

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 Sutor, 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):	Ounces per day
Fruit drinks (not juice)	
Tea	
Added sugar intake:	Teaspoons per day
From soda and other soft drinks	
From all sources	
Vegetable consumption:	Servings per day
Vegetables other than fried potatoes	
Fried potatoes	

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			All Children
	Full-Time	Part-Time	Homemaker	
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			All Children
	Full-Time	Part-Time	Homemaker	
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			All Children
	Full-Time	Part-Time	Homemaker	
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			All Children
	Full-Time	Part-Time	Homemaker	
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			All Children
	Full-Time	Part-Time	Homemaker	
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 Sutor, 2001). In addition, a substantial proportion of children of all ages may not consume enough zinc (USDA/ARS, 1999; Gleason and Sutor, 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.

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			All Children
	Full-Time	Part-Time	Homemaker	
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			All Children
	Full-Time	Part-Time	Homemaker	
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

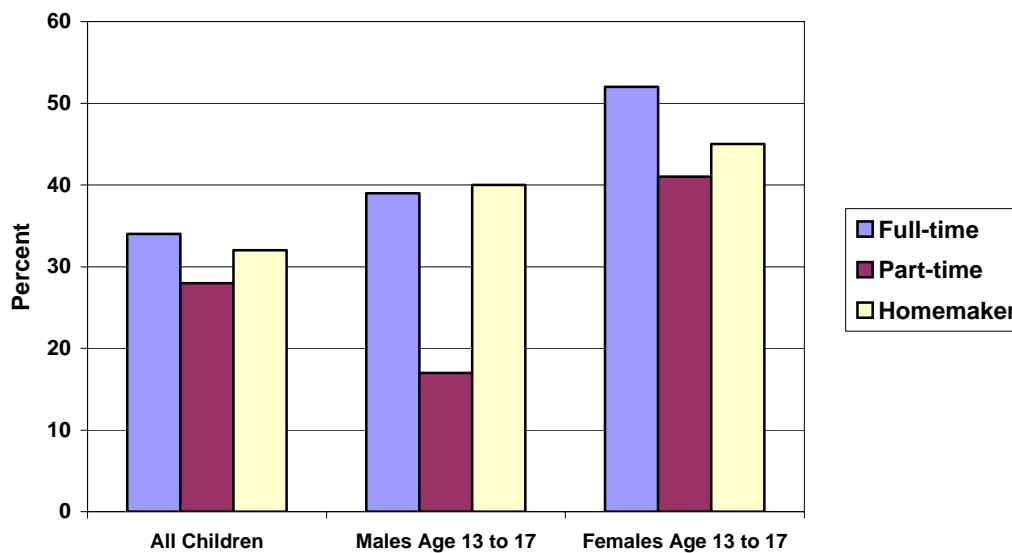
²¹ The proportions of children with food energy intake above 110 percent or below 90 percent of REA were determined on a per-day basis, and then averaged.

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			All Children
	Full-Time	Part-Time	Homemaker	
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			All Children
	Full-Time	Part-Time	Homemaker	
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

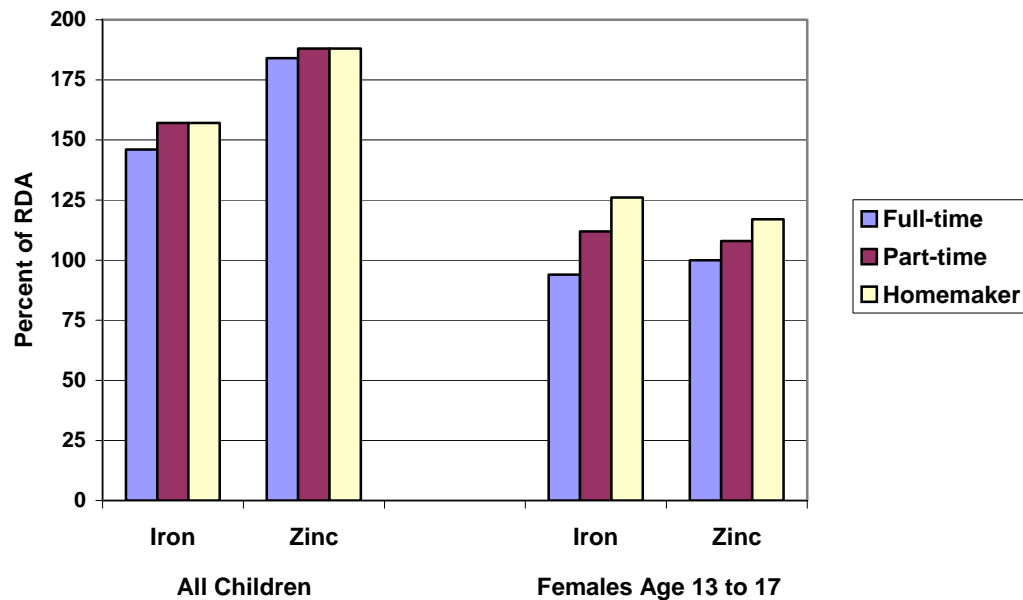
When children of all ages are combined, there appears to be a negative relationship between maternal employment and dietary iron for children whose mothers work full-time. Average iron intake among children whose mothers work full-time is 143 percent of RDA compared to 156 percent of RDA for children 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			All Children
	Full-Time	Part-Time	Homemaker	
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

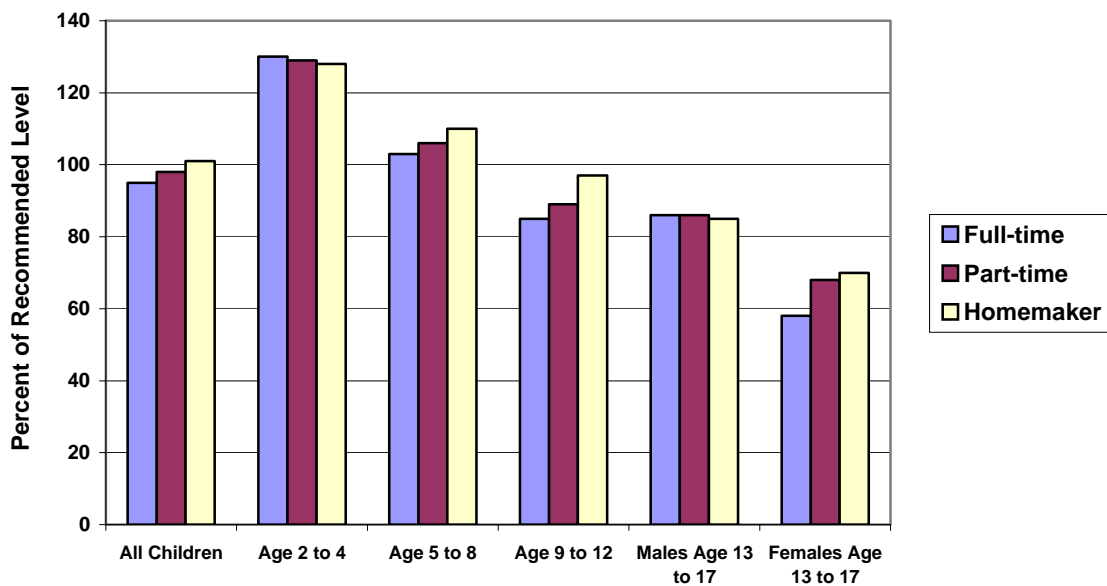
* Statistically significant difference from children whose mothers are homemakers at the 10 percent level

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 Sutor, 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.

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			All Children
	Full-Time	Part-Time	Homemaker	
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			All Children
	Full-Time	Part-Time	Homemaker	
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			All Children
	Full-Time	Part-Time	Homemaker	
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

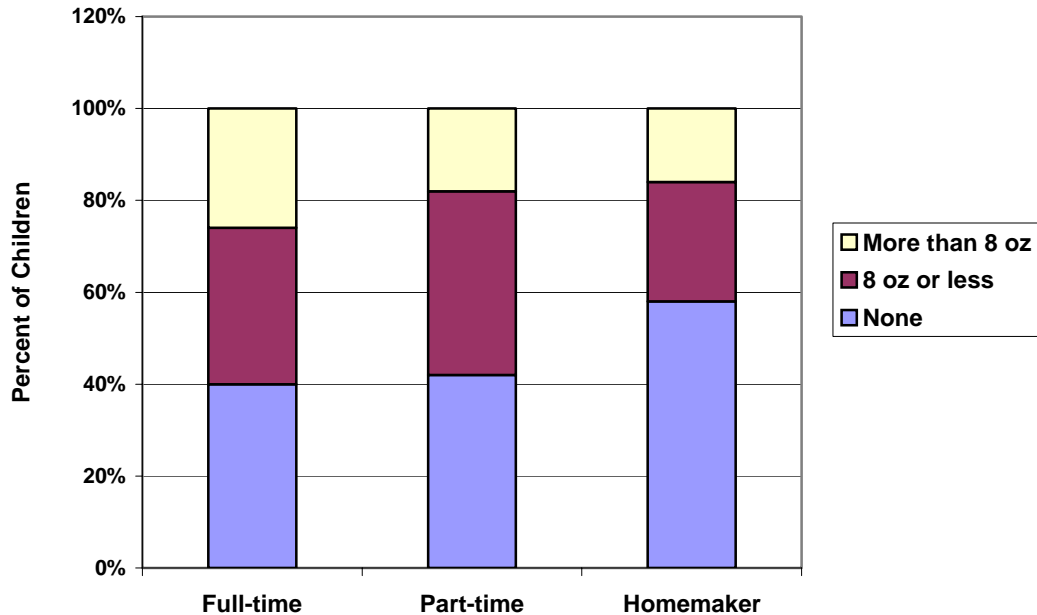
** Statistically significant difference from children whose mothers are homemakers at the 5 percent level

* 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			All Children
	Full-Time	Part-Time	Homemaker	
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			All Children
	Full-Time	Part-Time	Homemaker	
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			All Children
	Full-Time	Part-Time	Homemaker	
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			All Children
	Full-Time	Part-Time	Homemaker	
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.