	17.3	20.4	20.1
Maximum sample size	1,824	895	1,542	4,261
5 to 8 years				
None	38.9%	38.4%	37.4%	38.2%
Up to 8 ounces	36.6	40.3	36.2	37.2
More than 8 ounces	24.5	21.3	26.4	24.5
Maximum sample size	836	393	631	1,860
9 to 12 years				
None	42.0%	32.1%	40.6%	39.2%
Up to 8 ounces	34.9	33.3	35.3	34.6
More than 8 ounces	23.0	34.7**	24.1	26.2
Maximum sample size	428	206	238	827
13 to 17 years, male				
None	48.3%	48.9%	47.1%	48.2%
Up to 8 ounces	25.0	13.4	19.0	21.1
More than 8 ounces	26.8	37.7	33.9	30.7
Maximum sample size	232	86	99	417
13 to 17 years, female				
None	40.5%	32.9%	39.3%	38.5%
Up to 8 ounces	24.0	36.5	32.4	28.6
More than 8 ounces	35.5	30.6	28.3	32.9
Maximum sample size	239	95	82	416
By income category				
Under 130% of poverty				
None	29.6%***	41.7%	42.9%	37.9%
Up to 8 ounces	41.8**	34.6	33.7	36.7
More than 8 ounces	28.6*	23.6	23.3	25.4
Maximum sample size	822	431	1,051	2,304
130 to 185% of poverty				
None	38.3%	37.5%	41.7%	39.2%
Up to 8 ounces	32.3	36.6	38.0	35.1
More than 8 ounces	29.5**	25.9	20.3	25.6
Maximum sample size	470	242	396	1,108

Exhibit 2.11

Daily Consumption of Soft Drinks Other Than Soda[a]

	Maternal Employment Status			
	Full-Time	**Part-Time**	**Homemaker**	**All Children**
Over 185% of poverty				
None	43.4%	46.5%**	39.1%	43.1%
Up to 8 ounces	36.6	33.2	36.6	35.7
More than 8 ounces	20.1*	20.3	24.3	21.2
Maximum sample size	2,267	1,002	1,145	4,414
By Number of Adults				
One				
None	32.9%	48.6%***	30.0%	36.2%
Up to 8 ounces	39.7	32.2	39.8	38.0
More than 8 ounces	27.4	19.2**	30.2	25.8
Maximum sample size	571	184	244	999
Multiple				
None	40.7%	43.5%	42.1%	41.7%
Up to 8 ounces	36.9	34.1	35.1	35.6
More than 8 ounces	22.5	22.5	22.9	22.7
Maximum sample size	2,988	1,491	2,348	6,827

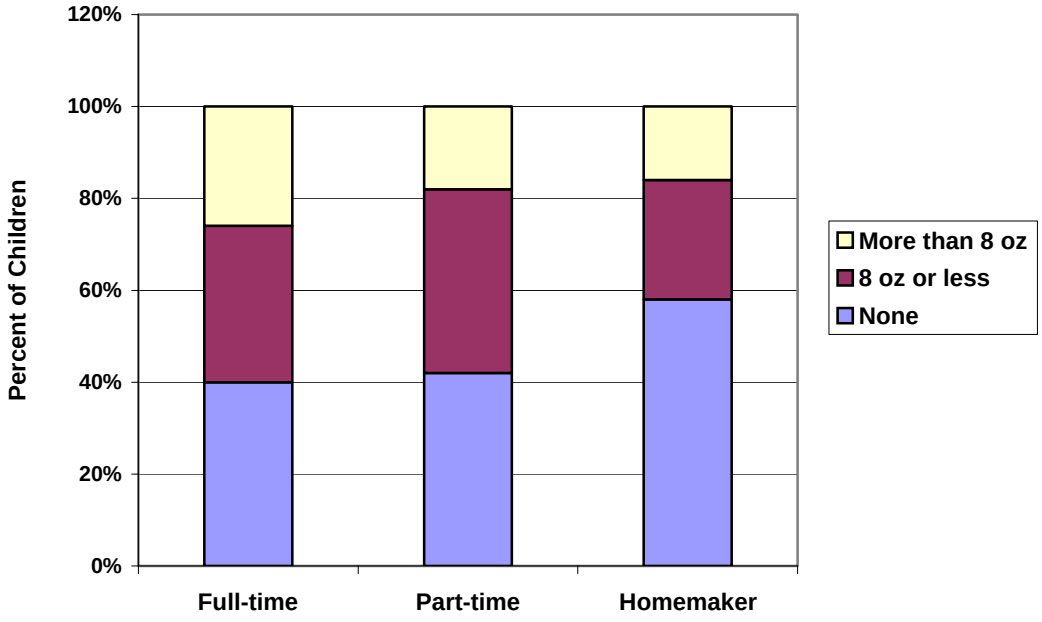
a Includes fruit drinks (not juice), iced tea, lemonade.

*** Statistically significant difference from children whose mothers are homemakers at the 1 percent level
** Statistically significant difference from children whose mothers are homemakers at the 5 percent level
* Statistically significant difference from children whose mothers are homemakers at the 10 percent level

The analysis of children's consumption of other soft drinks provides little evidence of a relationship with maternal employment. The only consistent and statistically significant finding is a tendency for low-income (at or below 185 percent of poverty) children of full-time working mothers to consume more soft drinks (other than soda) than children of nonworking mothers (Exhibit 2.11).

Exhibit 2.12

Soda Consumption Among Children in Single-Adult Households, by Maternal Employment Status



Added Sugar

The CSFII Pyramid servings data include information on added sugar intake. Most of the added sugars in the typical American diet come from foods in the Pyramid tip—soft drinks, candy, jams, jellies, syrups, and table sugar added to foods like coffee or cereal. Added sugars in the food groups come from foods such as ice cream, sweetened yogurt, chocolate milk, canned or frozen fruit with heavy syrup, and sweetened bakery products like cakes and cookies. Quantities of added sugar are expressed in terms of teaspoons. For reference, USDA's Food Guide Pyramid provides recommended maximum amounts of added sugars at three different levels of total food energy intake. They range from 6 teaspoons a day for a diet of 1,600 calories to 18 teaspoons a day for intakes of 2,800 calories per day. Results here are presented separately for total added sugars and added sugars from all soft drinks combined.

Children's mean intake of total added sugars is 23 teaspoons, which exceeds the recommended maximum of 18 teaspoons for individuals with the highest calorie requirements (Exhibit 2.13).[27] Almost half of children's sugar consumption comes from soda and other soft drinks (10 teaspoons). Added sugar consumption from all sources generally increases as children get older, although intakes are quite different between teenage boys and girls (35 and 24 teaspoons, respectively). This may reflect the lower average food energy intakes of teenage girls. Added sugar intake also seems to increase with household income, although not the contribution from soda and other soft drinks.

[27] Since the analysis was completed, the DRI Committee made a recommendation that added sugars not provide more than 25 percent of total energy intake (IOM/FNB, 2002). For a 1,600-calorie diet this would amount to no more than 400 calories, or about 25 teaspoons of added sugar per day—considerably more than the USDA recommendation.

Exhibit 2.13

Mean Added Sugar Intake (teaspoons per day)

	Maternal Employment Status			
	Full-Time	**Part-Time**	**Homemaker**	**All Children**
All children				
Added sugar from all sources	23.1	23.1	22.4	22.9
Added sugar from soda and other soft drinks	10.4	9.6	9.8	10.1
Maximum sample size	3,559	1,675	2,592	7,826
By age group				
2 to 4 years				
Added sugar from all sources	15.1**	14.1	14.0	14.5
Added sugar from soda and other soft drinks	5.5**	4.4	4.9	5.1
Maximum sample size	1,824	895	1,542	4,261
5 to 8 years				
Added sugar from all sources	20.3**	19.4	18.8	19.6
Added sugar from soda and other soft drinks	7.4**	6.1	6.4	6.8
Maximum sample size	836	393	631	1,860
9 to 12 years				
Added sugar from all sources	24.3	26.5	25.1	25.1
Added sugar from soda and other soft drinks	9.8	11.0	9.8	10.1
Maximum sample size	428	206	238	827
13 to 17 years, male				
Added sugar from all sources	35.5	34.3	34.6	35.1
Added sugar from soda and other soft drinks	20.2	17.5	19.7	19.5
Maximum sample size	232	86	99	417
13 to 17 years, female				
Added sugar from all sources	24.2	24.4	22.6	23.9
Added sugar from soda and other soft drinks	13.1	12.1	11.8	12.6
Maximum sample size	239	95	82	416
By income category				
Under 130% of poverty				
Added sugar from all sources	21.0	20.3	19.7	20.3
Added sugar from soda and other soft drinks	10.0	9.1	9.6	9.6
Maximum sample size	822	431	1,051	2,304

Exhibit 2.13

Mean Added Sugar Intake (teaspoons per day)

	Maternal Employment Status			
	Full-Time	**Part-Time**	**Homemaker**	**All Children**
130 to 185% of poverty				
Added sugar from all sources	22.0	23.7	23.3	22.7
Added sugar from soda and other soft drinks	9.9	10.3	10.3	10.1
Maximum sample size	470	242	396	1,108
Over 185% of poverty				
Added sugar from all sources	24.0	24.0	23.6	23.9
Added sugar from soda and other soft drinks	10.6*	9.6	9.5	10.2
Maximum sample size	2,267	1,002	1,145	4,414
By number of adults				
One				
Added sugar from all sources	23.0**	22.1	20.8	22.3
Added sugar from soda and other soft drinks	10.3	10.1	9.7	10.0
Maximum sample size	571	184	244	999
Multiple				
Added sugar from all sources	23.1	23.4	22.5	23.0
Added sugar from soda and other soft drinks	10.4	9.6	9.8	10.1
Maximum sample size	2,988	1,491	2,348	6,827

*** Statistically significant difference from children whose mothers are homemakers at the 1 percent level
** Statistically significant difference from children whose mothers are homemakers at the 5 percent level
* Statistically significant difference from children whose mothers are homemakers at the 10 percent level

There are no discernable differences overall in children's intake of added sugars by maternal employment status. The data do suggest a somewhat higher intake of added sugars among two groups of children whose mothers work full-time compared with their homemaker mother counterparts: younger children (2 to 8 years old) and children in single-adult households. Differences are significant and of the magnitude of 1 to 2 teaspoons of added sugar per day.

Fried Potatoes

As noted above, the number of servings of vegetables a child consumes may include a significant share of fried potatoes, which are typically high in fat content. Pyramid servings data and USDA food codes that identify fried potatoes (French fries, home fries, tater tots, and hash browns) were used to separately examine children's intake of fried potatoes and vegetables, excluding fried potatoes. Vegetable servings are defined in the Pyramid database as 1 cup of raw leafy vegetables; ½ cup of other vegetables, cooked (includes fried potatoes) or chopped raw; or ¾ cup of vegetable juice. Serving sizes for very young children, 2 to 3 years old are two-thirds the size (USDA/ARS, 2000; USDA/CNPP, 1999). The recommended number of vegetable group servings ranges from 3 to 5, depending on total food energy intake (Bowman *et al.*, 1998; USDA, 1992).

Children's consumption of all vegetables is 2.6 servings per day overall (Exhibit 2.14). This amount falls short of even the lower bound of the recommended number of servings to consume in a day. (Low levels of vegetable consumption are also reflected in the HEI vegetable score of 5.4 discussed earlier in this chapter.) Fried potatoes contribute a little more than one fourth of the daily servings of total vegetables for all children combined (0.7 servings). Teenage boys have the highest intake of fried potatoes at 1.0 serving per day, on average. Neither fried potato nor other vegetable consumption vary with household income or the number of adults.

Maternal employment is associated with a slightly, but statistically higher intake of fried potatoes among children whose mothers work full-time compared with children of homemakers (0.7 *versus* 0.6 servings). Results are generally consistent across income groups and regardless of the number of adults in the household. Whereas the youngest children's (2 to 4 years old) diets follow this pattern for fried potatoes, however, they also consume more non-fried potato vegetables if their mothers work full-time. The importance of these findings is unclear, however, as the differences only amount to one or two tenths of a vegetable serving.

Exhibit 2.14

Consumption of Fried Potatoes and Other Vegetables (servings per day) [a]

	Maternal Employment Status			
	Full-Time	**Part-Time**	**Homemaker**	**All Children**
All children				
Fried potatoes	0.7***	0.7	0.6	0.7
Vegetables other than fried potatoes	1.9	1.9	2.0	1.9
Maximum sample size	3,559	1,675	2,592	7,826
By age group				
2 to 4 years				
Fried potatoes	0.6***	0.5	0.5	0.5
Vegetables other than fried potatoes	1.8***	1.6	1.7	1.7
Maximum sample size	1,824	895	1,542	4,261
5 to 8 years				
Fried potatoes	0.6***	0.4	0.4	0.5
Vegetables other than fried potatoes	1.6	1.6	1.6	1.6
Maximum sample size	836	393	631	1,860
9 to 12 years				
Fried potatoes	0.7	0.6	0.6	0.7
Vegetables other than fried potatoes	1.9	1.9	2.0	1.9
Maximum sample size	428	206	238	827
13 to 17 years, male				
Fried potatoes	1.1	1.2	0.8	1.0
Vegetables other than fried potatoes	2.8	2.3	2.8	2.7
Maximum sample size	232	86	99	417
13 to 17 years, female				
Fried potatoes	0.7	0.8	0.7	0.7
Vegetables other than fried potatoes	2.0	2.1	2.3	2.1
Maximum sample size	239	95	82	416

Exhibit 2.14

Consumption of Fried Potatoes and Other Vegetables (servings per day) [a]

	Maternal Employment Status			
	Full-Time	**Part-Time**	**Homemaker**	**All Children**
By income category				
Under 130% of poverty				
Fried potatoes	0.8**	0.7	0.6	0.7
Vegetables other than fried potatoes	2.0	2.1	2.1	2.0
Maximum sample size	822	431	1,051	2,304
130 to 185% of poverty				
Fried potatoes	0.6	0.7*	0.5	0.6
Vegetables other than fried potatoes	2.1	1.7*	1.9	2.0
Maximum sample size	470	242	396	1,108
Over 185% of poverty				
Fried potatoes	0.7**	0.6	0.6	0.7
Vegetables other than fried potatoes	1.9	1.8	1.9	1.9
Maximum sample size	2,267	1,002	1,145	4,414
By number of adults				
One				
Fried potatoes	0.7**	0.7**	0.5	0.7
Vegetables other than fried potatoes	2.2	2.1	1.9	2.1
Maximum sample size	571	184	244	999
Multiple				
Fried potatoes	0.7**	0.6	0.6	0.6
Vegetables other than fried potatoes	1.9	1.8**	2.0	1.9
Maximum sample size	2,988	1,491	2,348	6,827

a A serving of vegetables is defined in the Food Guide Pyramid as 1 cup of raw leafy vegetables; ½ cup of other vegetables, cooked or chopped raw; or ¾ cup of vegetable juice.

*** Statistically significant difference from children whose mothers are homemakers at the 1 percent level
** Statistically significant difference from children whose mothers are homemakers at the 5 percent level
* Statistically significant difference from children whose mothers are homemakers at the 10 percent level

Summary

The analysis reported here provides evidence of a net *negative* association of mother's employment on children's nutrition. The findings are especially notable among children whose mothers work full-time compared to children with homemaker mothers. Poorer diet quality overall, measured by the HEI, was determined to be the net outcome of strong negative results for 5- to 8-year-olds (fewer daily servings of grains and fruit, and less variety overall) and weaker positive results for preschoolers (more vegetables and less saturated fat). Although preschool children of full-time working mothers have higher HEI scores than children of homemakers, they consume significantly more food energy, perhaps putting them at higher risk for overweight.

Other nutrition outcomes for which significantly poorer outcomes for children of working mothers were found include lower mean iron and dietary fiber intake among 5- to 12-year-olds, lower iron

intake for teenage girls, greater soda consumption, and greater consumption of fried potatoes. Of particular concern is the association between maternal employment and lower iron intake among teenage girls. This group has the highest requirements and the lowest relative mean intake of iron (94 percent of RDA); teenage girls are also at greater risk for underconsumption of food energy and dietary fiber, with more than half consuming less than 90 percent of the 1989 REA and less than 60 percent meeting daily recommendations for fiber.

These differences do not necessarily indicate causation. They could perhaps be accounted for by other differences among the groups that are correlated with maternal employment status. This possibility is explored in the next chapter. Nonetheless, they are of interest in their own right, as they identify areas of potential concern for policymakers in a well-defined population.

Chapter 3
Multivariate Analyses of Mother's Work and Children's Nutrition Outcomes

In Chapter 2, it was shown that children whose mothers work full-time tend to have less positive nutrition outcomes than children of nonworking mothers. Areas in which significant differences were seen included overall diet quality (Healthy Eating Index score); food energy intake for infants and preschool children; mean intake of iron, zinc, and dietary fiber among teenage girls; dietary fiber intake for school-age children; and consumption of soda.

It is plausible that these differences could be caused by maternal employment, because working mothers have less time to supervise their children's diets. These differences, however, could also be attributable in part to other characteristics that are correlated with maternal employment. Conversely, if other household circumstances are more favorable for children of working mothers, the bivariate differences could be **underestimates** of the effects of maternal employment.

In fact, as shown below, children of working mothers are relatively advantaged in some important ways: their households have more income, and the mothers have more education and are more knowledgeable about nutrition. On the other hand, resources available **excluding** the mother's earnings are greater among households with homemaker mothers than among those with full-time working mothers (but higher still among households with part-time working mothers). In a sense, the full-time working mothers "have to" work.

Other factors could cause nutrition outcome differences in either direction: race and ethnicity (full-time working mothers are more likely to be black, and nonworking mothers are more likely to be Hispanic), mother's age (working mothers tend to be older), region and urbanicity, and household size.

In this chapter, after documenting the other differences in household circumstances, estimates are presented of differences in selected children's nutrition outcomes controlling for these factors. The qualitative findings for this set of outcomes remain unchanged. Virtually all differences that were previously found to be statistically significant remain so after regression adjustment. A few additional differences for particular age groups attain statistical significance. This supports the hypothesis that full-time maternal employment causes the observed differences in child nutrition outcomes.

Child, Household, and Maternal Characteristics

Marked demographic and socioeconomic differences can be seen between children of working and nonworking mothers, and, to a lesser extent, between the children of mothers who work full-time *versus* part-time. Children of homemaker mothers are more likely to be preschoolers, Hispanic, poor, and from large households than children of working mothers; and homemaker mothers themselves are younger and less well educated than working mothers. Children of part-time working mothers are disproportionately non-Hispanic white, and their mothers tend to be better educated than full-time

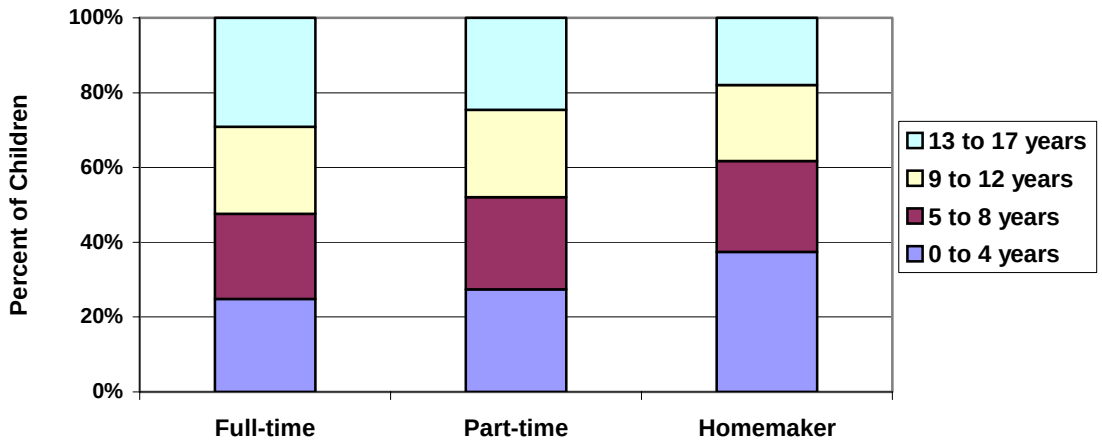
working mothers. In addition, working mothers, both full- and part-time, are more knowledgeable about nutrition than homemakers, although nutrition attitudes are similar across the three groups.

Characteristics of Sample Children

The CSFII sample children range in age from infancy to 17 years. Younger children are naturally concentrated among nonworking mothers, reflecting considerations of child development and need for child care. Nearly two fifths of children of nonworking mothers are under age five, *versus* only a quarter of children of working mothers (Exhibit 3.1). (Note that all analyses presented in this report are age-adjusted.)

Exhibit 3.1

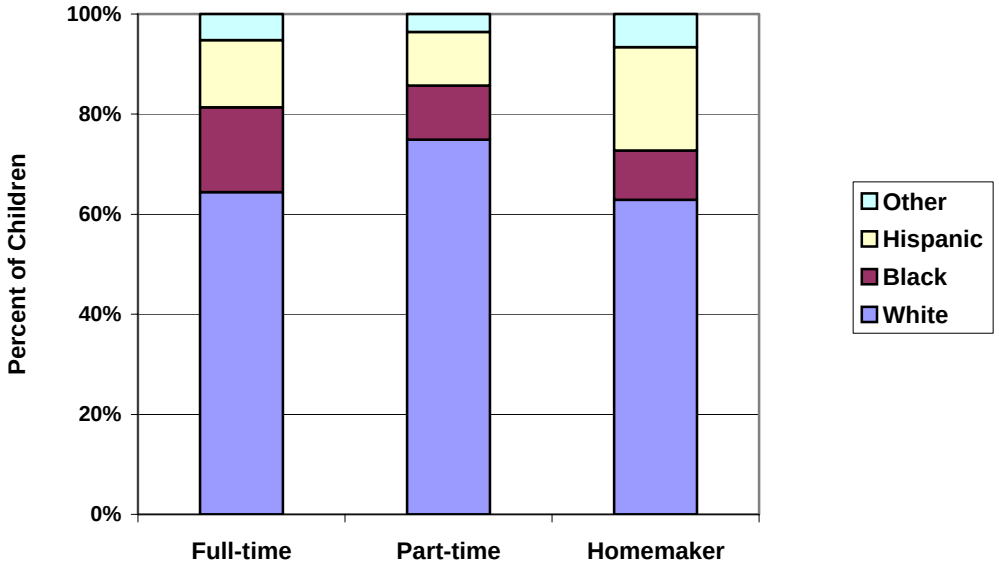
Age of Children, by Maternal Employment Status



Racial/ethnic background also varies markedly across the three groups. Three quarters of children whose mothers work part-time are white, in contrast to fewer than two thirds in the other two groups (Exhibit 3.2). Hispanic children are heavily concentrated among nonworking mothers, whereas black children are especially likely to have full-time working mothers.

Exhibit 3.2

Race/Ethnicity of Children, by Maternal Employment Status

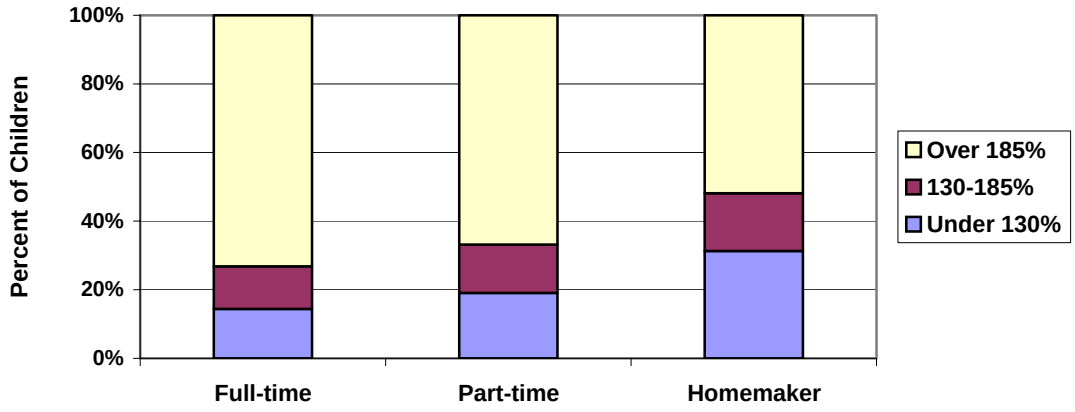


Characteristics of Households

Households with homemaker mothers are somewhat larger on average than households with full-time or part-time working mothers. Although the number of adults is the same on average (2.1), households with homemaker mothers tend to include more children (2.2 *versus* 1.8 to 2.0). They are also substantially poorer (Exhibit 3.3) and more likely to be receiving public assistance (14 percent *versus* 2 to 4 percent). Barely half of households with homemaker mothers have incomes over 185 percent of the federal poverty level, compared with two thirds to three quarters of households with mothers who work part-time and full-time (52 percent *versus* 67 and 73 percent).

Exhibit 3.3

Household Income as Percent of Poverty, by Maternal Employment Status

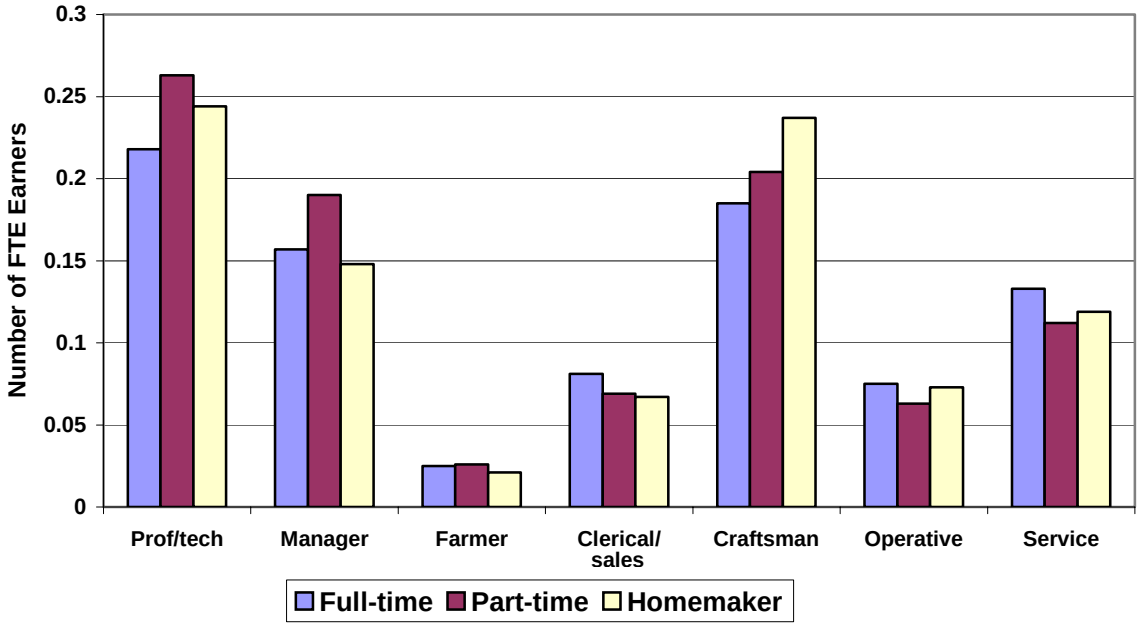


This analysis of relative household income may be seriously misleading, however, with regard to the resources and choices available to mothers. The higher income of households with full-time working mothers is in fact explained by those mothers' very decision to work. To understand the relative well-being of these groups of households, we need to consider how well off they would be based on other household income if none of the mothers chose to work. Although it is not possible to determine this exactly based on available data, an approximate answer can be obtained by examining the occupations and hours worked by other adults in these households. It may reasonably be assumed that a mother's decision to work is generally an effect rather than a cause of the employment and earnings of other household members (e.g., her husband).

It appears that mothers who work part-time are initially better off than homemaker mothers, and that mother who work full-time are initially worse off. The mean number of full-time equivalent workers other than the mother herself is 0.90 for homemaker mothers, *versus* 0.93 for part-time working mothers and 0.87 for full-time working mothers. Furthermore, part-time working mothers are more likely to have an earner in the household who is professional/technical or managerial, whereas full-time working mothers are more likely to have an earner who is a clerical, sales, or service worker (Exhibit 3.4).

Exhibit 3.4

FTE Earners in Mothers' Households, by Occupation and Maternal Employment Status



FTE = Full Time Equivalent

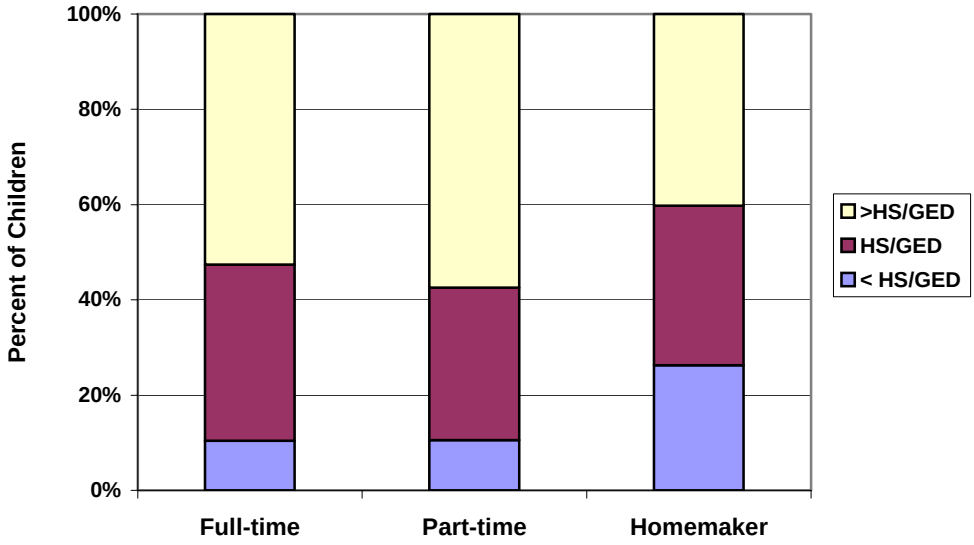
This information can be used to construct a crude index of "other earnings" in households. The numbers of full-time equivalent workers in each occupation, male and female, are multiplied by the average weekly earnings of men and women in those occupations in 1996, based on the CPS. The value of this index is $587 for homemakers, *versus* $558 for full-time and $626 for part-time working mothers—i.e., 7 percent higher for part-time working mothers than for homemakers, and 5 percent lower for full-time working mothers than for homemakers. The occupational distribution of other adults in mothers' households thus strengthens the pattern seen with regard simply to the presence and number of other earners.

Demographic Characteristics of Mothers

A quarter of homemaker mothers are under age 30, compared with less than a fifth of working mothers (25 percent *versus* 19 percent). Homemaker mothers have substantially less education than full-time, and especially part-time, working mothers (Exhibit 3.5).

Exhibit 3.5

Mothers' Education, by Employment Status



Maternal Nutrition Knowledge and Attitudes

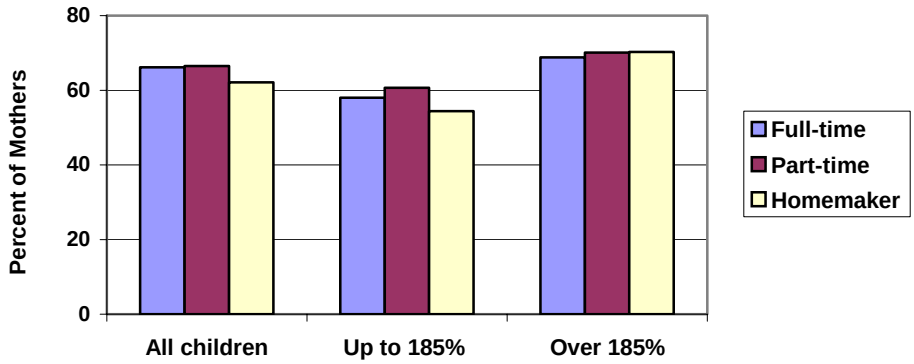
The extent to which working mothers differ from nonworking mothers in their nutrition knowledge, and awareness of and attitudes towards dietary recommendations and diet-disease relationships, may also help to explain differences in child outcomes. A subset of mothers who responded to CSFII was queried about their nutrition knowledge and attitudes in the DHKS. Their responses were summarized into two indices.

Nutrition knowledge is represented as a respondent's score (percent correct) across three batteries of items: a group of five items pertaining to recommended numbers of servings from the main Food Guide Pyramid food groups; a group of four items pertaining to practical knowledge about dietary fat, saturated fat, cholesterol, and nutrient amounts in foods; and a group of seven items pertaining to relationships between diet and disease. A score was calculated for each battery, and was then averaged over the three.

Working mothers have significantly higher nutrition knowledge scores than nonworking mothers: 66 to 67 percent *versus* 62 percent ($p < 0.05$ for both). The scores are strongly related to household income; controlling for income group, the differences by maternal employment nearly vanish (Exhibit 3.6).

Exhibit 3.6

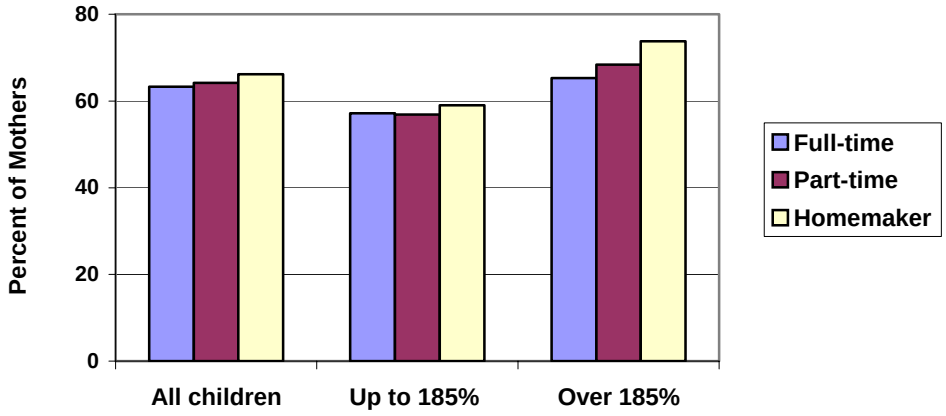
Mothers' Nutrition Knowledge Score, by Employment Status and Household Income Relative to Poverty



Nutrition attitudes were similarly measured by averaging the mother's scores over three sets of questions. The batteries pertained to perceived importance of dietary guidelines (11 items), importance of safety and nutrition in food purchasing decisions (two items), and beliefs about the relationship between diet and health (three items). The mean attitude scores were similar among the three groups of mothers (63 to 66 percent). Among mothers in higher-income households, however, homemaker mothers had significantly higher attitude scores than full-time working mothers ($p < 0.01$; Exhibit 3.7).

Exhibit 3.7

Mothers' Nutrition Attitude Score, by Employment Status and Household Income Relative to Poverty



The remainder of this chapter presents results from multivariate models of child nutrition outcomes. Covariates include measures of characteristics of the children, their households, and their mothers. Because the DHKS was administered to mothers of only about 15 percent of the sample of children for whom dietary recall data were available, nutrition knowledge and attitude measures are not included in the models. A supplementary analysis, however, restricted to those dyads for which DHKS data were available, found that the estimated regression-adjusted differences were virtually identical when nutrition knowledge and attitude measures were added to the models.

Healthy Eating Index and Component Scores

It was found in Chapter 2 that **children of full-time working mothers** had significantly lower mean HEI scores than their counterparts with homemaker mothers. This was attributable to lower scores for grains, fruit, and variety, despite higher scores for vegetables. These significant results for all ages combined were repeated for 5- to 8-year-olds. Similar results were seen for 9- to 12-year-olds, with the difference that the total fat component was also significantly worse, and the vegetable score was not significantly better. For 2- to 4-year-olds, in contrast, the overall HEI score was significantly higher among children of working mothers, due to higher scores on grains, vegetables, meat, and saturated fat, and despite lower scores on sodium.

Few significant differences were found between **children of part-time working mothers** and homemakers—none for all ages combined, and positive effects for 2- to 4-year-olds, attributable to higher scores for fruit, total fat, saturated fat, and cholesterol. A negative effect was seen with regard to saturated fat for 9- to 12-year-olds.

After taking account of children's age (and teenagers' sex), mother's age, race/ethnicity, and education, the number of adults and children in the household, an index of earnings from other adults, region of the country, and urbanicity, quite similar results are obtained. Mothers' **full-time employment** is associated with a general decrease of 0.6 points in children's HEI ($p < 0.10$), attributable to lower scores on grains, fruit, and variety (Exhibit 3.8). The countervailing positive effect for vegetables loses statistical significance. As in the bivariate analyses, the overall effect is essentially the net effect of strong negative results for 5- to 8-year-olds, and weaker positive results for preschoolers (age 2 to 4). The overall negative difference for 9- to 12-year-old children of full-time working mothers is no longer statistically significant—but it missed statistical significance at the 10 percent level by only a small margin. Regression-adjusted differences for older children (age 9 to 12 and teenagers) are small, with a few scattered marginally significant effects.

The regression-adjusted results for 5- to 8-year-olds look like those for all children, only stronger: significant negative differences for grains, fruit, and variety as well as overall (and a positive difference for vegetables). For preschoolers (age 2 to 4), in contrast, full-time employment is associated with **better** outcomes overall, due to superior scores on grains, vegetables, and meat (and despite inferior scores on sodium).

Again, as in the bivariate analyses, much weaker patterns are seen for **part-time employment**. For all children combined the differences are virtually zero in total HEI score and for each component. A significant positive overall difference is seen for preschoolers, due to fruit and saturated fat, and a significant negative overall difference for 9- to 12-year-olds, due to fruit and total fat.

Exhibit 3.8

Regression-Adjusted Differences for HEI and Component Scores:[a] Working Mothers *versus* Nonworking Mothers

Outcome	Mean for All Children	Regression-Adjusted Differences for Maternal Employment Status	
		Full-time	Part-time
All children			
HEI score	66.1	–0.6*	–0.1
Grain	7.4	–0.1**	–0.0
Vegetable	5.4	0.2	0.0
Fruit	4.6	–0.3**	–0.0
Milk	6.7	–0.1	0.1
Meat	5.8	0.0	–0.1
Total fat	7.3	0.0	–0.0
Saturated fat	5.9	–0.1	–0.1
Cholesterol	8.5	0.0	0.1
Sodium	6.9	0.0	–0.0
Variety	7.7	–0.2***	–0.0
By age group			
2 to 4 years			
HEI score	72.1	0.7**	1.1**
Grain	8.0	0.2***	0.1
Vegetable	5.6	0.4***	0.0
Fruit	6.8	–0.1	0.5***
Milk	7.4	0.1	–0.1
Meat	6.0	0.2**	0.0
Total fat	7.5	0.0	0.1
Saturated fat	5.6	0.2	0.3**
Cholesterol	8.9	0.0	0.1
Sodium	8.6	–0.2***	–0.0
Variety	7.9	0.0	0.0
5 to 8 years			
HEI score	67.4	–0.9*	–0.6
Grain	7.4	–0.2**	–0.0
Vegetable	5.0	0.4***	0.2
Fruit	5.0	–0.5***	–0.4*
Milk	7.5	–0.2	0.0
Meat	5.5	–0.1	–0.0
Total fat	7.3	0.0	0.0
Saturated fat	5.6	0.0	–0.2
Cholesterol	8.8	0.1	–0.0
Sodium	7.6	–0.1	0.0
Variety	7.8	–0.4***	–0.1
9 to 12 years			
HEI score	65.4	–1.3	–1.7*
Grain	7.4	–0.3*	–0.2
Vegetable	5.2	0.0	–0.2

Exhibit 3.8

Regression-Adjusted Differences for HEI and Component Scores:[a] Working Mothers *versus* Nonworking Mothers

Outcome	Mean for All Children	Regression-Adjusted Differences for Maternal Employment Status	
		Full-time	Part-time
Fruit	4.0	–0.5*	–0.6*
Milk	6.8	0.1	0.2
Meat	5.8	0.0	0.2
Total fat	7.3	–0.2	–0.5**
Saturated fat	5.9	–0.3	–0.3
Cholesterol	8.6	0.1	0.1
Sodium	6.3	0.1	–0.0
Variety	8.1	–0.3	–0.3
13 to 17 years, male			
HEI score	61.4	–1.2	0.9
Grain	7.4	0.0	0.4
Vegetable	5.7	0.1	0.3
Fruit	3.0	–0.4	0.1
Milk	6.3	0.1	0.5
Meat	6.7	0.3	–0.2
Total fat	6.9	–0.1	0.1
Saturated fat	6.1	–0.4	–0.4
Cholesterol	7.3	–0.5*	–0.0
Sodium	4.4	–0.1	–0.2
Variety	7.6	–0.2	0.4
13 to 17 years, female			
HEI score	61.9	0.1	0.8
Grain	6.4	–0.4	–0.2
Vegetable	5.5	–0.3	–0.1
Fruit	3.5	0.3	0.8*
Milk	4.5	–0.4	–0.1
Meat	5.4	–0.4	–0.4
Total fat	7.3	0.6*	0.3
Saturated fat	6.5	0.4	0.1
Cholesterol	8.8	0.4	0.3
Sodium	7.2	0.3	0.1
Variety	6.9	–0.4	–0.0

a Range of scores for the HEI is 0 to 100; ranges for each component of the HEI are 0 to 10.

*** Statistically significant difference at the 1 percent level.
** Statistically significant difference at the 5 percent level.
* Statistically significant difference at the 10 percent level.

Multivariate models include the following covariates: indicators for children's age groups (including male and female teenagers); indicators for maternal age under 30, over 40; indicators for maternal race/ethnicity black, Hispanic, other nonwhite; indicators for maternal education less than high school diploma, greater than high school diploma, unknown; number of adults and number of children in household; index for earnings from other adult household members; and indicators for region of country and urbanicity.

The major results, that HEI scores of preschool children of full-time and part-time working mothers are significantly higher than those of their counterparts with homemaker mothers, and that the scores of 5- to 8-year-old children with full-time working mothers are notably lower than those of their counterparts with homemaker mothers, remain unchanged after regression adjustment.

Healthy Eating Index Diet Rating

The results for children's diet rating are also qualitatively similar. It was found in Chapter 2 that there were no statistically significant differences for all age groups combined, but a marked higher likelihood that 9- to 12-year-old children of working mothers *versus* homemaker mothers have poor diets. Likewise, in the multivariate analysis, neither full-time nor part-time maternal employment is associated with a significant difference for all children in the proportion that have either good or poor diets (the middle category, "needs improvement", was omitted; Exhibit 3.9). One marginally significant difference is no longer significant—the effect on the likelihood of poor diet for 5- to 8-year-old children of part-time working mothers).

For 9- to 12-year-olds, part-time employment is associated with an 8.5 percentage point greater likelihood of a poor diet ($p < 0.01$); marginally significant effects associated with full-time employment are seen for both the likelihood of a good diet (3.7 percentage points less) and the likelihood of a poor diet (4.7 percentage points more; $p < 0.10$ for both).

Exhibit 3.9

Regression-Adjusted Differences for HEI Diet Rating: Working Mothers *versus* Nonworking Mothers[a,b]

Outcome	Mean for All Children	Regression-Adjusted Outcomes for Maternal Employment Status	
		Full-time	Part-time
All children			
Good diet	9.3%	–0.9%	0.0%
Poor diet	7.8	1.2	0.2
By age group			
2 to 4 years			
Good diet	24.9%	2.4%	1.3%
Poor diet	2.9	–0.4	–0.8
5 to 8 years			
Good diet	7.5%	–1.5%	0.9%
Poor diet	4.9	0.4	–0.8
9 to 12 years			
Good diet	6.5%	–3.7%*	–2.6%
Poor diet	6.9	4.7*	8.5***
13 to 17 years, male			
Good diet	2.3%	1.5%	1.3%
Poor diet	15.9	0.7	–5.7

Exhibit 3.9

Regression-Adjusted Differences for HEI Diet Rating: Working Mothers *versus* Nonworking Mothers[a,b]

Outcome	Mean for All Children	Regression-Adjusted Outcomes for Maternal Employment Status	
		Full-time	Part-time
13 to 17 years, female			
Good diet	2.7%	–2.1%	–0.7%
Poor diet	12.9	–0.9	–4.8

a An HEI score over 80 implies a "good diet," an HEI score between 51 and 80 implies a diet that "needs improvement," and an HEI score less than 51 implies a "poor diet."

b Differences for dichotomous outcomes are expressed as percentage points at the mean.

*** Statistically significant difference at the 1 percent level.
** Statistically significant difference at the 5 percent level.
* Statistically significant difference at the 10 percent level.

Multivariate models include the following covariates: indicators for children's age groups (including male and female teenagers); indicators for maternal age under 30, over 40; indicators for maternal race/ethnicity black, Hispanic, other nonwhite; indicators for maternal education less than high school diploma, greater than high school diploma, unknown; number of adults and number of children in household; index for earnings from other adult household members; and indicators for region of country and urbanicity.

Food Energy Intake

Bivariate comparisons showed no significant differences for all children combined in mean percent of the 1989 REA or percent of children with food energy intake above 110 percent of REA; but children of part-time working mothers were significantly less likely to be consuming less than 90 percent of the REA.

Among age groups, infants and children age 1 to 2 and 3 to 4 with full-time working mothers consumed significantly more food energy relative to the REA than corresponding children of home-maker mothers; and the consumption of less than 90 percent of the REA by children of part-time working mothers was attributable to teenage males.

These results are all replicated in the multivariate analysis (Exhibit 3.10). Several other differences in specific age groups attain statistical significance: higher mean energy intake by 3- to 4-year-old children of part-time working mothers; and, for the probability of energy intake less than 90 percent of REA, lower for infants and 1- to 2-year-old children of full-time working mothers, higher for 5- to 8-year-old children of full-time working mothers, and lower for infants of part-time working mothers.

Exhibit 3.10
Regression-Adjusted Differences for Intake of Food Energy: Working Mothers *versus* Nonworking Mothers

Outcome	Mean for All Children	Regression-Adjusted Differences for Maternal Employment Status	
		Full-time	Part-time
All children			
Mean percent of REA	109.4%	0.5%	1.4%
Percent above 110% REA[a]	42.3	0.6	2.1
Percent below 90% REA[a]	32.2	1.2	–5.4*
By age group			
0 to 11 months			
Mean percent of REA	119.1%	5.6%**	3.6%
Percent above 110% REA	53.5	5.3	7.0
Percent below 90% REA	18.2	–4.6*	–6.5*
1 to 2 years			
Mean percent of REA	114.0%	5.6%***	0.5%
Percent above 110% REA	48.8	4.6*	–3.1
Percent below 90% REA	26.5	–4.2*	–2.3
3 to 4 years			
Mean percent of REA	117.4%	3.3%**	3.2%*
Percent above 110% REA	51.9	2.7	1.6
Percent below 90% REA	25.2	–1.1	–1.3
5 to 8 years			
Mean percent of REA	106.9%	–1.7%	–2.4%
Percent above 110% REA	39.6	–0.6	–3.2
Percent below 90% REA	30.3	5.2**	0.7
9 to 12 years			
Mean percent of REA	108.8%	–3.9%	0.9%
Percent above 110% REA	40.4	–2.0	1.3
Percent below 90% REA	32.7	2.3	–1.6
13 to 17 years, male			
Mean percent of REA	113.7%	3.2%	3.6%
Percent above 110% REA	44.3	1.0	11.4
Percent below 90% REA	34.6	–1.9	–27.0***
13 to 17 years, female			
Mean percent of REA	95.7%	0.1%	5.0%
Percent above 110% REA	30.3	–0.2	6.4
Percent below 90% REA	48.2	4.2	–6.4

a Differences for dichotomous outcomes are expressed as percentage points at the mean.

*** Statistically significant difference at the 1 percent level.
** Statistically significant difference at the 5 percent level.
* Statistically significant difference at the 10 percent level.

Multivariate models include the following covariates: indicators for children's age groups (including male and female teenagers); indicators for maternal age under 30, over 40; indicators for maternal race/ethnicity black, Hispanic, other nonwhite; indicators for maternal education less than high school diploma, greater than high school diploma, unknown; number of adults and number of children in household; index for earnings from other adult household members; and indicators for region of country and urbanicity.

Iron and Zinc Intake

The bivariate analyses showed that children of full-time working mothers consumed significantly less iron (as a percent of 2001 RDA) than their counterparts with homemaker mothers, especially 5- to 8-year-olds, 9- to 12-year-olds, and teenage girls. The latter two age groups also consumed less zinc (relative to 2001 RDA) than their counterparts. Among children of part-time working mothers, 1- to 2-year-olds consumed less zinc than their counterparts.

The multivariate results repeat the results for iron, but find in addition significantly positive differences for iron among infant children of full-time and part-time working mothers, and among teenage males with part-time working mothers (Exhibit 3.11). The negative results for zinc are no longer seen for 9- to 12-year-old children and teenage daughters of full-time working mothers, nor for children age 1 to 2 of part-time working mothers. Thus, it can be inferred that the zinc intake differences for those subgroups are attributable to other differences rather than to maternal employment *per se*. Additional positive differences for zinc are found for male teenage children with both full-time and part-time working mothers. As noted in Chapter 2, with most subgroups consuming far in excess of the 2001 RDA for iron and for zinc, differences due to maternal employment may not be important nutritionally.

Exhibit 3.11
Regression-Adjusted Differences for Intake of Iron and Zinc: Working Mothers *versus* Nonworking Mothers

	Mean for All Children	Regression-Adjusted Differences for Maternal Employment Status	
		Full-time	Part-time
All children			
Mean percent of iron RDA	149.2%	–5.5%**	1.2%
Mean percent of zinc RDA	166.5	–1.0	0.6
By age group			
7 to 11 months			
Mean percent of iron RDA	146.0%	17.9%**	15.6%*
Mean percent of zinc RDA	223.9	5.0	–4.4
1 to 2 years			
Mean percent of iron RDA	151.0%	4.6%	0.8%
Mean percent of zinc RDA	240.8	3.8	–6.3
3 to 4 years			
Mean percent of iron RDA	150.8%	–3.1%	4.0%
Mean percent of zinc RDA	226.6	–1.0	6.9
5 to 8 years			
Mean percent of iron RDA	136.7%	–7.6%**	–2.1%
Mean percent of zinc RDA	192.4	–5.9	–3.0
9 to 12 years			
Mean percent of iron RDA	176.5%	–13.4%**	–5.8%
Mean percent of zinc RDA	188.6	–10.6	–7.7

Exhibit 3.11
Regression-Adjusted Differences for Intake of Iron and Zinc: Working Mothers *versus* Nonworking Mothers

	Mean for All Children	Regression-Adjusted Differences for Maternal Employment Status	
		Full-time	Part-time
13 to 17 years, male			
Mean percent of iron RDA	180.1%	13.4%	27.0%**
Mean percent of zinc RDA	160.9	28.0**	29.7**
13 to 17 years, female			
Mean percent of iron RDA	104.3%	–22.4%**	–12.7%
Mean percent of zinc RDA	105.0	–11.4	–8.6

*** Statistically significant difference at the 1 percent level.
** Statistically significant difference at the 5 percent level.
* Statistically significant difference at the 10 percent level.

Multivariate models include the following covariates: indicators for children's age groups (including male and female teenagers); indicators for maternal age under 30, over 40; indicators for maternal race/ethnicity black, Hispanic, other nonwhite; indicators for maternal education less than high school diploma, greater than high school diploma, unknown; number of adults and number of children in household; index for earnings from other adult household members; and indicators for region of country and urbanicity.

Dietary Fiber Intake

It was shown in Chapter 2 that children of full-time working mothers consumed significantly less dietary fiber than children of homemaker mothers, especially 9- to 12- year-olds and teenage females. Fiber consumption was also significantly lower among 9- to 12-year-old children of part-time working mothers than among their counterparts with homemaker mothers. These results are repeated in the multivariate analysis (Exhibit 3.12), with an additional significant negative difference for 5- to 8-year-old children of part-time working mothers.

Exhibit 3.12

Regression-Adjusted Differences for Intake of Dietary Fiber: Working Mothers *versus* Nonworking Mothers

	Mean for All Children	Regression-Adjusted Differences for Maternal Employment Status	
		Full-time	Part-time
All children			
Mean percent of dietary fiber recommendation[a]	97.2%	–4.8%**	–4.1%
By age group			
2 to 4 years			
Mean percent of dietary fiber recommendation	129.2%	2.5%	1.8%

Exhibit 3.12

Regression-Adjusted Differences for Intake of Dietary Fiber: Working Mothers *versus* Nonworking Mothers

	Mean for All Children	Regression-Adjusted Differences for Maternal Employment Status	
		Full-time	Part-time
5 to 8 years			
Mean percent of dietary fiber recommendation	106.1%	–7.8%***	–6.9%**
9 to 12 years			
Mean percent of dietary fiber recommendation	89.5%	–10.2%**	–9.8%**
13 to 17 years, male			
Mean percent of dietary fiber recommendation	85.9%	1.4%	0.2%
13 to 17 years, female			
Mean percent of dietary fiber recommendation	62.6%	–7.05	–2.0%

a Based on American Health Foundation recommendation of "age plus 5" grams dietary fiber per day for children age 2 and above (Williams, 1995).

*** Statistically significant difference at the 1 percent level.
** Statistically significant difference at the 5 percent level.
* Statistically significant difference at the 10 percent level.

Multivariate models include the following covariates: indicators for children's age groups (including male and female teenagers); indicators for maternal age under 30, over 40; indicators for maternal race/ethnicity black, Hispanic, other nonwhite; indicators for maternal education less than high school diploma, greater than high school diploma, unknown; number of adults and number of children in household; index for earnings from other adult household members; and indicators for region of country and urbanicity.

Soda Consumption

It was previously shown that children of full-time working mothers were significantly more likely than children of homemaker mothers to drink more than 8 ounces of soda per day (and conversely, less likely to drink no soda). The differences were concentrated among 2- to 4-year-olds and 5- to 8-year-olds. Although there were no significant overall differences for children of part-time working mothers, there appeared to be a positive difference for teenage males (less likely to drink no soda).

The multivariate analysis finds the same patterns (Exhibit 3.13). In addition, the large positive difference in the likelihood of drinking more than 8 ounces of soda a day, seen for teenage daughters of part-time working mothers relative to their counterparts with homemaker mothers, achieves statistical significance.

Exhibit 3.13

Regression-Adjusted Differences for Daily Consumption of Soda: Working Mothers *versus* Nonworking Mothers[a]

	Mean for All Children	Regression-Adjusted Differences for Maternal Employment Status	
		Full-time	Part-time
All children			
None	43.9%	–3.7%*	–3.5%
More than 8 ounces	20.7	3.6**	5.4
By age group			
2 to 4 years			
None	51.5%	–5.7%***	0.6%
More than 8 ounces	9.7	0.5	–2.1
5 to 8 years			
None	42.7%	–8.8%***	–1.2%
More than 8 ounces	18.3	6.7***	1.6
9 to 12 years			
None	34.1%	1.3%	–3.9%
More than 8 ounces	38.7	0.8	5.6
13 to 17 years, male			
None	16.9%	–3.5%	–10.2%*
More than 8 ounces	69.8	6.0	6.6
13 to 17 years, female			
None	20.4%	–0.6%	–5.7%
More than 8 ounces	55.5	4.6	20.9***

a Differences for dichotomous outcomes are expressed as percentage points at the mean.

*** Statistically significant difference at the 1 percent level.
** Statistically significant difference at the 5 percent level.
* Statistically significant difference at the 10 percent level.

Multivariate models include the following covariates: indicators for children's age groups (including male and female teenagers); indicators for maternal age under 30, over 40; indicators for maternal race/ethnicity black, Hispanic, other nonwhite; indicators for maternal education less than high school diploma, greater than high school diploma, unknown; number of adults and number of children in household; index for earnings from other adult household members; and indicators for region of country and urbanicity.

Other Soft Drink Consumption

No significant differences were seen in Chapter 2 with regard to consumption of other soft drinks for all ages combined. Scattered significant effects were seen for children of part-time working mothers: 2- to 4-year-old children were significantly more likely to drink none, and 9- to 12-year-old children were significantly more likely to drink over 8 ounces, than their counterparts with homemaker mothers.

The overall lack of significant differences was repeated in the multivariate analyses, as was the age-specific result for 9- to 12-year-olds (Exhibit 3.14). A few additional differences achieved statistical significance: for children of part-time working mothers, 5- to 8-year-olds were less likely to drink no other soft drinks, and more likely to drink over 8 ounces, than their counterparts with homemaker mothers, and teenage sons of part-time working mothers were more likely to drink over 8 ounces than their counterparts with homemaker mothers.

Exhibit 3.14

Regression-Adjusted Differences in Daily Consumption of Other Soft Drinks: Working Mothers *versus* Nonworking Mothers[a,b]

		Regression-Adjusted Differences for Maternal Employment Status	
	Mean for All Children	Full-time	Part-time
All children			
None	41.0%	–0.8%	–3.3%
More than 8 ounces	23.1	–0.2	1.2
By age group			
2 to 4 years			
None	42.1%	–4.0%**	2.9%
More than 8 ounces	20.1	1.0	–2.6
5 to 8 years			
None	38.2%	1.1%	1.9%
More than 8 ounces	24.5	–2.9	–7.0**
9 to 12 years			
None	39.2%	–0.2%	–9.1%*
More than 8 ounces	26.2	1.0	8.8**
13 to 17 years, male			
None	48.2%	2.1%	–8.1%
More than 8 ounces	30.7	–3.0	11.3*
13 to 17 years, female			
None	38.5%	–3.9%	–5.6%
More than 8 ounces	32.9	3.8	–2.8

a Includes fruit drinks (not juice), iced tea, lemonade.

b Differences for dichotomous outcomes are expressed as percentage points at the mean.

*** Statistically significant difference at the 1 percent level.
** Statistically significant difference at the 5 percent level.
* Statistically significant difference at the 10 percent level.

Multivariate models include the following covariates: indicators for children's age groups (including male and female teenagers); indicators for maternal age under 30, over 40; indicators for maternal race/ethnicity black, Hispanic, other nonwhite; indicators for maternal education less than high school diploma, greater than high school diploma, unknown; number of adults and number of children in household; index for earnings from other adult household members; and indicators for region of country and urbanicity.

Added Sugar Intake

No significant differences were seen for all age groups combined for added sugar intake in Chapter 2. For children age 2 to 4 and 5 to 8 of full-time working mothers, however, intake of added sugar from all sources, and in particular intake of added sugar from soda and other soft drinks, was significantly greater than among their counterparts with homemaker mothers.

Similarly, the multivariate analyses find no significant differences for all age groups combined (Exhibit 3.15). The patterns of significant differences for age groups are a little different, however. Among children of full-time working mothers, only the difference for all sources of added sugar for 5- to 8-year-olds remains statistically significant; and two differences in added sugar from soda and other soft drinks achieve statistical significance for children of part-time working mothers relative to their counterparts with homemaker mothers: a positive difference for 9- to 12-year-olds, and a negative difference for teenage males. It appears that other differences, rather than maternal employment *per se*, explain the greater intake of added sugars by 2- to 4-year-old children of full-time working mothers.

Exhibit 3.15

Regression-Adjusted Differences for Intake of Added Sugars (teaspoons per day): Working Mothers *versus* Nonworking Mothers

	Mean for All Children	Regression-Adjusted Differences for Maternal Employment Status	
		Full-time	Part-time
All children			
Added sugar from all sources	22.9	0.4	0.5
Added sugar from soda and other soft drinks	10.1	0.4	–0.0
By age group			
2 to 4 years			
Added sugar from all sources	14.5	0.6	–0.3
Added sugar from soda and other soft drinks	5.1	0.4	–0.3
5 to 8 years			
Added sugar from all sources	19.6	1.0*	–0.1
Added sugar from soda and other soft drinks	6.8	0.7	–0.3
9 to 12 years			
Added sugar from all sources	25.1	–0.5	1.5
Added sugar from soda and other soft drinks	10.1	–0.0	1.2*
13 to 17 years, male			
Added sugar from all sources	35.1	–0.1	–1.0
Added sugar from soda and other soft drinks	19.5	–0.1	–2.3**

Exhibit 3.15

Regression-Adjusted Differences for Intake of Added Sugars (teaspoons per day): Working Mothers *versus* Nonworking Mothers

13 to 17 years, female			
Added sugar from all sources	23.9	1.4	2.6
Added sugar from soda and other soft drinks	12.6	1.2	1.0

*** Statistically significant difference at the 1 percent level.
** Statistically significant difference at the 5 percent level.
* Statistically significant difference at the 10 percent level.

Multivariate models include the following covariates: indicators for children's age groups (including male and female teenagers); indicators for maternal age under 30, over 40; indicators for maternal race/ethnicity black, Hispanic, other nonwhite; indicators for maternal education less than high school diploma, greater than high school diploma, unknown; number of adults and number of children in household; index for earnings from other adult household members; and indicators for region of country and urbanicity.

Consumption of Fried Potatoes and Other Vegetables

Finally, children of full-time working mothers were previously found to consume significantly more fried potatoes than children of homemaker mothers, especially children age 2 to 4 and 5 to 8. In addition, children age 2 to 4 consumed more of other vegetables if their mothers were working full-time.

These results are all repeated in the multivariate analysis (Exhibit 3.16). Several other differences achieved significance: greater consumption of fried potatoes by teenage sons of both full-time and part-time working mothers relative to their counterparts with homemaker mothers, and lesser consumption of other vegetables by teenage daughters of full-time working mothers and teenage sons of part-time working mothers.

Summary

The results presented in Chapter 2 were simple comparisons of means and proportions among groups of children that differed by maternal employment status, adjusted only for differences in the age distributions. It might be expected that conclusions based on these comparisons would need to be modified when other differences among the groups were taken into account.

In fact, the three groups of children differ in some important ways. Children of homemaker mothers are more likely to be Hispanic or non-Hispanic white, poor, and from large households than children of working mothers. The homemaker mothers themselves tend to be younger, less well-educated, and less knowledgeable about nutrition than working mothers. Resources available from other earners are greatest, on average, in households with part-time working mothers, and lowest in households with full-time working mothers.

Controlling for these factors does not, however, substantively alter the conclusions drawn in Chapter 2. The analysis still finds that children whose mothers work full-time tend to have less positive nutrition outcomes than children of nonworking mothers.

Exhibit 3.16

Regression-Adjusted Differences for Consumption of Fried Potatoes and Other Vegetables (servings per day): Working Mothers *versus* Nonworking Mothers

	Mean for All Children	Regression-Adjusted Differences for Maternal Employment Status	
		Full-time	Part-time
All children			
Fried potatoes	0.7	0.1***	0.1*
Vegetables other than fried potatoes	1.9	–0.1	–0.1
By age group			
2 to 4 years			
Fried potatoes	0.5	0.1**	0.1
Vegetables other than fried potatoes	1.7	0.1**	–0.0
5 to 8 years			
Fried potatoes	0.5	0.2***	0.1
Vegetables other than fried potatoes	1.6	–0.0	0.0
9 to 12 years			
Fried potatoes	0.7	0.1	–0.0
Vegetables other than fried potatoes	1.9	–0.2	–0.1
13 to 17 years, male			
Fried potatoes	1.0	0.3***	0.5***
Vegetables other than fried potatoes	2.7	–0.0	–0.5**
13 to 17 years, female			
Fried potatoes	0.7	–0.0	0.1
Vegetables other than fried potatoes	2.1	–0.3*	–0.3

*** Statistically significant difference at the 1 percent level.
** Statistically significant difference at the 5 percent level.
* Statistically significant difference at the 10 percent level.

Multivariate models include the following covariates: indicators for children's age groups (including male and female teenagers); indicators for maternal age under 30, over 40; indicators for maternal race/ethnicity black, Hispanic, other nonwhite; indicators for maternal education less than high school diploma, greater than high school diploma, unknown; number of adults and number of children in household; index for earnings from other adult household members; and indicators for region of country and urbanicity.

The multivariate and bivariate results are contrasted in Exhibit 3.17. The bolded entries represent differences that were significant in the bivariate analyses only. It can be seen that these are relatively few in number, and generally pertain to specific age groups. The only result for all age groups combined that lost significance was the positive effect for the vegetable component of the HEI for children of full-time mothers. Thus, this analysis is consistent with the hypothesis that for most child nutrition outcomes, the differences between children of full-time working and homemaker mothers are related to maternal employment *per se*, rather than the result of other differences between the groups.

Exhibit 3.17

Summary of Significant Differences in Bivariate and Multivariate Analyses

	Full-time *versus* Homemaker		**Part-time *versus* Homemaker**	
	Significant Differences (bivariate)	**Significant Differences (multivariate)**	**Significant Differences (bivariate)**	**Significant Differences (multivariate)**
Total HEI	All children (–) Age 2-4 (+) Age 5-8 (–) **Age 9-12 (–)**	All children (–) Age 2-4 (+) Age 5-8 (–)	Age 2-4 (+)	Age 2-4 (+) *Age 9-12 (–)*
Grain	All children (–) Age 2-4 (+) Age 5-8(–) Age 9-12 (–)	All children (–) Age 2-4 (+) Age 5-8(–) Age 9-12 (–)		
Vegetable	**All children (+)** Age 2-4 (+) Age 5-8 (+)	 Age 2-4 (+) Age 5-8 (+)		
Fruit	All children (–) Age 5-8 (–) Age 9-12 (–)	All children (–) Age 5-8 (–) Age 9-12 (–)	Age 2-4 (+)	Age 2-4 (+) *Age 5-8 (–)* *Age 9-12 (–)* *Age 13-17F (+)*
Milk	**Age 5-8 (–)**			
Meat	Age 2-4 (+) **Age 13-17F (–)**	Age 2-4 (+)		
Total fat	**Age 9-12 (–)**	Age 13-17F (+)	**Age 2-4 (+)** Age 9-12 (–)	 Age 9-12 (–)
Saturated fat	**Age 2-4 (+)** **Age 13-17M (–)**		Age 2-4 (+)	Age 2-4 (+)
Cholesterol		*Age 13-17M (–)*	**Age 2-4 (+)**	
Sodium	Age 2-4 (–)	Age 2-4 (–)		
Variety	All children (–) Age 5-8 (–) **Age 9-12 (–)** **Age 13-17F (–)**	All children (–) Age 5-8 (–)		
Good diet	**Age 2-4 (+)**	 *Age 9-12 (–)*	**Age 2-4 (+)**	
Poor diet	 Age 9-12 (+)	 Age 9-12 (+)	**Age 5-8 (–)** Age 9-12 (+)	 Age 9-12 (+)
Food energy: mean percent of REA	Age 0-11m (+) Age 1-2 (+) Age 3-4 (+)	Age 0-11m (+) Age 1-2 (+) Age 3-4 (+)		*Age 3-4 (+)*
Food energy: above 110% REA		*Age 1-2 (+)*		
Food energy: below 90% REA		 *Age 0-11m (–)* *Age 1-2 (–)* *Age 5-8 (+)*	All children (–) Age 13-17M (–)	All children (–) *Age 0-11m (–)* Age 13-17M (–)

Exhibit 3.17

Summary of Significant Differences in Bivariate and Multivariate Analyses

	Full-time *versus* Homemaker		Part-time *versus* Homemaker	
	Significant Differences (bivariate)	**Significant Differences (multivariate)**	**Significant Differences (bivariate)**	**Significant Differences (multivariate)**
Iron	All children (–)	All children (–)		*Age 7-11m (+)*
		Age 7-11m (+)		*Age 13-17M (+)*
	Age 5-8 (–)	Age 5-8 (–)		
	Age 9-12 (–)	Age 9-12 (–)		
	Age 13-17F (–)	Age 13-17F (–)		
Zinc	**Age 9-12 (–)**	*Age 13-17M (+)*	**Age 1-2 (–)**	*Age 13-17M (+)*
	Age 13-17F (–)			
Fiber	All children (–)	All children (–)		*Age 5-8 (–)*
	Age 5-8 (–)	Age 5-8 (–)	Age 9-12 (–)	Age 9-12 (–)
	Age 9-12 (–)	Age 9-12 (–)		
	Age 13-17F (–)			
Soda: None	All children (–)	All children (–)	**Age 9-12 (–)**	
	Age 2-4 (–)	Age 2-4 (–)	Age 13-17M (–)	Age 13-17M (–)
		Age 5-8 (–)		
Soda: more than 8 ounces	All children (+)	All children (+)	Age 2-4 (–)	
	Age 5-8 (+)	Age 5-8 (+)		*Age 13-17F (+)*
Other soft drinks: None		*Age 2-4 (–)*	**Age 2-4 (+)**	
				Age 9-12 (–)
Other soft drinks: more than 8 ounces				*Age 5-8 (–)*
			Age 9-12 (+)	Age 9-12 (+)
				Age 13-17 (+)
Added sugar from all sources	**Age 2-4 (+)**			
	Age 5-8 (+)	Age 5-8 (+)		
Added sugar from soda and other soft drinks	**Age 2-4 (+)**			*Age 9-12 (+)*
	Age 5-8 (+)			*Age 13-17M (–)*
Fried potatoes	All children (+)	All children (+)		*All children (+)*
	Age 2-4 (+)	Age 2-4 (+)		*Age 13-17M (+)*
	Age 5-8 (+)	Age 5-8 (+)		
		Age 13-17M (+)		
Vegetables other than fried potatoes	Age 2-4 (+)	Age 2-4 (+)		*Age 13-17M (–)*
		Age 13-17F (–)		

Bolded results are significant in bivariate analyses only. *Italicized* results are significant in multivariate analyses only

Among the key results repeated in the multivariate analysis for all ages combined, comparing children of full-time working mothers to children of homemaker mothers, are that the total HEI score is lower, as well as the scores for the grain, fruit, and variety components; iron intake is lower; and intake of soda and fried potatoes is higher. For children of part-time working mothers, the finding for all ages combined of a lower likelihood of energy intake below 90 percent of the REA is replicated.

Age-specific differences for children of full-time working mothers that remain significant are:

- For preschoolers, higher total HEI scores, higher scores for the vegetable and meat components, and lower scores for the sodium component.
- Also for preschoolers, higher intake of food energy, a greater likelihood of consuming some soda, and higher consumption of both fried potatoes and other vegetables.
- For school-age children (children age 5 to 8 and/or age 9 to 12), lower total HEI scores, lower scores for the grain, fruit, and variety components, but higher scores for the vegetable component.
- Also for school-age children, lower intake of iron, zinc, and fiber, greater likelihood of consuming over 8 ounces of soda, and higher consumption of fried potatoes.
- For teenage girls, lower intake of iron.

The results for teenage girls with regard to zinc and fiber did not retain statistical significance. These two differences thus appear to be due to other differences between the groups.

Comparing children of part-time working mothers with children of homemaker mothers within age groups, differences that remain significant in the multivariate analysis include:

- For preschoolers, higher total HEI scores, higher scores on the fruit and saturated fats components, and lower likelihood of drinking more than 8 ounces of soda.
- For school-age children, higher scores on the total fat component of HEI, lower intake of fiber, and greater likelihood of drinking more than 8 ounces of soft drinks other than soda.
- For teenage boys, lower likelihood of food energy intake under 90 percent of the REA, and higher likelihood of drinking at least some soda.

Other differences that lost significance include lower intake of zinc for 1-to-2-year-olds, greater likelihood of consuming at least some soda for 9-to-12-year-olds, and lower likelihood of consuming other soft drinks for 2-to-4-year-olds.

Chapter 4
Role of the Child and Adult Care Food Program in Children's Diets

The CACFP provides federal funds for qualifying meals served to children in nonresidential day care facilities.[28] These include some child care centers, after-school-hours child care centers, family and group child care homes, and Head Start programs.[29] Since 1999, the program also includes reimbursement for meals served to preschool children in homeless shelters. Care providers are reimbursed at various rates for up to two meals and one snack per day served to eligible children,[30] and in some cases, they receive USDA commodities. Eligibility for the child component of the CACFP is limited to children age 12 and under.[31]

The goal of the CACFP is to provide nutritious meals and snacks to children attending child care programs. To this end, USDA has established minimum requirements for meals and snacks served in participating centers and child care homes. These requirements were modeled on the school meal programs meal patterns and were designed to ensure that meals and snacks served in the CACFP provide the types and amounts of food required to help meet participants' daily energy and nutrient needs. The meal patterns specify categories of foods (meal components) to be offered at each meal and snack, as well as minimum portion sizes. Minimum portion sizes for children vary by age group.[32] Currently, CACFP meals and snacks are not required to meet specific nutrient-based standards such as those used in the NSLP and SBP.

Although the CACFP has been in existence for almost 35 years, research on the impact of the program on children's nutrition has been limited. To date there have been only a few studies documenting the relative contribution of CACFP meals and snacks to children's total diet, and none used national samples of children (Glantz, 2003). Although some research has been published on the nutrient content of meals **offered** (Briley *et al.*, 1993; Fox *et al*., 1997; Crepinsek *et al*., 2002a), the nutrient profile of meals and snacks actually consumed by participating children may differ from the meals and snacks offered by providers.[33] Thus, to gain a full understanding of the contribution

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28 The CACFP also operates in adult day care centers. This discussion is limited to the component of the program that serves children in child care centers and homes.

29 Note that Head Start is a preschool program for low-income children and does not provide child care per se. All Head Start centers are required to participate in the CACFP.

30 During the period the Early Childhood and Child Care Study was conducted, child care centers could receive reimbursement for an additional meal or snack for children in care eight or more hours per day. The regulations changed as a result of the Personal Responsibility and Work Opportunity Reconciliation Act of 1996 (PRWORA) (P.L. 104-193). PRWORA also changed the reimbursement structure for family child care homes to more closely resemble that for centers. Higher reimbursement rates apply to meals and snacks served by low-income providers in low-income neighborhoods, or served to low-income children.

31 An exception is made for children of migrant workers and children with disabilities, who may participate through ages 15 and 18, respectively.

32 The age groups are: 1 to 2, 3 to 5, and 6 to 12 years. There is a separate meal pattern for infants.

33 For example, children may decline one or more of the foods offered; children may select portions that differ from that of the average portion; or children may waste (not consume) some of the food they take.

CACFP meals and snacks actually make to children's total energy and nutrient needs, it is necessary to examine CACFP meals and snacks **as consumed** by children. The first part of this chapter is devoted to results of just such an analysis, using data from the 1995 ECCCS. It is hoped that findings from this part of the study might assist program staff by possibly serving as the basis for developing nutrient-based standards or otherwise updating or revising menu planning guidance, nutrition education requirements for child care providers, and reimbursement policies, and to inform future CACFP research.

As discussed in Chapter 1, one measure of a successful outcome of the CACFP may be its ability to provide children of working mothers with a diet that is nutritionally comparable to that provided by mothers who are full-time homemakers. The CACFP also has the potential to dampen any negative effects of maternal employment on children's diets. The second part of this chapter is devoted to comparisons of nutrition outcomes between CACFP-participating children of working mothers and not-in-care children of nonworking mothers.

Contribution of CACFP Meals to Children's Dietary Intake

As noted above, CACFP regulations and guidance materials provide only broad standards for meals and snacks offered under the program. In the absence of specific nutrient-based standards, prior studies have used the recommendations of the American Dietetic Association (ADA) (1994 and 1999) as a benchmark for assessing the adequacy of the meals and snacks consumed by CACFP participants. The ADA recommends that children in care for eight or more hours per day receive food that provides at least one-half to two-thirds of their daily nutrition needs (based on age-appropriate RDAs). The recommendation for children in part-day programs (four to seven hours per day) is for one-third of their daily needs. In addition, the ADA recommends that meals and snacks be consistent with the *Dietary Guidelines for Americans*.

This section describes participating children's average consumption of food energy and nutrients over 24 hours, and the relative contribution of CACFP meals and snacks to total intakes. It begins with a description of the sample children and their households, overall and for the three types of CACFP care (i.e., family child care homes, Head Start centers, and child care centers). Because there are some important differences in the characteristics of participants and their families, dietary data are also presented by type of CACFP care.

The analyses suggest that, on average, total daily intakes of children participating in the CACFP meet recommendations for food energy and most dietary components. They also suggest that CACFP meals and snacks make a positive contribution to total dietary intake, but may benefit from changes to lower the fat, especially saturated fat, and sodium in foods offered and served to children. School-age children in CACFP centers tend to receive less of their daily nutrition needs from CACFP than their counterparts in homes, but this does not appear to detract from their total intakes which are adequate for most nutrients.

Characteristics of CACFP Sample Children and Their Households

The ECCCS obtained complete information on 24-hour dietary intake for 948 children, age 1 to 10 years old.[34] The data collection methods used are summarized in Chapter 1 and described in detail in the final study report (Fox *et al*., 1997). About 42 percent of the sample children received CACFP meals and snacks in Head Start centers, one-third (33 percent) in other child care centers, and nearly one-quarter (24 percent) in family child care homes.

Exhibit 4.1 presents the available demographic information on the ECCCS sample children and their households. Sampling weights were applied to reflect the national number of children in CACFP (see Appendix B for a description of the weighting methodology). The general underlying patterns, as well as differences by child care type, are important to consider in interpreting findings on the role of the CACFP in children's diets.

Almost three quarters of all children in the CACFP are preschoolers 3 to 5 years of age, with the remainder about equally split between toddlers (1 to 2 years) and school-age children (6 to 10 years). Participants are a little more likely to be white than minority (54 *versus* 46 percent), and black children are more heavily represented than other minority groups 31 *versus* 15 percent). A substantial number of children spend 8 or more hours per day in CACFP care (48 percent); another 36 percent are in care from 4 to 8 hours daily. The relatively small proportion of participants in care less than 4 hours a day are probably children who also attend school.

The average household of CACFP children consists of two adults and two children, although one third of children live in single-adult households. Most mothers with children in CACFP have some education beyond high school and are employed. As of 1995, approximately equal proportions of children were from families with incomes above and below 185 percent of poverty.

Differences between children in CACFP family child care homes and children in Head Start and child care centers are especially notable. Children in Head Start centers are all preschoolers age 3 to 5 years, and so are nearly three-quarters of children in child care centers. In contrast, fewer than half of children in child care homes are preschoolers, and over one-third are toddlers age 1 to 2. Furthermore, the great bulk (83 percent) of children in child care homes are white, and only 7 percent are black. Whites comprise only 38 and 49 percent of children in Head Start and child care centers, respectively, whereas blacks comprise 45 and 36 percent of these children.

Children in child care centers are more disadvantaged than children in family child care homes, and children in Head Start are even more so. Head Start program regulations require that no more than 10 percent of enrolled children can have family incomes above the federal poverty level. Children at or below 185 percent of poverty are eligible for reduced-price meals in Head Start and other child care centers; since PRWORA, this is also the threshold below which children's meals in homes qualify for reimbursements at the higher (Tier I) rate. Only 18 percent of children in homes fall under this cut-off, but 49 percent of children in child care centers and 88 percent of children in Head Start centers do

[34] Infants were excluded from this analysis for several reasons: (1) the number of infants in the ECCCS sample was too small to draw conclusions; (2) very little of the food consumed by infants in CACFP care is supplied by the provider (parents often supply infant formula and other baby food); and (3) infant feeding patterns are unique, i.e., they do not consume discreet meals and snacks. Eleven- to 12-year-olds were excluded because they were not adequately represented in the ECCCS sample—only two children over age 10 had complete data.

so. Similarly, the proportions living in single-adult households are 24 percent for children in homes, but 34 percent and 41 percent for children in child care and Head Start centers, respectively. The households of children in both family child care homes and child care centers, however, tend to include fewer children.

Exhibit 4.1

Characteristics of CACFP Sample Children and Their Families

	Family Child Care Homes	Head Start Centers	Child Care Centers	All CACFP
Age[a]				
1-2 years	34.9%	--	11.4%	14.1%
3-5 years	46.9	100.0%[b]	70.7	73.0
6-10 years	18.3	--	17.8	12.8
Gender[c]				
Male	42.7%	49.4%	48.9%	47.5%
Female	57.3	50.6	51.1	52.5
Race/Ethnicity				
Non-Hispanic White	82.6%	38.2%	48.8%	54.5%
Non-Hispanic Black	7.2	44.8	35.8	31.0
Hispanic	7.3	10.4	6.6	7.8
Other	2.9	6.5	8.8	6.7
Hours in CACFP care				
Less than 4	19.4%	14.5%	15.7%	16.3%
4 to 8	19.4	76.3	20.7	36.3
8 or more	61.2	9.2	7.2	47.5
Mean	*7.2*	*5.2*	*7.2*	*6.6*
Number of adults				
1	24.5%	40.7%	34.2%	33.5%
2	69.2	50.6	52.6	56.3
3 or more	6.3	8.7	13.2	10.2
Mean	*1.8*	*1.7*	*1.8*	*1.8*
Number of children				
1	35.3%	20.0%	27.9%	27.6%
2	43.5	31.0	44.2	40.4
3	15.3	25.4	15.1	18.0
4 or more	5.9	23.6	12.8	14.1
Mean	*1.9*	*2.7*	*1.8*	*2.3*

Exhibit 4.1

Characteristics of CACFP Sample Children and Their Families

	Family Child Care Homes	Head Start Centers	Child Care Centers	All CACFP
Number of household members				
2	8.0%	8.8%	8.7%	8.6%
3	35.9	22.7	27.0	28.0
4	36.8	26.3	35.5	33.3
5	12.5	21.1	19.3	18.1
6 or more	6.9	21.1	9.5	12.1
Mean	*3.8*	*4.4*	*4.0*	*4.1*
Household income as percent of poverty				
At or below 185%	18.1%	87.7%	48.6%	51.8%
Over 185%	81.9	12.3	51.4	48.2
Mother's education				
Less than high school/GED	3.2%	20.9%	8.6%	10.8%
High school/GED	31.2	44.7	24.2	31.8
More than high school/GED	65.5	34.4	67.1	57.4
Mother's employment status				
Homemarker	5.4%	44.6%	10.8%	18.8
In school	8.4	8.0	9.8	8.9
Working	86.2	47.5	79.4	72.2
Sample size	231	402	315	948

a Infants and 11- to 12-year-olds (*n*=2) are excluded.

b Head Start specifically targets preschoolers. Two Head Start children in the 6- to 10-year age group were dropped from the sample as anomalous.

c Children for whom gender was missing (*n*=3) are excluded.

Data were missing on race/ethnicity, household size and income, and mother's employment status for 2 percent of children in child care centers, 4 percent in family child care homes, and up to 7 percent in Head Start centers.

Note: The low 41 percent response rate to the 24-hour recall portion of the ECCCS on which these estimates are based raises concerns of potential bias. In-CACFP-care energy intake does not significantly differ between respondents and nonrespondents (see Appendix D), but whether their out-of-care energy intake systematically differs cannot be determined. Due to this uncertainty, we recommend that these data be interpreted with caution.

Finally, the mothers of children in family child care homes and child care centers are considerably more highly educated than mothers of children in Head Start centers (66 to 67 percent *versus* 34 percent with more than a high school degree or GED). These mothers are also overwhelmingly likely to be working (86 percent and 79 percent, respectively). Fewer than half (47 percent) of mothers of Head Start children are working; as noted previously, these are not child care programs, but rather enrichment programs.

Note that although most of the children in CACFP homes in 1995 were in families with household income above 185 percent of poverty, since tiering, the share of low-income children has increased.[35] Likewise, although mothers of children in child care centers and family care child homes were substantially more likely to be employed in 1995 than mothers with children in Head Start, this may also have changed with PRWORA.

Children's 24-Hour Dietary Intake and the Role of CACFP Meals and Snacks

Children's intakes of total food energy and 12 nutrients and other dietary components were calculated for the full 24-hour period and, separately, for the contribution from CACFP meals and snacks. The unit of analysis was the "child-day," representing children's dietary intake over the course of a typical day in CACFP child care. Dietary intake findings, tabulated overall and by type of CACFP care and age group,[36] are discussed below. The standard errors for all mean nutrient values are tabulated in Appendix E. Note that results for the 6-to-10-year age group are based on fewer than 100 child days.

The response rate to the dietary recall interview in the ECCCS was low, 41 percent. The nonresponse analysis in Appendix D did not find evidence of substantial bias when 24-hour recall respondents' energy intake during CACFP care was compared with that of other observed children. There is still the possibility that nonrespondents' out-of-CACFP-care dietary intake was systematically different from that of respondents, which would bias our results. USDA's Food and Nutrition Service therefore recommends that these analyses should not be considered as representative of CACFP participants or of the impact of the program.

Food Energy and Key Nutrients

Exhibit 4.2 shows results of the analysis of children's intake of food energy, protein, and key vitamins and minerals. The nutrients selected for analysis are those for which standards have been established for the school meal programs (NSLP and SBP). Intakes of food energy and key nutrients are expressed as a percent of the RDA.[37] The most recently published RDAs at the time of analysis were used (NRC, 1989a; IOM, 1997, 2000, and 2001).[38] Calcium intake is shown relative to both the 1989 RDA and the Adequate Intake (AI) level released as part of the 1997 Dietary Reference Intakes (DRIs), because a new calcium RDA could not be established.

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35 The Family Child Care Homes Legislative Changes Study found about twice as many children with household income at or below 185 percent of poverty in CACFP homes in 1999 than in 1995 (39 *vs.* 21%; Crepinsek *et al.*, 2002b).

36 Sample sizes precluded further stratification, for example, by hours in CACFP care or common meal and snack combinations. For the most part, age is a reasonable proxy for full-day (toddlers and preschool children) and part-day care (school-age children).

37 The RDAs for children age 6 to 10 were calculated as weighted averages of the corresponding 1989 RDAs for children age 4 to 6 and children age 7 to 10. Because life stage (age/gender) groups for the newer RDAs (i.e., those developed to replace the 1989 RDAs; IOM/FNB, 1997, 2000, and 2001) differ from the age groups used in the 1989 RDAs, the RDAs used for children age 3 to 5 are the weighted average of new RDAs for children age 1 to 3 and 4 to 8. The new RDAs for children age 6 to 10 are the weighted averages for children age 4 to 8 and the separate RDAs for males and females age 9 to 13.

38 In addition to new reference values for food energy (EERs), DRIs were recently released for the macronutrients protein, carbohydrate, fat, and fiber (IOM/FNB, 2002). As noted in Chapter 2, EERs for children vary by age, gender, and physical activity level. Because data on physical activity were not collected in the ECCCS, it is not possible to predict what the effect of applying EERs to the analysis would be. For protein, new RDAs are somewhat lower for children age 1 to 5 (13 to 19 grams per day), and somewhat higher for the 6 to 10 age group (19 to 34 grams), relative to 1989 RDA values for children age 1 to 10 (16 to 28 grams). Applying the new protein RDAs would not meaningfully alter the results presented here.

Exhibit 4.2

Average Food Energy and Key Nutrients Consumed in CACFP Care and Over 24 Hours, by Age of Child[a]

	Family Child Care Homes		Head Start Centers		Child Care Centers		All CACFP	
	% Daily Recommendation in 24 Hours	% Daily Recommendation from CACFP	% Daily Recommendation in 24 Hours	% Daily Recommendation from CACFP	% Daily Recommendation in 24 Hours	% Daily Recommendation from CACFP	% Daily Recommendation in 24 Hours	% Daily Recommendation from CACFP
Food energy (1989 REA)								
1-2 years	108%	47%	--	--	102%	43%	106%	45%
3-5 years	97	45	100%	36%	104	40	101	39
6-10 years	102	25	--	--	87	14	93	18
Protein (1989 RDA)								
1-2 years	337%	148%	--	--	324%	134%	333%	143%
3-5 years	294	140	318%	117%	319	120	314	122
6-10 years	300	66	--	--	233	38	257	48
Vitamin A (1989 RDA)								
1-2 years	206%	101%	--	--	183%	85%	199%	95%
3-5 years	193	98	234%	109%	207	85	215	96
6-10 years	219	42	--	--	149	30	174	34
Vitamin C (2000 RDA)								
1-2 years	636%	201%	--	--	638%	272%	637%	224%
3-5 years	443	195	572%	181%	549	203	540	193
6-10 years	422	91	--	--	386	106	399	100
Calcium (1997 AI)								
1-2 years	200%	99%	--	--	158%	79%	186%	92%
3-5 years	156	86	138%	66%	147	71	145	72
6-10 years	148	38	--	--	108	26	122	30

Exhibit 4.2

Average Food Energy and Key Nutrients Consumed in CACFP Care and Over 24 Hours, by Age of Child[a]

	Family Child Care Homes		Head Start Centers		Child Care Centers		All CACFP	
	% Daily Recommendation in 24 Hours	% Daily Recommendation from CACFP	% Daily Recommendation in 24 Hours	% Daily Recommendation from CACFP	% Daily Recommendation in 24 Hours	% Daily Recommendation from CACFP	% Daily Recommendation in 24 Hours	% Daily Recommendation from CACFP
Calcium (1989 RDA)								
1-2 years	125%	62%	--	--	99%	49%	116%	58%
3-5 years	128	72	128%	61%	124	60	126	63
6-10 years	158	41	--	--	118	27	133	32
Iron (2001 RDA)								
1-2 years	156%	61%	--	--	134%	58%	149%	60%
3-5 years	138	55	140%	45%	135	47	138	47
6-10 years	175	35	--	--	126	14	144	22
Zinc (2001 RDA)								
1-2 years	241%	97%	--	--	221%	92%	234%	95%
3-5 years	196	87	218%	74%	212	82	212	79
6-10 years	229	40	--	--	188	24	203	30
Number of child days								
1-2 years	128	128	--	--	73	73	201	201
3-5 years	161	161	574	574	352	352	1,087	1,087
6-10 years	59	59	--	--	41	41	100	100

a All means are expressed as a percent of age-weighted RDAs. Calcium intake is also presented as a percent of the DRI-based AI value.

Note: The low 41 percent response rate to the 24-hour recall portion of the ECCCS on which these estimates are based raises concerns of potential bias. In-CACFP-care energy intake does not significantly differ between respondents and nonrespondents (see Appendix D), but whether their out-of-care energy intake systematically differs cannot be determined. Due to this uncertainty, we recommend that these data be interpreted with caution.

Estimated total food energy intake among CACFP participants falls within 8 percent of the 1989 REA for all age groups, in almost all types of CACFP care. The one exception is 6- to 10-year old children in child care centers, whose average daily food energy intake falls below the REA. This value is lower than the mean percent of REA for 6- to 10-year olds in family child care homes (87 *versus* 102 percent; $p < 0.10$). Mean energy intakes below the REA are not particularly concerning, given the high prevalence of overweight among all U.S. children.[39]

CACFP meals and snacks overall contribute an average of 45 and 39 percent of the REA for toddlers and preschool children (1-2 and 3-5 age groups). For 1- to 5-year olds in care at least 8 hours per day (in homes and centers), the CACFP contribution to energy intake falls just below the ADA recommendation that children receive food that provides at least one-half of their daily nutrition needs. The share of total food energy from CACFP for children in part-day care, including Head Start, is in line with the one-third-daily-needs recommendation.

For children age 6 to 10, the CACFP contribution to total food energy intake is about half as much as for younger children (18 percent), falling below the ADA recommendation for part-day care. This reflects the relatively few hours per day school-age children spend in child care (median of 3 hours per day) and differences in patterns of consumption of CACFP meals and snacks (Glantz *et al*., 1997; Fox *et al*., 1997).

With regard to 24-hour intake of protein, vitamins A and C, calcium, iron, and zinc, children in CACFP care are consuming, on average, considerably more than the RDA. These results do not seem to vary with child age or the type of CACFP child care (Exhibit 4.2). Although mean 24-hour intakes are higher than recommended levels, there is still some proportion of children whose usual intake is below the RDA for one or more of these nutrients. This cannot be determined from group means, which are based on only one day's food intake. Nevertheless, given the magnitude of most point estimates, the share of children with inadequate intakes is likely to be small.[40]

CACFP meals and snacks alone provide more than 100 percent of the RDA for protein and vitamin C, and close to 100 percent of the vitamin A RDA, for both toddlers and preschool children ages 1 to 5. The CACFP contribution to calcium, iron, and zinc requirements is also substantial for these groups, ranging from means of 47 percent of the iron RDA for 3- to 5-year olds to 95 percent of the zinc RDA for 1- to 2-year olds. CACFP meals and snacks consumed by children age 1 to 5 meet the full-day-care ADA recommendations for all of these key nutrients, regardless of type of CACFP care.[41]

As with energy intake, CACFP contributes a smaller share of school-age children's nutrient requirements compared with younger children age 1 to 5. Overall, children age 6 to 10 consume 100 percent of the RDA for vitamin C in CACFP care, and from approximately one quarter to one half the RDA

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[39] The possibility of underreporting of food energy intake cannot be ruled out. As described in Chapter 1, dietary data on meals and snacks consumed in CACFP were collected by trained observers, but for the remaining part of the day, dietary recalls were conducted with parents by telephone. The problem is more likely to be concentrated among the 6- to 10-year old children for whom fewer meals and snacks were directly observed, and because parents may not be aware of all foods and beverages consumed while at school.

[40] As noted in Chapter 2, the type of analysis required to determine the share of children with inadequate nutrient intakes was beyond the scope of this project.

[41] The 95 percent confidence interval for the percent of RDA for iron among 3- to 5-year old children in centers is 37 to 57 percent.

for the other nutrients examined. With the exception of iron, school-age children's intake in CACFP care meets or approximates the ADA part-day recommendation of one-third daily requirements for all of the nutrients examined. The lower contribution to iron intake is due to 6-to 10-year old children in centers. These children consume significantly less of their RDA for iron in CACFP than their counterparts in family child care homes (14 *versus* 35 percent of RDA). One explanation for the disparity may relate to the ECCCS finding that few older children were receiving breakfast in center care—ready-to-eat (presumably iron-fortified) cereals were a major source of iron in CACFP breakfasts overall (Fox *et al*., 1997).

Fat, Saturated Fat, and Carbohydrate

Children's intakes of total fat, saturated fat, and carbohydrate, expressed as a percent of total food energy, were compared to *Dietary Guidelines* and the National Research Council's (NRC) recommendations for these macronutrients. Results are shown in Exhibit 4.3 for children 3 to 5 and 6 to 10 years of age.[42] Current *Dietary Guidelines* recommend that children over 2 years of age consume no more than 30 percent of food energy from total fat and less than 10 percent from saturated fat (USDHHS and USDA, 2000). The NRC's *Diet and Health* report calls for consumption of more than 55 percent of total food energy from total carbohydrate (NRC, 1989b). Although these recommendations are intended to apply to total daily intake, it is useful to consider the extent to which CACFP meals and snacks may enhance or detract from meeting these benchmarks over the full 24-hour period.

The analysis suggests that CACFP children consume diets that approach, but do not quite meet daily dietary recommendations for the three macronutrients examined.[43] That is, mean total fat and saturated fat intakes exceed *Dietary Guidelines* recommendations, and total carbohydrate intake falls slightly below the NRC-recommended level. There is virtually no variation between the preschool and school-age groups, or across the three types of CACFP care. Point estimates for 3- to 5-year old children in CACFP are approximately 32 percent of total food energy from fat, 13 percent of energy from saturated fat, and 54 percent of energy from carbohydrate. These findings are comparable to estimates of fat, saturated fat, and carbohydrate intake among U.S. children of similar ages, as measured in the 1994 to 1996 and 1998 CSFII (USDA/ARS, 1999).

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[42] *Dietary Guidelines* and NRC recommendations for daily intake apply only to children age 2 and above. For the relevant nutrients/dietary components, results are presented only for the CACFP age groups for which recommendations fully apply.

[43] Acceptable Macronutrient Distribution Ranges (AMDRs) have been set for total fat and carbohydrate (IOM/FNB, 2002). The AMDR for fat is 30 to 40 percent of total food energy for children age 1 to 3 and 25 to 35 percent for children age 4 to 18; the AMDR for carbohydrate is 45 to 65 percent of energy. If these ranges were used in this analysis, conclusions about participants' diets and the CACFP contribution would differ. That is, the mean percent of food energy from total fat and from carbohydrate fall within the acceptable ranges, for participants of all ages, in all types of CACFP care, both over 24 hours and from CACFP meals and snacks alone.

Exhibit 4.3

Average Intake of Selected Macronutrients in CACFP Care and Over 24 Hours, by Age of Child

	Daily Recommendation (% food energy)	Family Child Care Home		Head Start Centers		Child Care Centers		All CACFP	
		% Total Food Energy in 24 Hours	% Total Food Energy from CACFP	% Total Food Energy in 24 Hours	% Total Food Energy from CACFP	% Total Food Energy in 24 Hours	% Total Food Energy from CACFP	% Total Food Energy in 24 Hours	% Total Food Energy from CACFP
Total fat									
3-5 years	≤ 30%[a]	31.7%	30.4%	31.8%	30.2%	31.7%	29.8%	31.7%	30.1%
6-10 years	≤ 30	30.7	30.2	--	--	32.7	23.5	32.0	26.0
Saturated fat									
3-5 years	< 10%[a]	13.2%	13.2%	12.9%	13.5%	12.6%	12.7%	12.8%	13.1%
6-10 years	< 10	12.4	12.2	--	--	13.7	10.3	13.2	11.0
Carbohydrate									
3-5 years	> 55%[b]	54.2%	55.6%	53.0%	54.0%	53.9%	56.6%	53.6%	55.4%
6-10 years	> 55	54.6	57.8	--	--	54.5	70.8	54.5	65.9
Number of child days									
3-5 years		161	161	574	574	352	352	1,087	1,086
6-10 years		59	59	--	--	41	39	100	98

a *Dietary Guidelines* recommendations (USDHHS/USDA, 2000).

b NRC recommendation (NRC, 1989b).

Dietary Guidelines and NRC recommendations are only applicable to children age 2 and older. This analysis was limited to children age 3 to 5 and 6 to 10, the only CACFP age groups for which the recommendations fully apply.

Note: The low 41 percent response rate to the 24-hour recall portion of the ECCCS on which these estimates are based raises concerns of potential bias. In-CACFP-care energy intake does not significantly differ between respondents and nonrespondents (see Appendix D), but whether their out-of-care energy intake systematically differs cannot be determined. Due to this uncertainty, we recommend that these data be interpreted with caution.

Meals and snacks consumed by children in CACFP care provide levels of total fat and carbohydrate that are consistent with *Dietary Guidelines* and NRC recommendations, respectively. For children in the 3- to 5-year age group, CACFP contributes, on average, approximately 30 percent of food energy as fat and 55 percent as carbohydrate. The CACFP contribution to daily intake of saturated fat (13 percent of food energy) exceeds recommendations for this age group, but not disproportionately so relative to other food sources. It appears that preschool children are consuming about the same share of energy from saturated fat in CACFP care and out of care. Again, there are virtually no differences by type of care.

Findings for the contribution of CACFP to the macronutrient intakes of 6- to 10-year-old children are similar to that for younger children, when compared to dietary recommendations. For this group, some differences are seen, however, by type of care. Compared with school-age children in homes, children in centers consume somewhat less energy from total fat (24 *versus* 30 percent; $p < 0.10$), and considerably more energy from carbohydrate (71 *versus* 58 percent; $p < 0.05$). Differences in the types of meals consumed by children age 6 to 10 in care (more breakfasts/lunches in homes and more high-carbohydrate snacks in centers) may explain the differences in macronutrient intake from CACFP between centers and homes.[44]

Cholesterol, Sodium, and Dietary Fiber

Children's dietary intake was also examined relative to the NRC's dietary recommendations for cholesterol and sodium (1989b) and the American Health Foundation's recommendation for dietary fiber intake in children over age 2 (Williams, 1995). These recommendations call for daily intakes of no more than 300 mg dietary cholesterol, no more than 2,400 mg sodium, and between 8 and 15 grams of dietary fiber per day (based on "age-plus-five grams per day" for children age 3 to 10). Exhibit 4.4 presents the proportion of daily recommended levels consumed over 24 hours and in CACFP for each of these dietary components. The contribution from CACFP meals and snacks is also expressed as a ratio relative to the CACFP contribution for total food energy.

The diets of both preschool and school-age CACFP participants meet recommendations, on average, for daily levels of cholesterol and dietary fiber. Cholesterol intakes are 66 and 60 percent of the 300 mg maximum, and dietary fiber intakes, 130 and 107 percent of the recommended minimums. Findings are qualitatively similar for children in all three types of CACFP care. In contrast, CACFP children's mean sodium intake exceeds the 2,400 mg daily maximum, by approximately 9 percent (216 mg) for 3- to 5-year-olds and 20 percent (480 mg) for children age 6 to 10. Preschool children in Head Start are more likely to consume excess sodium than their counterparts in CACFP homes and centers ($p < 0.001$ and $p < 0.10$, respectively).

[44] Data from the ECCCS suggest that children age 6 to 10 in family child care homes are substantially more likely to receive breakfast and lunch than 6- to-10-year-olds in child care centers (Glantz *et al*., 1997). In addition, although children in centers are somewhat more likely to receive snacks than children in homes (99 *versus* 70 percent), snacks tend to be lower in energy content than either breakfasts or lunches (Fox *et al*., 1997).

Exhibit 4.4a

Average Cholesterol, Sodium, and Dietary Fiber Consumed in CACFP Care and Over 24 Hours, by Age of Child

		Family Child Care Homes			Head Start Centers			Child Care Centers		
	Daily Recommendation	% Daily Recommendation in 24 Hours	% Daily Recommendation from CACFP	% Total from Meals in Care Relative to % Total Energy from Meals in Care	% Daily Recommendation in 24 Hours	% Daily Recommendation from CACFP	% Total from Meals in Care Relative to % Total Energy from Meals in Care	% Daily Recommendation in 24 Hours	% Daily Recommendation from CACFP	% Total from Meals in Care Relative to % Total Energy from Meals in Care
Cholesterol										
3-5 years	≤ 300 mg[a]	59%	27%	0.97	76%	28%	1.05	66%	24%	0.97
6-10 years	≤ 300 mg	81	25	1.09	--	--	--	60	8	0.52
Sodium										
3-5 years	≤ 2,400 mg[a]	99%	46%	0.98	116%	40%	0.98	108%	41%	0.96
6-10 years	≤ 2,400 mg	123	26	0.78	--	--	--	119	14	0.47
Dietary fiber										
3-5 years	> 8-10 g[b]	122%	56%	0.99	133%	50%	1.11	131%	55%	1.12
6-10 years	> 11-15 g[b]	104	25	0.91	--	--	--	108	19	1.47
Number of child days										
3-5 years		161	161	161	574	574	574	352	352	352
6-10 years		59	59	59	--	--	--	41	41	41

a NRC recommendation (NRC, 1989b).

b Based on American Health Foundation recommendation (Williams, 1995).

NRC and American Health Foundation recommendations are only applicable to children age 2 and older. This analysis was limited to children age 3 to 5 and 6 to 10, the only CACFP age groups for which the recommendations fully apply.

Note: The low 41 percent response rate to the 24-hour recall portion of the ECCCS on which these estimates are based raises concerns of potential bias. In-CACFP-care energy intake does not significantly differ between respondents and nonrespondents (see Appendix D), but whether their out-of-care energy intake systematically differs cannot be determined. Due to this uncertainty, we recommend that these data be interpreted with caution.

Exhibit 4.4b

Average Cholesterol, Sodium, and Dietary Fiber Consumed in CACFP Care and Over 24 Hours, by Age of Child, All CACFP

		All CACFP		
	Daily Recommendation	% Daily Recommendation in 24 Hours	% Daily Recommendation from CACFP	% Total from Meals in Care Relative to % Total Energy from Meals in Care
Cholesterol				
3-5 years	≤ 300 mg[a]	68%	26%	1.00
6-10 years	≤ 300 mg	68	14	0.74
Sodium				
3-5 years	≤ 2,400 mg[a]	109%	41%	0.97
6-10 years	≤ 2,400 mg	120	18	0.59
Dietary fiber				
3-5 years	> 8-10 g[b]	130%	53%	1.10
6-10 years	> 11-15 g[b]	107	21	1.25
Number of child days				
3-5 years		1,087	1,087	1,087
6-10 years		100	100	100

a NRC recommendation (NRC, 1989b).

b Based on American Health Foundation recommendations (Williams, 1995).

NRC and American Health Foundation recommendations are only applicable to children age 2 and older. This analysis was limited to children age 3 to 5 and 6 to 10, the only CACFP age groups for which the recommendations fully apply.

Note: The low 41 percent response rate to the 24-hour recall portion of the ECCCS on which these estimates are based raises concerns of potential bias. In-CACFP-care energy intake does not significantly differ between respondents and nonrespondents (see Appendix D), but whether their out-of-care energy intake systematically differs cannot be determined. Due to this uncertainty, we recommend that these data be interpreted with caution.

The contribution from CACFP to 3- to 5-year-old participants' dietary fiber intake is sizeable (53 percent of the recommended level). It meets the ADA recommendation for full-day care,[45] and surpasses the CACFP contribution to total food energy intake (ratio of 1.10). CACFP provides preschool children with about one quarter the daily maximum for dietary cholesterol, and 41 percent of the recommended limit for sodium. Although total sodium intake is somewhat high for this group of children, the amount from CACFP meals and snacks is not disproportionately high relative to its contribution to total food energy (ratio of 0.97). No differences by type of child care were found.

[45] As noted in Chapter 2, new DRI values (AIs) for total fiber are substantially higher than previous fiber recommendations for children. Reference values for children 1 to 10 years of age range from 19 to 31 grams per day (IOM/FNB, 2002). The effect of applying the new reference values to this analysis would be to reduce the mean percent of reference levels of dietary fiber overall and from CACFP meals and snacks; the contribution from CACFP would likely fall below the ADA recommendation for full-day care.

CACFP meals and snacks supply significantly less cholesterol, sodium, and dietary fiber for children 6 to 10 years of age compared with preschoolers (8 to 19 percent of recommended levels; $p < 0.001$ to $p < 0.05$). This is consistent with findings for total food energy, and the fewer meals and snacks they receive in care. As for the younger children, participants age 6 to 10 consume a high ratio of their dietary fiber to food energy requirements in CACFP care (ratio of 1.47). Finally, there is some evidence that school-age children in CACFP homes receive more cholesterol and sodium in care than those in centers; differences in point estimates for dietary fiber are not statistically significant.

Comparison of Diet Quality Between CACFP Children of Working Mothers and Not-in-Care Children of Nonworking Mothers

As shown in Chapter 2, children of working mothers tend to have worse dietary outcomes than children of nonworking mothers. CACFP participation might, however, ameliorate these differences. The purpose of the analysis discussed here was to determine whether children in CACFP care whose mothers work or are in school do as well as other children in terms of the nutritional quality of their diets. Outcome measures selected for this comparison include the Healthy Eating Index (HEI) scores, total food energy intake, and intake of other foods and nutrients important to the quality of children's diets. The analysis was limited to children 1 to 5 years of age, the group for whom CACFP and maternal employment were expected to have the most impact.

The samples of children were drawn from the 1995 ECCCS and the 1994-1996 CSFII[46] data sets. The ECCCS sample excluded children in CACFP whose mothers were neither working nor in school.[47] For the CSFII sample, children who consumed any meals or snacks from a child care center, family child care home, or in school **on the days covered by the dietary recalls** were excluded. Thus, the comparison was between children for whom the CACFP was likely substituting for mothers' care, and children not in child care for whom mothers' care was available.[48] Because ECCCS data were collected only on weekdays, dietary recalls for weekend days in the CSFII were discarded. The resulting samples from the ECCCS and the CSFII were 633 and 954 children, respectively.

It is important to recognize that the methods used to collect dietary data in the ECCCS and the CSFII were not identical. As described in Chapter 1, direct observation in conjunction with a menu survey of providers was used to obtain information on children's consumption of meals while in CACFP care; in addition, a telephone interview with the child's parent was conducted within 48 hours of the observation day to obtain information on the rest of the day's intake. In the CSFII, 24-hour recall data for children age 1 to 5 were collected in-person from the parent or other caregiver.

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46 To determine whether data from the 1998 CSFII could be used, selected measures of diet quality were compared between children from the 1994-1996 and 1998 samples. This analysis suggested there had been some shifts in the composition of children's diets that could potentially bias the comparison with data from the 1995 ECCCS. Therefore, observations from the 1998 CSFII were excluded.

47 This was the main excluded group, about three quarters of whom were 3- to 5-year-old children attending a Head Start program. Also excluded from the ECCCS sample were children in households with no female adults (n=17) and those in households where there were multiple related adult females with mixed employment statuses (n=3).

48 This group may have included some children who attended child care on days other than those for which dietary intake data were collected. For the purposes of this analysis, it was assumed that children's food consumption would only be influenced by meals received in child care on the days they actually consumed those meals and would not be affected by long-term patterns of child care participation.

The sections that follow present descriptive information on the sample children and their households, and the comparisons of children's diets. For about half the children in the ECCCS sample, intake data were available for two days, whereas for the other half data were available for only a single day. Many of the outcomes of interest are non-linear functions of intake, such as HEI component ratings based on numbers of servings in various food groups. Averaging such outcomes for a child over two days gives a different result than calculating the outcomes based on a two-day average of the child's intake.[49] To ensure that the constructed outcomes were comparable for children with one and two days of data, the approach was to calculate all outcomes on a **child-day** basis, and then to split to the child's sample weight between the two observations when both were available.

Two days of data were available for all children in the CSFII sample. The outcomes from these intake data were also calculated from the individual child-day records rather than from two-day averages of intake amounts. Sampling weights were then applied to reflect the national number of children in CACFP and the U.S. population (see Appendix B). Children under 2 years of age are not included in tabulations or the discussion of results for dietary measures where reference values do not apply. This was the case for all nutrition outcomes other than food energy, iron, and zinc.

The analysis finds that CACFP participants with working mothers are consuming diets of higher quality overall than children of homemakers not in child care. Based on the HEI, more children in CACFP received a "good" diet rating, and fewer had "poor" diets relative to those not in care. In addition, CACFP participants consume less soft drinks and added sugar. As for all children age 1 to 5 whose mothers work, CACFP participants in care over four hours per day are more likely to exceed recommendations for total food energy than their not-in-care counterparts with homemaker mothers. Other the other hand, they are also less likely to have average energy intakes below the desired levels. Both groups of children consume diets high in iron, zinc, and dietary fiber. They also do not differ in their intake of fried potatoes, but consume substantially less than the recommended three servings of vegetables per day.

Characteristics of Sample Children and Their Families

Exhibit 4.5 presents descriptive information on the ECCCS and CSFII sample children and their households. Several differences between the two groups emerged. In particular, compared with not-in-care children of homemaker mothers, CACFP children with working mothers are:

- Older (more preschoolers and fewer toddlers)
- More likely to be black and less likely to be Hispanic
- Less likely to be low-income or receiving public assistance
- Living in smaller households
- More likely to be located in the midwest or south and less likely to be located in the west
- More likely to have mothers with education beyond a high school degree or the equivalent.

49 For example, a child who ate no fruit on Day 1 and ample fruit on Day 2 would have HEI fruit component scores of 0 and 10 for the two days, averaging to a 5; but a score that was based on the two-day average of fruit intake might be 10.

Exhibit 4.5

Characteristics of Sample Children Age 1 to 5 and Their Households

	CACFP Participants with Working Mothers	Not-in-Care Children with Nonworking Mothers
Age		
1 year	6.6%	30.4%
2 years	12.0	28.3
3 years	25.9	12.3
4 years	29.6	11.7
5 years	25.8	17.5
Gender		
Male	47.8%	52.1%
Female	52.2	47.9
Race/Ethnicity		
Non-Hispanic White	55.0%	60.1%
Non-Hispanic Black	30.0	11.2
Hispanic	7.6	21.5
Other	7.4	7.3
Hours in CACFP care		
Less than 4	5.9%	--
4 to 8	30.5	--
8 or more	63.6	--
Mean	*7.6*	--
Household income as percent of poverty		
At or below 185%	47.1%	56.7%
Over 185%	52.9	43.3
Median	*202.9*	*160*
Public assistance		
Receiving assistance	9.7%	20.1%
Not receiving assistance	90.3	79.9
Household size/composition		
Mean number of household members	3.9%	4.7%
Mean number of adults	1.8	2.1
Mean number of employed adults	1.6	0.9
Mean number of children	2.1	2.6
Region		
Northeast	18.8%	19.9%
Midwest	28.7	19.4
South	36.9	31.1
West	15.6	29.6

Exhibit 4.5

Characteristics of Sample Children Age 1 to 5 and Their Households

	CACFP Participants with Working Mothers	Not-in-Care Children with Nonworking Mothers
Mother's education[a]		
Less than high school/GED	8.1%	25.6%
High school/GED	28.5	25.2
More than high school/GED	63.4	39.2
Sample size	633	954

a Data on mothers' education were available for 85 percent of CACFP sample.

Note: The low 41 percent response rate to the 24-hour recall portion of the ECCCS on which these estimates are based raises concerns of potential bias. In-CACFP-care energy intake does not significantly differ between respondents and nonrespondents (see Appendix D), but whether their out-of-care energy intake systematically differs cannot be determined. Due to this uncertainty, we recommend that these data be interpreted with caution.

These differences are similar to those seen between children of working and nonworking mothers in general, as documented in Chapter 2 (and Appendix C).

To control partially for the disparities in family income and household composition, the diet quality measures examined here are tabulated separately for subgroups defined by income relative to 185 percent of the federal poverty level and the number of adults in the household. Note that some subgroups contain less than 100 observations. Sample sizes were too small to stratify by other characteristics, such as child age, race/ethnicity, region, or mother's education.

Comparisons of Diet Quality: Healthy Eating Index

The HEI, as described in Chapter 2 of this report, provides an assessment of the degree to which an individual's diet meets the recommendations of the USDA Food Guide Pyramid and the *Dietary Guidelines*. Both overall HEI scores and all ten component scores were compared between the CACFP and CSFII groups,[50] and the results are shown in Exhibit 4.6. Note that here, and throughout the remainder of this chapter, results for the CACFP children are presented separately for those in child care more than four hours per day and four or fewer hours per day. Although the majority of CACFP participants age 1 to 5 years are in care for a significant portion of the day, it was expected that any nutritional effects of the programs would be less pronounced for those in part-day child care.

[50] HEI scores for the CSFII sample were available on-line from USDA (www.cnpp.usda.gov/hei9496data.htm, accessed April 2002). Scores for the ECCCS sample were computed based on USDA food codes and nutrients, and documentation provided in Bowman *et al*., 1998.

Exhibit 4.6

Mean Healthy Eating Index Scores[a]

	CACFP Participants with Working Mothers		Not-in-care Children with Nonworking Mothers
	≤ 4 hr in CACFP Care	> 4 hr in CACFP Care	
All children age 2 to 5			
HEI – total score	73.7***	73.8***	69.7
Grain score	7.4	7.2**	7.6
Vegetable score	4.9	5.3	5.0
Fruit score	7.9***	8.1***	6.2
Milk score	8.0**	8.8***	7.0
Meat score	5.4	5.3	5.8
Total fat score	8.0**	7.8**	7.2
Saturated fat score	5.6	4.6***	5.4
Cholesterol score	9.2	9.3*	9.0
Sodium score	8.4	8.3***	8.8
Variety score	8.8***	9.3***	7.7
Maximum sample size	107	479	696
By income category			
Up to 185% of poverty			
HEI – total score	73.4***	74.5***	68.2
Grain score	7.3	7.1	7.5
Vegetable score	4.9	5.8**	5.0
Fruit score	7.7***	8.1***	5.8
Milk score	8.4***	8.6***	6.9
Meat score	6.1	6.1	6.2
Total fat score	7.5	7.6**	6.9
Saturated fat score	4.8	4.6	5.1
Cholesterol score	9.3**	9.1*	8.7
Sodium score	8.4	8.0**	8.6
Variety score	9.1***	9.3***	7.6
Maximum sample size	75	259	400
Over 185% of poverty			
HEI – total score	74.1	73.3*	71.5
Grain score	7.5	7.2**	7.8
Vegetable score	4.9	4.8	5.1
Fruit score	8.4***	8.1***	6.8
Milk score	7.3	8.9***	7.2
Meat score	4.3	4.6*	5.3
Total fat score	8.9***	7.9	7.7
Saturated fat score	7.0*	4.6***	5.9
Cholesterol score	9.1	9.4	9.3
Sodium score	8.3	8.5*	8.9
Variety score	8.4	9.2***	7.7
Maximum sample size	32	220	296

Exhibit 4.6

Mean Healthy Eating Index Scores[a]

	CACFP Participants with Working Mothers		Not-in-care Children with Nonworking Mothers
	≤ 4 hr in CACFP Care	> 4 hr in CACFP Care	
By number of adults			
One			
HEI – total score	73.6***	74.3***	65.1
Grain score	7.1	7.2	7.3
Vegetable score	4.3	5.4	4.8
Fruit score	8.1***	8.1***	5.2
Milk score	7.6	8.8***	7.5
Meat score	5.1	6.3	6.4
Total fat score	8.4***	7.4***	6.0
Saturated fat score	6.1***	4.7*	3.7
Cholesterol score	9.6***	8.9	8.4
Sodium score	8.7	8.1	8.2
Variety score	8.6	9.5***	7.6
Maximum sample size	45	157	74
Multiple			
HEI – total score	73.8**	73.6***	70.3
Grain score	7.6	7.2**	7.7
Vegetable score	5.4	5.2	5.1
Fruit score	7.8***	8.1***	6.4
Milk score	8.4***	8.8***	7.0
Meat score	5.7	4.9**	5.7
Total fat score	7.6	7.9**	7.4
Saturated fat score	5.2	4.6***	5.7
Cholesterol score	8.9	9.5**	9.0
Sodium score	8.1*	8.4***	8.8
Variety score	9.0***	9.1***	7.7
Maximum sample size	62	322	622

a Range of scores for the HEI is 0 to 100; ranges for each component of the HEI are 0 to 10. The overall HEI score is the simple sum of the scores for each of the 10 components.

*** Statistically significant difference from children of nonworking mothers at the 1 percent level
** Statistically significant difference from children of nonworking mothers at the 5 percent level
* Statistically significant difference from children of nonworking mothers at the 10 percent level

Note: The low 41 percent response rate to the 24-hour recall portion of the ECCCS on which these estimates are based raises concerns of potential bias. In-CACFP-care energy intake does not significantly differ between respondents and nonrespondents (see Appendix D), but whether their out-of-care energy intake systematically differs cannot be determined. Due to this uncertainty, we recommend that these data be interpreted with caution.

Both part- and full-day CACFP participants with working mothers have significantly higher mean overall HEI scores than not-in-care children of nonworking mothers (74.3 and 73.9 *versus* 69.7).[51] Findings were similar for most subgroups, although differences are greatest for children in low-income and single-adult households. Mean HEI scores for CACFP participants are 6 to 9 points higher relative to not-in-care children of homemakers and suggest a positive influence of the program for these more disadvantaged groups of children.

The analysis of HEI components finds that overall scores represent the net effect of some variability in the direction of differences between children's individual component scores. Overall, the CACFP children with working mothers score significantly higher for fruit, milk, total fat, and dietary variety than the not-in-care group with nonworking mothers. This finding is independent of the hours spent in CACFP care. At the same time, CACFP children have significantly lower scores for grain, meat, saturated fat, and sodium when in care more than four hours per day. The higher HEI component scores among CACFP children seem to persist despite differences in family income and the number of adults in the household. The lower component scores, however, are almost exclusively concentrated among children with incomes over 185 percent of poverty and in multiple-adult households.

The differences in overall HEI scores between CACFP participants with working mothers and not-in-care children of homemakers are reflected in some, but not all, of the HEI diet ratings. As shown in Exhibit 4.7, three-quarters of children in both groups consume diets that "need improvement." With respect to a "good diet" rating, the proportion is significantly larger when CACFP participants in care more than four hours per day are compared with children not in care (25 *versus* 20 percent; $p<0.10$). The magnitude of this difference is similar for children who spend less time in care and across all subgroups, but generally not statistically significant. In contrast, the finding that fewer CACFP children had "poor diets" compared with children not in care was highly significant (0 to 0.2 *versus* 7 percent) and consistent across all income and household composition subgroups.

Comparisons of Diet Quality: Food Energy and Selected Nutrients

Children's intakes of total food energy, iron, zinc, and dietary fiber were assessed because of their links to physical and cognitive development and overall health. HEI scores alone may not reveal problematic levels of these dietary components. As for the prior analyses, children's food energy and nutrient intakes are expressed as percentages of available recommended daily values (Exhibit 4.8).[52] For food energy, approximations of the proportion of children with intakes exceeding 10 percent above and 10 percent below the 1989 REA are also provided.[53]

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[51] To find out if these positive findings were simply a reflection of differences in characteristics of the samples, total HEI score was also estimated in a multivariate model that included measures of hours in CACFP care, child age, gender, race/ethnicity, household income, receipt of public assistance, number of adults and number of children in the household, mother's education, and region. The estimated regression-adjusted differences in HEI score were quite comparable (4.3 for children in care 4 or fewer hours per day, and 4.0 for children in care more than 4 hours per day; $p < 0.0001$ for both).

[52] As discussed earlier in this chapter, new reference values for food energy and total fiber have been released, but were not available at the time these analyses were completed.

[53] These are arbitrary cutoff values, and are not intended as a measure of adequacy of energy intake.

Exhibit 4.7

HEI Diet Rating[a]

	CACFP Participants with Working Mothers		Not-in-care Children of Nonworking Mothers
	≤ 4 hr in CACFP Care	> 4 hr in CACFP Care	
All children age 2 to 5			
Poor diet	0.0%***	0.2%***	6.7%
Diet needs improvement	75.4	74.6	73.7
Good diet	24.6	25.1*	19.6
Maximum sample size	107	479	696
By income category			
Up to 185% of poverty			
Poor diet	0.0%***	0.4%***	8.7%
Diet needs improvement	81.9	76.6	72.2
Good diet	18.1	23.0	19.1
Maximum sample size	75	259	400
Over 185% of poverty			
Poor diet	0.0%***	0.2%***	4.3%
Diet needs improvement	64.4	73.0	75.5
Good diet	35.6	26.8	20.2
Maximum sample size	32	220	296
By number of adults			
One			
Poor diet	0.0%***	0.0%***	15.0%
Diet needs improvement	77.6	74.8	67.5
Good diet	22.4	25.2	17.5
Maximum sample size	45	157	74
Multiple			
Poor diet	0.0%***	0.5%***	5.6%
Diet needs improvement	73.5	74.6	74.5
Good diet	26.5	25.1	19.9
Maximum sample size	62	322	622

a An HEI score over 80 implies a "good diet," an HEI score between 51 and 80 implies a diet that "needs improvement," and an HEI score less than 51 implies a "poor diet."

*** Statistically significant difference from children of nonworking mothers at the 1 percent level
** Statistically significant difference from children of nonworking mothers at the 5 percent level
* Statistically significant difference from children of nonworking mothers at the 10 percent level

Note: The low 41 percent response rate to the 24-hour recall portion of the ECCCS on which these estimates are based raises concerns of potential bias. In-CACFP-care energy intake does not significantly differ between respondents and nonrespondents (see Appendix D), but whether their out-of-care energy intake systematically differs cannot be determined. Due to this uncertainty, we recommend that these data be interpreted with caution.

Exhibit 4.8

Mean Intake of Food Energy, Iron, Zinc, and Dietary Fiber

	CACFP Participants with Working Mothers		Not-in-Childcare Children of Nonworking Mothers
	≤ 4 hr in CACFP Care	> 4 hr in CACFP Care	
All children age 1 to 5[a]			
Food energy:			
Mean percent of 1989 REA	95.4%	104.4%***	96.2%
Percent above 110% REA	27.4	39.5***	30.4
Percent below 90% REA	38.1	33.6***	48.4
Percent of 2001 RDA for:			
Iron	132.6	139.9	144.5
Zinc	190.2*	218.2	218.0
Percent dietary fiber recommendation[b]	115.8	132.5***	121.3
Maximum sample size	107	526	954
By income category			
Up to 185% of poverty			
Food energy:			
Mean percent of 1989 REA	98.2%	104.2%***	95.1%
Percent above 110% REA	34.3	39.0**	30.3
Percent below 90% REA	40.1	39.1**	49.4
Percent of 2001 RDA for:			
Iron	133.7	134.9	144.1
Zinc	201.9	217.1	219.9
Percent dietary fiber recommendation[b]	112.9	134.2***	116.8
Maximum sample size	75	274	559
Over 185% of poverty			
Food energy:			
Mean percent of 1989 REA	90.6%	104.6%**	97.5%
Percent above 110% REA	15.5***	38.7*	30.4
Percent below 90% REA	34.5	31.1***	47.2
Percent of 2001 RDA for:			
Iron	130.8	144.0	145.0
Zinc	170.2*	219.1	215.5
Percent dietary fiber recommendation[b]	120.8	131.2	126.8
Maximum sample size	32	252	395
By number of adults			
One			
Food energy:			
Mean percent of 1989 REA	91.2%	108.0%***	96.5%
Percent above 110% REA	24.0	46.0**	33.5
Percent below 90% REA	46.1	33.8*	45.4

Exhibit 4.8

Mean Intake of Food Energy, Iron, Zinc, and Dietary Fiber

	CACFP Participants with Working Mothers		Not-in-Childcare Children of Nonworking Mothers
	≤ 4 hr in CACFP Care	> 4 hr in CACFP Care	
Percent of 2001 RDA for:			
Iron	134.0	131.8	146.7
Zinc	171.5*	219.8	223.1
Percent dietary fiber recommendation[b]	102.8	128.8*	103.0
Maximum sample size	45	168	96
Multiple			
Food energy:			
Mean percent of 1989 REA	99.2%	102.9%**	96.1%
Percent above 110% REA	30.4	35.9*	30.0
Percent below 90% REA	30.9***	35.2***	48.8
Percent of 2001 RDA for:			
Iron	131.3	143.4	144.2
Zinc	207.0	217.6	217.3
Percent dietary fiber recommendation[b]	127.5	134.2**	123.9
Maximum sample size	62	358	858

a For dietary fiber, only children 2 to 5 years of age are included.

b Based on American Health Foundation recommendation of "age-plus-five" grams per day (Williams, 1995).

*** Statistically significant difference from children of nonworking mothers at the 1 percent level
** Statistically significant difference from children of nonworking mothers at the 5 percent level
* Statistically significant difference from children of nonworking mothers at the 10 percent level

Note: The low 41 percent response rate to the 24-hour recall portion of the ECCCS on which these estimates are based raises concerns of potential bias. In-CACFP-care energy intake does not significantly differ between respondents and nonrespondents (see Appendix D), but whether their out-of-care energy intake systematically differs cannot be determined. Due to this uncertainty, we recommend that these data be interpreted with caution.

Food Energy

Average food energy intake is greater for children with working mothers in CACFP care compared with not-in-care children of nonworking mothers. The difference was significant for children in care over four hours per day (104 *versus* 96 percent of 1989 REA).[54] In addition, a significantly greater share (40 percent) of CACFP children consume in excess of 110 percent of their recommended energy levels than children not in care (30 percent). Results were similar for all children regardless of income or the number of adults in the household. These findings suggest that CACFP participation alone is not sufficient to ameliorate the association between maternal employment and higher levels of energy intake among all preschool children, as discussed in Chapters 2 and 3.

[54] The 1989 REA for children age 1 to 3 is 1,300 calories per day, and for children age 4 and 5, 1800 calories.

The analysis of children's food energy intake also found that significantly fewer CACFP participants had food energy intakes below 90 percent of the REA compared with not-in-care children of nonworking mothers. The difference was significant for full-day CACFP participants (34 percent *versus* 48 percent). Again, the pattern observed persists across subgroups. Whether or not this is indicative of a positive association between CACFP participation and food energy intake is difficult to say in light of the growing problem of childhood obesity.

Iron and Zinc

The analyses of mean iron and zinc intakes (Exhibit 4.8) did not reveal any differences between CACFP children whose mothers work and not-in-care children of nonworking mothers. Both groups are consuming, on average, about 40 percent more than the RDA for iron and over twice the RDA for zinc. These high levels of nutrient intake were maintained in spite of differences in income and household composition.

Dietary Fiber

Along with iron and zinc, intake of dietary fiber among children in both groups also exceeds recommended levels. Mean dietary fiber intakes are significantly higher among CACFP participants in care more than four hours a day compared with children not in care (132 *versus* 121 percent of the recommended value).[55] Results were replicated for subgroups except among children in higher income households, where dietary fiber intake did not differ between groups.

Comparisons of Diet Quality: Soft Drinks, Added Sugar, and Fried Potatoes

Overconsumption of soda, fruit-flavored drinks, and other sweetened beverages by children is cause for concern. As noted in Chapter 2, these soft drinks contribute to higher than desirable levels of sugar intake and are low in nutrients. Excessive consumption of added sugars has been linked to increases in food energy intake, and may contribute to childhood obesity. It was therefore of interest to examine these aspects of diet quality among CACFP participants with working mothers and other children. In addition, although vegetable consumption is generally considered health-promoting, the Food Guide Pyramid (and HEI) does not currently distinguish between high-fat fried potatoes and other types of vegetables. For this reason, fried potato consumption was also assessed. Given that the CACFP meal patterns do not allow soft drinks and, instead, require milk, fruit or juice, and vegetables, it seemed likely that participants would be consuming smaller quantities of the less healthful foods examined here compared with other children.

Soda and Soft Drinks

Exhibit 4.9 shows the proportions of children who consume soda and other soft drinks in the following daily quantities: none, up to 8 fluid ounces, and more than 8 fluid ounces.[56] CACFP participants with working mothers are significantly less likely to consume any soda than not-in-care children with nonworking mothers (68 to 75 percent *versus* 61 percent did not consume soda). They

[55] If dietary fiber intake was expressed in relation to the new, higher reference values (AIs), mean intake would probably not exceed these values. The differences between CACFP participants and nonparticipants, however, would remain.

[56] Soft drinks excluding soda are fruit-flavored beverages other than 100 percent fruit juice (e.g., lemonade, fruit punch, sports drinks) and iced tea, including artificially sweetened beverages.

are also significantly less likely to consume more than 8 ounces of soda per day (3 percent *versus* 11 percent). When subgroups were examined, differences in the likelihood of consuming any soda are significant only among children in low-income and multiple adult households. CACFP participants, however, are less likely to consume larger quantities of soda than other children regardless of income or number of adults in the household.

Exhibit 4.9

Consumption of Soda and Other Soft Drinks[a]

	CACFP Participants with Working Mothers		Not-in-Childcare Children of Nonworking Mothers
	≤ 4 hr in CACFP Care	> 4 hr in CACFP Care	
All children age 2 to 5			
Soda			
None	74.6%**	68.0%*	61.1%
Up to 8 oz	22.5	29.2	27.6
More than 8 oz	2.8***	2.8***	11.3
Other soft drinks			
None	51.9	60.1*	48.5
Up to 8 oz	32.8	28.8	30.7
More than 8 oz	15.3	11.1***	20.8
Maximum sample size	107	479	696
By income category			
Up to 185% of poverty			
Soda			
None	76.9%***	73.0%***	57.2%
Up to 8 oz	19.1*	22.0**	30.1
More than 8 oz	4.0***	5.1***	12.7
Other soft drinks			
None	46.0	54.9	48.8
Up to 8 oz	41.9*	31.6	28.2
More than 8 oz	12.1***	13.5**	23.1
Maximum sample size	75	259	400
Over 185% of poverty			
Soda			
None	70.8%	63.9%	66.0%
Up to 8 oz	28.4	35.1**	24.5
More than 8 oz	0.9***	1.0***	9.5
Other soft drinks			
None	61.9	64.3**	48.1
Up to 8 oz	17.2**	26.6	33.8
More than 8 oz	20.9	9.1**	18.1
Maximum sample size	32	220	296

Exhibit 4.9

Consumption of Soda and Other Soft Drinks[a]

	CACFP Participants with Working Mothers		Not-in-Childcare Children of Nonworking Mothers
	≤ 4 hr in CACFP Care	> 4 hr in CACFP Care	
By number of adults			
One			
Soda			
None	81.0%	72.6%	68.1%
Up to 8 oz	14.2	25.4	18.2
More than 8 oz	4.9*	2.0***	13.7
Other soft drinks			
None	56.8	51.7	49.5
Up to 8 oz	33.0	30.3	30.9
More than 8 oz	10.2	18.1	19.6
Maximum sample size	45	157	74
Multiple			
Soda			
None	69.0%	65.9%	60.2%
Up to 8 oz	30.0	30.9	28.9
More than 8 oz	1.0***	3.2***	11.0
Other soft drinks			
None	47.5	63.8**	48.3
Up to 8 oz	32.6	28.2	30.7
More than 8 oz	19.9	8.0***	21.0
Maximum sample size	62	322	622

a Includes fruit drinks (not juice), iced tea, lemonade.

*** Statistically significant difference from children of nonworking mothers at the 1 percent level
** Statistically significant difference from children of nonworking mothers at the 5 percent level
* Statistically significant difference from children of nonworking mothers at the 10 percent level

Note: The low 41 percent response rate to the 24-hour recall portion of the ECCCS on which these estimates are based raises concerns of potential bias. In-CACFP-care energy intake does not significantly differ between respondents and nonrespondents (see Appendix D), but whether their out-of-care energy intake systematically differs cannot be determined. Due to this uncertainty, we recommend that these data be interpreted with caution.

The patterns of consumption for soft drinks (other than soda) differ from those for soda in three respects. First, more children age 2 to 5 in both groups drink these beverages than they do soda (50 *versus* 37 percent; data not shown). Second, only CACFP children with working mothers who participate more than four hours per day are less likely to consume soft drinks than not-in-care children of homemakers (60 *versus* 48 percent; $p<0.10$). The amount of time in care also makes a difference in the share of children who consume in excess of 8 ounces of these beverages a day: 11 percent of CACFP participants *versus* 21 percent of not-in-care children of nonworking mothers. Finally, CACFP participants in higher income (but not low-income) households are significantly less likely to

consume other soft drinks in any quantity than children not in care. There were no differences between the groups among children in single-adult households.

Added Sugar

Results of the analysis of children's intake of added sugar (in teaspoons per day) are shown in Exhibit 4.10. Mean amounts are presented for total added sugar and added sugar from soda and other soft drinks. Reference values (maximums) for total added sugars, which are provided by USDA's Food Guide Pyramid, are 6 teaspoons a day for children 2 through 6 years of age, and two-thirds that amount (4 teaspoons) for younger children (Kennedy *et al*., 1995).

Exhibit 4.10

Mean Added Sugar Intake (teaspoons per day)

	CACFP Participants with Working Mothers		Not-in-Childcare Children of Nonworking Mothers
	≤ 4 hr in CACFP Care	> 4 hr in CACFP Care	
All children age 2 to 5			
Added sugar from all sources	13.0	12.3***	14.3
From soda and other soft drinks	3.4***	2.9***	5.2
Maximum sample size	107	479	696
By income category			
Up to 185% of poverty			
Added sugar from all sources	13.7	12.0**	13.5
From soda and other soft drinks	3.6***	3.3***	5.6
Maximum sample size	75	259	400
Over 185% of poverty			
Added sugar from all sources	12.0**	12.5***	15.3
From soda and other soft drinks	3.1*	2.6***	4.7
Maximum sample size	32	220	296
By number of adults			
One			
Added sugar from all sources	12.6	12.6	13.8
From soda and other soft drinks	3.3***	3.5***	5.7
Maximum sample size	45	157	74
Multiple			
Added sugar from all sources	13.4	12.1***	14.4
From soda and other soft drinks	3.5***	2.7***	5.2
Maximum sample size	62	322	622

*** Statistically significant difference from children of nonworking mothers at the 1 percent level
** Statistically significant difference from children of nonworking mothers at the 5 percent level
* Statistically significant difference from children of nonworking mothers at the 10 percent level

Note: The low 41 percent response rate to the 24-hour recall portion of the ECCCS on which these estimates are based raises concerns of potential bias. In-CACFP-care energy intake does not significantly differ between respondents and nonrespondents (see Appendix D), but whether their out-of-care energy intake systematically differs cannot be determined. Due to this uncertainty, we recommend that these data be interpreted with caution.

For those in care for more than four hours a day, CACFP participants with working mothers consume significantly less total added sugar than not-in-care children with nonworking mothers (12 *versus* 14 teaspoons per day). The added sugar contribution from soda and other soft drinks is significantly smaller for CACFP children regardless of time spent in care (3 *versus* 5 teaspoons). These patterns were consistent across all income and household composition subgroups.

Fried Potatoes

Children's consumption of fried potatoes, including French fries, tater tots, and hash browns, was measured in "servings," as defined by the Food Guide Pyramid. A serving of fried potatoes (and other cooked vegetables) is the equivalent of ½ cup; for children age 2 and 3 years, a serving is two-thirds of this amount. Exhibit 4.11 shows the results for fried potato consumption in the context of the total number of other (non-fried potato) vegetable servings consumed.

Exhibit 4.11
Consumption of Fried Potatoes and Other Vegetables (servings per day)

	CACFP Participants with Working Mothers		Not-in-care Children with Nonworking Mothers
	≤ 4 hr in CACFP Care	> 4 hr in CACFP Care	
All children age 2 to 5			
Fried potatoes	0.3	0.4	0.4
Other vegetables	1.6	1.9***	1.6
Maximum sample size	107	479	696
By income category			
Up to 185% of poverty			
Fried potatoes	0.3	0.3	0.4
Other vegetables	1.6	2.2***	1.6
Maximum sample size	75	259	400
Over 185% of poverty			
Fried potatoes	0.3	0.4	0.4
Other vegetables	1.6	1.7	1.5
Maximum sample size	32	220	296
By number of adults			
One			
Fried potatoes	0.2	0.3	0.4
Other vegetables	1.4	2.0	1.6
Maximum sample size	45	157	74
Multiple			
Fried potatoes	0.4	0.4	0.4
Other vegetables	1.9	1.9**	1.6
Maximum sample size	62	322	622

a A serving of vegetables is defined in the Food Guide Pyramid as 1 cup of raw leafy vegetables; ½ cup of other vegetables, cooked or chopped raw; or ¾ cup of vegetable juice.

*** Statistically significant difference from children of nonworking mothers at the 1 percent level
** Statistically significant difference from children of nonworking mothers at the 5 percent level
* Statistically significant difference from children of nonworking mothers at the 10 percent level

Note: The low 41 percent response rate to the 24-hour recall portion of the ECCCS on which these estimates are based raises concerns of potential bias. In-CACFP-care energy intake does not significantly differ between respondents and nonrespondents (see Appendix D), but whether their out-of-care energy intake systematically differs cannot be determined. Due to this uncertainty, we recommend that these data be interpreted with caution.

There is no difference in consumption of fried potatoes between CACFP children with working mothers and not-in-care children with nonworking mothers. Both groups consume, on average, less than one-half serving of fried potatoes per day. Mean intake of vegetables other than fried potatoes among CACFP participants in care more than four hours is significantly greater than for children not in child care (1.9 *versus* 1.6 servings). Although this represents an increase of less than one-half serving overall, the difference among low-income children is somewhat more substantial (about 0.6 servings). Fried potatoes comprise a larger share of total vegetable intake among not-in-care children of nonworking mothers than CACFP children whose mothers work.

Summary

The results presented in this chapter suggest that CACFP participants' diets, on average, meet daily recommendations for food energy, protein, vitamins A and C, iron, zinc, calcium, cholesterol, and dietary fiber. They also show that meals and snacks consumed in CACFP care make a substantial and positive contribution to these children's total dietary intake. The contribution of the CACFP to participants' diets does not vary much by type of care (Head Start, child care centers, or family child care homes), except among school-age children. Six-to-10-year-olds consume a smaller share of their food energy and iron needs from CACFP meals and snacks if cared for in child care centers *versus* family child care homes. This can be explained by the higher likelihood that children in homes are offered breakfast and lunch compared with centers, where they are more likely to be offered snacks (Fox *et al.*, 1997). Regardless of type of care, however, CACFP participants age 6 to 10 consume diets that meet recommendations for most nutrients.

CACFP participants age 3 to 10, like other children of the same age (USDA/ARS, 1999), consume, on average, somewhat more than the *Dietary Guidelines'* recommended levels of total and saturated fat, and more sodium and less carbohydrate than the NRC-recommended amounts. CACFP meals and snacks do not contribute disproportionately to their daily intake of any of these dietary components, although they do provide more than the recommended level of saturated fat (mean of about 13 percent of food energy). Continued efforts to educate providers and provide tools to assist them in serving lower fat and lower sodium meals and snacks seem warranted. In addition, USDA may want to consider periodic nutrient analysis of providers' menus to help target menu planning guidance appropriately.

The analyses suggest that preschool children (age 2 to 5) in CACFP whose mothers work or are in school have better diets than children cared for by their own mothers who do not work outside the home. An association was found between program participation and better overall diet quality (more fruit, milk, and variety, and less total fat); reduced likelihood of food energy consumption below 90 percent of the average requirement; and lower levels of soda, other soft drinks, and added sugars. The differences especially favor children in low-income households, suggesting that the target population is benefiting from the CACFP.

This study was also interested in the extent to which CACFP might dampen any negative effects of maternal employment on children's nutrition. In Chapters 2 and 3, it was found that preschool children (age 2 to 4) with full-time working mothers tended to have diets of **higher** quality overall than their counterparts with homemaker mothers. These children did worse than children of

homemaker mothers on overconsumption of food energy, sodium, soda, and added sugars. Results in this chapter suggest that CACFP care tends to moderate the effects of mother's work on preschool children's overconsumption of soda and added sugars, but does not moderate the effects on food energy and sodium intake. Other potentially positive effects of CACFP care for preschool children of full-time working mothers include greater fruit and milk consumption, lower total fat intake, lower likelihood of "poor" diet rating, and, for full-day care only (more than 4 hours), higher likelihood of "good diet" rating and greater consumption of vegetables excluding fried potatoes. These were outcomes for which CACFP preschoolers did significantly better than not-in-care children, but there were no differences for all preschoolers by maternal employment.

These analyses suggest that the CACFP is making a substantial and positive contribution to the diets of preschool children with working mothers. This study cannot prove, however, that CACFP is what makes the difference in their diets. An alternative explanation is that the differences in nutrition outcomes are due to compositional differences between the samples of children (Exhibit 4.5). To investigate this possibility, a regression analysis controlling for all of the measured characteristics of the children and their families was conducted. Results of this analysis confirmed the findings of better diet quality among CACFP participants.

Nonetheless, selection effects cannot be ruled out. Although controlling for measured characteristics (child age, gender, race/ethnicity, hours in care, household income and composition, mother's education, and region) did not alter the results, it may be that families of preschoolers that use CACFP care have other advantages over families of preschoolers not in care that are associated with better nutrition outcomes. For example, it may be that, in consideration of the difficulties in combining work and family responsibilities, only the most energetic and focused women who are mothers of preschoolers choose to work.

Another possible factor is the difference in data collection methodologies between the two data sources. It seems likely that underreporting of food intake would have been limited to out-of-care consumption for the CACFP sample, because data for meals consumed in care were collected by direct observation. On the other hand, with both the child and parent present for the dietary interview, underreporting may not have been a significant problem for the CSFII sample.

As noted in the executive summary, in the data sources, and throughout the CACFP tables, only 41 percent of the 24-hour recall sample of CACFP children, on which results in this chapter are based, responded to the survey. Although energy intake patterns of the respondent children and other children observed while eating in CACFP facilities were very similar (see Appendix D), it is possible that nonrespondents could have systematically different out-of-CACFP-care dietary intake patterns than respondents. USDA Food and Nutrition Service therefore recommends that analyses of these data should not be considered as representative of CACFP participants or of the impact of the program.

Regardless of the potential limitations, these findings are interesting and worth pursuing further, ideally with a prospective, experimental design.

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Appendix A
Determination of Child-Maternal Female Dyads in the CSFII

The analysis sample of child-mother dyads for this report was constructed from the Continuing Survey of Food Intakes by Individuals (CSFII) data for survey years 1994-1996 and 1998. The first step was to identify every potential dependent child. These are persons aged 0 to 17 years who were not labeled as reference persons (RPs), their spouses, or their partners. Also excluded were boarders, employees, or guests age 15 to 17 years. There were altogether 17,486 dependent children available for dyads.

The second step was to identify and rank the pool of potential mothers or maternal females for each dependent child. This included all females in the household who were age 15 years or older, and at least five years older than the child. Information was not available on the direct relationships between all household members (e.g., between the child and every household member), so each potential mother was rated according to her relationship to the RP. This resulted in a hierarchy of ratings (1 is best) specific to each relationship scenario (Exhibit A.1). For example, if the sample child was the child of the RP—a category accounting for nearly 90 percent of children in the CSFII—then optimal candidates for the child's mother were the RP (ranked 1), or the RP's spouse or partner (ranked 2 and 3, respectively). If the RP was male and no spouse or partner was listed, then the next best candidate would be the child's grandmother or aunt (ranked 4 and 5, respectively). Absent these household members, potential maternal females were other relatives (e.g., the RP's mother-in-law or aunt) or the child's (sufficiently older) sister.

Exhibit A.1

Rank Ordering of Potential Mothers in Household by Relationship to Reference Person (RP)

Child's Relationship to RP	Maternal Female's Relationship to RP
Foster child/Child	1 = RP, 2 = Spouse, 3 = Partner, 4 = Parent, 5 = Sibling, 6 = Other relative, 7 = Child, 8 = Foster child
Grandchild	1 = Child, 2 = RP, 3 = Spouse, 4 = Partner, 5 = Sibling, 6 = Other relative, 7 = Grandchild
Other relative	1 = Sibling, 2 = Other relative, 3 = RP, 4 = Spouse, 5 = Partner, 6 = Parent, 7 = Child; 8 = Grandchild
Sibling	1 = Parent, 2 = RP, 3 = Spouse, 4 = Partner, 5 = Sibling, 6 = Other relative
Guest/Unrelated/Boarder	1 = Guest, 2 = Other unrelated, 3 = Boarder, 4 = Partner, 5 = RP, 6 = Spouse, 7 = Parent, 8 = Sibling, 9 = Other relative, 10 = Child, 11 = Grandchild

The third step was to select one maternal female who completed a dyad with each child. The majority of dyads include a maternal female who was probably the child's mother; 95 percent of the females

selected were either a biological, foster, or step mother. If multiple females obtained the same rating for a given child, the dyad was incomplete because the most likely mother could not be determined, and the child was consequently excluded from the analysis sample. This accounted for just over 1 percent of the potential dyads. Most commonly, the sample child was the RP's grandchild, and the household included two or more women who were daughters of the RP and age 15 or more years older than the grandchild—either one of whom might thus be the child's biological mother.

After each dependent child was associated with a maternal female, two exclusionary criteria were applied. Although grandmothers were permissible as maternal females, dyads involving maternal females aged 60 years or older were dropped because those women would not be considered to be choosing between homemaking and working outside the home. They accounted for less than 1 percent of the potential dyads. Similarly, only homemakers and females whose employment status could be categorized as working full- or part-time were appropriate for analyses, which excluded about 9 percent of the dyads. The final analysis sample comprised 15,344 child-mother dyads.

Appendix B
Sample Weights

This appendix describes the sample weights that were used in analyses of the CSFII and ECCCS data.

CSFII Sample Weights

The CSFII sampling weights compensate for the variable probabilities of selection, differential response rates, and possible sampling frame deficiencies, for both household- and person-level data. The paragraphs below describe how person-level data were weighted to achieve national representativeness, taking into account nonresponse and noncoverage. A composite estimation approach was used to combine the CSFII 1994 to 1996 and 1998 samples, covering four years in total. Although the 1998 supplement to the CSFII comprised children aged 0 to 9 only, the sample was designed to allow these data to be combined with the CSFII/DHKS data for 1994 to 1996, using appropriate weights provided by USDA. These four-year sampling weights were therefore used on the combined dataset.

Base weights equal to the reciprocal of the probability of selection were assigned to each sample person. The probability of selection is the product of the probabilities of selecting: (1) the primary sampling unit (PSU); (2) the segment within the PSU; (3) the household within the segment; and (4) the eligible sample person within the household.

The base weights were adjusted for nonresponse on two factors: screening nonresponse, and person nonresponse. **Screening nonresponse** adjustments were made within four classes: census region, MSA status, minority status, and quarter of the year of field operations. The base weight of each eligible sample person was increased by a factor corresponding to the screener nonresponse rate within each class. Screener nonresponse-adjusted weights were then adjusted further to account for **person nonresponse** on classes defined by income level, age, sex, census region, MSA status, quarter of the year of field operations, and minority status of the segment. This produced nonresponse-adjusted base weights for sample persons who responded.

Finally, to compensate for variation in sample counts and possible undercoverage of certain groups, the nonresponse-adjusted weights were ratio adjusted to population estimates from the March Current Population Survey (CPS) for each year of data collection (i.e., 1994-1996 and 1998). Nonresponse rates were calibrated using an iterative process of raking ratio or multiplicative weighting so that the sum of the final weights corresponded to CPS subpopulations defined according to sex, age, home ownership, and several other household and segment characteristics. In other words, the target percentage established by the CPS is the weighted percentage for the sample using the final calibrated weights.

Jackknife replicate weights for variance estimation are also provided for each set of sampling weights. The jackknife replication method was designed to reflect the stratification and clustering used in the CSFII/DHKS sample design, and to capture the effects of the raking ratio adjustments described above. The replicate weights provided for the combined four-year sample (1994 to 1996 and 1998) were used.

ECCCS Sample Weights

The construction of weights for the ECCCS was conceptually similar to that for the CSFII.[57] Base weights were assigned as the inverse of the sampling probabilities, adjusted for for various special conditions. (For example, Massachusetts was used for the pretest, and this required adjusting the sampling probability somewhat.) Nonresponse adjustments were then made to these sampling probabilities. This was done by stratifying respondents and nonrespondents into homogenous cells and then inflating the inverse of the conditional sampling probabilities for respondents within each cell to account for missing observations from nonrespondents within that same cell. When the resulting weight was unreasonably large, the inflation factor was truncated and a proportional spreading procedure was used.

Sampling for this study followed a multistage, multiphase design. Six weights were constructed for the data analysis, corresponding to CACFP sponsors, child care providers, provider menus, on-site meal consumption, households, and 24-hour recall data. It is the last of these six weights that is used in the current study.

States were the primary sampling units. Eight states were selected with certainty, and another 12 states were selected with probability proportional to size.

Within states, sponsors were stratified by type of provider sponsored (family child care homes (FCCH), child care centers, and Head Start centers), and sponsors were then selected with probability proportional to size. When selecting the sponsor sample, independent child care centers (ICCCs) were treated as sponsors. This was necessary because the state lists of sponsors did not distinguish between "true" sponsors and ICCCs, but in fact ICCCs are child care providers, not sponsors. They entered the provider sample, where they were assigned appropriate weights.

From the sponsor sample, child care providers were sampled (the full provider sample) and asked to answer a provider survey. Providers were also asked to complete a menu survey and a food-preparer interview.

A subset of the full provider sample was selected for the on-site observations (the on-site provider sample). From that subset, children were selected and their CACFP meal consumption was observed. The children's parents were interviewed about their meal consumption while not in child care and to obtain information on household characteristics such as income and maternal employment.

The selection of children into the sample was based on logistic considerations. Although children in FCCHs are usually fed together, children in centers tend to be fed in small groups whose composition is homogenous with respect to age. To allow the observers at centers to watch the food consumption of the sampled children, a group of noninfant children was first chosen and then six children were selected from that group. (If the center served infants, one infant and five children from the chosen non-infant group were selected instead.) In FCCHs, the selected sample simply comprised six non-infant children (if the number of eligible children was as many as six), or five noninfants and one infant (if any eligible infants were enrolled). Children ineligible to be sampled included infants who were exclusively breastfed, children who were not enrolled for both of the scheduled observation

[57] For a full description of the construction of the ECCCS weights, see Fox *et al.*, 1997, Appendix E.

days, and siblings of sample members. The first two groups were deemed outside of scope. The siblings were represented by other children enrolled with the same provider, i.e., by increasing the child weights of the other children in the same group proportionally.

The analysis of meals consumed in care is intended to describe **children in care on a typical day**—not all children enrolled in care. Hence, children who were selected into the sample but absent on one or both observation days were not nonrespondents for purposes of constructing the corresponding weights, but rather outside of scope.

The overall response rate for the 24-hour recall sample was quite low, including as it did attrition at all of the intermediate stages. Nonetheless, the resulting sample of children is in principle nationally representative. The assigned weights take account of both sampling probabilities and nonresponse rates to the extent possible.

Appendix C
Characteristics of CSFII Sample Children, Households, and Mothers

This appendix presents descriptive information on the characteristics of the CSFII sample of children, their households, and their mothers, whose nutrition outcomes are tabulated in this report. Data are stratified by maternal employment status and have been weighted to achieve national representativeness. The broad underlying patterns are important to bear in mind in interpreting the differences in nutrition outcomes (Chapters 2 and 3) and related factors (reported in Volume II). The most striking patterns are generally differences between all working and nonworking mothers rather than between full-time and part-time working mothers.

With regard to **demographics**, compared with children of working mothers, children of homemaker mothers are:

- Younger;
- Less likely to be black and more likely to be Hispanic;
- Poorer and more likely to be receiving public assistance; and
- In households with more children.

These patterns are expected, given the developmental and financial reasons for mothers to stay at home with younger children, and the well-established employment patterns of working mothers by race/ethnicity (Burstein *et al.*, 2001).

Compared to working mothers, the homemaker mothers themselves:

- Are younger; and
- Have less formal education.

The most notable difference between children of mothers that work full-time and part-time is that the former are more likely to be non-Hispanic black and the latter are more likely to be non-Hispanic white. In addition, the households of full-time working mothers have somewhat higher incomes and are a little less likely to receive public assistance than the households of part-time working mothers. The full-time working mothers themselves tend to have less formal education than their part-time counterparts.

Because working mothers tend to have more formal education than homemakers, it seems likely that they will differ in their **nutrition knowledge**, including awareness of dietary recommendations, and their **attitudes** towards healthful dietary practices. Furthermore, through working, women may be exposed to a variety of cultural influences, which may have further effects on their attitudes toward diet and its relationship to health. Mother's nutrition knowledge and attitudes are expected to affect the foods they purchase, prepare, and serve to their children.

The analyses presented here provide some evidence that working mothers have more nutrition knowledge than homemakers, but not consistently so. In particular, they can more accurately identify

food sources of dietary fat and interpret nutrient composition information on food labels. In addition, a slightly larger share of working mothers can correctly report the Food Guide Pyramid serving recommendations for each of the five major food groups. On the other hand, working and nonworking mothers are equally capable of identifying foods that contain saturated fat and answering questions about fats and oils, and differences in mothers' awareness of diet-disease relationships are minimal.

In contrast to the trends for nutrition knowledge, attitudes toward the importance of nutrition among working mothers tend to be less favorable than among homemakers. Although greater nutrition knowledge among working mothers might mediate the effects of time constraints on their children's diets, this could be outweighed by their perceptions of the importance of dietary recommendations. Working mothers are especially less likely to feel that moderating salt/sodium intake or choosing a diet low in saturated fat and adequate in fiber are very important than nonworking mothers. In addition, part-time working mothers are the least likely to consider nutrition a very important factor when buying food.

Demographic Characteristics of Sample Children

As noted in Chapter 1, the CSFII sample children range in age from infancy to 17 years. Younger children (preschoolers) are naturally concentrated among nonworking mothers, reflecting considerations of child development and the need for child care (i.e., logistics and costs). Nearly two-fifths (37 percent) of children of nonworking mothers are under age 5, *versus* only a quarter (25 to 27 percent) of children of working mothers (Exhibit C.1). At the other end of the spectrum, teenagers comprise a greater proportion of children of mothers who work full-time (29 percent) or part-time (25 percent) than of mothers who do not work (18 percent).

Exhibit C.1

Demographic Characteristics of Sample Children

	Maternal Employment Status			
	Full-Time	**Part-Time**	**Homemaker**	**All Children**
Age				
0-4 years	24.8%	27.4%	37.4%	29.1%
5-8 years	22.8	24.7	24.3	23.6
9-12 years	23.3	23.4	20.3	22.4
13-17 years	29.1	24.6	18.0	24.8
Gender				
Male	50.9%	49.5%	52.0%	50.9%
Female	49.1	50.5	48.0	49.1
Race/Ethnicity				
Non-Hispanic white	64.4%	74.9%	62.9%	66.3%
Non-Hispanic black	17.0	10.8	9.8	13.5
Hispanic	13.4	10.7	20.7	15.0
Other	5.2	3.6	6.6	5.3
Sample size	7,365	3,376	4,603	15,344

Although there is practically no association between child's gender and maternal employment status, racial/ethnic background does vary markedly. Three-quarters (75 percent) of the children whose mothers work part-time are white, in contrast to less than two-thirds (63 to 64 percent) in the other two groups. Hispanic children are heavily concentrated among nonworking mothers, comprising 21 percent of this subgroup, *versus* only 11 to 13 percent of children of working mothers. Black children are especially likely to have full-time working mothers.

Household Composition, Income, and Location

CSFII data describe the households in terms of size, composition, annual income, receipt of public assistance, geographic region, and urbanicity of residence. These characteristics are tabulated below in two ways: as percentages of **children** and as percentages of **households**. Both vantage points are of interest because nutrition outcomes and factors affecting children's nutrition may be either child level (e.g., nutrient intake) or household level (e.g., food expenditures, food security).[58]

The two sets of distributions shown below (Exhibit C.2) differ only to the extent that households with more children (more heavily weighted in the child-level tabulations) differ in their characteristics from households with fewer children. For example, mean household size is smaller when calculated at the household level than at the child level. For the former calculation, each household is counted once, regardless of size; for the latter calculation, households with multiple children count as many times as there are children. The **patterns** of household characteristics across maternal employment status, however, are qualitatively similar, whether viewed at the household-level or at the child-level.

Household Size and Composition

Including the maternal female and child who comprise a dyad, the number of household members ranges from 2 to 16. On average, households with homemaker mothers are somewhat larger (4.4 members) than households with full-time (3.8) or part-time (4.1) working mothers. The average number of adults[59] per household is the same (2.1 adults) regardless of maternal employment status; as expected, the number of employed adults is lower in homemaker households (0.9) than in households with mothers who work full-time (1.9) or part-time (2.0). Households with homemaker mothers also include more children on average (2.2) than households with working mothers (1.8 to 2.0). This same pattern holds for children under five years old; on average, households with homemaker mothers have more young children (0.8 children) than do households with who work full-time (0.4) or part-time (0.6). This is to be expected, given that child care costs incurred by working mothers increase with the number of children needing care.

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[58] A small number of households include multiple maternal females. Those households in which these females vary in employment status have been excluded from the household-level tabulations, leaving a sample of 7,115 households. About half (75) of the 144 households that have two maternal females were excluded due to employment status variation. The child-level tabulations are based on the entire sample of 15,344 children (see Appendix A).

[59] Adults include household members aged 18 years or older, and members labeled as CSFII reference persons, their spouses, and their partners.

Exhibit C.2

Household Composition, Income, and Location

	Maternal Employment Status							
	Full-Time		Part-Time		Homemaker		All	
	House-hold	Child	House-hold	Child	House-hold	Child	House-hold	Child
Household size/ composition								
Mean number of household members	3.8	4.3	4.1	4.6	4.4	5.0	4.0	4.6
Mean number of adults	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Mean number of employed adults	1.9	1.9	2.0	2.0	0.9	0.9	1.7	1.6
Mean number of children	1.8	2.2	2.0	2.5	2.2	2.8	1.9	2.5
Mean number of children under 5	0.4	0.5	0.6	0.6	0.8	1.0	0.6	0.7
Household income as percent of poverty								
Under 130%	14.4%	18.2%	19.1%	21.6%	31.3%	36.3%	19.8%	24.3%
130-185%	12.4	13.7	14.1	15.4	16.8	16.5	13.9	14.9
Over 185%	73.2	68.1	66.8	63.0	51.9	47.2	66.3	60.8
Median	300		273		194		271	
Public assistance								
Receiving public assistance	2.2%	3.1%	4.3%	5.1%	14.4%	17.1%	5.8%	7.7%
Not receiving public assistance	97.8	97.0	95.7	94.9	85.6	82.9	94.2	92.3
Region								
Northeast	16.1%	15.4%	21.6%	21.9%	20.8%	20.7%	18.5%	18.4%
Midwest	23.5	24.5	26.7	28.7	18.7	18.4	22.9	23.6
South	39.9	39.2	28.8	26.6	34.8	33.4	36.2	34.7
West	20.5	20.8	22.9	22.8	25.7	27.5	22.4	23.3
Urbanicity								
MSA, central city	27.8%	27.7%	30.0%	29.3%	29.9%	30.2%	28.8%	28.8%
MSA, not central city	50.2	49.6	51.8	52.4	51.7	51.3	50.9	50.7
Non-MSA	22.0	22.7	18.3	18.3	18.4	18.5	20.3	20.4
Sample size		7,365		3,376		4,603	7,115	15,344

MSA = Metropolitan statistical area

In many of the analyses of child nutrition and related outcomes in this report, the distinction is made between children in one-adult *versus* multiple-adult households. It seems likely that the time constraints of working mothers would be more binding if other adults were not available to share household tasks. It should be borne in mind, however, that one-adult households are financially less well off. Nearly half of these households (46 percent) have incomes under 130 percent of the federal poverty guideline, compared with only one-sixth (16 percent) of households with more than one adult (not shown).

Household composition figures at the child-level reflect the same patterns reported above at the household-level: more household members, more children, and more preschool children in the households of homemaker mothers than in the households of working mothers.

Household Income

Total annual income (before taxes) is expressed as a percentage of the federal poverty guideline, capped at 300 percent of poverty. The median income in the sample is 271 percent of poverty, and two-thirds of the households have income equivalent to more than 185 percent of poverty. A markedly higher proportion of households with homemaker mothers (48 percent) live at or below 185 percent of poverty, than do households with full-time (27 percent) or part-time (33 percent) working mothers. Overall, about 6 percent of the households receive public assistance, which includes AFDC and TANF, but excludes benefits from the FSP or WIC. Compared to households in which maternal females work full- or part-time, a substantially higher proportion of households with homemakers receive public assistance (14 percent *versus* 2 to 4 percent). Similar income and public assistance patterns are seen at the child level, i.e., lower income and more public assistance for children whose mothers are homemakers.

Geographic Location

A plurality of the households (36 percent) are located in the south. Compared to households with full-time working mothers (the largest group), households with part-time working mothers are relatively less concentrated in the south and more in the northeast, whereas households with homemaker mothers are relatively more concentrated in the northeast and west. Urbanicity is measured by MSA status. Half of the households are located in MSAs that are not central cities, 29 percent are in central city MSAs, and 20 percent are in non-MSAs. Urbanicity does not vary noticeably by maternal employment status. Similar patterns are seen for the distribution of children as for the distribution of households.

Demographic Characteristics of Maternal Females

Mothers range in age from 16 to 59 years (Exhibit C.3).[60] Approximately half of the children are cared for by mothers who are in their thirties, regardless of employment status. More of the mothers who work are in their forties, than among homemakers (26 to 27 percent *versus* 20 percent). Similar to their children, mothers who work full-time, part-time, and not at all are disproportionately likely to be non-Hispanic black, non-Hispanic white, and Hispanic, respectively. Finally, homemakers are substantially more likely than working mothers to have less than a high school education or GED (26 percent *versus* 10 to 11 percent). Among working mothers, post-secondary education is more prevalent among part-time than full-time workers (58 percent *versus* 53 percent).

[60] Because the usual unit of analysis is the child-maternal female dyad, characteristics of maternal females have been tabulated here based on the sample of 15,344 dyads, rather than on the smaller number of unique maternal females in these dyads.

Exhibit C.3

Demographic Characteristics of Maternal Females

	Maternal Employment Status			
	Full-Time	**Part-Time**	**Homemaker**	**All Children**
Age				
16-21 years	1.5%	2.7%	3.9%	2.5%
22-29 years	17.9	16.1	21.2	18.5
30-39 years	51.4	52.5	50.8	51.5
40-49 years	25.5	26.7	19.7	24.1
50-59 years	3.6	2.1	4.5	3.6
Race/Ethnicity				
Non-Hispanic white	66.4%	75.5%	63.9%	67.7%
Non-Hispanic black	16.4	11.1	9.5	13.2
Hispanic	12.5	10.2	20.5	14.4
Other	4.7	3.2	6.1	4.8
Education				
Less than high school/GED	10.4%	10.6%	26.3%	15.1%
High school/GED	37.0	32.0	33.5	34.9
More than high school/GED	52.6	57.5	40.2	50.0
Sample size	7,365	3,376	4,603	15,344

Mother's Nutrition Knowledge and Attitudes

A mother's specific nutrition knowledge, as well as her beliefs and attitudes toward healthful eating, can be expected to influence the diet and health of her children. Research is mixed, but has shown that this is more likely for preschool than older children (Blaylock *et al*., 1999). Differences in nutrition knowledge and attitudes between working and nonworking mothers may help in understanding and interpreting differences in their children's nutrition outcomes.

The 1994 to 1996 Diet and Health Knowledge Survey (DHKS) provided information on nutrition and health knowledge and attitudes for a subset of adults aged 20 or older who also participated in the CSFII.[61] Among all 15,344 mother-child dyads identified in the CSFII, there were 1,517 mothers (about 10 percent) who completed the DHKS. These mothers comprise the sample for analyses comparing the nutrition knowledge and attitudes of working and nonworking mothers.[62]

Responses to survey items were used to develop measures of nutrition knowledge and attitudes in the following seven areas:

[61] The DHKS also collected information on the respondent's own dietary behaviors, self-assessment of her diet, and use of food labels. These items were not examined here because they cannot reasonably be linked to children's diets.

[62] The sample size did not allow for reliable estimates of outcomes by number of adults in the household, income below 130 percent of poverty, or further stratification by age of sample child.

Nutrition knowledge:

- Knowledge of Food Guide Pyramid recommendations
- Knowledge about dietary fat, saturated fat, and cholesterol
- Knowledge about nutrient information on food labels
- Awareness of diet-disease relationships

Attitudes:

- Attitudes toward importance of dietary guidelines
- Attitude towards importance of nutrition and other food purchasing considerations
- Beliefs about relationship between diet and health

For some of the topics, responses to individual survey items are presented. For others, summary measures were constructed, generally by summing the number of correct responses to a set of related questions or, for ordinal scales, computing the proportion of respondents who provided a positive response (e.g., agree or somewhat agree). The methodologies used to group survey items and summarize responses draw upon previous work with the DHKS by Colavito *et al*. (1996), Blaylock *et al*. (1999), Guthrie *et al*. (1999), and Gleason *et al*. (2000). Results for each nutrition knowledge and attitude domain are separately presented below.

Nutrition Knowledge

Knowledge of Food Guide Pyramid Recommendations

The Food Guide Pyramid is an educational tool designed to assist people in putting the *Dietary Guidelines for Americans* into practice. It is intended to promote balance, moderation and variety in one's diet. Recommendations for the number of daily servings from each of five main food groups are commonly presented as ranges, for example, "2 to 4 servings of fruit per day". For adults, the **specific** number of servings recommended depends mainly on their energy requirements. For children, the number of servings recommended also depends on age (USDA, 1992). It was expected that a mother's understanding of the appropriate number of servings for herself from each food group would carry over into appropriate meal planning for her children. The question in the DHKS about the Food Guide Pyramid recommendations was:

> ***How many servings from the (FOOD GROUP) would you say a person of your age and sex should eat each day for good health?***

Because the recommended ranges are so much more widely publicized than the specific values by age and calorie level, any response within the recommended range was considered "correct".

As shown in Exhibit C.4, mothers' knowledge of Food Guide Pyramid recommendations varies by food group. Almost three quarters (72 percent) of mothers' correctly report the recommended number of servings for the fruit group (two to three servings), whereas only 12 percent do so for the bread, cereal, rice and pasta group (six to 11 servings).[63] Although there are some differences, knowledge of recommendations follows a similar pattern for mothers of both younger (0 to 8 years old) and older children (9 to 17 years). The most notable differences in mothers' knowledge of Food Pyramid recommendations relate to income level. Low-income mothers (household income below 185 percent

[63] Virtually all of the mothers who did not answer correctly underestimated the recommendation for the bread group.

of poverty) are less likely to identify the number of servings recommended for all but the fruit group when compared with mothers whose income is higher (over 185 percent of poverty). For example, almost 20 percent fewer low-income mothers report the correct recommendation for the vegetable (three to five servings) and bread groups than higher-income mothers.

Exhibit C.4

Mothers' Knowledge of Food Guide Pyramid Recommendations, by Food Group[a]

	Maternal Employment Status			
	Full-Time	**Part-Time**	**Homemaker**	**All Children**
All children				
Fruits	73.5%	72.9%	70.5%	72.2%
Vegetables	61.9	64.2	55.5	59.7
Milk, yogurt, cheese	60.0	61.3	57.8	59.7
Bread, cereal, rice, pasta	11.6	14.5	9.7	11.6
Meat, poultry, fish, dry beans, eggs, nuts	65.5	65.9	59.1	62.9
Maximum sample size	721	318	472	1,511
By age group				
0 to 8 years				
Fruits	76.0%	75.1%	69.7%	73.3%
Vegetables	70.4**	67.7	56.8	64.5
Milk, yogurt, cheese	55.1	57.6	55.1	55.5
Bread, cereal, rice, pasta	14.2	16.8	13.0	14.2
Meat, poultry, fish, dry beans, eggs, nuts	70.2**	67.9	56.2	64.1
Maximum sample size	310	138	275	723
9 to 17 years				
Fruits	70.8%	70.4%	71.4%	70.9%
Vegetables	52.5	60.4	53.9	54.5
Milk, yogurt, cheese	65.4	65.5	60.9	64.3
Bread, cereal, rice, pasta	8.8	11.9	6.0	8.7
Meat, poultry, fish, dry beans, eggs, nuts	60.2	63.6	62.3	61.4
Maximum sample size	411	180	197	788
By income category				
Up to 185% of poverty				
Fruits	75.3%	74.6%	67.5%	71.1%
Vegetables	55.2*	45.7	42.8	47.7
Milk, yogurt, cheese	42.0	60.6**	43.4	47.3
Bread, cereal, rice, pasta	5.9	8.2	6.8	6.7
Meat, poultry, fish, dry beans, eggs, nuts	61.5	70.8***	49.7	57.7
Maximum sample size	268	153	286	707

Exhibit C.4

Mothers' Knowledge of Food Guide Pyramid Recommendations, by Food Group[a]

	Maternal Employment Status			
	Full-Time	**Part-Time**	**Homemaker**	**All Children**
Over 185% of poverty				
Fruits	72.9%	72.0%	73.7%	72.8%
Vegetables	64.0	75.0	68.9	66.6
Milk, yogurt, cheese	66.2	61.2*	72.8	66.7
Bread, cereal, rice, pasta	13.5	18.4	12.7	14.4
Meat, poultry, fish, dry beans, eggs, nuts	66.7	62.7	68.6	65.8
Maximum sample size	453	165	186	804

a The recommended number of USDA Food Guide Pyramid servings per day varies by age and gender. The ranges for each food group are: fruits, 2-4 servings; vegetables, 3-5 servings; milk, yogurt, cheese, 2-3 servings; bread, cereal, rice, pasta, 6-11 servings; meat, poultry, fish, dry beans, eggs, nuts, 2-3 servings (Bowman *et al.*, 1998).

*** Statistically significant difference from children whose mothers are homemakers at the 1 percent level
** Statistically significant difference from children whose mothers are homemakers at the 5 percent level
* Statistically significant difference from children whose mothers are homemakers at the 10 percent level

Knowledge of Food Guide Pyramid recommendations does not differ significantly by maternal employment status, although greater proportions of working mothers correctly report the recommendations for each of the five food groups (Exhibit C.5). Among low-income mothers and those with younger children, maternal employment is positively and significantly related to knowledge of some, but not all, of the Food Guide Pyramid serving recommendations. For example, significantly more low-income mothers who work part-time compared with low-income homemakers know the recommendations for the milk, yogurt, and cheese (61 *versus* 43 percent) and the meat, poultry, fish, and meat substitutes groups (71 *versus* 50 percent). Working mothers with children up to 8 years old, especially those who work full-time, are more likely to know the recommended number of servings for the vegetable and meat, poultry, fish, and meat substitutes (two to three servings) groups than homemakers (70 *versus* 56 to 57 percent reporting correctly for both food groups).

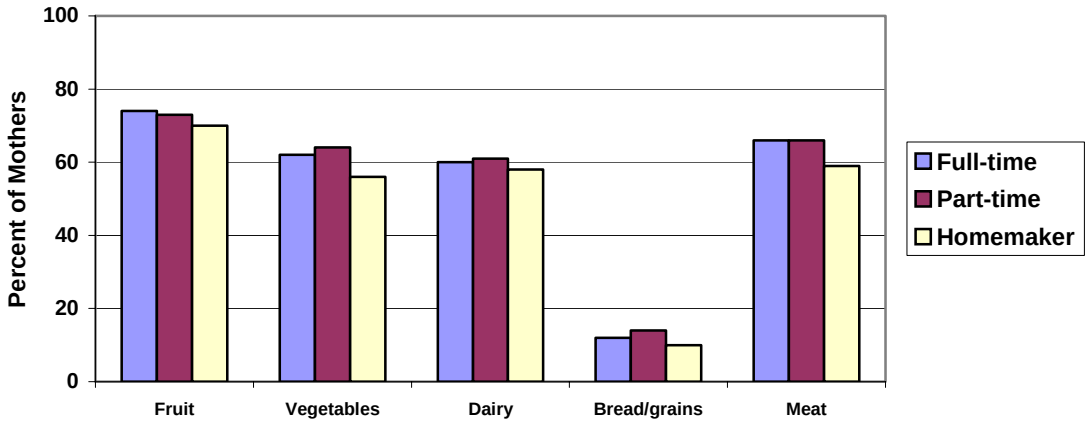
Knowledge About Dietary Fat, Saturated Fat and Cholesterol

Lowering dietary intake of fat, saturated fat and cholesterol has been a target of the *Dietary Guidelines for Americans* since 1980. Most people know that high levels of saturated fat and cholesterol can increase blood cholesterol and risk for heart disease, and that high fat diets are linked to some types of cancer. They also need to know, however, how to make appropriate food choices with respect to these dietary components. The comparisons discussed below are based on three sets of questions that addressed this type of knowledge. For example, DHKS respondents were asked:

Based on your knowledge, which has more saturated fat: butter or margarine?

Exhibit C.5

Mother's Knowledge of Food Guide Pyramid Recommendations, by Food Group and Employment Status



The average percentages of correct responses were computed for four such items about saturated fat, and six similar items about total fat. In addition, the percentage of correct responses to four items pertaining to the general concepts about saturated fat, unsaturated fat, and cholesterol was computed to represent principles related to dietary fat and cholesterol. An example of this type of question is:

> ***If a food has no cholesterol is it also: low in saturated fat, high in saturated fat, or could it be either high or low in saturated fat?***

On average, mothers are able to correctly answer 71 percent of the questions about food sources of total fat and two thirds of the questions about saturated fat. They know the correct response to less than half (41 percent) of the questions on general principles related to fats and cholesterol (Exhibit C.6). The pattern is similar for mothers with younger and older children, but varies by income level. Scores on all three measures are lower for low-income mothers compared with higher income mothers.

Exhibit C.6

Mothers' Knowledge about Sources of Dietary Fat and Cholesterol[a]

	Maternal Employment Status			
	Full-Time	**Part-Time**	**Homemaker**	**All Children**
All children				
Total fat	73.2%***	76.1%***	65.7%	71.2%
Saturated fat	67.7	69.8	65.5	67.6
Fats and cholesterol	42.0	42.0	39.3	41.4
Maximum sample size	726	318	473	1,517
By age group				
0 to 8 years				
Total fat	72.0%**	74.1%***	63.5%	68.9%
Saturated fat	67.4	68.2	67.3	67.5
Fats and cholesterol	40.4	38.2	40.4	40.0
Maximum sample size	312	138	276	726
9 to 17 years				
Total fat	74.5%**	78.4%***	68.3%	73.8%
Saturated fat	68.1	71.6*	63.4	67.7
Fats and cholesterol	43.8*	46.2*	37.9	42.9
Maximum sample size	414	180	197	791
By income category				
Up to 185% of poverty				
Total fat	66.3%***	69.7%***	56.8%	62.4%
Saturated fat	62.3	64.6	57.6	61.3
Fats and cholesterol	35.1	36.1	32.4	34.3
Maximum sample size	268	153	287	708
Over 185% of poverty				
Total fat	75.5%	80.5%*	74.9%	76.2%
Saturated fat	69.6*	72.7	73.8	71.2
Fats and cholesterol	44.4	46.1	46.5	45.3
Maximum sample size	458	165	186	809

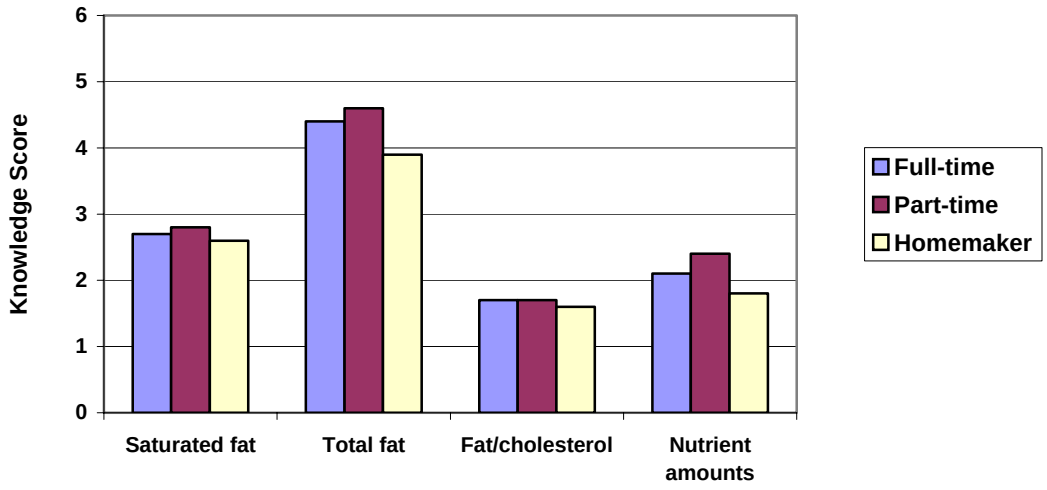
a Based on the average percent of correct responses to four questions about saturated fat, six questions about total fat, and four questions about principles related to dietary fat and cholesterol.

*** Statistically significant difference from children whose mothers are homemakers at the 1 percent level
** Statistically significant difference from children whose mothers are homemakers at the 5 percent level
* Statistically significant difference from children whose mothers are homemakers at the 10 percent level

With regard to maternal employment, the only difference found in mothers' knowledge of dietary fat, saturated fat, and cholesterol overall is for total fat scores (Exhibit C.7). Working mothers have a significantly higher percent of correct responses when identifying food sources of total fat than homemakers (73 to 76 percent *versus* 66 percent). Results are consistent across both age groups examined, but are less pronounced among mothers with incomes over 185 percent of poverty.

Exhibit C.7

Mothers Knowledge About Fat and Cholesterol and Nutrient Information on Food Labels, by Employment Status



Knowledge About Nutrient Information on Food Labels

Another type of knowledge that may influence food choices is the ability to interpret label information on the nutrient composition of foods. The Nutrition Facts section of food labels is one source of this information. A question on the DHKS asked:

> ***Now think about the section of the food label that tells the amount of calories, protein, and fat in a serving of the food. If it showed that one serving of the food contained (AMOUNT OF NUTRIENT), would you consider that to be a low amount or a high amount?***

The question was asked about five nutrients: fat, saturated fat, cholesterol, sodium, and dietary fiber. A summary score was computed based on the percent of correct responses.

Results show that mothers of both younger and older children are able to discern between high and low amounts in a food for an average of 41 percent of the nutrients examined (Exhibit C.8). Consistent with other measures of maternal nutrition knowledge, low-income mothers do more poorly in this area than higher income mothers (32 *versus* 46 percent correct).

There is a significant positive relationship between employment status and mothers' ability to interpret nutrient information on food labels. Both full- and part-time working mothers have higher scores on this measure than homemakers (42 and 48 *versus* 35 percent correct). Mothers who work part-time correctly answer the most nutrient composition questions for all age and income groups considered (Exhibit C.8). This finding is consistent with the fact that part-time working mothers have higher levels of formal education compared with both homemakers and mothers who work full-time.

Exhibit C.8

Mothers' Knowledge about Nutrient Information on Food Labels[a]

	Maternal Employment Status			
	Full-Time	**Part-Time**	**Homemaker**	**All Children**
All children				
Nutrient amounts	42.4%***	47.9%***	35.2%	41.0%
Maximum sample size	726	318	473	1,517
By age group				
0 to 8 years				
Nutrient amounts	43.5%**	47.7%***	35.3%	41.0%
Maximum sample size	312	138	276	726
9 to 17 years				
Nutrient amounts	41.1%	48.2%***	34.9%	41.1%
Maximum sample size	414	180	197	791
By income category				
Up to 185% of poverty				
Nutrient amounts	29.8%	43.0%***	27.6%	31.9%
Maximum sample size	268	153	287	708
Over 185% of poverty				
Nutrient amounts	46.6%	50.4%*	43.1%	46.2%
Maximum sample size	458	165	186	809

a Based on the average percent of correct responses to questions about amounts (high versus low) per serving of five nutrients: fat, saturated fat, cholesterol, sodium, and dietary fiber.

*** Statistically significant difference from children whose mothers are homemakers at the 1 percent level
** Statistically significant difference from children whose mothers are homemakers at the 5 percent level
* Statistically significant difference from children whose mothers are homemakers at the 10 percent level

Awareness of Diet-Disease Relationships

The final aspect of nutrition knowledge considered here reflects an individual's awareness that certain health problems are related to dietary practices. This type of knowledge may motivate a person to learn more about nutrition and adopt healthy eating behaviors. A mother who is aware that a particular eating behavior has health implications will presumably try to influence the corresponding aspect of her child's diet. The relevant DHKS item was:

> ***Have you heard about any health problems caused by:***
>
> - ***eating too much fat?***
> - ***not eating enough fiber?***
> - ***eating too much salt or sodium?***
> - ***not eating enough calcium?***
> - ***eating too much cholesterol?***
> - ***eating too much sugar?***
> - ***being overweight?***

The proportion of mothers with a "yes" response to each part of the question was calculated and compared across employment categories.[64]

Overall, most mothers are aware of a causal relationship between each dietary behavior queried and health problems (Exhibit C.9). Awareness is highest for "being overweight" (95 percent) and lowest for "not eating enough fiber" (68 percent). This pattern is qualitatively the same regardless of age of child or income category. Diet-disease awareness is lower among low-income mothers (54 to 91 percent) compared with higher income mothers (77 to 97 percent).

Exhibit C.9

Mothers' Awareness of Diet-Disease Relationships, by Dietary Practice

	Maternal Employment Status			
	Full-Time	**Part-Time**	**Homemaker**	**All Children**
All children				
Eating too much fat	88.6%	90.7%	90.9%	89.9%
Not eating enough fiber	68.5	70.2	68.0	68.8
Eating too much salt/sodium	92.8	84.6	89.2	89.9
Not eating enough calcium	90.7***	90.3**	80.4	87.2
Eating too much cholesterol	93.5	89.3	88.9	91.1
Eating too much sugar	82.4	77.0	84.1	81.8
Being overweight	96.6	94.3	93.5	94.9
Maximum sample size	714	315	466	1,495
By age group				
0 to 8 years				
Eating too much fat	86.8%	87.3%	90.0%	88.2%
Not eating enough fiber	65.7	63.6	65.7	65.3
Eating too much salt/sodium	92.0	79.1	86.0	87.3
Not eating enough calcium	91.8**	88.0	80.3	86.5
Eating too much cholesterol	93.7	87.9	87.5	90.2
Eating too much sugar	82.0	76.8	82.9	81.4
Being overweight	97.0	90.9	90.0	93.1
Maximum sample size	310	136	273	719
9 to 17 years				
Eating too much fat	90.6%	94.5%	91.9%	91.8%
Not eating enough fiber	71.7	77.6	70.5	72.7
Eating too much salt/sodium	93.8	90.7	92.8	92.9
Not eating enough calcium	89.5*	92.9**	80.6	88.0
Eating too much cholesterol	93.4	90.9	90.5	92.1
Eating too much sugar	82.9	77.2	85.4	82.3
Being overweight	96.2	98.1	97.3	96.9
Maximum sample size	404	179	193	776

[64] Although some researchers have defined diet-health awareness based on the respondent being able to correctly identify specific dietary practice-health problem links (e.g., sodium consumption and hypertension), it is felt that the "perception" of a relationship alone can affect dietary behavior (communication with Linda Cleveland, USDA Food Surveys Research Group).

Exhibit C.9

Mothers' Awareness of Diet-Disease Relationships, by Dietary Practice

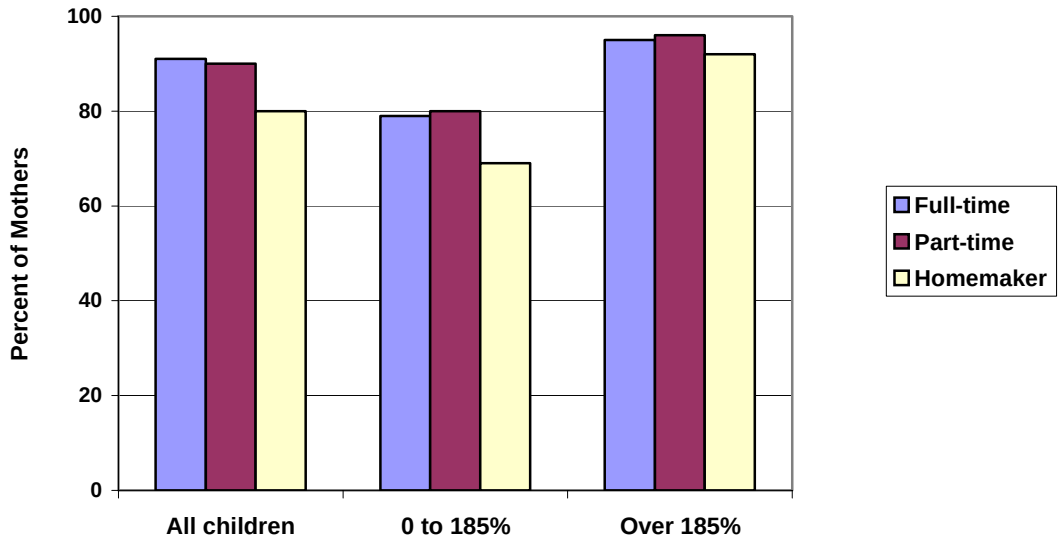
	Maternal Employment Status			
	Full-Time	**Part-Time**	**Homemaker**	**All Children**
By income category				
Up to 185% of poverty				
Eating too much fat	76.8%*	82.2%	86.4%	83.0%
Not eating enough fiber	50.6	57.7	53.1	54.1
Eating too much salt/sodium	83.2	76.3	85.7	83.4
Not eating enough calcium	79.2*	80.5*	68.6	74.8
Eating too much cholesterol	82.5	76.5	83.1	81.7
Eating too much sugar	77.9	75.4	84.4	80.1
Being overweight	95.3	91.4	88.6	91.0
Maximum sample size	260	150	280	690
Over 185% of poverty				
Eating too much fat	92.6%	95.4%	95.6%	93.7%
Not eating enough fiber	74.6*	77.4	83.2	77.0
Eating too much salt/sodium	96.1	89.1	92.8	93.5
Not eating enough calcium	94.6	96.0	92.5	94.1
Eating too much cholesterol	97.3	97.0	94.8	96.3
Eating too much sugar	84.0	78.3	83.7	82.8
Being overweight	97.1	96.0	98.2	97.1
Maximum sample size	454	165	186	805

*** Statistically significant difference from children whose mothers are homemakers at the 1 percent level
** Statistically significant difference from children whose mothers are homemakers at the 5 percent level
* Statistically significant difference from children whose mothers are homemakers at the 10 percent level

There is little to no difference in the diet-disease awareness of working mothers compared with homemakers. The only significant difference overall is a ten-percentage-point increase in the share of working mothers aware of a relationship between not eating enough calcium compared with homemakers. Results do not vary by age of child or income, but the difference for calcium is smaller and non-significant among higher income mothers (Exhibit C.10).

Exhibit C.10

Mothers' Awareness of a Relationship Between Not Eating Enough Calcium and Health Problems, by Household Income Relative to Poverty and Employment Status



Attitudes

Attitudes Toward the Importance of Dietary Guidelines

Although knowledge and awareness of dietary recommendations may play a role, favorable attitudes are also necessary and important influences on dietary behavior. The seriousness with which mothers view various dietary guidelines may be reflected in the corresponding aspects of their children's diets, for example, the components of the Healthy Eating Index. The DHKS asked mothers how important 11 positive dietary practices were to them, specifically:

> ***To you personally, is it very important, somewhat important, not too important, or not at all important to:***
>
> - ***Use salt or sodium only in moderation?***
> - ***Choose a diet low in saturated fat?***
> - ***Choose a diet with plenty of fruits and vegetables?***
> - ***Use sugars only in moderation?***
> - ***Choose a diet with adequate fiber?***
> - ***Eat a variety of foods?***
> - ***Maintain a healthy weight?***
> - ***Choose a diet low in fat?***
> - ***Choose a diet low in cholesterol?***
> - ***Choose a diet with plenty of breads, cereals, rice and pasta?***
> - ***Eat at least two servings of dairy products daily?***

The proportions of mothers who felt the behavior was "very important" were compared across employment groups. At least half of all mothers feel that eight of the 11 guidelines are very important to them (Exhibit C.11). The guideline considered very important to the most mothers involves maintaining a healthy weight (79 percent); close to one-third of mothers feel that choosing a diet with plenty of breads and grains is very important (35 percent). Mothers' attitudes follow a similar pattern across child age and household income groups. An interesting exception is the finding that 14 percent more low-income than higher income mothers feel that eating at least two servings of dairy products daily is very important.

Exhibit C.11

Mothers' Attitudes Toward Dietary Guidelines: Percent Reporting Positive Behavior Is Very Important to Them

	Maternal Employment Status			
	Full-Time	**Part-Time**	**Homemaker**	**All Children**
All children				
Salt/Sodium	47.7%	40.9%**	54.6%	48.6%
Saturated fat	50.9**	52.9	62.2	55.3
Fruits and vegetables	67.4	76.1	72.5	70.8
Sugars	47.7	48.3	53.1	50.1
Fiber	46.3**	53.5	56.9	51.3
Variety	56.7	55.4	61.2	58.3
Weight	76.7	77.8	80.8	78.7
Fat	59.9	56.9	64.1	61.3
Cholesterol	53.8	53.2	62.1	56.8
Breads, cereals, rice, pasta	32.1	36.0	39.5	35.4
Dairy products	43.0	43.4	51.3	45.9
Maximum sample size	720	306	451	1,477
By age group				
0 to 8 years				
Salt/Sodium	46.4%	34.1%**	52.3%	46.6%
Saturated fat	47.7*	40.4**	60.8	51.6
Fruits and vegetables	69.5	71.6	73.4	71.4
Sugars	46.0	34.8**	55.0	47.6
Fiber	43.9	41.7	54.1	47.6
Variety	51.4	44.2	59.1	53.2
Weight	74.0*	73.8	84.1	78.0
Fat	55.0**	53.1	67.2	59.5
Cholesterol	48.5**	47.0	61.9	53.6
Breads, cereals, rice, pasta	31.7	30.6	40.3	35.0
Dairy products	46.0	43.2	54.9	49.0
Maximum sample size	309	130	263	702
9 to 17 years				
Salt/Sodium	49.0%	48.5%	57.1%	50.8%
Saturated fat	54.4	66.7	63.7	59.2
Fruits and vegetables	65.0	81.1	71.6	70.0
Sugars	49.6	63.2	51.0	52.8
Fiber	49.1	66.4	60.1	55.4
Variety	62.6	67.8	63.5	64.0

Exhibit C.11

Mothers' Attitudes Toward Dietary Guidelines: Percent Reporting Positive Behavior Is Very Important to Them

	Maternal Employment Status			
	Full-Time	**Part-Time**	**Homemaker**	**All Children**
				(cont.)
Weight	79.6	82.2	77.2	79.6
Fat	65.3	61.1	60.7	63.3
Cholesterol	59.5	60.1	62.3	60.3
Breads, cereals, rice, pasta	32.4	41.9	38.5	35.9
Dairy products	39.8	43.6	47.3	42.4
Maximum sample size	411	176	188	775
By income category				
Up to 185% of poverty				
Salt/Sodium	49.4%	44.1%	52.9%	50.7%
Saturated fat	53.5	49.9	55.2	54.1
Fruits and vegetables	71.2	71.3	69.6	71.3
Sugars	53.1	46.8	51.2	51.7
Fiber	53.3	49.1	52.8	52.5
Variety	51.6	57.6	50.9	53.4
Weight	78.3	82.0	81.1	81.0
Fat	57.4	55.4	60.8	59.5
Cholesterol	55.2	50.7	54.0	54.1
Breads, cereals, rice, pasta	34.0	28.9	35.6	33.3
Dairy products	55.4	52.8	54.0	54.8
Maximum sample size	268	149	269	686
Over 185% of poverty				
Salt/Sodium	47.0%	38.9%**	56.3%	47.5%
Saturated fat	50.1***	55.4*	69.1	55.9
Fruits and vegetables	66.0	79.3	75.7	70.5
Sugars	45.9	49.4	54.9	49.2
Fiber	44.0**	56.1	61.0	50.6
Variety	58.6**	53.2**	71.2	61.0
Weight	76.2	75.0	80.6	77.5
Fat	60.9	57.7	67.7	62.4
Cholesterol	53.4***	54.6*	70.1	58.3
Breads, cereals, rice, pasta	31.4	41.3	43.3	36.5
Dairy products	38.8	37.4	49.0	40.9
Maximum sample size	452	157	182	791

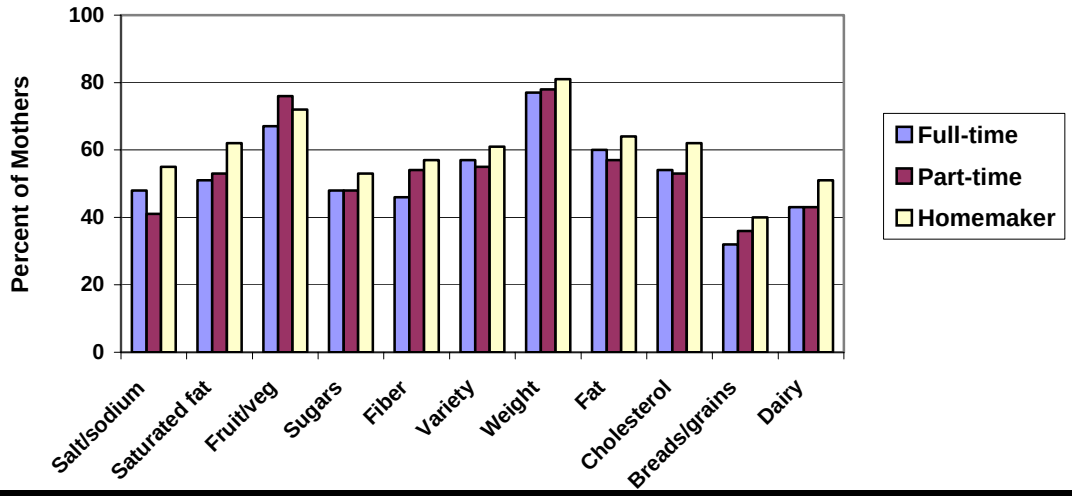
*** Statistically significant difference from children whose mothers are homemakers at the 1 percent level
** Statistically significant difference from children whose mothers are homemakers at the 5 percent level
* Statistically significant difference from children whose mothers are homemakers at the 10 percent level

In contrast to the trends reported above for nutrition knowledge, working mothers tend to have less favorable attitudes towards the importance of all 11 dietary guidelines than homemakers (Exhibit C.12). Differences in the proportions of working and nonworking mothers who feel the practices are very important are statistically significant for only three of guidelines examined: fewer part-time working mothers find the use of salt/sodium in moderation to be very important compared with

homemakers (41 *versus* 55 percent), and full-time working mothers are the least likely to feel that choosing a diet low in saturated fat or adequate in fiber is very important (a difference of about ten percentage points between working and nonworking mothers for both guidelines). Maternal employment status is more strongly associated with attitudes towards dietary guidelines among mothers with children age 0 to 8 years old and in higher income households (over 185 percent of poverty).

Exhibit C.12

Mothers' Attitude Towards Importance of Dietary Guidelines, by Employment Status



Attitude Toward Importance of Nutrition and Other Food Purchasing Considerations

It was expected that when purchasing food, working mothers would put relatively more emphasis on **ease of preparation** and perhaps **how well the food keeps** (to minimize shopping trips), whereas nonworking mothers put relatively more emphasis on **price**. The importance of these considerations associated with time *versus* money pressures may spill over for either group into putting less emphasis on **nutrition**. To explore these issues, responses of "very important" to the following DHKS item were tabulated:

When you buy food, how important is (FACTOR)—very important, somewhat important, not too important, or not at all important?

- ***How safe the food is to eat?***
- ***Nutrition?***
- ***Price?***
- ***How well the food keeps?***
- ***How easy the food is to prepare?***
- ***Taste?***

Taste has been shown to be the most important factor in food selection in studies conducted over the last decade (Guthrie *et al*., 1999), and remains important here. Approximately 88 percent of all mothers rate **taste** as very important when buying food (Exhibit C.13). In contrast to past studies, **food safety** is rated just as high (88 percent).[65] **Nutrition**, which is rated very important by two-thirds of all mothers, has received slightly higher ratings in other studies (74 to 78 percent), but is typically considered more important than **price** and other attributes. The exception in this sample is among low-income mothers where **nutrition, price** and **how the food keeps** are considered very important by equal proportions of mothers. Not surprisingly, **price** is much less important among higher income mothers.

Exhibit C.13

Mothers' Attitudes Toward Nutrition and Other Factors in Buying Food: Percent Reporting Factor Is Very Important to Them

	Maternal Employment Status			
	Full-Time	**Part-Time**	**Homemaker**	**All Children**
All children				
Safety	88.3%	88.9%	85.8%	87.7%
Nutrition	67.9	55.7**	69.5	66.7
Price	42.7***	38.5***	63.0	48.5
How well food keeps	59.6	53.3	58.9	58.3
Ease of preparation	44.5	34.5	40.4	41.0
Taste	88.3	87.9	84.9	87.5
Maximum sample size	722	315	473	1,510
By age group				
0 to 8 years				
Safety	88.3%	87.4%	86.7%	87.5%
Nutrition	64.4	46.3***	72.4	64.4
Price	44.2***	32.6***	62.3	49.4
How well food keeps	59.6	50.7	61.1	58.6
Ease of preparation	43.7	34.2	37.7	39.6
Taste	85.9	84.6	86.9	86.1
Maximum sample size	312	137	276	725
9 to 17 years				
Safety	88.3%	90.6%	84.7%	87.9%
Nutrition	71.8	66.2	66.3	69.2
Price	40.9***	45.0**	63.7	47.5
How well food keeps	59.5	56.1	56.4	58.0
Ease of preparation	45.3	34.9	43.4	42.6
Taste	91.1*	91.7*	82.6	89.1
Maximum sample size	410	178	197	785

[65] Because food safety in a literal sense is virtually a non-issue in the United States, respondents who emphasize this factor are presumably thinking about such considerations as absence of pesticides, lack of irradiation, and freshness.

Exhibit C.13

Mothers' Attitudes Toward Nutrition and Other Factors in Buying Food: Percent Reporting Factor Is Very Important to Them

	Maternal Employment Status			
	Full-Time	**Part-Time**	**Homemaker**	**All Children**
By income category				
Up to 185% of poverty				
Safety	85.1%	84.8%	83.9%	84.8%
Nutrition	63.4	64.2	69.2	67.0
Price	68.7	53.8***	76.3	69.7
How well food keeps	76.3	69.6	67.4	70.9
Ease of preparation	51.9	32.6	44.0	44.3
Taste	93.3**	93.1*	82.0	88.3
Maximum sample size	267	150	287	704
Over 185% of poverty				
Safety	89.4%	90.4%	87.6%	89.3%
Nutrition	69.5	51.2***	70.0	66.5
Price	33.7**	28.2***	48.9	36.5
How well food keeps	53.9	42.6	49.8	51.2
Ease of preparation	42.0	35.0	36.5	39.2
Taste	86.7	84.7	87.9	87.0
Maximum sample size	455	165	186	806

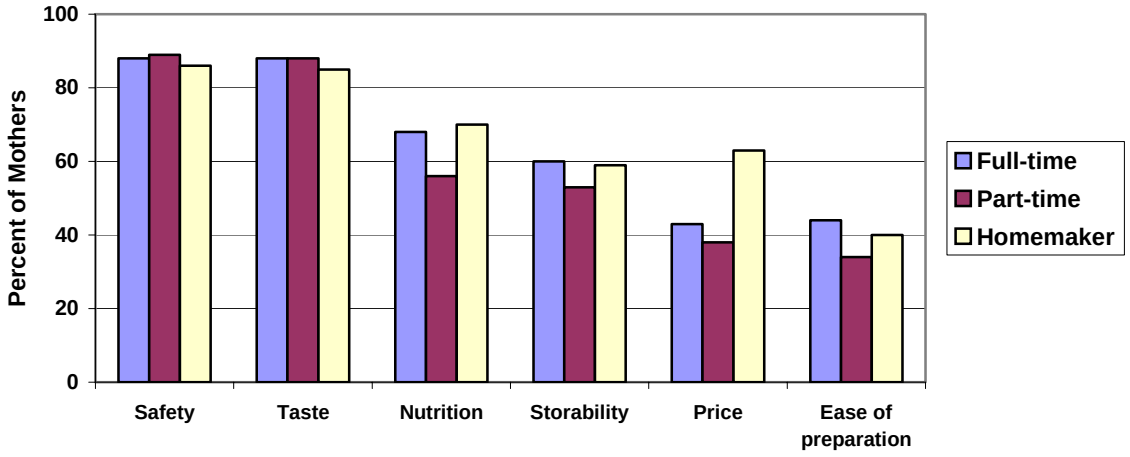
*** Statistically significant difference from children whose mothers are homemakers at the 1 percent level
** Statistically significant difference from children whose mothers are homemakers at the 5 percent level
* Statistically significant difference from children whose mothers are homemakers at the 10 percent level

As predicted, homemakers are more likely to report **price** as a very important factor in buying food than either full-time or part-time working mothers (63 percent *versus* 43 and 38 percent, respectively). This is illustrated in Exhibit C.14 and probably reflects the lower average household income for this group compared with working mothers. The differences in attitudes toward **price** are significant across most child age and income groups, but are smaller in magnitude for low-income mothers. Surprisingly, there were no significant differences in the importance of **ease of preparation** or **how well the food keeps** between working and nonworking mothers.

Oddly, part-time working mothers are significantly less likely to report **nutrition** as very important than homemakers (56 *versus* 68 percent). This difference tends to be concentrated among mothers of young children and with higher family incomes.

Exhibit C.14

Importance of Nutrition and Other Factors to Mothers in Buying Food, by Employment Status



Beliefs About Relationship Between Diet and Health

A mother's opinion about the benefits and the barriers associated with a particular dietary practice may influence the quality of her child's diet. Three items from the DHKS in particular can be thought of as representing barriers or facilitators to healthy eating. These items are:

> ***(1) Some people are born to be fat and some thin; there is not much you can do to change this.***
>
> ***(2) There are so many recommendations about healthy ways to eat, it's hard to know what to believe.***
>
> ***(3) What you eat can make a big difference in your chance of getting a disease, like heart disease or cancer.***

The proportions of mothers indicating that they "somewhat/strongly disagree" (statements 1 and 2 above) or "somewhat/strongly agree" (statement 3) were used to compare beliefs of working and nonworking mothers.

The vast majority of mothers overall (92 percent) agree with statement 3, suggesting they believe in the relationship between diet and disease risk. This belief should, theoretically, enhance the adoption of healthful eating behaviors among their children. Mothers in higher income households are somewhat more likely to hold this belief than those in low-income households, but age of child makes no difference (Exhibit C.15). Most mothers (63 percent) disagree with the statement (1) inferring that a person's weight is **un**related to diet (or other factors, e.g., exercise), but a fairly large proportion believe this to be true. Only one-fifth of all mothers disagree that it is difficult to know which, among many, dietary recommendations to believe (statement 2). These beliefs may represent a barrier to adopting healthful dietary practices. Based on their responses to statements 2 and 3, a larger share of low-income mothers hold beliefs that are considered barriers to healthy eating compared with higher income mothers.

Maternal employment does not seem to be associated with the diet- and health-related beliefs examined here. There are no significant differences in the responses of working and nonworking mothers overall. Low-income working mothers are significantly less likely to feel that it is difficult to know which dietary recommendations to believe than homemakers in the same income category (10 *versus* 18 percent disagreed with statement 2). In addition, among higher income mothers, more of those working than not working believe a person's weight can be affected by diet (62 to 63 *versus* 78 percent disagreed with statement 1).

Exhibit C.15

Mothers' Beliefs in Diet and Health Relationship

	Maternal Employment Status			
	Full-Time	**Part-Time**	**Homemaker**	**All Children**
All children				
Born to be fat/thin, can't change (% disagree)	61.2%	60.0%	67.2%	62.6%
Don't know what recommendations to believe (% disagree)	20.0	23.8	24.3	22.1
Diet can affect risk for disease (% agree)	94.2	88.0	90.2	91.8
Maximum sample size	726	317	473	1,516
By age group				
0 to 8 years				
Born to be fat/thin, can't change (% disagree)	62.5%	57.2%	64.1%	62.2%
Don't know what recommendations to believe (% disagree)	19.9	30.0	25.0	23.7
Diet can affect risk for disease (% agree)	93.5	87.4	91.6	91.7
Maximum sample size	312	138	276	726
9 to 17 years				
Born to be fat/thin, can't change (% disagree)	59.8%	63.1%	70.6%	63.2%
Don't know what recommendations to believe (% disagree)	20.1	17.0	23.4	20.3
Diet can affect risk for disease (% agree)	94.9	88.7	88.7	92.0
Maximum sample size	414	179	197	790
Up to 185% of poverty				
Born to be fat/thin, can't change (% disagree)	57.8%	54.4%	56.0%	56.4%
Don't know what recommendations to believe (% disagree)	10.3**	10.3*	18.2	13.9
Diet can affect risk for disease (% agree)	88.5	76.6	85.9	85.1
Maximum sample size	268	153	287	708

Exhibit C.15

Mothers' Beliefs in Diet and Health Relationship

	Maternal Employment Status			
	Full-Time	**Part-Time**	**Homemaker**	**All Children**
Over 185% of poverty				
Born to be fat/thin, can't change (% disagree)	62.3%**	62.7%*	78.2%	66.1%
Don't know what recommendations to believe (% disagree)	23.3	31.4	30.5	26.8
Diet can affect risk for disease (% agree)	96.1	95.3	94.9	95.6
Maximum sample size	458	165	186	809

*** Statistically significant difference from children whose mothers are homemakers at the 1 percent level
** Statistically significant difference from children whose mothers are homemakers at the 5 percent level
* Statistically significant difference from children whose mothers are homemakers at the 10 percent level

Appendix D
Early Childhood and Child Care Study Non-Response Analysis

The **Early Childhood and Child Care Study** used a multi-stage sampling design, comprising (1) a representative sample of states; (2) a representative sample of sponsors within these states; (3) a representative sample of providers within each sponsoring agency; and (4) a representative sample of children within each provider. All selected states participated. Sponsors and providers were stratified by mode of child care (Head Start centers, other child care centers, and family child care homes).[66] Each participating provider was assigned a target week during the field period, during which a menu survey, observations of meals consumed in child care, and dietary recall interviews with parents all took place. In addition, a household interview was conducted with the parents of participating children during this week or at a later time. Although the response rates at most stages of sample selection were reasonable, the cumulative response rate was only 41 percent overall for the 24-hour recall interviews (Glantz *et al*., 1997). This resulted mainly from an inability to reach parents during the two days following the meal observations, rather than parents' refusing to complete the interview. In addition, many family child care homes declined to participate in the meal observations.

Fortunately, some information on non-respondents is available. Basic characteristics of sponsors were obtained in the process of constructing the sample, and some information was obtained from most non-respondent providers. Furthermore, both household interview and observational data are available for some children who were observed in care. These data permit an analysis of non-response bias at the various stages of the sample. All comparisons except those between observed children with and without 24-hour recall data are done using **unweighted** data, because weights were not calculated for non-respondents.

Respondent and Non-Respondent Sponsors

Of the 1,190 sponsors selected, 990 responded by supplying lists of child care providers under their aegis. Respondent sponsors tended to sponsor similar numbers of providers as all sponsors if they were selected into the family child care homes or Head Start center strata (Exhibit D.1). If they were selected into the "other" (non-Head Start) center stratum, however, they tended to sponsor smaller numbers of centers. Respondent sponsors were distributed among regions similarly to all sponsors.

Respondent and Non-Respondent Providers

Of the 456 providers selected from the sponsors' lists for meal observations, 336 were cared-for children who were ultimately observed. Respondents were similar to all providers with regard to

[66] Although agencies can sponsor multiple types of providers, they were selected into the sample based on a particular provider type.

mean enrollment and percent self-sponsoring (Exhibit D.2). They were somewhat less likely than all providers to be located in the West.

Exhibit D.1

Characteristics of Respondent and Non-Respondent Sponsors (unweighted)

	Respondent Sponsors	Non-Respondent Sponsors	All Sponsors
Mean number of providers			
For sponsors of family child care homes	497.6	378.0	480.0
For sponsors of Head Start centers	9.9	11.7	10.2
For sponsors of other centers	3.4	19.1	5.5
Region			
Northeast	16.3%	7.0%	14.7%
Southeast	34.7	25.0	31.3
Midwest	32.2	27.0	33.0
West	16.9	41.0	20.9
Number of sponsors	990	200	1,190

Universe comprises eligible sponsors selected from state lists. Respondent sponsors are those that supplied lists of providers.

Exhibit D.2

Characteristics of Respondent and Non-Respondent Child Care Providers (unweighted)

	Respondent Providers	Non-Respondent Providers	All Providers
Mean enrollment			
Homes	9.7	8.6	9.2
Head Start centers	73.6	81.6	74.6
Other centers	80.7	83.2	81.3
Percent of self-sponsoring providers	14.9%	16.7%	15.4%
Region			
Northeast	18.2%	28.3%	20.8%
Southeast	34.8	27.5	32.9
Midwest	32.4	20.0	29.2
West	14.6	14.6	17.1
Number of providers	336	120	456

Universe comprises eligible providers selected for meal observations. Respondent providers are those in which children were observed.

Observed and Non-Observed Children

Of the 2,354 children selected from provider lists to be observed at meal and snack time, 1,359 were observed eating meals and snacks in care. Provider characteristics for children who were observed were similar to provider characteristics for all selected children (Exhibit D.3).

Exhibit D.3

Provider Characteristics for Observed and Non-Observed Children (unweighted)

	Observed Children	Non-Observed Children	All Selected Children
Provider's mean enrollment			
Homes	10.3	11.2	10.6
Head Start centers	70.9	86.6	77.9
Other centers	77.5	84.5	80.7
Percent of self-sponsoring providers	15.4%	15.3%	15.3%
Region			
Northeast	19.1%	14.5%	17.1%
Southeast	36.6	43.8	39.6
Midwest	33.4	24.1	29.5
West	11.0	17.6	13.8
Number of providers	1,359	995	2,354

Universe comprises children selected for meal observations. Observed children were observed eating at least one meal or snack in care.

Observed Children With and Without 24-Hour Recall Data

Finally, 24-hour recall data were obtained for 954 of the 1,359 children who were observed eating meals and snacks in care. Although respondents were similar to non-respondents with regard to age distribution, provider enrollment, percent of self-sponsoring providers, and region, there were large differences in household income (Exhibit D.4). Observed children without 24-hour recall data were substantially more likely to reside in households with incomes at or below 185 percent of the federal poverty level. This is undoubtedly due to the greater time stresses experienced by low-income working families with children, which, as shown elsewhere in this report, are substantially more likely than higher-income working families to include only one adult.

On the other hand, respondent and non-respondent children were quite similar with regard to the meals and snacks they were observed to eat in care. Meal patterns and food energy consumption at each eating occasion differed little between the two groups (Exhibit D.5).

Exhibit D.4

Characteristics of Observed Children with 24-Hour Recall Data and with Observation Data Only (weighted)

	Children with Recall and Observation Data	Children with Observation Data Only
Child's age at last birthday		
1-2 years	14.2%	12.8%
3-5 years	78.3	79.8
6-12 years	7.6	7.4
Household income		
At or below 185% of poverty	59.9%	80.1%
Over 185% of poverty	40.1	19.9
Provider's mean enrollment		
Homes	10.4	10.0
Head Start centers	70.2	72.2
Other centers	79.1	73.7
Percent of self-sponsoring providers	15.6%	14.8%
Region		
Northeast	20.8%	15.1%
Southeast	34.7	41.0
Midwest	33.9	32.4
West	10.7	11.6
Number of children (unweighted)	954	405

Universe comprises children who were observed eating meals and snacks in care. Respondent children are those with at least one 24-hour recall.

Exhibit D.5

Meal Patterns and Percent of REA for Food Energy Consumed by Observed Children with 24-Hour Recall Data and with Observation Data (weighted)

	Children with Recall and Observation Data	Children with Observation Data Only
Meal combinations consumed in care[a]		
2 meals and 1 snack	34.3%	36.0%
2 snacks or 1 snack and 1 meal	17.5	17.3
1 snack	14.2	15.7
2 meals	10.7	11.8
2 meals and 2 snacks or more	10.6	8.8
1 meal and 2 snacks	7.8	5.1
1 meal	4.9	5.3
Percent of 1989 REA for food energy consumed in CACFP meals and snacks		
Breakfast:		
Ages 1-2	16.2%	12.7%
Ages 3-5	14.3	14.6
Ages 6-10	17.9	13.7
All ages	14.9	14.2
Lunch:		
Ages 1-2	23.5%	21.6%
Ages 3-5	22.8	22.5
Ages 6-10	24.4	27.9
All ages	23.0	22.6
Morning snack:		
Ages 1-2	12.0%	9.6%
Ages 3-5	9.8	11.3
Ages 6-10[b]	14.8	4.8
All ages	10.4	10.6
Afternoon snack:		
Ages 1-2	11.2%	10.9%
Ages 3-5	10.2	10.9
Ages 6-10[b]	12.0	10.1
All ages	10.7	10.7
Number of children[c] (unweighted)	943	400

Universe comprises children who were observed eating meals and snacks in care. Respondent children are those with at least one 24-hour recall.

a Meals include breakfast, lunch, and dinner/supper. Evening snacks were rare and are excluded from this analysis.

b Sample sizes are very small for both groups (n<6).

c Some children were missing information on the specific meals and snacks consumed in care (five with recalls and three with observations only). In addition, two children over age 10 in each group, and four Head Start children with recall data whose ages were over 5, were excluded.

Summary

The ECCCS was designed to be nationally representative of children in CACFP care. Sampling weights were adjusted at each stage to correct for non-response based on selected observed characteristics. Nonetheless, a high non-response rate raises concern about the validity of generalization from the sample to the CACFP population as a whole, particularly if there is reason to believe that non-respondents differ systematically from respondents.

The two most striking aspects of the comparisons above are that sponsors and providers from the West were relatively less likely to participate, and that families with incomes up to 185 percent of poverty whose children were observed in child care were less likely to provide 24-hour recall data. Weights have been used to correct for these discrepancies to the extent possible. The similarity in two key outcome measures between groups of observed children for whom 24-hour recall data are and are not available suggests that the description of the program based on respondents alone is not greatly distorted.

Appendix E
Standard Errors for Selected Exhibits in Chapter 4

Exhibit E.1

Standard Errors for Estimates of Average Food Energy and Nutrients Consumed in CACFP Care and Over 24 Hours in Exhibit 4.2[a]

	Family Child Care Homes		Head Start Centers		Child Care Centers	
	% Daily Recommendation in 24 Hours	% Daily Recommendation from CACFP	% Daily Recommendation in 24 Hours	% Daily Recommendation from CACFP	% Daily Recommendation in 24 Hours	% Daily Recommendation from CACFP
Food energy (1989 REA)						
1-2 years	6.69	4.45	--	--	4.36	4.62
3-5 years	3.59	2.78	2.37	1.90	4.37	4.30
6-10 years	3.46	2.38	--	--	7.46	4.98
Protein (1989 RDA)						
1-2 years	31.22	16.67	--	--	15.17	14.55
3-5 years	15.38	10.79	10.31	6.91	19.66	14.19
6-10 years	11.33	9.40	--	--	26.48	18.28
Vitamin A (1989 RDA)						
1-2 years	18.39	13.16	--	--	15.14	10.57
3-5 years	14.06	10.12	15.58	15.91	16.22	13.79
6-10 years	25.26	7.33	--	--	13.93	6.33
Vitamin C (2000 RDA)						
1-2 years	53.98	21.56	--	--	68.01	38.96
3-5 years	30.15	18.71	26.78	13.41	30.09	20.99
6-10 years	29.61	15.70	--	--	69.13	32.67
Calcium (1997 AI)						
1-2 years	14.64	14.67	--	--	8.28	9.03
3-5 years	9.74	6.17	4.50	4.45	8.51	8.62
6-10 years	7.76	4.61	--	--	21.53	12.71
Calcium (1989 RDA)						
1-2 years	9.15	9.17	--	--	5.17	5.64
3-5 years	6.19	5.89	4.02	3.78	5.45	6.94
6-10 years	6.99	5.03	--	--	15.40	12.11
Iron (2001 RDA)						
1-2 years	15.33	8.87	--	--	4.58	5.53
3-5 years	13.14	4.32	4.49	3.41	8.47	5.19
6-10 years	9.11	4.94	--	--	7.38	4.50

Exhibit E.1

Standard Errors for Estimates of Average Food Energy and Nutrients Consumed in CACFP Care and Over 24 Hours in Exhibit 4.2[a]

	Family Child Care Homes		Head Start Centers		Child Care Centers	
	% Daily Recommendation in 24 Hours	% Daily Recommendation from CACFP	% Daily Recommendation in 24 Hours	% Daily Recommendation from CACFP	% Daily Recommendation in 24 Hours	% Daily Recommendation from CACFP
Zinc (2001 RDA)						
1-2 years	21.56	11.61	--	--	8.41	11.20
3-5 years	11.96	7.05	9.82	4.52	14.73	10.31
6-10 years	12.91	5.74	--	--	20.81	12.17
Number of child days						
1-2 years	128	128	--	--	73	73
3-5 years	161	161	574	574	352	352
6-10 years	59	59	--	--	41	41

a All values are expressed as a percent of age-weighted RDAs. Calcium is also presented as a percent of the DRI-based AI value.

Exhibit E.2

Standard Errors for Estimates of Average Intake of Selected Macronutrients Consumed in CACFP Care and Over 24 Hours in Exhibit 4.3

		Family Child Care Homes		Head Start Centers		Child Care Centers	
	Daily Recommendation (% food energy)	% Total Food Energy in 24 Hours	% Total Food Energy from CACFP	% Total Food Energy in 24 Hours	% Total Food Energy from CACFP	% Total Food Energy in 24 Hours	% Total Food Energy from CACFP
Total fat							
3-5 years	≤ 30%[a]	0.65	1.12	0.33	0.77	0.80	1.33
6-10 years	≤ 30	0.81	1.73	--	--	0.85	3.51
Saturated fat							
3-5 years	< 10%[a]	0.40	0.55	0.15	0.40	0.33	0.56
6-10 years	< 10	0.38	0.64	--	--	0.59	1.78
Carbohydrate							
3-5 years	> 55%[b]	0.85	1.29	0.40	0.84	1.04	1.91
6-10 years	> 55	0.79	1.68	--	--	0.90	6.07
Number of child days							
3-5 years		161	161	574	574	352	352
6-10 years		59	59	--	--	41	39

a *Dietary Guidelines* recommendation (USDHHS/USDA, 2000).

b NRC recommendation (NRC, 1989b).

Exhibit E.3

Standard Errors for Estimates of Average Cholesterol, Sodium, and Dietary Fiber Consumed in CACFP Care and Over 24 Hours in Exhibit 4.4[a]

		Family Child Care Homes			Head Start Centers			Child Care Centers		
	Daily Recommendation	% Daily Recommendation in 24 Hours	% Daily Recommendation from CACFP	% Total from Meals in Care Relative to % Total Energy from Meals in Care	% Daily Recommendation in 24 Hours	% Daily Recommendation from CACFP	% Total from Meals in Care Relative to % Total Energy from Meals in Care	% Daily Recommendation in 24 Hours	% Daily Recommendation from CACFP	% Total from Meals in Care Relative to % Total Energy from Meals in Care
Cholesterol										
3-5 years	≤ 300 mg[a]	3.37	3.20	0.03	2.52	2.03	0.03	3.66	2.80	0.04
6-10 years	≤ 300 mg	5.72	6.38	0.12	--	--	--	6.27	3.33	0.12
Sodium										
3-5 years	≤ 2,400 mg[a]	4.37	3.51	0.02	2.35	1.93	0.02	4.05	4.50	0.05
6-10 years	≤ 2,400 mg	3.92	3.50	0.04	--	--	--	9.12	6.40	0.08
Dietary fiber										
3-5 years	> 8-10 g[b]	7.63	5.32	0.04	4.05	3.23	0.03	5.01	5.28	0.05
6-10 years	> 11-15 g[b]	4.26	3.46	0.07	--	--	--	12.69	7.97	0.23
Number of child days										
3-5 years		161	161	161	574	574	574	352	352	352
6-10 years		59	59	59	0	0	0	41	41	41

a NRC recommendation (NRC, 1989b).

b Based on American Health Foundation recommendation of "age-plus-five" grams per day (Williams, 1995).