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Children's Diets in the Mid-1990s: Dietary Intake and Its Relationship with School Meal Participation

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Children's Diets in the Mid-1990s: Dietary Intake and Its Relationship with School Meal Participation

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EXECUTIVE SUMMARY

Children's diets may influence their lives in a variety of ways, including affecting their growth, health outcomes, and cognitive development. The U.S. Department of Agriculture has developed several nutrition programs to promote healthy eating among children, including the National School Lunch Program (NSLP) and the School Breakfast Program (SBP). As of 1996 (the last year covered by this study) approximately 26 million students participated in the lunch program and 6.6 million participated in the breakfast program each school day. By fiscal year 1999, average daily participation was nearly 27 million for the NSLP and was 7.3 million for the SBP.

This report is the first of two reports on the nutrition of children using findings from the analysis of the 1994-1996 Continuing Survey of Food Intake by Individuals (CSFII). The key objectives of the overall study are to describe the diets of school-aged U.S. children as of the mid-1990s, examine relationships between children's participation in the school meal programs and their dietary intake, and examine changes in intake between the periods 1989-1991 and 1994-1996. This first report describes children's mean food and nutrient intake, reports the percentage meeting various dietary standards, and compares the diets of participants and nonparticipants in the school meal programs. A second report focuses on changes between the early and mid-1990s in the dietary intake of children.

The 1994-1996 CSFII collected dietary intake and other data from a nationally representative sample of noninstitutionalized residents of the United States. The analysis in this report uses data from nearly 2,700 children ages 6 through 18 years who completed two nonconsecutive days of dietary intake interviews. Parents assisted children ages 6 through 11 years in reporting their intakes; older children reported their food and beverage consumption independently.

The analysis presented in this report includes several important methodological features. To address the issue of what proportion of children meet various dietary standards, we used statistical methods to obtain unbiased estimates of the distribution of usual intake using two days of intake information for each child. Since accepted reference standards (Estimated Average Requirements [EARs]) have not yet been developed for nutrients other than the B-vitamins, phosphorus, and magnesium, we assigned reference standards derived from the 1989 Recommended Dietary Allowances (RDAs) or Adequate Intakes (AIs) for the remaining nutrients.

Since the CSFII provides no direct measure of school meal participation status on the days of dietary data collection, we determined participation largely according to the foods the student reported having obtained and consumed from the school cafeteria on that day. Finally, in examining the relationship between school meal participation and dietary intake, we obtained regression-adjusted mean food and nutrient intake estimates after controlling for observable characteristics of participants and nonparticipants. Fifteen types of variables were used in the regression adjustment.

CHILDREN'S DIETARY INTAKES

On average, students' reported daily consumption of food energy is less than the Recommended Energy Allowance (REA), especially among females. Mean food energy intakes by males ranged from 96 to 97 percent of the REA, whereas intakes by females ranged from 83 to 87 percent of the REA. These relatively low reported intakes may have been the result of underreporting of food intake by children. Alternatively, the reported intakes may have been accurate but the children's actual energy requirements may have been lower than implied by the REA due to low physical activity levels among children.

Children's mean intakes of most vitamins and minerals exceed the RDA; however, mean intakes of vitamin E, folate, and zinc are less than this dietary standard.[1] In addition, children's mean intake of calcium is below the AI and children's *median* intakes of vitamin A and magnesium are below the RDA.

Mean daily intakes of many vitamins and minerals relative to dietary standards differ greatly by age and gender. Despite the differences, for vitamin C and for B vitamins other than folate, mean intakes for all groups are well in excess of the RDA. For folate and the other vitamins and minerals, one or more age/gender group has a mean intake less than the RDA. Females ages 14 to 18 have the lowest mean intakes of vitamins and minerals.

Nearly all children meet the reference standard for most B vitamins, but many children of all ages are at risk of inadequate intakes of folate, magnesium, zinc, and vitamins A and E. In addition, a large proportion of children have calcium intakes well below the AI level. Particularly large proportions of children have low intakes of several of these nutrients. For example, fewer than half of all children meet the reference standards for folate and calcium and between half and two-thirds meet the standards for vitamin E, magnesium, and zinc.

Teenage girls are at especially high risk of having low vitamin and mineral intakes. For three nutrients (folate, calcium, and magnesium), fewer than 15 percent of 14- to 18-year-old females meet reference standards. Half or just over half of these teenage girls meet the reference standards for vitamin A, vitamin E, iron, phosphorus, and zinc. Females ages 9 to 13 also tend to have low intakes of the same set of vitamins and minerals as teenage girls. In general, children aged 6 to 8 (both males and females) are likely to meet the standards for vitamins and minerals; the exceptions to this are vitamin E and zinc.

Non-Hispanic blacks and "others" are at increased risk of low or inadequate intakes of folate, magnesium, calcium, phosphorus, and vitamin A. Hispanics and "others" are at increased risk of low or inadequate intake of vitamin E. Household income did not appear to be consistently related to risk of inadequate intake.

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[1]The dietary standard used for folate was set in 1998. If the previous 1989 standard for folate intake had been used, a larger proportion of children would have met this standard. Since the new standard for folate intake was accompanied by a requirement that grains/breads be fortified with folate, the percentage of children meeting the 1998 standard may have increased after the 1994-1996 data collection period.

Most children take fewer than the recommended number of servings of the five major food groups, especially in relation to their energy requirements. Only 2 percent of children meet Food Guide Pyramid servings recommendations for all five major food groups. Girls ages 14 to 18 have especially low intakes of fruits and dairy products, and this is consistent with their low mean nutrient intakes. Overall, the percentages of children meeting the recommended number of food group servings are 14 percent for fruit, 17 percent for meat, 20 percent for vegetables, 23 percent for grain, and 30 percent for milk.

Children are heavy consumers of regular or diet soda. Overall, 56 to 85 percent of children (depending on age and gender) consume soda on any given day. Teenage males are especially heavy consumers of soda, with over a third consuming more than three servings a day.

Small percentages of children meet the recommendations for intake of total fat, saturated fat, fiber, and sodium. Fewer than one-third of females ages 14 to 18 meet the recommendations for total fat and saturated fat intake, but even smaller percentages of children meet these recommendations among the other age/gender groups. Among 9- to 13-year-old males, for example, only 14 percent meet the total fat recommendation and 6 percent meet the saturated fat recommendation. Young children are most likely to meet the recommendations for sodium and fiber.

Black children are very unlikely to meet recommendations for total fat, saturated fat, and sodium intake. Only 7 percent of black children limit their total fat intake to 30 percent or less of food energy, 5 percent limit their saturated fat intake to less than 10 percent of food energy, and 11 percent limit their sodium intake to 2,400 mg. Non-Hispanic whites and "others" are the racial/ethnic groups most likely to meet recommendations for total fat, saturated fat, and cholesterol.

Children's diets are high in added sugars. For all children, added sugars--including sugars used as ingredients in processed foods or added to foods as they are consumed--contribute a mean of 20 percent of total food energy. Differences as a percentage of calories are relatively small for the age/gender groups. However, absolute mean intake of added sugars ranges from 19 teaspoons for females ages 6 to 8 years to 36 teaspoons/day (3/4 cup) for males ages 14 to 18 years.

Compared with lunch and 24-hour intake, breakfast tends to be substantially higher in nutrient density for vitamins and minerals. Breakfast contributes a higher percentage of essential nutrients relative to its energy contribution than do lunch and other meals during the day. Furthermore, children's intakes of fat, saturated fat, and sodium are closer to being in line with dietary recommendations at breakfast than at other meals during the day. However, substantial proportions of children skip breakfast. Nearly 20 percent of females ages 14 to 18 skipped breakfast on both days for which intake was reported, which may contribute to their low mean intake of nutrients.

RELATIONSHIP BETWEEN SCHOOL MEAL PROGRAM PARTICIPATION AND DIETARY INTAKE

The school meal programs play a substantial role in the diets of school-aged children. On average, however, children get much more food away from school than at school. Because many children do not participate in the school meal programs, foods from the school cafeteria (most, but not all of which are offered as part of the NSLP or SBP)[2] contribute a mean of 19 percent of the daily food energy intake of all children on school days; children get the rest of their food elsewhere. On the other hand, SBP participants, most of whom also consume a school lunch, obtain about half of their food energy for the day from school cafeteria foods.

NSLP participation is associated with higher mean intakes of food energy and of many nutrients, both at lunch and over 24 hours. After controlling for observable characteristics, NSLP participants consume a mean of 94 percent of the REA over 24 hours (on school days), whereas nonparticipants consume 88 percent. Relative to nonparticipants, participants consume greater amounts of vitamins B_6, vitamin B_{12}, thiamin, riboflavin, calcium, phosphorus, magnesium, and zinc. The differences in the 24-hour intake of these nutrients are largely explained by the differences in participants' and nonparticipants' intakes of all foods at lunch.

NSLP participants continue to have higher mean intakes of total fat, saturated fat, and sodium than nonparticipants, both at lunch and over 24 hours. Total fat intake from all foods consumed at lunch is 37 percent of food energy for participants and 32 percent for nonparticipants, while saturated fat intake is 15 and 11 percent, respectively. These findings are consistent with reports from earlier studies. Higher intakes of fat at lunch almost entirely explain the 24-hour differences in fat intake between the two groups. Participants' intakes at lunch may have included a la carte foods sold in the school cafeteria and other foods in addition to foods that were part of the school lunch.

NSLP participants have substantially lower intakes of added sugars than do nonparticipants. At lunch, added sugars contribute 13.2 percent of food energy for participants and 22.9 percent for nonparticipants. Nonparticipants also consume significantly more added sugars over 24 hours. This difference leads to a corresponding difference in carbohydrate intake--participants' carbohydrate intake as a percentage of food energy is lower than that of nonparticipants.

NSLP participants are more likely than nonparticipants to consume vegetables, milk and milk products, and meat and meat substitutes, both at lunch and over 24 hours; they also consume less soda and/or fruit drinks. Participants consume an average of 1.3 servings of vegetables at lunch compared with 0.6 servings by nonparticipants. Similarly, participants consume more milk servings at lunch than do nonparticipants (0.8 versus 0.2 servings). Perhaps as a substitute for milk, nonparticipants consume an average of 0.4 servings of soda and 0.3 servings of fruit drinks at lunch, compared with 0.2 and 0.1, respectively, for participants.

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[2]The School Food Purchase Study (Daft et al. 1998) found that 80 percent of 1996-1997 district food service revenues resulted from either USDA reimbursements for free or reduced-price meals or from the sale of paid or reduced-price meals to students.

SBP participation is associated with higher intakes of food energy, calcium, phosphorus, and vitamin C. These higher intakes are evident over 24 hours, not just at breakfast. For example, participants' regression-adjusted mean food energy intake is 96 percent of the REA, compared with 90 percent among nonparticipants. Significantly larger percentages of participants than nonparticipants meet reference standards for vitamin C, vitamin B_{12}, thiamin, and calcium. The favorable findings for vitamin C and calcium may be related, in part, to participants' much higher intakes of fruit and milk.

Students who participate in both the school breakfast and school lunch programs have higher mean intakes of food energy, seven vitamins and minerals, total fat, saturated fat, fiber, and sodium than do students who participate in neither program. Participants are significantly more likely to meet the dietary standards for the intake of vitamin C, vitamin B_6, vitamin B_{12}, thiamin, riboflavin, calcium, iron, magnesium, phosphorus and zinc. On the other hand, participants are less likely to meet fat and sodium guidelines. For example, 15 percent of participants and 32 percent of nonparticipants have daily intakes of saturated fat less than 10 percent of food energy. Intake of added sugars is lower for participants. Compared with students who participate in neither program, participants in both programs consume (at breakfast and lunch) more than twice as many servings of milk and of fruit and vegetables combined and one-quarter the number of servings of soda and fruit drinks.

Improvements in the school meal programs can be a positive step in promoting healthy eating among children. In particular, improvements are needed to promote children's intakes that are consistent with dietary recommendations related to intake of fat, saturated fat, sodium, and fiber.

I. INTRODUCTION

Children's diets have a wide range of potential effects on their lives. What children eat may affect their growth and various health outcomes, both in childhood and as they become adults. Dietary factors may be related to obesity in children, which itself is associated with a variety of adverse health and social consequences. Finally, children's diets may be related to their cognitive development, as undernourishment may influence their ability to concentrate in school.

The U.S. Department of Agriculture (USDA) recognizes the importance of dietary factors in childhood development and, as part of an effort to promote healthy eating, has developed several child nutrition programs. The two largest are the National School Lunch Program (NSLP) and the School Breakfast Program (SBP), which serve lunches and breakfasts to students in most schools in the United States.

This report uses the 1994-1996 Continuing Survey of Food Intake by Individuals (CSFII) to describe the diets of school-aged children in the United States as of the mid-1990s and examine the relationship between the children's participation in the school meal programs and their dietary intake. By assessing the current status of children's diets and the relationship between school meal program participation and those diets, the report aims to identify areas for improvement in children's dietary intake and especially in that part of their diets they obtain in school.

The rest of this chapter provides some background information on this study and describes previous research on the quality of children's diets and the dietary effects of participation in the NSLP and SBP. Chapter II describes the data used in the analysis and outlines some key methodological issues. Chapter III presents our results on children's dietary intake, for all school-aged children and for key subgroups. Finally, Chapter IV compares the dietary intake of NSLP and

SBP participants versus nonparticipants, taking into account observable differences in the characteristics of these two groups. A variety of additional detailed information is presented in the appendixes. To complement the description and assessment of children's diets and the school meal programs as of the mid-1990s in this report, a companion report will examine change over time in children's diets, focusing on the 1990s.

A. BACKGROUND

The NSLP was established with the passage of the National School Lunch Act of 1946. A main goal of the program was to "safeguard the health and well-being of the nation's children." The SBP was originally established as a pilot program in 1966 to provide funding for breakfast in "poor areas and areas where children had to travel a great distance to school." The intent of the program was to provide a nutritious meal to children who might otherwise not receive an adequate breakfast. The SBP was established as a permanent program in 1975. As of 1996 (the last year covered by this study), these two programs provided school meals to about 26 million schoolchildren each day. By fiscal year 1999, average daily participation was nearly 27 million for the NSLP and over 7 million for the SBP.

All public and most private elementary and secondary schools in the United States are eligible to participate in the NSLP and SBP (that is, to offer USDA-reimbursable lunches and breakfasts). To participate, schools must offer to all students meals or meal choices that meet federally specified nutritional requirements. On average, schools must offer lunches containing one-third of the Recommended Dietary Allowance (RDA) for selected nutrients and must offer breakfasts containing one-fourth of the RDA. Until 1995, school lunches were required to consist of two servings of fruit and/or vegetables and one serving each of grain products, dairy products, and meat or meat substitutes; school breakfasts were required to consist of two servings of grain or meat products or one serving of each, along with one serving each of milk and fruit/vegetables.[1] Since 1995, participating schools have been able to use a variety of approaches to meet the RDAs and dietary guidelines.

To be eligible for free meals, a student must be a member of a family that receives food stamps or Temporary Assistance for Needy Families (TANF) or that has an income less than or equal to 130 percent of the poverty line. To be eligible for reduced-price meals, a student must be a member of a family that has an income between 130 and 185 percent of the poverty line. Income-eligible students become certified by completing an application and being approved or through a process known as direct certification.

As described in Section B, most recent research on children's diets and the school meal programs used data from the late 1980s and early 1990s. However, several changes since then suggest that children's diets may have changed substantially since the early 1990s.

Two general factors may have indirectly influenced children's diets during the 1990s. First, the National Research Council (NRC) in 1989 adopted specific quantitative guidelines in place of their previous qualitative standards for the intake of dietary components such as fat, sodium, and cholesterol. For example, people now had the specific goal of reducing their fat intake to 30 percent of food energy rather than the general directive of reducing their fat intake to reduce their risk of chronic disease. Second, in 1992 the USDA published the Food Guide Pyramid, which contained specific recommendations for the consumption of five major food groups. Again, this provided government-sanctioned goals for consumption, such as three to five servings of vegetables a day, rather than general encouragement to eat more fruit and vegetables. These factors may have

[1]Under the "offer-versus-serve" option, a school lunch could be considered USDA - reimbursable if students selected at least three of the five lunch components listed above; a school breakfast could be considered USDA-reimbursable if students selected at least three of the four breakfast components.

contributed to the general trend reported in the *Third Report on Nutrition Monitoring in the United States* that "trends in the amounts of food available for consumption suggest that Americans are slowly changing their eating patterns toward more healthful diets" (Life Sciences Research Office 1995).

Three other factors may have influenced children's diets through their participation in the NSLP and SBP. First, these programs--particularly the SBP--have grown in scale during the past 20 years. The average number of students served by the SBP per day increased from 3.4 million in 1985 to 6.9 million in 1997. Second, the much-publicized results of the first School Nutrition Dietary Assessment (SNDA-1) Study in 1993 (Burghardt et al. 1993) emphasized that students' intakes of dietary fat and the fat content of school meals were well above the newly recommended levels.[2] The publicity surrounding these findings may have led some schools to make changes to their meal programs in an attempt to make these meals healthier. Third, concern over the nutritional quality of school meals, partly in response to the SNDA-1 findings, led to the publication of new USDA regulations in June 1995, which required that school food authorities prepare meals that meet new nutrition standards for fat, saturated fat, and other key nutrients (*Federal Register,* June 13, 1995). These requirements were not imposed on most schools during the period covered by the 1994-1996 CSFII, but schools may have begun changing their meal program in preparation for the requirements.

From the existing research on children's diets and the changes that have taken place during the 1990s, the USDA's Food and Nutrition Service (FNS) has developed a strategic plan aimed at helping the agency accomplish its goal of providing children and needy families access to a more

[2] A *second* School Nutrition Dietary Assessment study is currently being conducted under USDA funding.

healthful diet (U.S. Department of Agriculture 1997).[3] This strategic plan includes the goal of promoting more healthful diets among school-aged children. The first specific objective within this larger goal is to "ensure that school meals are consistent with the *Dietary Guidelines for Americans* and the Recommended Dietary Allowances (RDAs)." The second objective is that "children make food choices for a healthy diet."

To update knowledge on the diets of school-aged children and to provide baseline information on FNS's strategic plan objectives, the report addresses the following research questions:

- What is the food and nutrient intake of the school-aged population?
  - What are school-aged children's mean intakes of key foods and nutrients at breakfast, at lunch, and over 24 hours, relative to accepted dietary standards?
  - What proportion of children have usual intakes that meet various dietary standards?
- What are the food and nutrient intakes of SBP/NSLP participants and nonparticipants?
  - After controlling for observable characteristics, do participants and nonparticipants have different mean food and nutrient intakes at breakfast, at lunch, and over 24 hours?
  - Are there differences in the proportion of participants and nonparticipants whose dietary intakes meet accepted dietary standards?

B. LITERATURE REVIEW

Previous research on children's diets and on the effects of the school meal programs on dietary intake have typically used nationally representative data sets to examine mean food and nutrient intake levels of all children and of key subgroups, such as SBP/NSLP participants and nonparticipants. The findings of the research have been consistent across studies using different data sets and methodological approaches. However, the studies have struggled to deal with the

[3]This strategic plan was developed in response to the Government Performance and Results Act (GPRA), a federal initiative aimed at encouraging all federal agencies to operate more efficiently.

methodological issues of underreporting food intake and of measuring the prevalence of dietary inadequacy.

1. Research on Children's Diets

Typically, previous studies of children's diets have addressed one or more of the following topics: children's overall food energy and nutrient intake, their intake of particular foods or food groups, and changes in their food and nutrient intake over time.

a. Energy and Nutrient Intake

Food Energy. Most studies have found children's average food energy intake to lie below the Recommended Energy Allowance (REA). For example, Kennedy and Powell (1997) used the 1994 CSFII to find that different subgroups of children ages 0 to 18 years have mean food energy intake levels ranging from 88 to 99 percent of the REA. Using the 1989-1991 CSFII, Lin and Guthrie (1996) found mean food energy intake levels of 82 to 92 percent of the REA among children ages 2 to 17. Kennedy and Goldberg (1995) used Phase I (1988-1991) of the National Health and Nutrition Examination Survey (NHANES) to show mean food energy intake levels below the REAs for various subgroups of children ages 1 to 19. These studies also found that, on average, reported food energy intake levels relative to the REA are higher among younger children than older children and higher among males than females.

In contrast to the three studies described above, two studies found mean food energy intake levels among children that exceed the REA. Using nationally representative data from the SNDA-1 study on children in elementary and secondary school during the 1991-1992 school year, Burghardt et al. (1993) found that these children's mean food energy intake level is 111 percent of the REA.[4]

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[4]One unique feature of the dietary intake data collection methodology in the SNDA-1 study was (continued...)

Among 10-year-olds in Bogalusa, Louisiana, in 1987-1988, Nicklas et al. (1993) found a mean food energy intake level of 2,224 kilocalories, 111 percent of the REA of 2,000 for this age group.

Studies showing dietary intake levels substantially below the REA may suffer from underreporting of food intake.[5] A number of methodological studies have provided direct evidence of underreporting in food intake surveys, especially among females and people who are overweight (Bandini et al. 1990; Black et al. 1991; Lichtman et al. 1992; and Mertz et al. 1991). Livingstone et al. (1991) and Champagne et al. (1998) looked specifically at dietary recall among children and found evidence of underreporting among this group. In particular, Champagne et al. (1998) found that in 8-day food records, children underreported their mean daily food energy intake by 17 to 33 percent of energy expenditure. If children's average intake levels were truly below the REA, which is an estimate of the average energy requirement among individuals within a given group, one would expect to observe a large proportion of children to be underweight. However, studies have shown a large proportion of overweight rather than underweight children (Kennedy and Goldberg 1995; and Troiano et al. 1995). An alternative possibility is that the REA is an overestimate of children's true energy requirement at current activity levels.

Macronutrient Intake. Previous research has consistently found that children's intakes of total fat and saturated fat exceed recommended levels. For the period of the late 1980s and early to mid-1990s, studies using various data sources have found mean fat intake levels to range from 33 to 37

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[4](...continued)
that the dietary intake interviews were usually conducted immediately after either breakfast or lunch and the 24-hour dietary recall period included the 24 hours immediately preceding the interview. In most dietary intake surveys, the recall period covers the 24 hours in the previous day.

[5]In addition to underreporting, it is possible that children report eating foods that they did not actually eat. However, given that most surveys show that mean food energy intake is well below the REA, such "false memories" of foods consumed are unlikely to be widespread. See Dwyer et al. (1989) and Witschi (1990) for a discussion of food misreporting.

percent of food energy (Devaney et al. 1995; Johnson et al. 1994; Kennedy and Powell 1997; Levine and Guthrie 1997; Lin and Guthrie 1996; McDowell et al. 1994; and Morton and Guthrie 1998). These studies found mean saturated fat intake to be 12 to 13 percent of food energy. These mean intake levels exceed the recommended maximum intake levels of 30 percent of food energy from fat and less than 10 percent from saturated fat. In addition, most of these studies also found carbohydrate intake to be less than the recommended minimum intake level of 55 percent of food energy.

Among children, fat and saturated fat intakes as a percentage of food energy do not vary greatly by age and gender, according to previous studies (Kennedy and Goldberg 1995; and Lin and Guthrie 1996). However, among older teenagers, total fat tends to provide a higher percentage of food energy for males than for females (Devaney et al. 1995).

Two studies found that low-income children tend to have greater intake of total fat and saturated fat as a percentage of food energy than do higher-income children (Devaney et al. 1995; and Kennedy and Goldberg 1995). Most studies have found few differences in total fat and saturated fat (as a percentage of food energy) by race (Devaney et al. 1993; Johnson et al. 1994; Kennedy and Goldberg 1995; and Levine and Guthrie 1997), although an earlier study found that fat intake is significantly higher among blacks than among whites (Devaney and Fraker 1986).

Vitamin and Mineral Intake. Studies show that children's mean intake of most vitamins and minerals exceeds the RDAs.[6] However, for some subgroups of children, mean intakes of selected vitamins and minerals consistently have been found to be below the RDAs. Among teenagers, for example, mean intakes of vitamins A and E, calcium, magnesium, and zinc are below the 1989 RDA

[6]As described below, mean vitamin and mineral intake levels measured in relation to the RDA do not yield information on the extent to which intake of a particular nutrient is inadequate. However, presenting mean intake levels relative to the RDA is a useful way to benchmark average intake of nutrients for different age/gender groups, because they have different nutrient requirements.

(Johnson et al. 1994; Kennedy and Powell 1997; Levine and Guthrie 1997; and Lin and Guthrie 1996). For teenage girls, these studies also find that the mean intake of iron is below the RDA. Devaney et al. (1995), while showing mean vitamin and mineral intake levels to be greater than those of most other studies, also found that teenage girls have mean intake levels of calcium, iron, magnesium, and zinc that are below the RDA.

As with food energy, younger children tend to have higher mean vitamin and mineral intake levels (relative to the RDA) than older children, and males tend to have higher intake levels than females, especially among teenagers (Johnson et al. 1994; and Levine and Guthrie 1997; and Lin and Guthrie 1996). By contrast, mean intake levels do not vary greatly by income (Devaney et al. 1995; Johnson et al. 1994; and Kennedy and Goldberg 1995). On average, white children have higher intake levels than black children for several vitamins and minerals, including vitamin A and calcium (Kennedy and Goldberg 1995; and Levine and Guthrie 1997). After controlling for observable characteristics such as income, differences by race persisted for children's intake of these nutrients and several others--riboflavin, folate, and phosphorus (Devaney et al. 1993). Conversely, Devaney et al. (1993) found that black children have *higher* mean vitamin C intake levels than whites after controlling for other factors.

Other Food Components. Past research has also found that children's intake of dietary fiber is lower than recommended intake levels (Levine and Guthrie 1997; and Lin and Guthrie 1996) and their intake of sodium too high. Estimates of sodium intake vary widely, but typical mean intake levels substantially exceed the recommended maximum of 2,400 milligrams (mg). For example, Kennedy and Goldberg (1995) found that mean sodium intake levels among various groups of children ages 6 to 18 range from 2,614 to 3,853 mg--and this excludes salt added at the table. In addition, teenage males tend to have substantially greater intakes of sodium than teenage females

(Devaney et al. 1995; Johnson et al. 1994; and Kennedy and Goldberg 1995). Johnson et al. (1994) found mean sodium intakes of 2,836 mg among females and 3,865 mg among males ages 11 to 18, and Devaney et al. (1995) found mean intake of 4,653 mg among all children in elementary and secondary school. By contrast, most studies have found that mean cholesterol intake does not exceed the recommended maximum level of 300 mg, except among teenage boys (Devaney et al. 1995; Johnson et al. 1994; Levine and Guthrie 1997; and Lin and Guthrie 1996). Sodium and cholesterol intake do not vary greatly by family income.

b. Food Intake

Children typically make their dietary choices based on their preferences for foods rather than their preferences for nutrients, so it is useful to examine the literature on children's food intake. Most studies of this type have focused on intakes of specific food groups, although some studies have examined which individual foods children consume, and still others have focused on children's decisions to eat or skip entire meals.

Past research clearly shows that children, on average, do not have food consumption patterns that are consistent with recommendations given by the USDA Food Guide Pyramid (U.S. Department of Agriculture 1992). According to Muñoz et al. (1997 and 1998), the percentages of children consuming the recommended number of servings are only 28 percent for fruit, 31 percent for meat and meat substitutes, 36 percent for grain products, 38 percent for vegetables, and 54 percent for milk and milk products (hereafter, milk products). Among all children, this study found that only 2 percent meet all five of these pyramid servings recommendations, 10 percent meet at least four of the five recommendations, and 40 percent meet either none or one of the recommendations. Levine and Guthrie (1997) examined children's *mean* food group intakes and also found that these intakes are low relative to the pyramid servings recommendations. Krebs-Smith et al. (1996) found that only one in five children ages 2 to 18 consumes at least five servings of fruit or vegetables per day. This study also found that the vegetables children eat are often not rich in micronutrients; for example, nearly one-fourth of all vegetables consumed were french fries.[7]

Teenage girls have particularly low intake levels of some food groups, just as they have low overall nutrient intake levels. Muñoz et al. (1997 and 1998) found that, while 54 percent of all children meet the pyramid servings recommendation for dairy products, only 22 percent of females ages 12 to 19 meet this requirement. Lin and Guthrie (1996) found that, over the three-day dietary intake period of the 1989-1991 CSFII, 30 percent of teenage girls had no fruit or fruit juice, and 18 percent had no milk. The vegetables these girls ate were not likely to be nutrient dense--only 15 percent ate dark-green leafy vegetables and 17 percent ate deep-yellow vegetables.

Studies also show that food group intake varies somewhat by income and race/ethnicity. Relative to low-income children, higher-income children tend to consume more fruit and dairy products (Muñoz et al. 1997 and 1998). White children tend to consume more dairy products but fewer foods from the meat and meat substitutes group than black or Hispanic children (Levine and Guthrie 1997; and Muñoz et al. 1997 and 1998). In particular, white children consume fewer servings of chicken and fish, although they consume a greater number of servings of red meat.

Another way of examining children's dietary patterns is to look at the frequency with which they miss entire meals. A number of studies have examined how commonly children skip breakfast, and the results of these studies differ depending upon how breakfast is defined. Devaney and Stuart (1998) used several different definitions to examine breakfast skipping and found that about 12 percent of children in elementary and secondary school consume 0 calories of food energy for breakfast, 13 percent consume under 50 calories, and 31 percent have breakfast food energy intake

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[7]One major finding of studies looking beyond the consumption of the five major food groups is that children's consumption of soft drinks is high. Evans and Cronin (1986) found that as of the late 1970s, 64 to 78 percent of children consumed at least one soft drink on each of three consecutive days. Morton and Guthrie (1998) also found high soft drink consumption using more recent data.

that is less than 10 percent of the daily REA. Other studies have found breakfast skipping to be in the same general range of these estimates. Evans and Cronin (1986) found that 30 percent of children skip breakfast on at least one of three consecutive days. Lin and Guthrie (1996) found that from 5 to 24 percent skip breakfast, depending on the age of the child. Both Devaney and Stuart (1998) and Lin and Guthrie (1996) found that children become much more likely to skip breakfast as they get older.

c. Limitations of Research on Children's Diets

The research on children's diets has resulted in generally consistent findings and conclusions on children's food and nutrient intake.[8] This consistency makes the results convincing, since the studies use a variety of data sets covering different time periods and have used somewhat different methodologies. Overall, there are two main limitations with respect to using the results of previous research to assess children's current dietary status. First, most of the studies cited above are based on data from the early 1990s and before, so they may not represent the current situation accurately. Second, none of the studies provides estimates of the proportion of children whose usual dietary intake is inadequate in some respect. We describe each of these limitations below.

Among the studies cited above, only two use data more recent than from 1991 to 1992. Kennedy and Powell (1997) use data from the 1994 CSFII, and Morton and Guthrie (1998) use data from the 1994-1995 CSFII. While studies of children's dietary intake in the early 1990s and before will be suggestive of children's current dietary intake, changes may have occurred since then. In fact, both Kennedy and Powell (1997) and Morton and Guthrie (1998) provide evidence that children's diets have changed over this period. These changes may have followed general dietary

[8] An exception to the consistency of these findings involves the estimates of children's food energy intake.

trends in the full population or may have resulted from external changes influencing children only, such as changes in the NSLP or SBP.

The studies cited above describe children's diets primarily in terms of their mean intake of food or nutrients. This type of analysis, while useful for descriptive purposes, does not reveal the extent of underconsumption or overconsumption of particular nutrients by children. Even if mean intakes equal or exceed the RDA, substantial proportions of children may have diets that do not meet their nutrient requirements. If the analysis is limited to children's mean or median intakes, it is not possible to assess the proportion of children whose usual dietary intake is adequate versus inadequate.

Several studies have attempted to address this issue by presenting the proportion of children whose observed intake meets a particular dietary standard. For example, these studies have examined the proportions that meet dietary standards such as fat intake that does not exceed a recommended maximum, that meet the "age plus 5" standard for fiber intake, or that have micronutrient intake in excess of the RDA (or some percentage of the RDA).[9] As discussed in Chapter II, however, using the RDA or a percentage of the RDA to assess adequacy of intake is not recommended. Importantly, previous studies have presented biased estimates of the proportion whose usual intake meets a standard, because they have not accounted for day-to-day variation in food intake. Statistical methods now exist for estimating the distribution of usual intake based on the distribution of observed intake, but none of the studies cited above used these methods.

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[9]The "age plus 5" standard for fiber intake was originally proposed by Williams (1995) and Williams et al. (1995). Since then, the American Heart Association has adopted this standard (Van Horn 1997) and it has been used in a number of research studies (for example, Hampl et al. 1998; Nicklas et al. 2000).

2. Research on the School Meal Programs

Research on children's involvement in the NSLP and SBP has focused on participation in these programs (that is, eating a school lunch or breakfast) and on the effects of participation on dietary intake. Since the SBP is less widely available in schools than the NSLP, research on the SBP has also addressed the issue of whether the availability of this program makes students less likely to skip breakfast.

a. The National School Lunch Program

The NSLP serves school lunches to approximately 26 million students each school day. The size of this program has been relatively constant since the mid-1970s, ranging from 23 to 27 million students between 1977 and 1996 (Rossi 1998). As of 1996, the 26 million daily participants included 12.6 million who received free meals and 2.6 million who received reduced-price meals. FNS administrative data show a current NSLP participation rate of 57 to 59 percent among students attending school on a given day. This estimated participation rate is broadly consistent with that from the SNDA-1 study, which showed a participation rate among attending students of about 55 percent (Gleason 1995).

A number of studies have shown that elementary students are more likely than high school students to participate in the NSLP, that males are more likely than females to participate, and that an increase in the price students pay for lunch has a negative effect on participation (Akin et al. 1983; Barnes 1988; Gleason 1995 and 1996; and Maurer 1984). Studies have also found that attitudinal factors are related to participation. Marples and Spillman (1995) found participation to be positively related to students' perceptions of the quality and variety of food offered for lunch. Robinson (1978) and Wellisch et al. (1983) found that students are more likely to participate when their parents have positive attitudes about the cost, convenience, and nutritional quality of school lunches.

Students are also more likely to participate in the NSLP when they have fewer options for lunch. For example, Maurer (1984) and Barnes (1988) found students to be more likely to participate when they do not have the option of going home for lunch. Older students also sometimes leave school at lunch to eat at fast-food restaurants. Gleason (1996) found that students attending schools with a "closed campus" policy (where they cannot leave the school grounds during the lunch period) were more likely to participate than students in "open campus" schools (where some leave to eat lunch elsewhere). The same study also found that students are less likely to eat a school lunch when vending machines are available in school.

Team Nutrition, designed to assist schools in implementing the USDA's School Meals Initiative for Healthy Children, is working to empower schools to serve meals that meet the Dietary Guidelines.[10] As schools attempt to improve the nutritional quality of their meals, a key question is whether students will consider school lunches less attractive and be less likely to participate as a result. Few studies have addressed this question, and the available research on the issue is mixed. Gleason (1995) found that students are significantly less likely to participate when their school serves lunches that have less than 32 percent of food energy from fat as opposed to lunches that have higher levels of fat. Osganian (1996) found that, when schools decreased the fat content of their school lunches from 38.7 to 31.9 percent as part of the Child and Adolescent Trial for Cardiovascular Health (CATCH), there was no significant decline in NSLP participation.[11]

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[10]Team Nutrition provides training and technical assistance for school food service by providing multifaceted, integrated nutrition education for children and their parents. It also involves school administrators and other school and community partners to support healthy eating and physical activity among children.

[11]The results of these two studies are not necessarily in conflict. Gleason (1995) found no significant difference in NSLP participation at schools offering lunches with 32 to 35 percent of food energy from fat versus those at schools offering higher-fat lunches.

Much previous research on the NSLP focuses on whether program participation influences students' dietary intake. Most of this research has found that participation is positively related to the lunch intake of selected vitamins and minerals. Program participation has also been found to be positively related to 24-hour intakes of these vitamins and minerals, but these effects tend to be smaller and are less likely to be statistically significant. Finally, recent research has suggested that participants have significantly higher intake of dietary fat than do nonparticipants.

Howe and Vaden (1980) studied a small group of high school sophomores and juniors in a midwestern city in 1978, and found that NSLP participants had significantly higher lunch intakes of protein, vitamin A, vitamin C, thiamin, riboflavin, calcium, and iron than did nonparticipants. Over 24 hours, only the relationship between participation and riboflavin remained statistically significant. Akin et al. (1983) used nationally representative data covering approximately the same time period (the 1977-1978 Nationwide Food Consumption Survey) to show that NSLP participation is positively and significantly related to the 24-hour intakes of food energy, vitamin A, vitamin C, vitamin B_6, and iron. The study found these relationships to be especially strong among low-income children.

Wellisch et al. (1983) estimated the effect of NSLP participation on dietary intake among students in a nationally representative sample of public schools in the United States in 1980 to 1981. They found participation to positively affect students' 24-hour intake of protein, vitamin A, vitamin B_6, riboflavin, niacin, calcium, phosphorus, and magnesium. The estimated effects of participation on lunch intake were found to be significant for an even broader range of nutrients. Fraker (1987) analyzed the same data to estimate the relationship between NSLP participation and sodium and macronutrient intake. This study found participation to be positively related to the lunch intake of energy and protein and negatively related to the lunch intake of fat and sodium. However, few of these effects were found to be statistically significant. Furthermore, the relationships between NSLP participation and students' intake of sodium and macronutrients over 24 hours were found to be weaker and even less likely to be statistically significant.

The most recent major study of the dietary effects of NSLP participation was the SNDA-1 study, which covered the 1991-1992 school year (Devaney et al. 1993; and Gordon et al. 1995). This study controlled for both observable characteristics and unobservable characteristics (through selection bias models) in measuring the relationship between participation and intake. Before unobserved characteristics were taken into account, NSLP participation was found to be positively related to the lunch intake of food energy and a broad range of vitamins and minerals and negatively related to vitamin C intake. In the selection bias models, NSLP participation was estimated to positively affect the lunch intake of vitamin A, vitamin B_{12}, niacin, riboflavin, calcium, phosphorus, magnesium, and zinc, and to negatively affect the lunch intake of vitamin C.[12] Few of these effects persisted over 24 hours. In the selection bias models, the study found that NSLP participation positively affects the 24-hour intake of vitamin A and negatively affects the 24-hour intake of vitamin C. All other effects on 24-hour food energy and vitamin and mineral intake were estimated to be statistically insignificant.

A striking finding that came out of the SNDA-1 study was that NSLP participation has a positive and significant effect on students' fat and saturated fat intake, and a negative and significant effect on their carbohydrate intake. Over 24 hours, the study estimated that NSLP participation leads to a three percentage point increase in fat intake as a percentage of food energy, a one percentage point increase in saturated fat intake, and a five percentage point decrease in carbohydrate intake.

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[12]However, this study also found that the mean intake of vitamin C among NSLP participants was well above the RDA (in particular, it was equal to 274 percent of the RDA compared with 134 percent of the RDA for vitamin A). Thus, the negative effect of intake was unlikely to have led to a positive effect on the percentage of children with inadequate intake.

The foods consumed by participants and nonparticipants help explain their differences in fat and carbohydrate intake. Gordon and McKinney (1995) found that participants are much more likely to consume milk at lunch, while nonparticipants are more likely to drink soft drinks or fruit juices. In addition, participants are more likely than nonparticipants to consume foods from the meat group at lunch.

b. The School Breakfast Program

Participation in the SBP has grown dramatically in recent years, from an average daily number of participants of 2.5 million in 1977 to 6.6 million in 1996 and 7.3 million in 1999. This increase in participation has primarily been the result of SBP breakfasts being offered in more schools rather than as a result of an increasing SBP participation rate among students in SBP schools. Recent use by some schools of Provisions 2 and 3 of the SBP regulations, which permit the service of free meals to all students, may also have contributed to increases in school breakfast participation. By 1997, 70 percent of schools offered the SBP to their students. As of 1991 to 1992, when fewer than half of all schools offered the SBP, participating schools were likely to be public, in urban or rural areas, and to serve a heavily disadvantaged population (Wemmerus et al. 1996). Among students in participating schools during 1994 to 1996, FNS administrative data suggest a participation rate of about 20 percent, roughly the same as that found in the SNDA-1 sample (Gleason 1995).

A key research issue involving the SBP has been whether the availability of the SBP in a school makes students more likely to eat breakfast. This question has been motivated by the presumption that breakfast eating will improve students' cognitive abilities and school performance.[13] In addition,

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[13]Empirical evidence on the effect of breakfast eating on school performance is mixed. Dickie and Bender (1982) reached this conclusion in their review of the early literature in this area. Pollitt and Matthews (1998) conclude that "no definitive conclusions can be drawn from the existing data on either the long- or short-term benefits of breakfast on cognition or school learning." The pooled (continued...)

the question is relevant given evidence on the positive effect of breakfast eating on 24-hour dietary intake (Devaney and Fraker 1989; Morgan et al. 1986; and Nicklas et al. 1998).

Early evidence suggested that the availability of the SBP did not affect whether students eat breakfast (Devaney and Fraker 1989; and Gleason 1995).[14] To define breakfast eating, however, these studies used either students' self-reports of breakfast eating or a relatively small amount of food energy (50 calories). Devaney and Stuart (1998) replicated these earlier findings. However, by defining breakfast as consisting of a minimum of 10 percent of the REA, they also found that the availability of the SBP has a positive effect on breakfast eating among low-income children. In particular, the availability of the SBP increases the proportion of low-income students who eat breakfast from 63 to 74 percent. The effects are largest among elementary students.

Early research on the effects of SBP participation on students' dietary intake found mixed effects of the program. For example, Wellisch et al. (1983) found SBP participation to be associated with higher breakfast intakes of calcium, phosphorus, and magnesium, and lower breakfast intakes of vitamin A, vitamin B_6, niacin, thiamin, and iron. Over 24 hours, most of these relationships disappeared, except for positive effects on calcium and phosphorus intake.

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[13](...continued)
data suggest that omitting breakfast interferes with cognition and learning, an effect that is more pronounced in nutritionally at-risk children than in well-nourished children. At the very least, breakfast consumption improves school attendance and enhances the quality of the students' diets. Meyers et al. (1989) examined the effect of eating an SBP breakfast on school performance and found that SBP participation leads to higher test scores and lower levels of absenteeism and tardiness. Murphy et al. (1998) did not examine test scores, but found that participation in a universal-free school breakfast program is positively and significantly related to students' math grades and rates of attendance.

[14]An exception to this is Nicklas et al. (1993), who found that after the SBP was introduced in Bogalusa, Louisiana, the percentage of 10-year-old students who skipped breakfast (had no calories) declined.

Using the same data on students in public schools during the 1980-1981 school year, Devaney and Fraker (1989) estimated the effects of SBP participation on the intake of selected nutrients after controlling for observable characteristics and unobservable characteristics (or selection bias). They found SBP participation to have little effect on food energy intake (except for a positive effect on food energy intake at breakfast among 5- to 10-year-olds), positive effects on breakfast intake of calcium and magnesium and 24-hour intake of calcium, and negative effects on the intake of vitamin A, iron, and cholesterol at breakfast and over 24 hours. Devaney et al. (1987) found that SBP participants were more likely than nonparticipants to drink milk, which they linked with the estimated positive effect on calcium. They also found that participants consumed fewer eggs and less ready-to-eat cereal, which, they argued, caused the negative effects of the program on the intake of selected vitamins and minerals and caused participants to consume less cholesterol at breakfast than nonparticipants.

Between the 1980-1981 school year and the 1991-1992 school year, when data from the SNDA-1 study were collected, the SBP not only grew but also changed in terms of its effect on students' food consumption. Using SNDA-1 data, Gordon and McKinney (1995) found no difference in SBP participants' and nonparticipants' intake of eggs or ready-to-eat cereals. However, they found that participants consumed more milk, cheese, meat, grains, and fruit juice than nonparticipants.[15]

Devaney et al. (1993) and Gordon et al. (1995) found that these differences in food intake contributed to positive and significant effects of SBP participation on students' breakfast intakes of food energy, protein, thiamin, riboflavin, calcium, phosphorus, and magnesium and on students' 24-

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[15]One reason for this change in the effect of the SBP on children's diets may be that the requirements for a breakfast to qualify for SBP reimbursement changed during this period. Prior to 1989, students only had to select three food items--milk, a vegetable or fruit, and meat or grain products--for their meal to be considered an SBP breakfast. In 1989, a second meat or grain product was added to the SBP requirements.

hour intakes of these same nutrients except for riboflavin. These studies found no significant effect of SBP participation on students' intake of fat, saturated fat, sodium, or cholesterol.

c. Limitations of Research on School Meal Programs

As with the research on children's diets generally, the research on the school meal programs is based primarily on data collected before recent changes in these programs were implemented. The most recent studies are based on SNDA-1 data, which cover the 1991-1992 school year. Since then, the school meal programs have come under increasing pressure to improve nutritional quality, in particular, to reduce the fat and sodium content. Furthermore, the SBP has continued to expand during the 1990s. Given the extent of the changes in estimated dietary effects of the SBP between 1980 to 1981 and 1991 to 1992, further investigation is warranted using more recent data.

All prior studies have confronted the problem that participants and nonparticipants may differ in ways that are related to dietary intake; that is, differences in intake between participants and nonparticipants may be due to differences in their characteristics rather than to the effects of program participation. Most studies address this issue by controlling for observable characteristics. However, unobserved differences between participants and nonparticipants may remain even after observable characteristics have been controlled; that is, there may be selection bias. Given a set of assumptions, econometric techniques exist for controlling for selection bias, and these techniques have been used by several studies (Devaney and Fraker 1989; Devaney et al. 1993; and Gordon et al. 1995). The drawback of selection bias models is that they often lack robustness; that is, relatively minor changes in the specification of the models lead to changes in the models' results.

II. DATA AND METHODOLOGY

The analysis presented in this report is based on the 1994-1996 panels of the CSFII. For a sample of 6- to 18-year-old children drawn from the CSFII, this report presents mean food and nutrient intake levels, with mean nutrient intake measured relative to age- and gender-specific RDAs. These mean intake levels reflect the average characteristics of the diets of school-aged children. To assess the degree to which children may be overconsuming or underconsuming particular nutrients, the report also presents the proportion of children whose usual intake meets a variety of established dietary standards.

In addition to examining children ages 6 to 18 as a group, the report focuses on particular subgroups, the most important being participants and nonparticipants in the school meal programs, the NSLP and the SBP. For participants and nonparticipants, we examine mean intakes and the proportion meeting various dietary standards after controlling, using regression analysis, for other key characteristics. Besides participants and nonparticipants, additional subgroups include age/gender, race/ethnicity, household income, and food sufficiency status.

Section A of this chapter describes the CSFII data set and the sample of school-aged children used in the analysis. Section B outlines some key methodological issues that arose in conducting the analysis.

A. CSFII

The 1994-1996 CSFII, conducted by the Agricultural Research Service of the USDA, is based on three independently drawn, nationally representative samples of the noninstitutionalized population of the United States. The three samples each cover one year of the 1994-1996 period. The three separate one-year samples were then combined to provide data for the three-year period.

The samples were drawn using stratified, clustered, multistage techniques (low-income individuals were oversampled). Throughout this report, sample weights are used to adjust for nonresponse and the oversampling of low-income children.

The CSFII collected information on the dietary intake of all sample members on two nonconsecutive days during the survey year, using 24-hour dietary recalls collected during in-person interviews. Data on the second day of dietary intake for an individual usually were collected 3 to 10 days after the first day and on a different day of the week. The dietary intake data in the CSFII include information on children's intake of individual foods (and foods belonging to each of the Food Guide Pyramid food groups) and intake of food energy, key nutrients, and other dietary components. Because the data also include the time of day that each food was consumed, it is possible to measure food and nutrient intake over both a 24-hour period and for specific meals during the day. The CSFII also contains information on where each food was obtained, which makes it possible to determine the proportion of students' intakes provided from school sources.

Another key piece of information in the CSFII, for purposes of this study, is students' participation in the school meal programs. For each sample member, the CSFII provides information on the number of days per week or month the student usually participates in the SBP and NSLP. However, since this information does not relate directly to the days on which intake data are collected, we have also used information on the foods consumed from the school cafeteria to define SBP and NSLP participation status on the two CSFII intake days for each school-aged child.[1] Finally, the CSFII contains a variety of demographic, socioeconomic, and other information useful for defining subgroups of sample members and for using as control variables in the regression analysis.

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[1]Details on the construction of this variable are provided in Section B.4.

The 1994-1996 CSFII collected dietary intake data with special attention to the accuracy of the information collected. In particular, interviewers made special efforts to reduce the amount of underreporting of foods consumed, including multiple passes through the day's listing of foods consumed to probe respondents for any foods they may have forgotten on previous pass-throughs. Interviewers also probed respondents extensively to determine the exact types and amounts of foods consumed. However, it is unlikely that these steps completely eliminated underreporting in the CSFII.

A key feature of the 1994-1996 CSFII is that response rates are relatively high: 80 percent for the first day of CSFII dietary intake data and 76 percent for two days. Earlier CSFII surveys had much lower response rates. For example, the 1989-1991 CSFII had response rates of 58 percent for the first day of dietary intake data and 45 percent for all three days.

The analysis in this report is based on the 2,692 children ages 6 to 18 who completed two days of dietary intake interviews.[2] For the broad analysis of school-aged children's food and nutrient intake, we used all children in this age group and included all intake days. For the analysis of the dietary intake of participants and nonparticipants in either the NSLP or the SBP, or both, the sample is limited to students attending schools that offer each program and to intake days that were school days (as opposed to weekend days, holidays, or days during the summer when the child could not have participated in the NSLP or SBP).

The characteristics of school-aged children based on the CSFII sample are summarized in Tables II.1 and II.2. These tables present data on age/gender, race/ethnicity, household income, certification

[2]Although children age five and younger may attend school or preschool, they are less likely to have access to the school meal programs. Furthermore, dietary intake information in the CSFII was routinely collected from children under age 6 via proxy, while information from children ages 6 and older was collected from the children directly (with the assistance of an adult household member for children ages 6 through 11).

TABLE II.1

CHARACTERISTICS OF SCHOOL-AGED CHILDREN, BY AGE/GENDER, 1994 TO 1996
(Percentages)

Characteristic		Males, 6 to 8	Females, 6 to 8	Males, 9 to 13	Females, 9 to 13	Males, 14 to 18	Females, 14 to 18
Race/Ethnicity							
Hispanic		13	13	14	14	11	13
Non-Hispanic, black		14	15	14	18	14	18
Non-Hispanic, white		68	67	67	64	71	65
Other		5	5	5	5	5	3
Income/Certification Status	**						
Income <= 130% of poverty							
Certified		22	28	19	23	18	13
Not certified		3	3	3	3	8	9
Income 131 to 185% of poverty							
Certified		8	4	10	7	4	5
Not certified		7	8	7	9	6	8
Income 185 to 299% of poverty							
Certified		3	3	5	2	2	2
Not certified		20	17	18	17	18	18
Income >= 300% of poverty							
Certified		1	1	1	3	0	1
Not certified		35	36	37	37	45	44
Region	**						
Northeast		17	24	20	20	18	16
Midwest		29	22	22	23	27	26
South		32	28	36	35	33	38
West		23	26	22	22	22	21
Urbanicity	**						
Urban		32	31	26	29	29	30
Suburban		53	48	52	49	50	44
Rural		16	20	22	22	21	26
Intake day							
School day		54	56	52	53	49	49
Weekend day		23	23	26	26	26	28
Summer day		23	21	22	21	24	23
Food Sufficiency							
Food sufficient		97	96	98	97	97	97
Food insufficient		3	4	2	3	3	3
Sample Size		**357**	**336**	**552**	**560**	**446**	**441**
Weighted Sample Size (Thousands)		**5,804**	**5,558**	**9,858**	**9,778**	**9,717**	**8,982**

SOURCE: Weighted tabulations based on one or two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: Sample includes only students attending schools that offer school breakfasts (for the SBP groups) and lunches (for the NSLP groups) on intake days during the school year. Students who had two intake days that were not school days were excluded.

*Significantly different from zero at the .05 level, two-tailed test.
**Significantly different from zero at the .01 level, two-tailed test.

TABLE II.2

CHARACTERISTICS OF SCHOOL-AGED CHILDREN, BY RACE/ETHNICITY, 1994 TO 1996
(Percentages)

Characteristic		White	Black	Hispanic	Other
Gender/Age					
Male, 6 to 8		12	11	12	12
Female, 6 to 8		11	11	11	11
Male, 9 to 13		20	17	22	23
Female, 9 to 13		19	22	21	20
Male, 14 to 18		21	17	16	21
Female, 14 to 18		18	21	18	13
Income/Certification Status	**				
Income <= 130% of poverty					
Certified		8	39	49	37
Not certified		4	8	6	2
Income 131 to 185% of poverty					
Certified		5	13	10	1
Not certified		8	6	4	7
Income 185 to 299% of poverty					
Certified		2	6	3	3
Not certified		22	8	8	17
Income >= 300% of poverty					
Certified		1	3	2	1
Not certified		50	16	17	33
Region	**				
Northeast		19	18	18	17
Midwest		30	18	5	18
South		33	56	22	14
West		18	7	55	51
Urbanicity	**				
Urban		19	62	35	47
Suburban		57	25	42	38
Rural		24	13	23	15
Intake day					
School day		52	52	52	52
Weekend day		26	25	26	26
Summer day		23	23	22	21
Food Sufficiency					
Food sufficient		98	98	90	97
Food insufficient		2	2	10	3
Sample Size		**1,735**	**411**	**430**	**116**
Weighted Sample Size (Thousands)		**34,190**	**7,705**	**6,481**	**2,321**

SOURCE: Weighted tabulations based on one or two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: Sample includes only students attending schools that offer school breakfasts (for the SBP groups) and lunches (for the NSLP groups) on intake days during the school year. Students who had two intake days that were not school days were excluded.

*Significantly different from zero at the .05 level, two-tailed test.
**Significantly different from zero at the .01 level, two-tailed test.

status, food sufficiency status, region of residence, urbanicity, and type of day (school, weekend, summer).[3] Table II.1 reveals no significant differences in the racial/ethnic distribution among the age/gender groups. Overall, close to two-thirds of the sample is white (non-Hispanic), 14 percent is Hispanic, 16 percent is black (non-Hispanic), and the remaining 4 percent is from "other" racial/ethnic groups.[4] There are significant differences by age/gender in household income and certification status, region of residence, and urbanicity. About 40 percent of children have incomes that make them eligible for free or reduced-price school meals, and this proportion of poor children is slightly lower among children ages 14 to 18 than among younger children. The South is more heavily represented than other regions, especially for females ages 14 to 18, and close to half the children live in suburban areas.

The characteristics of the children in our sample differ somewhat by race/ethnicity, with much lower incomes for the nonwhite groups, very high proportions of blacks in the South and Hispanics and "others" in the West, and very high proportions of blacks and "others" residing in urban areas (Table II.2). The estimated levels of food insufficiency do not differ significantly across the racial/ethnic subgroups, but this is probably because of the small size of the group classified as food insufficient. Notably, 10 percent of Hispanic children are classified as food insufficient, compared with 2 to 3 percent for the other groups.

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[3]Children's food sufficiency status is based on a household-level question from the CSFII. The question asks the household which of the following statements best describes the food eaten in their household during the last three months: "enough of the kinds of foods we want to eat," "enough but not always the kinds of foods we want to eat," "sometimes not enough to eat," or "often not enough to eat." Households giving either of the "not enough" responses are considered to be food insufficient.

[4]The category "others" includes Asians, Pacific Islanders, American Indians, Alaskan natives, and other racial/ethnic groups (perhaps including people who classify themselves as of mixed racial background).

B. METHODOLOGICAL ISSUES

Characterizing and assessing children's dietary intake with two days of CSFII intake data involved a variety of methodological issues. Seven such issues were (1) defining appropriate dietary reference standards to use for descriptive purposes and to assess children's dietary intake, (2) estimating the distribution of children's usual dietary intake using only two days of intake information, (3) understanding the CSFII methodology for defining the number of servings of each of the food groups that sample members consumed, (4) measuring students' NSLP and SBP participation status on the days on which their dietary intakes were measured, (5) defining which foods children consume for breakfast and which they consume for lunch, (6) defining which intake days during the year were school days, and (7) determining statistical significance. In addition, we had to determine the most appropriate way for comparing the dietary intake of NSLP/SBP participants and nonparticipants while controlling for other differences in the characteristics of participants and nonparticipants that might independently affect their dietary intake. In this section, we discuss our approach for addressing each of these methodological issues.

1. Defining Reference Standards for Dietary Intake

To describe and assess the intake of nutrients and other dietary components by school-aged children, we use four sources: (1) Dietary Reference Intake (DRI) standards (Institute of Medicine 1997 and 1998), (2) 1989 RDAs for nutrients for which DRIs have not yet been developed (National Research Council 1989a), (3) 1995 *Dietary Guidelines for Americans,* and (4) recommendations presented in *Diet and Health* by the National Research Council (1989b). The use of DRIs merits special attention, since this is a new group of reference standards, few investigators have used DRIs in dietary studies, and guidelines for their use are currently under development.

The DRIs consist of several measures: the Estimated Average Requirement (EAR), the RDA, the Adequate Intake (AI), and the Tolerable Upper Intake Level (UL).[5] The EAR is the intake that meets the estimated nutrient needs of 50 percent of people in a given group and is used to assess the adequacy of population intakes (Institute of Medicine 1997 and 1998). The RDA is based directly on the EAR; it is set at a level estimated to be two standard deviations above the EAR.[6] The AI is the average observed intake or an experimentally derived intake by a defined subgroup that appears to sustain a defined nutritional state, such as normal circulating nutrient values, growth, or other functional indicators of health (Institute of Medicine 1997). The AI is set when the state of knowledge is such that the EAR cannot be determined. The RDA and AI are both recommended intake values for individuals. DRIs have been set for nine of the nutrients covered in this report--calcium, phosphorus, magnesium, and the B vitamins thiamin, riboflavin, niacin, vitamin B_6, folate, and vitamin B_{12}. For only one of these (calcium), an AI rather than an EAR and RDA was set.

To facilitate comparison with other studies, Table II.3 presents up to four dietary standards in recent use. The values in bold are the most recent recommended intake values (RDAs or AIs) for all the vitamins and minerals we examine.[7] This serves, in part, to normalize intakes by age and gender. For food energy, we present intake as a percentage of the 1989 REA. The tables that present intakes as a percentage of recommended intake values are intended for descriptive purposes only, not as an assessment of adequacy of intake.

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[5]We do not examine the ULs in this report.

[6]If the standard deviation of the EAR is not known, it is estimated to be a certain proportion of the EAR, typically 10 percent. Another way of saying this is that the coefficient of variation is assumed to be 0.10.

[7]Among the nutrients we examined, DRIs were only available for calcium (AI only), magnesium, phosphorus, and the B vitamins at the time the analysis was conducted. For the remaining nutrients, 1989 RDAs were used.

TABLE II.3

1989 RECOMMENDED DIETARY ALLOWANCES AND DIETARY REFERENCE INTAKE-BASED DIETARY STANDARDS, BY AGE/GENDER

Nutrient	Children, 4 to 6	Children, 4 to 8	Children, 7 to 10	Males, 11 to 14[a] (9 to 13)	Females, 11 to 14[a] (9 to 13)	Males, 15 to 18[a] (14 to 18)	Females, 15 to 18[a] (14 to 18)
Food Energy (kcal)							
1989 REA	**1,800**	n.a.	**2,000**	**2,500**	**2,200**	**3,000**	**2,200**
80% of 1989 REA	1,440	n.a.	1,600	2,000	1,760	2,400	1,760
Vitamin A (mcg RE)							
1989 RDA	**500**	**n.a.**	**700**	**1,000**	**800**	**1,000**	**800**
80% of 1989 RDA	400	n.a.	560	800	640	800	640
Vitamin C (mg)							
1989 RDA	**45**	n.a.	**45**	**50**	**50**	**60**	**60**
80% of 1989 RDA	36	n.a.	36	40	40	48	48
Vitamin E (mg á-TE)							
1989 RDA	**7**	n.a.	**7**	**10**	**8**	**10**	**8**
80% of 1989 RDA	5.6	n.a.	5.6	8	6.4	8	6.4
Vitamin B_6 (mg)							
1989 RDA	1.1	n.a.	1.4	1.7	1.4	2.0	1.5
1998 RDA	n.a.	**0.6**	n.a.	**1.0**	**1.0**	**1.3**	**1.2**
80% of 1989 RDA	0.88	n.a.	1.12	1.36	1.12	1.60	1.20
1998 EAR	n.a.	0.5	n.a.	0.8	0.8	1.1	1.0
Vitamin B_{12} (mcg)							
1989 RDA	1.0	n.a.	1.4	2.0	2.0	2.0	2.0
1998 RDA	n.a.	**1.2**	n.a.	**1.8**	**1.8**	**2.4**	**2.4**
80% of 1989 RDA	0.8	n.a.	1.12	1.6	1.6	1.6	1.6
1998 EAR	n.a.	1.0	n.a.	1.5	1.5	2.0	2.0

Table II.3 *(continued)*

Nutrient	Children, 4 to 6	Children, 4 to 8	Children, 7 to 10	Males, 11 to 14[a] (9 to 13)	Females, 11 to 14[a] (9 to 13)	Males, 15 to 18[a] (14 to 18)	Females, 15 to 18[a] (14 to 18)
Niacin (mg NE)							
1989 RDA	12	n.a.	13	17	15	20	15
1998 RDA	n.a.	**8**	n.a.	**12**	**12**	**16**	**14**
80% of 1989 RDA	9.6	n.a.	10.4	13.6	12	16	12
1998 EAR	n.a.	6	n.a.	9	9	12	11
Thiamin (mg)							
1989 RDA	0.9	n.a.	1.0	1.3	1.1	1.5	1.1
1998 RDA	n.a.	**0.6**	n.a.	**0.9**	**0.9**	**1.2**	**1.0**
80% of 1989 RDA	0.72	n.a.	0.8	10.4	0.88	1.2	0.88
1998 EAR	n.a.	0.5	n.a.	0.7	0.7	1.0	0.9
Riboflavin (mg)							
1989 RDA	1.1	n.a.	1.2	1.5	1.3	1.8	1.3
1998 RDA	n.a.	**0.6**	n.a.	**0.9**	**0.9**	1.3	**1.0**
80% of 1989 RDA	0.88	n.a.	0.96	1.2	1.04	1.44	1.04
1998 EAR	n.a.	0.5	n.a.	0.8	0.8	1.2	0.9
Folate							
1989 RDA (mcg)	75	n.a.	100	150	150	200	180
1998 RDA (mcg DFE)[b]	n.a.	**200**	n.a.	**300**	**300**	**400**	**400**
80% of 1989 RDA (mcg)	60	n.a.	80	120	120	160	144
1998 EAR (mcg DFE)	n.a.	160	n.a.	250	250	330	330
Calcium (mg)							
1989 RDA	800	n.a.	800	1,200	1,200	1,200	1,200
1997 AI	n.a.	**800**	n.a.	**1,300**	**1,300**	**1,300**	**1,300**
80% of 1989 RDA	640	n.a.	640	960	960	960	960
80% of 1997 AI	n.a.	640	n.a.	1,040	1,040	1,040	1,040

Table II.3 *(continued)*

Nutrient	Children, 4 to 6	Children, 4 to 8	Children, 7 to 10	Males, 11 to 14[a] (9 to 13)	Females, 11 to 14[a] (9 to 13)	Males, 15 to 18[a] (14 to 18)	Females, 15 to 18[a] (14 to 18)
Iron (mg)							
1989 RDA	**10**	n.a.	**10**	**12**	**15**	**12**	**15**
80% of 1989 RDA	8	n.a.	8	9.6	12	9.6	12
Magnesium (mg)							
1989 RDA	120	n.a.	170	270	280	400	300
1997 RDA	n.a.	**130**	n.a.	**240**	**240**	**410**	**360**
80% of 1989 RDA	96	n.a.	136	216	224	320	240
1997 EAR	n.a.	110	n.a.	200	200	340	300
Phosphorus (mg)							
1989 RDA	800	n.a.	800	1,200	1,200	1,200	1,200
1997 RDA	n.a.	**500**	n.a.	**1,250**	**1,250**	**1,250**	**1,250**
80% of 1989 RDA	640	n.a.	640	960	960	960	960
1997 EAR	n.a.	405	n.a.	1,055	1,055	1,055	1,055
Zinc (mg)							
1989 RDA	**10**	n.a.	**10**	**15**	**12**	**15**	**12**
80% of 1989 RDA	8	n.a.	8	12	9.6	12	9.6

SOURCE: Institute of Medicine (1997, 1998); and National Research Council (1989a).

NOTE: The values in bold are the most recent recommended intake values. The values that are underlined are the values used to assess adequacy of intake.

[a] Age range for 1989 RDAs. Age range for DRI-based values is given in parentheses.

[b] The reported intake of niacin as a percentage of the RDA is an underestimate because intake is reported in mg of niacin and does not include an estimate of the niacin that is contributed by the conversion of tryptophan to niacin. The RDA is given in mg of niacin equivalents and assumes that all niacin will be considered.

á-TE = alpha-Tocopherol equivalent; DFE = dietary folate equivalent; kcal = kilocalories; mcg = micrograms; mg = milligrams; n.a. = not applicable; NE = niacin equivalent; RE = retinol equivalent; REA = Recommended Energy Intake.

To assess adequacy of intake, we estimate the proportion of children whose usual intake equals or exceeds the EAR, if available.[8] According to Beaton (1998) and Carriquiry (1999), the fraction of the population with nutrient intakes below the EAR may provide an accurate approximation of the prevalence of inadequacy. The higher the percentage of children with intakes at or above the EAR, the lower the risk that they have intakes below their requirement. Comparing individuals' nutrient intakes with the RDA or AI (rather than the EAR) is not recommended for assessing adequacy (Institute of Medicine 2000). Nonetheless, for nutrients for which an EAR has not been set, we use 80 percent of the 1989 RDA as a reference value.[9] This percentage is intended to approximate the average requirement. However, there is no way to predict the accuracy of working backward from the 1989 RDA to get the average requirement, since the 1989 RDA report (National Research Council 1989a) does not present estimates either of the average requirement or of the standard deviations of the requirements for most nutrients.

According to the National Academy of Sciences subcommittee on the uses and interpretations of the DRIs, the AI cannot be used to determine the prevalence of inadequate intakes (Institute of Medicine 2000). As shown in Table II.3, the calcium AIs are slightly higher than the 1989 calcium RDAs for children. By definition, the AI is expected to meet or exceed the needs of essentially all healthy members of the population (as is the case for RDAs), but the amount by which the AI does so cannot be estimated. Considering these facts, the decision was made to not assess the adequacy of calcium intake using the AI or some percentage of the AI. Instead, we present estimates of the full distribution of calcium intake for all children and for key subgroups of children. While this does

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[8]The reference values used to assess adequacy of intake are underlined in Table II.3.

[9]This estimate is based on the assumption that the coefficient of variation for these nutrients is 0.125. If the RDA is assumed to be two standard deviations above the average requirement, a coefficient of variation of 0.125 implies that the average requirement is 80 percent of the RDA.

not yield estimates of the prevalence of inadequacy, it shows where the distribution of calcium intakes lies with respect to the AI, which is the recommended intake for individuals. Presenting these distributions also allows us to make useful comparisons of intakes among demographic groups.

Appendix tables (A.1.A to A.1.F) show the distribution of usual intake (the 5th, 10th, 15th, 25th, 50th, 75th, 85th, 90th, and 95th percentiles of this distribution) for various nutrients and dietary components for selected age and gender groups. This will allow comparison with forthcoming EARs, facilitating appropriate assessment of the extent to which the populations meet new EARs. Appendix Table A.2 contains measures of the percentage of children whose usual intakes of vitamins and minerals equal or exceed the alternative reference values shown in Table II.3. For example, Table A.2 presents proportions of sample members whose usual intake of the B vitamins meets or exceeds 80 percent of the 1989 RDA. The purpose of this table is to make the results in this study more comparable with previous studies that have used the 1989 RDA values rather than the new DRI-based reference values.

To assess intake of macronutrients, we use the 1995 *Dietary Guidelines for Americans* and NRC's *Diet and Health*. The 1995 edition of the *Dietary Guidelines* specified quantitative standards for fat and saturated fat and recommended that individuals limit their intake of sodium and cholesterol. The specific quantitative recommendations are that individuals:

- Limit total fat to 30 percent or less of total food energy
- Limit saturated fat to less than 10 percent of total food energy

Diet and Health recommends the following quantitative standards for sodium, cholesterol, carbohydrate, and protein intake:

- Limit sodium intake to 2,400 mg or less per day
- Limit dietary cholesterol to 300 mg or less per day
- Carbohydrate intake should be at least 55 percent of food energy.
- Protein intake should be no more than twice the RDA.

Finally, although there are no explicit recommendations for fiber intake in the *Dietary Guidelines* or *Diet and Health,* Williams (1995) and Williams et al. (1995) suggest the simple formula "age plus 5" grams of fiber per day for children ages two or older. The American Heart Association has also adopted this standard (Van Horn 1997) and it has been used in a number of past research studies (for example, Hampl et al. 1998; Nicklas et al. 2000). In addition to describing school-aged children's mean intakes of macronutrients, we also present the percentages of children whose macronutrient or fiber intake is consistent with each of these recommendations.

2. Measuring Usual Intake

Most standards of dietary adequacy are defined in terms of usual intake, which is the long-run average of daily intakes of a particular nutrient for an individual. Since there are two days of dietary intake information in the CSFII, we can calculate a two-day average intake for each person as an estimate of usual intake *for that individual*. However, the intake of a particular nutrient by an individual may vary considerably from one day to another, and from one two-day period to another. Therefore, people's intake measured over two days will vary across the population more than a true measure of individuals' usual intake would. Thus, while a person's two-day average intake level may be an unbiased estimate of that individual's usual intake, the distribution of two-day average intake levels across a population is not an unbiased estimate of the distribution of usual intake levels across that population.[10] In particular, the dispersion of the two-day average intake distribution will be larger than the dispersion of the usual intake distribution. Thus, if two-day average intakes are used to estimate the proportion of school-aged children whose usual intake of a particular nutrient is below or above a particular dietary standard, the results will be biased.

The NRC proposed an empirical method for adjusting observed nutrient intake to obtain unbiased estimates of the distribution of usual intake using two days of intake information for each individual (National Research Council 1986). This method estimates the intra-individual variation in nutrient intake and removes this source of variation before estimating the distribution of usual intakes across a population. Nusser et al. (1996) proposed alternative methods for estimating the distribution of usual intake that improved upon the NRC methods by dropping the required NRC assumption of normality in the distribution of daily intake. The Nusser et al. (1996) method accounts for the fact that daily intake data for individuals are nonnegative and often very skewed.

We use the methods developed by Nusser et al. (1996) in estimating the usual intake distribution of school-aged children to generate estimates of the percentile values of the usual distribution and the proportion of children whose usual intake is above or below particular dietary reference values. To implement these procedures, we use the Software for Intake Distribution Estimation (SIDE) program (Iowa State University 1996). We do not use this methodology to estimate the distribution of usual *food* intake, because the distribution of daily food intake is typically much more skewed than the distribution of daily nutrient intake and often includes a large proportion of values of zero.

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[10]In addition, the *mean* two-day average intake of a nutrient in a population may be an unbiased estimate of the *mean* usual intake of that nutrient in that population.

As a result, it is much more difficult to estimate the distribution of usual food intake than that of usual nutrient intake.

3. Estimating Food Group Servings

To examine food intake by children, we determined the mean number of servings of foods in the five major food groups of the Food Guide Pyramid and of selected other foods. We also determined the percentages of children consuming selected numbers of servings from each Pyramid food group, the percentages consuming at least the minimum number of servings specified in the Food Guide Pyramid, and the percentages of children consuming the age- and gender-specific target as defined in the Healthy Eating Index (see Table II.4). Except for the milk group, this gender-specific target number of servings for each group of children is higher than the minimum of the range of servings recommended by the Food Guide Pyramid.

The CSFII Pyramid Servings database was used to obtain numbers of servings of foods in the five major food groups, intake of grams of discretionary fat, and number of teaspoons of added sugars. In this database, most reported foods (89 percent) are multiple-ingredient foods. The USDA separated these foods into their ingredients and categorized these ingredients into food groups that were consistent with Pyramid definitions for serving sizes (U.S. Department of Agriculture 1998). For example, the serving weight of stew (that corresponded to the weight reported by the child) was selected from the food coding database; the weight of each ingredient was divided by the gram weight per serving to determine the number of servings or fractions of a serving.

The Pyramid Servings database uses one ounce of lean meat or the equivalent as the serving size for the meat and meat substitutes group. For analyses in this report, the number of 1-ounce servings was converted to the number of 2.5-ounce meat servings to be consistent with the serving size used in the Healthy Eating Index (Kennedy et al. 1995; and Bowman et al. 1998).

TABLE II.4

HEALTHY EATING INDEX TARGET NUMBER OF SERVINGS PER DAY
FROM THE USDA FOOD GUIDE PYRAMID

		Recommended Servings per Day, by Pyramid Food Group				
Gender/Age	Energy (kcal)	Grains	Vegetables	Fruits	Milk	Meat
Children, 4 to 6	1,800	7	3.3	2.3	2	2.1
Children, 7 to 10	2,000	7.8	3.7	2.7	2	2.3
Females, 11 to 18	2,200	9	4	3	3	2.4
Males, 11 to 14	2,500	9.9	4.5	3.5	3	2.6
Males, 15 to 18	3,000	11	5	4	3	2.8
Minimum of Food Guide Pyramid Recommended Range		6	3	2	2	2

SOURCE: Kennedy et al. (1995); and Bowman et al. (1998)

NOTE: The target number of servings per day is based on the Recommended Energy Allowance for age and gender rather than the amount of energy usually consumed by the individual. For females 11 to 18 who are pregnant or lactating, the recommended servings per day for each of the food groups except dairy is slightly higher than for those who are not pregnant or lactating.

To determine the number of servings of grain products consumed, the Pyramid Servings database accounted for grains used in snack-type grain products (such as corn chips), desserts (such as cookies and cakes), and other foods (such as a thickeners for batter or breading) using a method that defines servings based on the grain content of the food. Thus, the number of grain servings counted may be higher than if obvious grain servings such as bread, rolls, rice, and pasta were the only ones counted. On the other hand, only the actual grain content of breakfast cereals is counted (some are less than 50 percent grain).

The term “added sugars” includes all sugars used as ingredients in processed foods (for example, bread, cake, candy, soft drinks, jelly, ice cream, and catsup) and sugars eaten separately or added to foods when they are consumed. All the following ingredients contribute to the intake of “added sugars”: white sugar, brown sugar, raw sugar, corn syrup, corn syrup solids, high-fructose corn syrup, malt syrup, maple syrup, pancake syrup, fructose sweetener, liquid fructose, honey, molasses, anhydrous dextrose, and crystal dextrose. The sugars that occur naturally in foods, such as lactose in milk and fructose in fruit, are not included with “added sugars.”[11]

The term “discretionary fat” covers all fats added in preparation or when eating (such as butter, margarine, cream cheese, oil, shortening, lard, meat drippings, cocoa, and chocolate), but it also accounts for all “excess” fat from foods in the five major food groups. Excess fat refers to amounts beyond those that would be consumed if only the lowest-fat forms were eaten. This means that the fat in one percent milk, two percent milk, and whole milk is included in discretionary fat, as is the fat in biscuits, sausage, regular hot dogs, and so forth. Fat content that exceeds the amounts listed below is counted as discretionary fat (U.S. Department of Agriculture 1998):

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[11]The CSFII contains no information on consumption of total sugars, that is, added sugars plus sugars occurring naturally in foods.

- Grain products: 1.01 grams allowable fat per serving
- Vegetables: 0.22 grams allowable fat per serving
- Fruits: 0.28 grams allowable fat per serving
- Dairy products: 0.44 grams allowable fat per serving
- Meat and meat substitutes: 2.651 grams allowable fat per ounce of cooked lean meat equivalent

An implication of this is that discretionary fat intake may be high even if little fat is added to food.

4. Defining SBP/NSLP Participation

As noted previously, the CSFII provides no direct measure of children's SBP/NSLP participation status on the days on which dietary intake information was collected. Instead, there are proxy reports of the number of days per week or month the child usually eats a school lunch or breakfast. It would be possible to define participation according to whether a child usually eats a school meal some minimum number of times per week, such as three. However, even students who usually participate three times a week may not have participated on the day the dietary intake information was collected. Alternatively, students who usually eat a school meal fewer than three times a week may have eaten lunch on the intake day. This problem is compounded by the fact that the usual participation is typically reported by proxy--an adult family member who may or may not know the child's exact school meal participation habits. The resulting imprecision in the measurement of SBP/NSLP participation would reduce the likelihood that we observe substantial and statistically significant differences in the food and nutrient intake of participants and nonparticipants.

Our approach to this methodological problem is to attempt to measure whether each child ate a school meal on the day dietary intake information was collected. Since each CSFII respondent in our sample has two days of dietary intake data collection, this leads to two binary participation variables for each child in the sample. Participation on the intake day is determined according to the foods the student reported having obtained and consumed from the school cafeteria that day. A student who reports having consumed at least three of the five USDA meal pattern components for lunch from the school cafeteria (two servings of fruit or vegetables and one serving each of grain products, dairy products, and meat/meat substitutes) is defined as an NSLP participant. A student who reports having consumed at least two of the four USDA breakfast components (two servings of grain or meat products and one serving each of milk and fruit/vegetables) is defined as an SBP participant.[12,13]

This approach to defining students' SBP/NSLP participation status on the CSFII intake days has two main limitations. First, although the CSFII provides information on which foods were obtained from the school cafeteria, we do not know whether these school cafeteria foods came as part of a school meal or were purchased by the student on an a la carte basis. We do not believe this problem leads to much misclassification of students' participation status, since we feel it unlikely that many students purchase enough a la carte items from the school cafeteria to fulfill at least three of the USDA lunch component requirements without actually purchasing a school lunch. However, it is

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[12]This approach to defining NSLP and SBP participation is very similar to the one used in the SNDA-1 study (Burghardt et al. 1993). In that study, participation defined in this way was highly correlated with students' own reports about whether they ate a school lunch/breakfast on a given day. The biggest difference between the SNDA-1 participation definition and the participation definition used in our study is that the SNDA-1 definition was based on foods *selected* for lunch from the school cafeteria, while our definition is based on foods *consumed* for lunch from the school cafeteria.

[13]This definition of NSLP participation corresponds to the definition of participation under offer-versus-served, as described earlier. However, the definition of SBP participation is more "lenient" than the offer-versus-served definition--our definition calls for only two breakfast components whereas the offer-versus-serve definition calls for three components. We relax the breakfast participation definition because few school cafeterias offer a la carte items for breakfast (27 percent according to Daft et al. 1998); thus most cafeteria breakfast foods reported by students would be part of SBP breakfasts.

important to remember that the lunch intakes of NSLP participants (and the breakfast intakes of SBP participants) potentially include foods that are not part of USDA meals.

Second, students are classified as to whether they get a school lunch or not according to the foods they *select* from the school cafeteria, but the CSFII provides information only on the foods students report having *consumed* from the school cafeteria. We have no information on plate waste--foods students select from the school cafeteria but do not consume.[14] If students select five lunch components but consume only two of them, they would not be considered NSLP participants under our definition.

Two methods were used to overcome this data limitation. First, the number of servings of a food that children eat was "rounded up" to the next highest integer so that students who select a food item from the cafeteria but report eating only a small portion of it will be credited with a serving of that food.[15] This does not account for foods that students select but do not eat at all, but it does account for cases in which students select a food but eat only a small portion.

Second, for students who are defined as nonparticipants according to the criteria described above but who eat at least one food from the school cafeteria for a particular meal--thus providing evidence that they were present in the cafeteria for lunch--information on their usual SBP or NSLP participation was used to adjust their participation status. If these students are reported to "usually participate" five days a week, then they are redefined as participants on the intake day. The purpose

[14]Among foods students select from the school cafeteria, according to Burghardt et al. (1993), they waste (that is, do not consume) 9 percent of the meat, 10 percent of the grain products, 6 percent of the milk, and 13 percent of the fruits and vegetables.

[15]In particular, if a student consumes at least 15 percent of a serving of a food, we consider that to be one serving for the purpose of defining school meal participation. In the case of the fruit/vegetable group for lunch and the grains/meat group for breakfast, if a student reports consuming at least 1.15 servings, we consider that to be 2 servings selected. This "rounding up" was done only for the purpose of defining participation status.

of this redefinition is to capture SBP/NSLP participation among students who select a school meal but then eat only one or two items.[16]

The participation status variables constructed as described here appear to be valid when compared with other sources of information on NSLP and SBP participation. In particular, the implied NSLP participation rate using this definition is 52.1 percent on day one and 47.9 percent on day two among all students enrolled in schools that offer the NSLP. The NSLP participation rate for the years 1994 to 1996, according to FNS administrative data, was 57 to 59 percent. However, this participation rate is defined only among students attending school (not absent) on a given day. The CSFII sample of students enrolled in NSLP schools includes both students attending school on the intake day and students absent from school. If the CSFII participation rates are adjusted upward to account for students who were absent from school on the intake days, they increase to 56.2 percent on day one and 51.7 percent on day two.[17] Thus, it appears that our definition of NSLP participation is close to the true participation rate (although it may understate true participation slightly on intake day two).

NSLP participation on the intake day according to this definition is also closely correlated with usual NSLP participation reported in the CSFII survey. For example, only 9 percent of those who report that they usually participate zero days a week are defined as participants on day one, while 74 percent of those who report that they usually participate five days a week are day one participants.

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[16]A small number of children are redefined as participants in this way. In particular, about five percent of all students (on each intake day) were originally defined as NSLP nonparticipants but then redefined as participants after information on their usual participation status was examined. Less than one percent of students had their SBP participation status redefined in this way.

[17]We adjusted the participation rates among all enrolled students by assuming an attendance rate of 92.7 percent and dividing the unadjusted participation rate by 0.927. The assumption of a 92.7 percent attendance rate is the same as the assumption the USDA uses in generating its participation rate estimates.

This definition appears to underreport SBP participation a bit more than NSLP participation. The estimated SBP participation rates among all enrolled students at SBP schools are 15.1 percent on intake day one and 15.2 percent on intake day two; the rates among non-absent students are 16.3 percent on day one and 16.4 percent on day two. FNS administrative data suggest that the true SBP participation rate among non-absent students at SBP schools is 20 percent.

An alternative way to define a binary participation variable would have been to use information on students' usual participation. In particular, three possibilities would have been to define students as participants: (1) if and only if they usually participate at least three times a week, (2) if and only if they usually participate at least one time a week, or (3) if and only if they usually participate five times a week. Table II.5 shows the estimated participation rates and numbers of participants under each of these participation definitions and under the food-based participation definition used throughout the report. The participation variables based on usual participation show higher participation rates than the food-based participation variable.[18]

5. Defining Breakfast and Lunch

Part of the analysis in this report involves describing what children (and SBP/NSLP participants and nonparticipants) eat for breakfast and lunch. To present this information, we need to define what constitutes breakfast and lunch, in other words, what foods should be included in what we call breakfast and lunch. Two alternative approaches to defining breakfast and lunch are (1) to include all foods consumed during specific times during the day, and (2) to include all foods consumed during eating occasions that CSFII sample members themselves define as breakfast and lunch. We use a combination of these approaches in this report--we define breakfast and lunch primarily

[18]Appendix Table B.1.B shows how the difference in the mean intakes of participants and nonparticipants varies according to which of these four participation definitions is used.

TABLE II.5

NSLP/SBP PARTICIPATION LEVELS AND RATES UNDER ALTERNATIVE DEFINITIONS OF PARTICIPATION

	NSLP		SBP		SBP and NSLP	
Definition	Number of Participants (Millions)	Participation Rate	Number of Participants (Millions)	Participation Rate	Number of Participants (Millions)	Participation Rate
1. Usually Participates at Least 1 Time a Week	33.0	77.9	8.6	32.0	8.3	31.0
2. Usually Participates at Least 3 Times a Week	27.7	65.3	6.8	25.2	6.5	24.3
3. Usually Participates 5 Times a Week	23.1	54.6	5.7	21.3	5.5	20.5
4. Participation on the Intake Day[a]	21.4	50.4	4.2	15.5	3.7	14.0

SOURCE: Weighted tabulations based on 1994-1996 CSFII.

[a] This is the definition of participation used throughout the text.

NSLP = National School Lunch Program; SBP = School Breakfast Program.

according to the times that foods are consumed, but we also use respondents' definitions of their eating occasions to categorize foods consumed at ambiguous times of day into either breakfast or lunch (or neither). Our approach differs slightly for school days as opposed to holidays, weekends, and summer.

In particular, on *school days,* breakfast is defined as including (1) all foods consumed between 5:00 A.M. and 9:30 A.M., and (2) all foods consumed between 9:30 A.M. and 10:30 A.M. that the sample member reports as being part of breakfast. On *holidays, weekends,* and *summer days,* breakfast is defined as including (1) all foods consumed between 5:00 A.M. and 9:30 A.M., and (2) all foods consumed between 9:30 A.M. and 11:00 A.M. that the sample member reports as being part of breakfast.

On *school days,* lunch is defined as including (1) all foods consumed between 10:30 A.M. and 2:00 P.M.; (2) all foods consumed between 9:30 A.M. and 10:30 A.M. that the sample member reports as being part of brunch, lunch, dinner, or supper; and (3) all foods consumed between 2:00 P.M. and 3:30 P.M. that the sample member reports as being part of brunch or lunch. On *holidays, weekends,* and *summer days,* lunch is defined as including (1) all foods consumed between 11:00 A.M. and 2:30 P.M.; (2) all foods consumed between 9:30 A.M. and 11:00 A.M. that the sample member reports as being part of brunch, lunch, dinner, or supper; and (3) all foods consumed between 2:30 P.M. and 4 P.M. that the sample member reports as being part of brunch or lunch.

With these definitions, 18.6 percent of all foods consumed on school days are defined as being part of breakfast, and 33.1 percent are defined as being part of lunch. Among these breakfast foods, 96.5 were also labeled by sample members as being part of breakfast. Among foods not defined in our study as part of breakfast, 1.1 percent were labeled by sample members as part of breakfast. Among the school day lunch foods (according to our definition), 88.4 percent were labeled by sample members as part of lunch; among foods not defined as being part of lunch, 0.5 percent were labeled by sample members as part of lunch. The numbers for nonschool days are similar.

6. Defining School Days

CSFII dietary intake data were collected on nearly every day of the 1994, 1995, and 1996 calendar years. For the analysis in this report, however, it was useful to distinguish among (1) days on which students were required to attend school, (2) weekend or other vacation days during the school year, and (3) summer days. Unfortunately, the CSFII contains no direct information on whether students attended school or were supposed to attend school on the intake days.[19] Thus, we had to make an educated guess about which days were school days, and we applied this hypothesized school year schedule to all children in our sample. Because different school districts have different schedules, a day defined as a school day may not apply to every student.

Incorrectly defining the school year for a given child could lead to two types of errors. First, an intake day could be defined as a school day when, in fact, the child was not required to attend school on that day. An implication of this type of error is that this child will be defined as an SBP and NSLP nonparticipant on this day, even though the child did not have an opportunity to eat a school breakfast or lunch.[20] This will lead to a negative bias in the participation rate estimate and also will lead to error in the comparison of the dietary intake of participants and nonparticipants. Second, an intake day could be defined as a nonschool day when, in fact, the child was required to attend school

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[19]The CSFII does include information on whether the foods children consume were obtained from the school cafeteria. Thus, for children who get foods from the school cafeteria, we can be sure that their intake day was a school day. However, for children who do not get any foods from the school cafeteria on their intake day, we do not know whether this day was not a school day or whether they just didn't eat at school that day.

[20]For intake days that are nonschool days, the NSLP and SBP participation variables are set to "missing."

on that day. The main implication of this type of error is that we will lose information that could be used to compare SBP/NSLP participants and nonparticipants.

Since we judged the first type of error to have more problematic implications for the analysis, the definition of the school year used in the analysis attempts to minimize that type of error. For example, while many school systems begin the school year on or before the day after Labor Day, the school year is defined to begin one week after Labor Day in this report. The end of the school year is defined to be the end of the first full week in June. In between these two dates, we counted all days as school days except for weekend days and a few selected holidays and vacations. In particular, nonschool days include Veterans Day, Thanksgiving Day and the subsequent Friday, days during a winter break defined as December 21 through January 1 (or January 2 on the year in which January 1 fell on a Sunday), Martin Luther King Day, Presidents' Day, the Friday before Easter Sunday, and Memorial Day.[21]

As a check on whether these are appropriate days to exclude from the school year (and whether other days should be excluded as well), we examined where children obtained their foods between 5:00 A.M. and 2:30 P.M. on these days. On a day that is truly a nonschool day, students should obtain no foods from the school cafeteria. For the holidays and vacation days listed above, none (or very few) of the foods children consumed on these days were obtained from the school cafeteria.[22] It is possible that these students attended school on these days and obtained their food elsewhere, but we

[21]Although most schools also give students a week of vacation in the spring, this spring break varies widely across schools, so we could not determine which week to define as spring break.

[22]In particular, among the 1,307 intake days that were defined as nonschool days during the school year (either weekend days, vacation days, or holidays), only 2.7 percent of children selected at least one food from the school cafeteria. Among the 1,323 intake days defined as nonschool summer days, 3.6 percent of children selected at least one food from the school cafeteria.

have no evidence of this. Furthermore, on other days not likely to be holidays, a substantial fraction of the foods consumed by students was typically obtained in school.

7. Significance Testing

Throughout the report, the characteristics and dietary intake values of different groups of children are compared. Because these comparisons are based on *samples* of children, the resulting differences we observe could be due to chance. Thus, we conduct tests of statistical significance to determine whether the observed differences are large enough that they are unlikely to be due to chance. In particular, the statistical significance of observed differences across groups is assessed using as a standard the five percent level of significance. This means that an observed difference will not be called statistically significant unless the probability that it resulted *only* from random variation (that is, from chance) is no more than five percent.

When describing differences across subgroups in dietary intake, we focus almost entirely on differences that are statistically significant, but there are two exceptions to this rule. First, we may discuss statistically insignificant differences between subgroups in a dietary outcome when the sample size for a particular subgroup is so small that achieving statistical significance is very difficult and when the observed difference is large and substantively interesting. Second, when the differences between subgroups in a set of related dietary outcomes are consistently in the same direction although only some of these differences are statistically significant, we will sometimes refer to the full set of observed differences without singling out those that are significant.

When comparing dietary intakes across a set of more than two subgroups, the significance tests examine whether there were significant differences between any of the subgroups. For example, a single significance test indicates whether there are significant differences in mean food energy intake between any of the four racial/ethnic subgroups.[23] Alternatively, a series of significance tests could have been conducted to determine whether the intakes of any two of the racial/ethnic subgroups differed significantly from one another. This would have allowed us to state, for example, whether the mean food energy intake of Hispanic children differed significantly from that of black children. However, we used the single, comprehensive significance test primarily, because it yields more general information in a relatively straightforward way.[24]

The majority of the significance tests in this report account for the fact that the CSFII data set uses a complex sample design. Most statistical software packages assume that the observations in the sample are statistically independent of one another when calculating standard error estimates and conducting significance tests. This assumption would be correct with simple random sampling, but not with the complex CSFII design. Thus, we used the SUDAAN statistical package to estimate standard errors by taking into account the complex sample design of the CSFII.

For the analysis of the distribution of usual intake conducted using the SIDE software package, we calculated most of the standard errors and conducted significance tests without correcting for the complex sample design of the CSFII. However, for selected key tables, we calculated both the uncorrected and corrected standard errors and found that the difference between the two was small. In particular, the "corrected" standard error is typically no more than five percent higher or lower than the "uncorrected" standard error.

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[23]In particular, the null hypothesis being tested is that the mean food energy intakes of each of the four racial/ethnic subgroups is the same.

[24]Where there are interesting differences between two subgroups within a larger set of subgroups, we also conducted these two-way significance tests. We present these results in the text when relevant.

8. Regression-Adjusted Comparison of Participants' and Nonparticipants' Intakes

Chapter IV of this report compares the food and nutrient intakes of SBP/NSLP participants versus those of nonparticipants. Since one of the goals of the school meal programs is to promote healthy eating among children, it is useful to examine directly whether the diets of SBP and NSLP participants are sufficiently high in food energy, vitamins, and minerals without being too high in fat, sodium, and cholesterol. Comparing participants' diets with those of nonparticipants is also useful as a benchmark indicating the dietary characteristics of a group not taking advantage of the school meal programs.

In comparing participants' and nonparticipants' diets, however, it is important to remember that these groups may differ in ways other than their SBP/NSLP participation status. For example, it turns out that participants are more likely than nonparticipants to be young and male.[25] These groups may also differ in characteristics such as their attitudes toward healthy eating. As a result, observed differences in the dietary intake of the two groups may be due to these differences in their characteristics rather than their program participation itself. For example, if males consume more than females, then participants may consume more than nonparticipants even if participation itself has no effect on dietary intake.

The analysis in this report attempts to control for observable differences in the characteristics of SBP/NSLP participants and nonparticipants by calculating "regression-adjusted" mean food and nutrient intake estimates for the two groups. A comparison of the groups' regression-adjusted mean intakes effectively eliminates differences in their observable characteristics. Thus, any remaining

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[25]See Chapter IV, Section A for further information on the observed characteristics of SBP and NSLP participants and nonparticipants.

difference in the regression-adjusted mean intakes is more likely due to their participation in the NSLP (or SBP).[26]

The process used to generate the regression-adjusted estimate of the mean intake of a given nutrient among NSLP participants and nonparticipants involved three steps. First, using a sample of students attending schools that offer the NSLP, we estimated an unweighted linear regression model with children's intake of that nutrient as the dependent variable and NSLP and SBP participation status and other relevant (observable) factors as independent variables.[27] Second, we calculated two different predicted intake levels for each sample member--one assuming that the person was a participant and the other assuming the person was a nonparticipant. Third, we calculated weighted mean values of each of these predicted intakes across individuals. The two weighted means are the regression-adjusted estimates of mean intake for participants and nonparticipants.

The regression used to generate regression-adjusted mean 24-hour intakes took the following form:

$$(1) \quad y_i = \alpha_0 + X_i\beta + \alpha_1 SBP_i + \alpha_2 NSLP_i + \varepsilon_i.$$

In the regression, children's 24-hour intake of the nutrient on the intake day (y_i) is regressed on a set of observable characteristics (X_i) and their SBP and NSLP participation statuses (SBP_i and $NSLP_i$).

[26]Alternatively, the differences in the regression-adjusted mean intakes of the two groups could be due to differences in their unobserved characteristics. Thus, we cannot definitively interpret the difference in regression-adjusted mean intakes as an unbiased estimate of the impact of participation in the NSLP (or SBP).

[27]We estimated an unweighted regression because we felt that characteristics upon which the sample weights were based were adequately controlled for by the independent variables in the model. We used the SUDAAN software package to estimate the regression model in a way that would take into account the complex CSFII sample design.

The sample upon which the regression is based includes only students attending NSLP (or SBP) schools and only intake days that were school days. Thus, each child could have contributed zero, one, or two days of data to the analysis. The independent variables in the model, other than SBP and NSLP, include:

- SBP School — a binary variable indicating whether the student's school serves the SBP
- Age/Gender — a set of five binary variables reflecting the child's age and gender
- Income/Poverty — a set of four binary variables reflecting the child's household income as a percentage of poverty
- Race/Ethnicity — a set of three binary variables indicating the child's race/ethnicity
- Day of Week — a set of four binary variables indicating which day of the week (Monday to Friday) the intake information was collected
- Season — a set of two binary variables indicating which season of the year (fall, winter, or spring) the intake information was collected
- Year — a set of two binary variables indicating which year (1994 to 1996) the intake information was collected
- Food Stamps — a binary variable indicating whether the child's family receives food stamps
- Family Size — the number of persons in the child's family
- Two Parent — a binary variable indicating whether the child lives with both parents
- Region — a set of three binary variables indicating which region of the country the child lives in
- Urbanicity — a set of two binary variables indicating whether the child lives in an urban, suburban, or rural area
- Television — the number of hours of television the child watched on intake day
- BMI — the child's body mass index (a square of this variable is also included in the model)

• Exercise — a set of two binary variables indicating how frequently the child exercises

For models in which the dependent variable measures intake at lunch alone, the model does not include SBP_i. For models in which the dependent variable measures intake at breakfast alone, the model does not include $NSLP_i$.

Once the regression model was estimated, the resulting coefficient estimates were used to calculate two predicted intake values for each student in the sample--one predicted intake assuming the student is an NSLP (or SBP) participant and the other assuming the student is a nonparticipant. The former predicted 24-hour intake value (assuming NSLP participation) was calculated as follows:

(2) $$y_i^p = \hat{\alpha}_0 + X_i\hat{\beta} + \hat{\alpha}_1 SBP_i + \hat{\alpha}_2.$$

The predicted 24-hour intake value for nonparticipants was:

(3) $$y_i^{np} = \hat{\alpha}_0 + X_i\hat{\beta} + \hat{\alpha}_1 SBP_i.$$

Thus, the difference between the predicted intake among participants and the predicted intake among nonparticipants is α_2, the coefficient estimate on NSLP participation in the regression model. To generate the regression-adjusted mean intake values of participants and nonparticipants, we calculated the mean values of y_i^p and y_i^{np}.

The regression-adjusted mean intakes of SBP participants and nonparticipants were computed analogously. That analysis was limited to students attending schools that offered the SBP. The report also includes tables of regression-adjusted mean intakes among students who participated in both the SBP and NSLP versus those who participated in neither program. In generating these estimates, three variables representing program participation were included in the regression model: (1) a binary variable indicating SBP participation alone, (2) a binary variable indicating NSLP participation alone, and (3) a binary variable indicating participation in both programs. The difference between the regression-adjusted mean intakes among participants and nonparticipants is based on the coefficient estimate of this third binary variable.

Finally, for binary dependent variables, such as whether a child's intake exceeds the EAR or meets a dietary guideline, the regression-adjustment process is slightly different. Instead of estimating an ordinary least squares (OLS) regression, we estimated a logistic regression to account for the binary nature of the dependent variable. As a result, the equation for calculating the predicted value among participants and nonparticipants is also different. Instead of being linear, the equation takes on the logistic functional form.

However, the binary variable in this regression indicating whether the child's intake exceeds a particular dietary standard is based on the child's intake on a single day rather than on his or her usual intake. Thus, the coefficient on the participation variable in this model is an estimate of the effect of participation on whether the child's *one-day* intake exceeds a given standard, not an estimate of the effect of participation on whether the child's *usual* intake exceeds the standard. To give a sense of the relationship between participation and children's usual intake, the appendix includes tables showing the proportion of participants and nonparticipants whose *usual* intakes exceed dietary standards. These mean values have not been regression adjusted.

III. CHILDREN'S DIETARY INTAKE, 1994 TO 1996

This chapter describes the dietary and food group intake of school-aged children, overall and for selected subgroups. It includes (1) descriptions and comparisons across subgroups of children's dietary intake, (2) assessments of the nutrient adequacy of intake and of the meeting of selected dietary standards, and (3) descriptions of food group intake. In addition to the results presented in the chapter, results of additional analyses that provide supporting detail are shown in Appendix Tables A.1.A through A.12.D and C.1 through C.12.

A. MEAN INTAKE OF FOOD ENERGY, NUTRIENTS, AND OTHER DIETARY COMPONENTS

The most straightforward way of describing children's dietary intake is to present average measures of their intake of food energy, nutrients, and other dietary components. Mean (or median) intake measures do not reveal the extent to which underconsumption or overconsumption of a particular nutrient may occur among children, but they do provide information on whether children consume a high or low level of the nutrient on average. Furthermore, presenting mean intake levels provides a useful way of describing and comparing dietary intake among important subgroups of children, such as particular age/gender or income groups.

1. Energy and Macronutrients

a. All School-Aged Children

Though many children are overweight and even obese (Troiano et al. 1995), mean total reported food energy intake by all school-aged children is 91 percent of the age/gender-specific REA (Table

III.1).[1] Median food energy intake is slightly lower, at 87 percent of the REA (Table III.2). These results are compatible with those of several earlier studies (for example, Kennedy and Goldberg 1995; Kennedy and Powell 1997; and Lin and Guthrie 1996) and suggest either substantial underreporting of food intake among school-aged children (as found by Champagne et al. 1998) or REAs that are too high for the current average activity level of children (see Chapter I, Section B).[2]

Among the macronutrients that contribute to food energy, total fat provides 32.5 percent of total energy intake and saturated fat provides 11.7 percent, on average.[3] Children's mean carbohydrate intake is just under 54.5 percent of food energy, with added sugars making up a substantial proportion of that total. Together, added sugars and discretionary fat contribute 45 percent of total energy intake, on average, with sugars contributing slightly less to the total (20 percent) than discretionary fat (25 percent).

A fairly large number of school-aged children skip breakfast on any given day. On intake day one, for example, nearly one in five children in our sample ate nothing for breakfast, and one in three children consumed foods that contributed less than 10 percent of the daily REA (Table III.3). The percentage skipping breakfast increases with age, especially among females (Figure III.1).

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[1]See Appendix Table A.3.A for the mean absolute intake levels among school-aged children for the dietary components listed in Table III.1. In addition, Appendix Table A.3.B shows the distribution of absolute intake levels, and Appendix Table A.3.C shows the distribution of intake levels relative to the RDAs for these dietary components. For standard errors for Table III.1 and selected other tables in Chapters III and IV, see Appendix C.

[2]As described in Chapter I, previous research has suggested substantial underreporting of food energy intake in dietary surveys. If this is the case, then not only are the reported levels of food energy intake likely to be below the actual intake levels, but the reported intake levels of other nutrients are also likely to be below the actual intake levels.

[3]The CSFII contains no information on children's intake of *trans*-fatty acids.

TABLE III.1

MEAN NUTRIENT INTAKE RELATIVE TO DIETARY STANDARDS AMONG SCHOOL-AGED CHILDREN, 1994 TO 1996

	Mean Intake		
Dietary Component	Breakfast	Lunch	24 Hours
Food Energy			
As percentage of 1989 REA	16.4	28.1	91.1
As percentage of 24-hour food energy intake	18.1	31.1	---
Percentage of Food Energy from:			
Total fat	25.9	33.8	32.5
Saturated fat	10.1	12.1	11.7
Carbohydrates			
Added sugars	18.9	20.1	19.6
Total	63.4	53.6	54.5
Protein	12.4	14.0	14.2
Vitamins (as Percentage of RDA)[a]			
Vitamin A	38.5	26.1	114.8
Vitamin C	60.1	49.4	194.7
Vitamin E	15.0	27.5	87.4
Vitamin B_6	60.2	44.4	183.2
Vitamin B_{12}	63.2	65.8	249.2
Niacin[b]	44.6	49.7	177.6
Thiamin	56.9	51.1	190.0
Riboflavin	78.1	61.9	235.6
Folate[c]	35.3	18.8	86.0
Minerals (as Percentage of RDA)[a]			
Calcium	21.2	24.2	80.4
Iron	42.9	32.7	131.0
Magnesium	22.8	30.1	102.7
Phosphorus	30.8	39.3	132.2
Zinc	21.3	25.4	91.9
Other Dietary Components			
Fiber (g)	2.2	4.2	13.6
Cholesterol (mg)	57.7	63.4	234.2
Sodium (mg)	532.6	1,059.3	3,309.2
Sample Size	**2,692**	**2,692**	**2,692**
Weighted Sample Size (Thousands)	**49,696**	**49,696**	**49,696**

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994-1996 CSFII.

[a] Mean intakes of vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus in this table are measured as a percentage of the Recommended Dietary Allowances (RDAs) based on the new Dietary Reference Intakes (DRIs). For the remaining vitamins and minerals except calcium, mean intakes are measured as a percentage of the 1989 RDAs. For calcium, mean intake is measured as a percentage of the DRI-based Adequate Intake.

[b] The reported intake of niacin as a percentage of the RDA is an underestimate because intake is reported in mg of niacin and does not include an estimate of the niacin that is contributed by the conversion of tryptophan to niacin. The RDA is given in mg of niacin equivalents and assumes that all niacin will be considered.

[c] The reported intake of folate as a percentage of the RDA is an underestimate because intake is reported in mcg of folate but the RDA is given in mcg of dietary folate equivalents. Expressing intake in mcg of folate does not make allowance for the high bioavailability of synthetic folic acid, as from fortified ready-to-eat cereals. Dietary folate equivalents consider bioavailability.

REA = Recommended Energy Allowance.

TABLE III.2

MEDIAN NUTRIENT INTAKE RELATIVE TO DIETARY STANDARDS AMONG SCHOOL-AGED CHILDREN, 1994 TO 1996

	Median Intake		
Dietary Component	Breakfast	Lunch	24 Hours
Food Energy			
As percentage of 1989 REA	15.4	27.0	86.7
As percentage of 24-hour food energy intake	18.0	31.5	---
Percentage of Food Energy from:			
Total fat	25.1	34.9	32.9
Saturated fat	9.8	12.2	11.8
Carbohydrates			
Added sugars	17.5	17.2	19.0
Total	64.6	52.2	54.2
Protein	12.4	13.7	13.9
Vitamins (as Percentage of RDA)[a]			
Vitamin A	29.5	16.0	90.2
Vitamin C	32.1	26.2	156.5
Vitamin E	9.6	23.2	78.1
Vitamin B_6	45.9	38.6	162.8
Vitamin B_{12}	44.2	53.2	211.3
Niacin[b]	35.3	45.4	164.4
Thiamin	48.6	46.4	175.3
Riboflavin	69.3	55.9	219.1
Folate[c]	26.0	15.1	74.4
Minerals (as Percentage of RDA)[a]			
Calcium	18.4	20.9	73.4
Iron	28.5	28.8	115.2
Magnesium	18.8	26.7	93.6
Phosphorus	24.8	33.8	112.2
Zinc	14.5	22.1	84.1
Other Dietary Components			
Fiber (g)	1.6	3.7	12.1
Cholesterol (mg)	20.6	47.7	196.8
Sodium (mg)	447.8	955.8	3,000.7
Sample Size	**2,692**	**2,692**	**2,692**

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994-1996 CSFII.

[a] Mean intakes of vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus in this table are measured as a percentage of the Recommended Dietary Allowances (RDAs) based on the new Dietary Reference Intakes (DRIs). For the remaining vitamins and minerals except calcium, mean intakes are measured as a percentage of the 1989 RDAs. For calcium, mean intake is measured as a percentage of the DRI-based Adequate Intake.

[b] The reported intake of niacin as a percentage of the RDA is an underestimate because intake is reported in mg of niacin and does not include an estimate of the niacin that is contributed by the conversion of tryptophan to niacin. The RDA is given in mg of niacin equivalents and assumes that all niacin will be considered.

[c] The reported intake of folate as a percentage of the RDA is an underestimate because intake is reported in mcg of folate but the RDA is given in mcg of dietary folate equivalents. Expressing intake in mcg of folate does not make allowance for the high bioavailability of synthetic folic acid, as from fortified ready-to-eat cereals. Dietary folate equivalents consider bioavailability.

REA = Recommended Energy Allowance.

TABLE III.3

SCHOOL-AGED CHILDREN'S DAY ONE MEAL SKIPPING USING VARIOUS DEFINITIONS OF BREAKFAST/LUNCH, BY SELECTED CHARACTERISTICS, 1994 TO 1996

	Percentage of Children Whose Breakfast Food Energy Intake Is:			Percentage of Children Whose Lunch Food Energy Intake Is:		
Population Group	0 kcal	< 50 kcal	< 10% of REA	0 kcal	< 50 kcal	< 10% of REA
Overall	19	20	33	9	9	16
Gender/Age	**	**	**	**	**	**
Males, 6 to 8	8	8	17	7	7	11
Females, 6 to 8	9	9	22	4	4	9
Males, 9 to 13	15	15	26	7	7	15
Females, 9 to 13	14	16	31	5	6	12
Males, 14 to 18	28	30	42	13	14	20
Females, 14 to 18	34	34	52	14	14	24
Race/Ethnicity	*	**	**	*	*	
Hispanic	23	23	33	12	13	14
Non-Hispanic, black	22	22	34	15	15	19
Non-Hispanic, white	17	18	32	7	7	20
Other	25	31	50	10	10	23
Household Income	*	*				
≤100% of poverty line	25	27	36	11	11	17
101 to 130% of poverty line	13	13	26	11	11	17
131 to 185% of poverty line	16	17	28	11	11	19
186 to 299% of poverty line	21	22	36	7	8	14
≥300% of poverty line	17	18	33	8	8	15
Type of Day				*	*	*
School day	18	18	33	7	7	13
Summer day	18	19	28	10	10	19
Weekend day or holiday during school year	22	24	38	12	12	18
Food Sufficiency Status			*			
Food sufficient	18	19	32	9	9	16
Food insufficient	37	37	54	16	16	20
NSLP Availability in School	*	*				**
NSLP available	18	19	32	8	8	15
NSLP not available	12	12	25	5	5	6
NSLP Participation Status				**	**	**
Participant	14	15	30	0	0	3
Nonparticipant	19	19	35	12	13	22
SBP Availability in School						
SBP available	19	19	31	7	8	14
SBP not available	16	17	33	7	8	14
SBP Participation Status	**	*	**			*
Participant	0	0	7	4	4	6
Nonparticipant	20	20	35	6	6	14

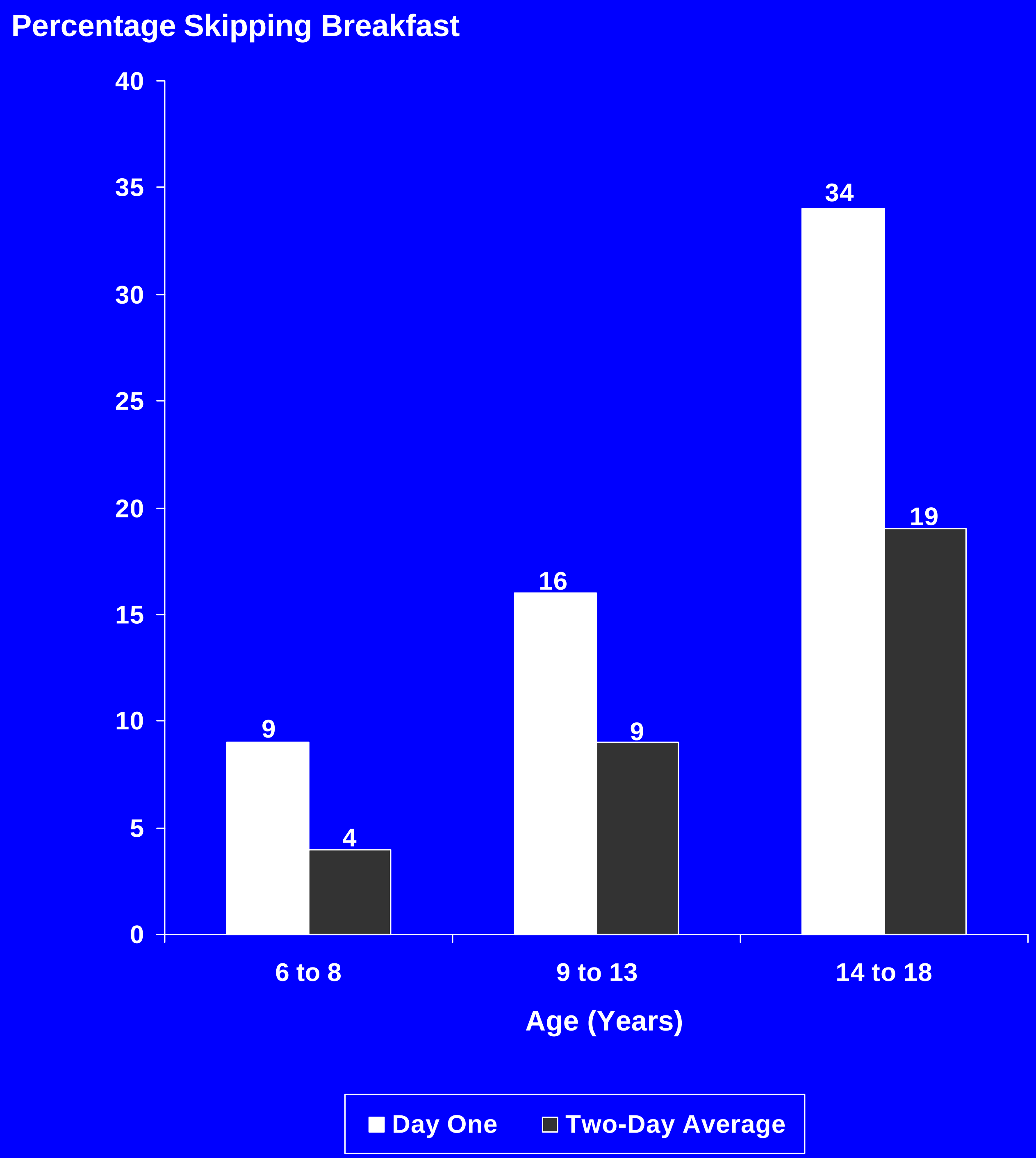
SOURCE: Weighted tabulations based on day one intake data from respondents of the 1994-1996 CSFII.

NOTE: See Chapter II, Section B.4 for definitions of SBP and NSLP participation status.

NSLP = National School Lunch Program; REA = Recommended Energy Allowance; SBP = School Breakfast Program.

*Differences in intake among subgroups significantly different from zero at the .05 level, chi-square test.
**Differences in intake among subgroups significantly different from zero at the .01 level, chi-square test.

Figure III.1
Percentage of Females Skipping Breakfast, by Age Group, 1994-1996 CSFII



Note: Skipping breakfast is defined as having less than 50 kcal of intake.

Lunch skipping is less common than breakfast skipping. Just under 10 percent of 6- to 18-year-old children ate nothing for lunch on intake day one, and 16 percent consumed foods that contributed less than 10 percent of the daily REA. Furthermore, children who skipped a meal on intake day one often ate that meal on intake day two; only nine percent ate nothing for breakfast and two percent ate nothing for lunch on both intake days (Appendix Tables A.4.A and A.4.B).

Meals vary substantially in the contributions they make to energy and macronutrient intake (Tables III.1 and III.2). Breakfast provides only 18 percent of total energy intake overall. Depending on how breakfast is defined, this value would be approximately 22 percent if those who skipped breakfast had been excluded. Children's breakfasts tend to be lower in fat than the meals they consumed at other times during the day. Mean fat intake at breakfast provides only 26 percent of the energy at that meal and contributes only about 5 percent to the total day's energy intake. Similarly, saturated fat at breakfast (10 percent of energy) contributes only about 2 percent to energy intake for the day. Lunch provides close to one-third of the energy for the day; the proportions of total and saturated fat, protein, and carbohydrates consumed are similar to those for the entire day. The percentage of energy contributed by added sugars is essentially the same at breakfast, at lunch, and over 24 hours.

b. Selected Subgroups

Age/Gender. Food energy intake as a percentage of the REA is lower for females than for males in each age group (Table III.4). This difference is most notable for 14- to 18-year-old females, whose mean energy intake is 83 percent of the REA, compared with 96 percent for males. At breakfast, 14- to 18-year-old females obtain, on average, only 13 percent of their REA, compared

TABLE III.4

MEAN 24-HOUR NUTRIENT INTAKE AMONG SCHOOL-AGED CHILDREN, BY AGE/GENDER, 1994 TO 1996

Dietary Component		Mean 24-Hour Intake: Males, 6 to 8	Females, 6 to 8	Males, 9 to 13	Females, 9 to 13	Males, 14 to 18	Females, 14 to 18
Food Energy (as Percentage of 1989 REA)	**	97	86	97	87	96	83
Percentage of Food Energy from:							
Total fat		32.5	32.5	32.8	32.1	32.9	32.3
Saturated fat	**	12.0	12.1	12.0	11.6	11.6	11.1
Carbohydrates							
Added sugars	**	18.7	18.0	19.0	20.0	21.0	20.8
Total	**	54.9	55.0	54.1	55.5	53.4	54.6
Protein		14.1	14.0	14.5	13.9	14.4	14.2
Vitamins (as Percentage of RDA)[a]							
Vitamin A	**	148	143	117	114	102	89
Vitamin C	**	217	196	211	191	201	159
Vitamin E	**	91	80	91	88	90	82
Vitamin B_6	**	282	237	192	155	171	119
Vitamin B_{12}	**	350	314	273	222	241	156
Niacin[b]	**	245	206	192	152	175	131
Thiamin	**	270	228	204	165	180	137
Riboflavin	**	350	303	259	210	200	161
Folate[c]	**	127	108	97	78	77	53
Minerals (as Percentage of RDA)[a]							
Calcium	**	116	102	79	65	89	54
Iron	**	145	125	155	110	163	87
Magnesium	**	174	156	110	92	75	57
Phosphorus	**	238	212	111	91	132	84
Zinc	**	101	87	99	88	98	79
Other Dietary Components							
Fiber (g)	**	12.4	11.5	14.9	12.5	16.8	12.1
Cholesterol (mg)	**	210	188	247	199	320	210
Sodium (mg)	**	2,931	2,558	3,553	2,902	4,474	2,933
Sample Size		**357**	**336**	**552**	**560**	**446**	**441**
Weighted Sample Size (Thousands)		**5,804**	**5,558**	**9,858**	**9,778**	**9,717**	**8,982**

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994-1996 CSFII.

[a] Mean intakes of vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus in this table are measured as a percentage of the Recommended Dietary Allowances (RDAs) based on the new Dietary Reference Intakes (DRIs). For the remaining vitamins and minerals except calcium, mean intakes are measured as a percentage of the 1989 RDAs. For calcium, mean intake is measured as a percentage of the DRI-based Adequate Intake.

[b] The reported intake of niacin as a percentage of the RDA is an underestimate because intake is reported in mg of niacin and does not include an estimate of the niacin that is contributed by the conversion of tryptophan to niacin. The RDA is given in mg of niacin equivalents and assumes that all niacin will be considered.

[c] The reported intake of folate as a percentage of the RDA is an underestimate because intake is reported in mcg of folate but the RDA is given in mcg of dietary folate equivalents. Expressing intake in mcg of folate does not make allowance for the high bioavailability of synthetic folic acid, as from fortified ready-to-eat cereals. Dietary folate equivalents consider bioavailability.

REA = Recommended Energy Allowance.

*Differences in intake among subgroups significantly different from zero at the .05 level, F test.
**Differences in intake among subgroups significantly different from zero at the .01 level, F test.

with 17 percent among 14- to 18-year-old males (Table A.6.A). Food energy intake relative to the REA is essentially constant for male school-aged children at 96 to 97 percent and for female school-aged children at 83 to 87 percent.

The proportion of energy provided by macronutrients varies little by age/gender group, but these small differences are statistically significant for saturated fat, added sugars, and total carbohydrates (Table III.4). The percentage of energy provided by added sugars tends to rise slightly with age (from about 18 percent to nearly 21 percent). Males ages 14 to 18 consume 23 percent of breakfast calories as added sugars, which is higher than for the other age/gender groups (Table A.6.A). At lunch, however, teenage males and females have comparable intakes of added sugars as a percentage of food energy (23 and 22 percent, respectively, Table A.6.B). Absolute intake of added sugars ranges from 19 tsp/day (more than 3/8 cup) for girls ages 6 to 8 to 36 tsp/day (3/4 cup) for males ages 14 to 18 (Figure III.2). Discretionary fat intake as a percentage of food energy is essentially the same for all the age/gender groups (see Appendix Tables A.5.A and A.5.B).

Race/Ethnicity. We found small but statistically significant differences in energy intake by racial/ethnic group, with the highest values for non-Hispanic whites and the lowest for "others," which includes Asian and Pacific Islanders, American Indians and Alaskan natives, and other racial/ethnic groups (Table III.5).[4] Similarly, the percentages of food energy from total fat, saturated fat, added sugars, and discretionary fat are lowest for "others." The food energy intake provided by discretionary fat and added sugars combined is 36 percent of total energy for "others"--substantially lower than that for Hispanics and for non-Hispanic whites and blacks (Figure III.3). Non-Hispanic black children have the highest mean fat intake levels, including 34.8 percent of food energy from

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[4]As described, the racial/ethnic group called "others" includes people from very different cultural backgrounds. For example, Asians' foodways vary greatly with their country of origin, and their foodways, in turn, differ greatly from those of American Indians and Alaskan natives. It is not clear who falls into the remaining "other racial/ethnic groups," but this group may include persons who classify themselves as mixed race.

TABLE III.5

MEAN 24-HOUR NUTRIENT INTAKE AMONG SCHOOL-AGED CHILDREN, BY RACE/ETHNICITY, 1994 TO 1996

		Mean 24-Hour Intake			
Dietary Component		Hispanic	Non-Hispanic Black	Non-Hispanic White	Other
Food Energy (as Percentage of 1989 REA)	**	87	88	93	82
Percentage of Food Energy from:					
Total fat	**	32.6	34.8	32.1	30.0
Saturated fat	**	11.7	12.3	11.6	10.5
Carbohydrate					
Added sugars	**	17.7	19.2	20.6	14.4
Total	**	53.5	51.6	55.4	54.9
Protein	**	14.8	14.6	13.9	16.0
Vitamins (as Percentage of RDA)[a]					
Vitamin A	**	112	93	122	92
Vitamin C		198	206	192	193
Vitamin E	**	83	82	90	74
Vitamin B_6		185	170	186	185
Vitamin B_{12}		260	240	250	236
Niacin[b]		172	175	180	173
Thiamin		187	182	192	188
Riboflavin	**	231	209	245	201
Folate[c]	**	89	75	88	78
Minerals (as Percentage of RDA)[a]					
Calcium	**	76	64	86	65
Iron	**	124	120	135	122
Magnesium	**	103	89	106	102
Phosphorus	**	130	116	137	121
Zinc		91	87	93	90
Other Dietary Components					
Fiber (g)	**	14.1	12.2	13.9	13.2
Cholesterol (mg)	**	260	261	224	225
Sodium (mg)		3,136	3,283	3,364	3,097
Sample Size		**430**	**411**	**1,735**	**116**
Weighted Sample Size (Thousands)		**6,481**	**7,705**	**34,190**	**2,321**

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994-1996 CSFII.

[a] Mean intakes of vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus in this table are measured as a percentage of the Recommended Dietary Allowances (RDAs) based on the new Dietary Reference Intakes (DRIs). For the remaining vitamins and minerals except calcium, mean intakes are measured as a percentage of the 1989 RDAs. For calcium, mean intake is measured as a percentage of the DRI-based Adequate Intake.

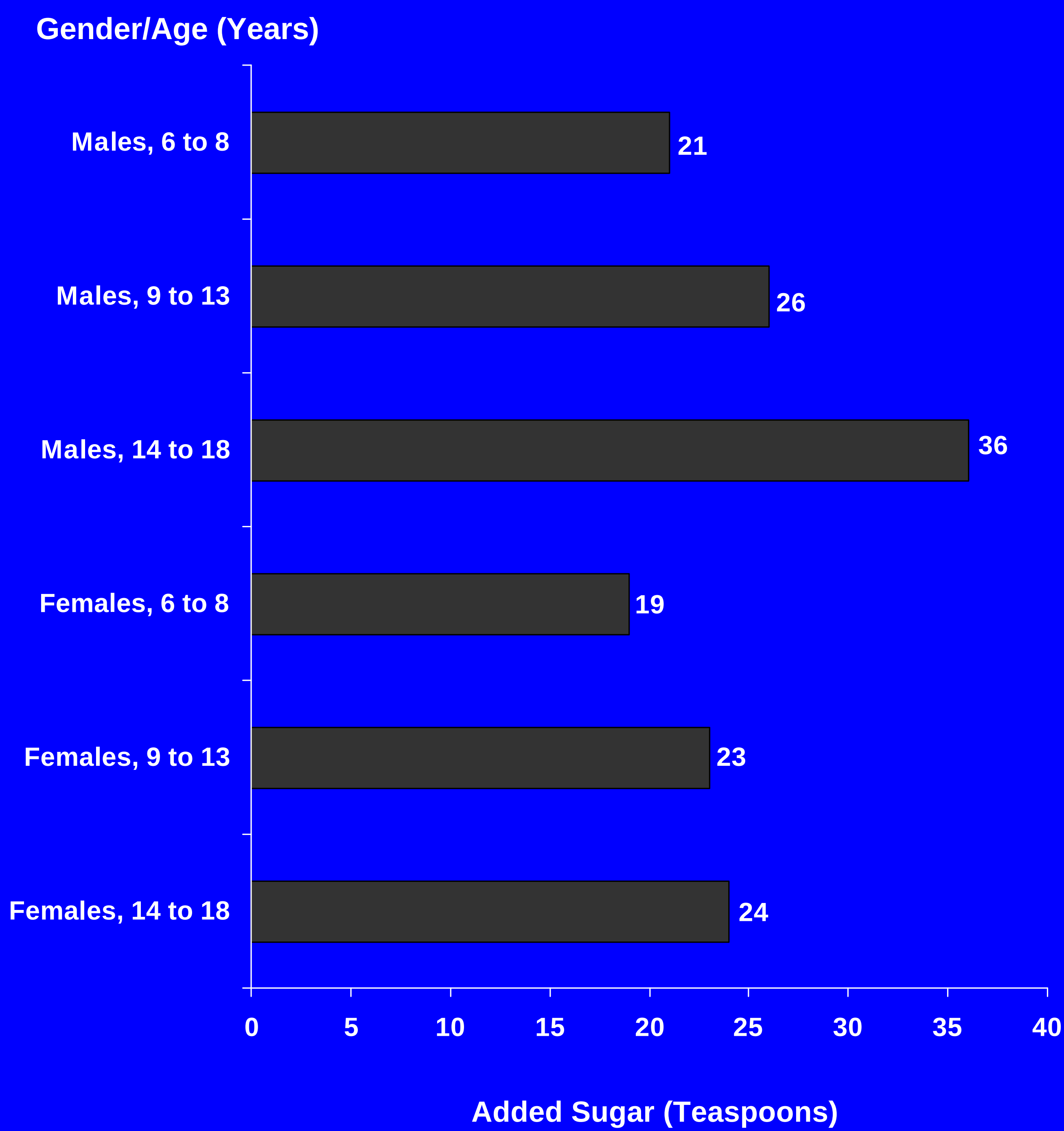
[b] The reported intake of niacin as a percentage of the RDA is an underestimate because intake is reported in mg of niacin and does not include an estimate of the niacin that is contributed by the conversion of tryptophan to niacin. The RDA is given in mg of niacin equivalents and assumes that all niacin will be considered.

[c] The reported intake of folate as a percentage of the RDA is an underestimate because intake is reported in mcg of folate but the RDA is given in mcg of dietary folate equivalents. Expressing intake in mcg of folate does not make allowance for the high bioavailability of synthetic folic acid, as from fortified ready-to-eat cereals. Dietary folate equivalents consider bioavailability.

REA = Recommended Energy Allowance.

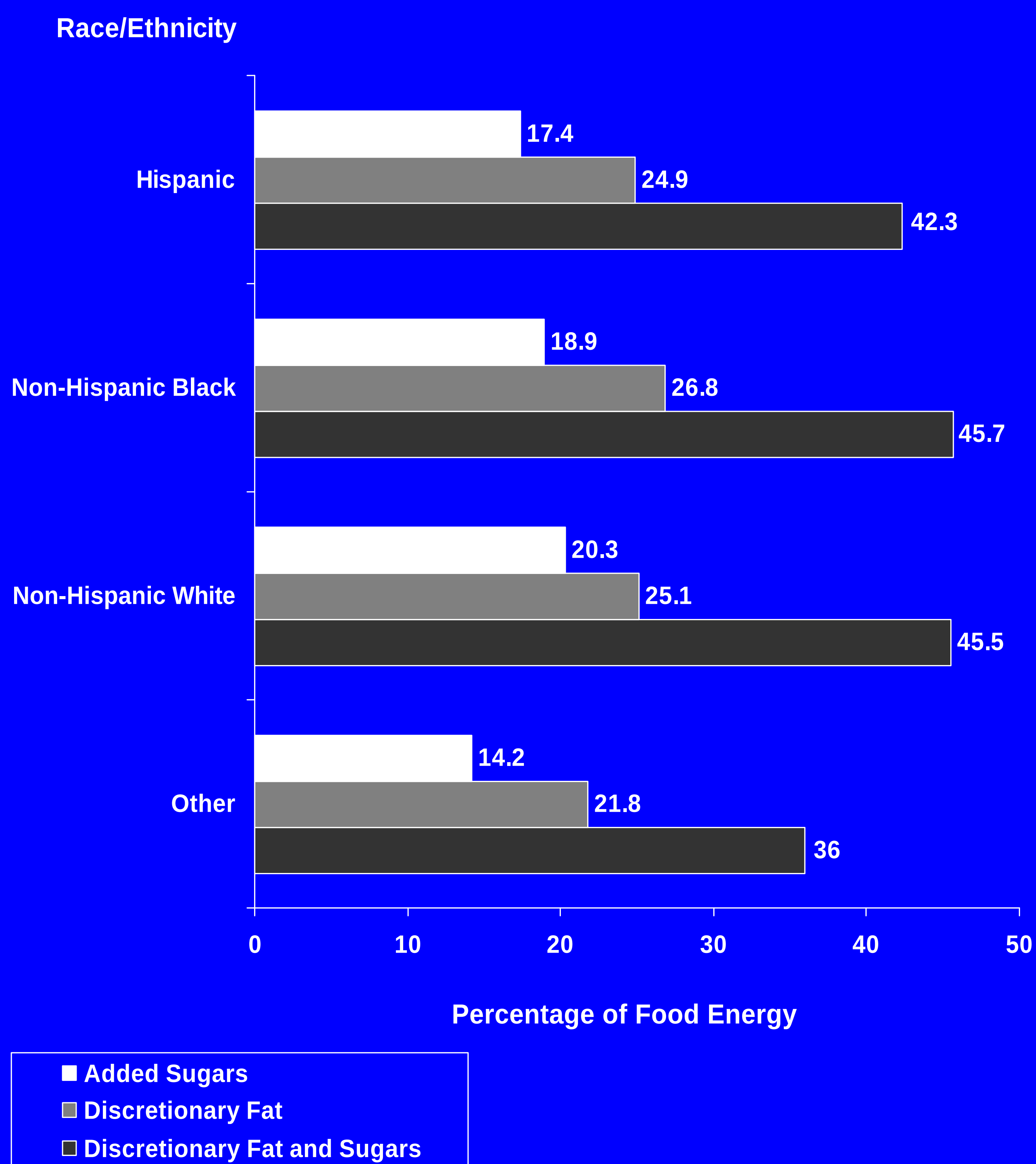
*Differences in intake among subgroups significantly different from zero at the .05 level, F-test.
**Differences in intake among subgroups significantly different from zero at the .01 level, F-test.

Figure III.2
Daily Intake of Added Sugar, by Gender and Age, 1994-1996 CSFII



Note: 24 teaspoons equal one-half cup of sugar.

Figure III.3
Discretionary Fat and Added Sugar Intake, by Race/Ethnicity, 1994-1996 CSFII



fat and 12.3 percent from saturated fat. By contrast, non-Hispanic white children have the highest mean intake level of added sugars (20.6 percent).

Household Income and Food Sufficiency Status. There are no clear trends for differences in energy intake by household income (Table III.6), but the group with the highest energy intake relative to the REA was the highest-income group (more than 300 percent of poverty), whose mean food energy intake is 94 percent of the REA. This group also has the lowest fat intake level (31.6 percent of food energy) and the highest added sugars intake level (20.4 percent of food energy) among the income groups.

When the small sample identified as "food insufficient" was compared with the food sufficient, the only statistically significant difference in macronutrient and energy intake was the slightly higher mean protein intake as a percentage of food energy among the food insufficient (Table III.7). However, since the sample of food insufficient children is so small, differences in intake between these groups that are not statistically significant at the five percent level or less may still be substantively interesting. For example, mean food energy intake relative to the REA among food sufficient children is five percentage points higher than among food insufficient children (91 versus 86 percent).

2. Vitamins and Minerals

a. All School-Aged Children

The extent to which school-aged children's average intakes of vitamins and minerals approaches or exceeds the RDA (or AI, in the case of calcium) varies considerably by nutrient and by whether average intake is measured using mean or median values. Relative to age-specific standards, the

TABLE III.6

MEAN 24-HOUR NUTRIENT INTAKE AMONG SCHOOL-AGED CHILDREN, BY HOUSEHOLD INCOME, 1994 TO 1996

		Mean 24-Hour Intake				
Dietary Component		≤100% of Poverty Line	101 to 130% of Poverty Line	131 to 185% of Poverty Line	186 to 299% of Poverty Line	≥ 300% of Poverty Line
Food Energy (as Percentage of 1989 REA)	*	89	90	89	89	94
Percentage of Food Energy from:						
Total fat	**	33.6	34.0	33.1	33.1	31.6
Saturated fat	**	12.0	12.2	12.0	11.7	11.3
Carbohydrates						
Added sugars	**	17.7	19.8	20.1	19.9	20.4
Total	**	52.4	52.3	54.0	54.5	56.0
Protein	**	14.9	14.7	14.0	14.1	13.9
Vitamins (as Percentage of RDA)[a]						
Vitamin A	*	110	98	113	110	123
Vitamin C		196	191	186	183	203
Vitamin E		83	80	86	86	91
Vitamin B_6	*	181	162	186	179	188
Vitamin B_{12}		270	291	252	232	241
Niacin[b]		174	165	176	177	182
Thiamin		188	175	192	186	195
Riboflavin		229	220	238	233	242
Folate[c]	*	84	74	88	83	90
Minerals (as Percentage of RDA)[a]						
Calcium	**	77	70	77	79	85
Iron	**	126	117	132	127	137
Magnesium		101	93	102	102	105
Phosphorus		133	124	129	130	135
Zinc		92	87	94	88	94
Other Dietary Components						
Fiber (g)	**	13.3	12.2	12.9	13.1	14.5
Cholesterol (mg)	**	269	279	243	217	218
Sodium (mg)		3,299	3,153	3,219	3,293	3,377
Sample Size		**547**	**196**	**369**	**595**	**985**
Weighted Sample Size (Thousands)		**9,033**	**3,189**	**6,825**	**10,338**	**20,310**

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994-1996 CSFII.

[a] Mean intakes of vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus in this table are measured as a percentage of the Recommended Dietary Allowances (RDAs) based on the new Dietary Reference Intakes (DRIs). For the remaining vitamins and minerals except calcium, mean intakes are measured as a percentage of the 1989 RDAs. For calcium, mean intake is measured as a percentage of the DRI-based Adequate Intake.

[b] The reported intake of niacin as a percentage of the RDA is an underestimate because intake is reported in mg of niacin and does not include an estimate of the niacin that is contributed by the conversion of tryptophan to niacin. The RDA is given in mg of niacin equivalents and assumes that all niacin will be considered.

[c] The reported intake of folate as a percentage of the RDA is an underestimate because intake is reported in mcg of folate but the RDA is given in mcg of dietary folate equivalents. Expressing intake in mcg of folate does not make allowance for the high bioavailability of synthetic folic acid, as from fortified ready-to-eat cereals. Dietary folate equivalents consider bioavailability.

REA = Recommended Energy Allowance.

*Differences in intake among subgroups significantly different from zero at the .05 level, F-test.

TABLE III.7

MEAN 24-HOUR NUTRIENT INTAKE AMONG SCHOOL-AGED CHILDREN, BY FOOD SUFFICIENCY STATUS, 1994 TO 1996

Dietary Component		Mean 24-Hour Intake: Food Sufficient	Food Insufficient
Food Energy (as Percentage of 1989 REA)		91	86
Percentage of Food Energy from:			
Total fat		32.5	32.8
Saturated fat		11.7	11.8
Carbohydrates			
Added sugars		19.8	17.4
Total		54.6	53.2
Protein	*	14.2	15.0
Vitamins (as Percentage of RDA)[a]			
Vitamin A		115	108
Vitamin C		195	176
Vitamin E		88	82
Vitamin B_6		184	176
Vitamin B_{12}		250	230
Niacin[b]	*	178	159
Thiamin		191	180
Riboflavin		236	225
Folate[c]		87	86
Minerals (as Percentage of RDA)[a]			
Calcium		81	80
Iron		131	116
Magnesium		103	101
Phosphorus		132	135
Zinc		92	86
Other Dietary Components			
Fiber (g)		13.6	13.6
Cholesterol (mg)	**	232	293
Sodium (mg)		3,310	3,111
Sample Size		**2,596**	**84**
Weighted Sample Size (Thousands)		**47,924**	**1,435**

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: The food sufficiency status of the child's family is assessed by a single CSFII question on whether members of the child's family got enough food to eat over the previous three months.

[a] Mean intakes of vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus in this table are measured as a percentage of the Recommended Dietary Allowances (RDAs) based on the new Dietary Reference Intakes (DRIs). For the remaining vitamins and minerals except calcium, mean intakes are measured as a percentage of the 1989 RDAs. For calcium, mean intake is measured as a percentage of the DRI-based Adequate Intake.

[b] The reported intake of niacin as a percentage of the RDA is an underestimate because intake is reported in mg of niacin and does not include an estimate of the niacin that is contributed by the conversion of tryptophan to niacin. The RDA is given in mg of niacin equivalents and assumes that all niacin will be considered.

[c] The reported intake of folate as a percentage of the RDA is an underestimate because intake is reported in mcg of folate but the RDA is given in mcg of dietary folate equivalents. Expressing intake in mcg of folate does not make allowance for the high bioavailability of synthetic folic acid, as from fortified ready-to-eat cereals. Dietary folate equivalents consider bioavailability.

REA = Recommended Energy Allowance.

*Differences in intake among subgroups significantly different from zero at the .05 level, F-test.
**Differences in intake among subgroups significantly different from zero at the .01 level, F-test.

mean intake levels of most vitamins and minerals (not including the contributions of vitamin-mineral supplements) are much higher than the medians. This arises because the distribution of intakes for most vitamins and minerals is skewed toward those with high intake levels. Both the mean and the median intakes of vitamin C, thiamin, riboflavin, niacin, vitamin B_6, and vitamin B_{12} far exceed 100 percent of the RDA, with most substantially above 100 percent (Tables III.1 and III.2).[5] For example, the mean intakes of vitamin B_{12}, riboflavin, and vitamin C are 249, 236, and 195 percent of the RDA, respectively. The mean, but not the median, intakes of vitamin A and magnesium exceed 100 percent of the RDA. Median intakes of vitamin E, folate, calcium, and zinc among school-aged children are substantially less than the RDA/AI. In particular, the median intake of zinc is 84 percent of the RDA and the median intakes of vitamin E, folate, and calcium are all less than 80 percent of the relevant standard. Examining mean intake levels among all school-aged children obscures some important differences by subgroup, described in the following section.

Previous studies (Life Sciences Research Office 1995) have identified vitamins A, E, and B_6, calcium, and zinc as nutrients for which mean intakes are typically much lower than the RDA for children in several age/gender groups. For the most part, our results are consistent with this analysis (except for vitamin B_6 and folate), but care must be taken in comparing the information presented in this report with earlier surveys because of changes in the RDAs.[6] For example, even if folate intake has not changed over time, folate intake by children of all ages would appear less favorable relative to the standard, since the 1998 RDAs for folate are much higher than the 1989 RDAs (Table II.1). Similarly, the 1997 RDAs for phosphorus and magnesium are higher for several age groups

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[5]The mean and median intakes of iron and phosphorus are somewhat higher than 100 percent of the RDA. However, as discussed below, there is evidence of inadequate intake of these nutrients for a substantial proportion of particular subgroups of children.

[6]See the tables in Appendix A for more information on nutrient intake levels that are either not measured relative to any dietary standards or measured relative to alternative dietary standards.

than they were in 1989. On the other hand, the 1998 RDA for vitamin B_6 is substantially lower than the 1989 RDA. For more information on mean micronutrient intake levels relative to both of the RDA standards, see Appendix Table A.2.

Another way of looking at school-aged children's vitamin and mineral intakes is to examine nutrient densities, which indicate how much of a particular nutrient people consume in relation to the amount of food energy they consume. In particular, it indicates the absolute nutrient intake per 1,000 kilocalories of food energy intake. Children who consume primarily foods that are high in vitamins and minerals will have high density levels. Those who consume many foods high in other dietary components, such as fat or sugar, will likely have low nutrient density levels. Table III.8 shows school-aged children's mean nutrient density levels at breakfast, at lunch, and over 24 hours.

For all vitamins and minerals except vitamin E, the nutrient densities of children's breakfast intakes are higher than their nutrient densities at lunch and over 24 hours. For some nutrients, these differences are quite large. For example, children's nutrient densities of vitamin A, vitamin C, vitamin B_6, thiamin, riboflavin, folate, iron, and phosphorus at breakfast are more than twice what they are at lunch. This is likely related to children's consumption of fortified breakfast cereals, which typically have high nutrient densities.

b. Selected Subgroups

Age/Gender. Regardless of whether the entire day, breakfast, or lunch is considered (Tables III.4, A.6.A, and A.6.B), mean intakes differ significantly by age/gender for all micronutrients examined except vitamin E (for which only 24-hour intakes differ significantly). In many cases, the differences are small. Examination of 24-hour intakes reveals that, with few exceptions, intakes of vitamins and minerals relative to dietary standards are much lower for females ages 14 to 18 years than for other age/gender groups (Table III.4). The relative intakes are lowest for the same vitamins

TABLE III.8

MEAN NUTRIENT DENSITY AMONG SCHOOL-AGED CHILDREN, 1994 TO 1996

	Mean Intake per 1,000 kcal of Food Energy Intake		
Dietary Component	Breakfast	Lunch	24 Hours
Vitamins			
Vitamin A (mcg RE)	837	335	444
Vitamin C (mg)	88	43	49
Vitamin E (mg)	3.2	3.5	3.5
Vitamin B_6 (mg)	1.6	0.7	0.9
Vitamin B_{12} (mcg)	3.0	1.9	2.2
Niacin (mg)	14.4	9.3	10.3
Thiamin (mg)	1.4	0.7	0.8
Riboflavin (mg)	1.9	0.9	1.0
Folate (mcg)	291	91	126
Minerals			
Calcium (mg)	660	450	449
Iron (mg)	13.7	6.1	7.5
Magnesium (mg)	145	113	118
Phosphorus (mg)	774	301	617
Zinc (mg)	7.0	4.8	5.4
Other Dietary Components			
Fiber (g)	6.2	6.8	6.7
Cholesterol (mg)	148	100	114
Sodium (mg)	1,419	1,692	1,609
Sample Size	**2,495**	**2,650**	**2,692**

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: Only respondents with positive food energy intake are included in the calculations.

kcal = kilocalories; mcg = micrograms; mg = milligrams; NE = niacin equivalent; RE = retinol equivalent.

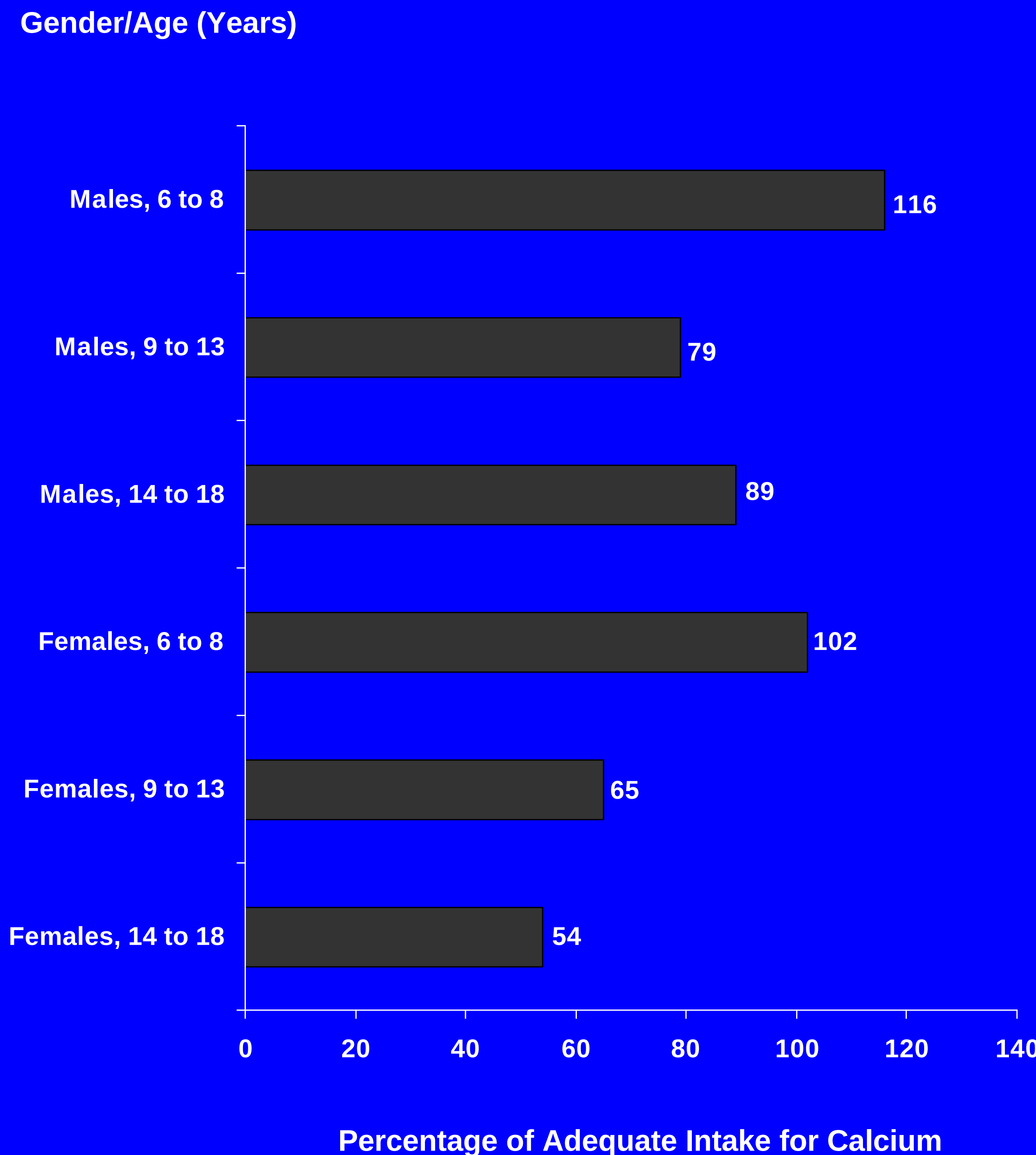
and minerals that were identified as problems for all children--vitamin A, folate, calcium, magnesium, and zinc. Mean folate intake by females ages 14 to 18 is especially low--53 percent of the RDA. Mean calcium intakes by females ages 9 to 13 and 14 to 18 are also very low--65 and 54 percent of the AI, respectively (Figure III.4). Mean calcium intakes by males in the same age groups, although lower than recommended, are considerably higher than those by females--79 and 89 percent of the AI.

At lunch (Appendix Table A.6.B), mean intakes of vitamins and minerals generally exceed one-third of the RDA/AI for the age-gender groups, with the following notable exceptions:

- Mean vitamin A intake is 30 percent or less of the RDA for all groups except females ages 6 to 8.
- Mean vitamin E and zinc intakes are 30 percent or less of the RDA for all groups.
- Mean folate intakes are 25 percent or less of the RDA for all groups, and only 13 percent for females ages 14 to 18.
- Mean calcium intakes are less than 30 percent of the AI for all children nine and older.
- Mean phosphorus intakes are less than one-third of the RDA for females nine and older.
- Mean magnesium intakes are less than one-third of the RDA for all groups except children ages six to eight.
- Mean iron intakes are close to or more than one-third of the RDA for all groups except for females ages 14 to 18, for whom they are only 23 percent.

In general, children's mean intake of vitamins and minerals as a percentage of the RDA tends to decline as children grow older. Part of the reason for this is that recommended nutrient intakes rise with the age group of the child much more quickly that the recommended food energy allowance (see Table II.3). Thus, compared with younger children, the diets of older children would provide a lower percentage of the recommended nutrient intakes unless they consumed greater proportion

Figure III.4
Mean Calcium Intake, by Gender and Age, 1994-1996 CSFII



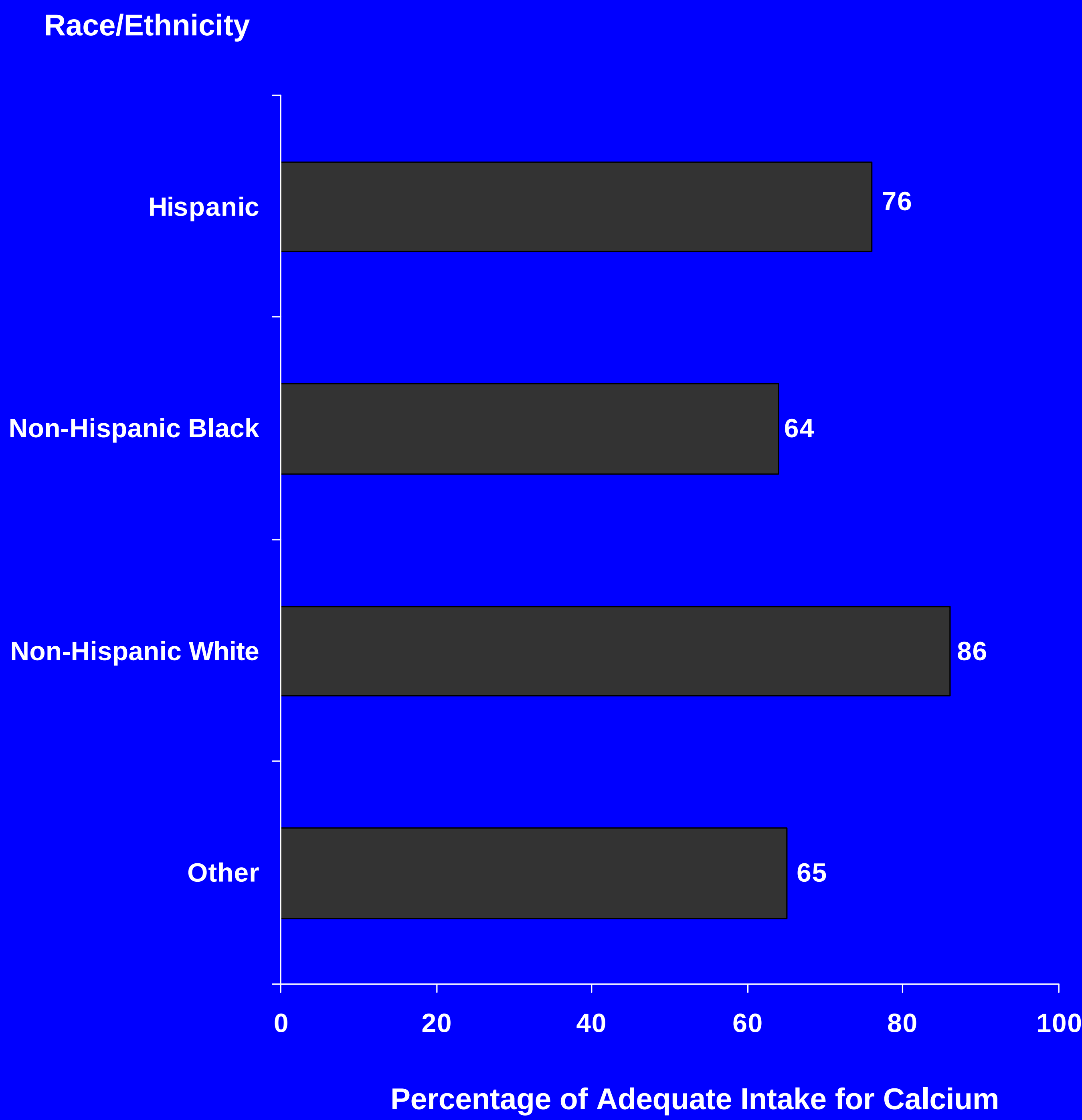
of food rich in nutrients (or a larger amount of food energy relative to the REA). However, the tendency is in the other direction. Girls ages 14 to 18 consume fewer milk products than younger girls, and both males and females tend to consume less fruit during their teenage years than when younger.

Racial/Ethnic Group. Mean intakes of several vitamins and minerals are substantially lower for some racial/ethnic groups than for others (Table III.5). Differences in intake among subgroups are statistically significant at the one percent level for vitamins A and E, riboflavin, folate, calcium, iron, and phosphorus. In general, non-Hispanic white and Hispanic children tend to have higher mean intake levels than non-Hispanic black and "other" children. In particular:

- Over 24 hours (Table III.5) and at breakfast (Appendix Table A.7.A), non-Hispanic blacks and "others" have lower relative intakes of vitamin A and folate than do Hispanics and non-Hispanic whites.
- Over 24 hours and at lunch (Appendix Table A.7.B), Hispanics, non-Hispanic blacks, and "others" have lower mean calcium intakes than non-Hispanic whites, and the difference is most marked for the non-Hispanic blacks and "others" (Figure III.5). At breakfast, intakes by Hispanics, non-Hispanic whites, and "others" are comparable. Intakes by non-Hispanic blacks are lower.
- "Others" have the lowest mean vitamin E intake levels, which may be related to their lower fat intake at breakfast, lunch, and over 24 hours..
- Non-Hispanic blacks have the lowest mean magnesium intake, and this difference is notable at breakfast and lunch, as well as over 24 hours.

Household Income. When examined by household income group, there are few sizable differences in mean 24-hour vitamin and mineral intakes relative to dietary standards. Intakes of only two--calcium and iron--differ significantly at the one percent level (Table III.6). Micronutrient intakes are not consistently higher with increased income. With the exception of vitamin B_{12}, vitamin and mineral intakes tend to be lowest for those at 100 to 130 percent of poverty. Mean intakes of

Figure III.5
Mean Calcium Intake, by Race/Ethnicity, 1994-1996 CSFII



vitamin A and iron are substantially higher for those above 300 percent of the poverty line than for those below that income, but there is no evidence of a trend of increased intake with increased income even for these two nutrients.

At breakfast, there are sizable differences by household income in mean iron intake relative to the RDA, with those at 100 to 130 percent of the poverty line having the lowest relative intakes (Appendix Table A.8.A). Nonetheless, mean intake for that group was still high--one-third of the RDA. Differences in mean intake by household income are modest at lunch (Table A.8.B).

Food Sufficiency Status. Table III.7 shows that mean vitamin and mineral intakes tend to be higher for food sufficient than for food insufficient children (of whom there are only 84 in our sample). However, the only statistically significant difference over 24 hours is lower intake of niacin by the food insufficient. At breakfast, food sufficient children have significantly higher intakes of three vitamins and minerals (Table A.9.A; see Table A.9.B for lunch intakes of the food sufficient and insufficient). Demographic data (Table II.4) indicate that the food insufficient group includes a disproportionately large percentage of Hispanics.

3. Other Food Components

a. All Children

Mean and median intakes of fiber, cholesterol, and sodium are presented in grams (g) or milligrams (mg) rather than as a percentage of a standard. For each of these food components, mean intakes (Table III.1) are higher than the medians (Table III.2). The target daily fiber intake of "age plus 5" ranges from 11 to 23 g for children of the ages included in this study. Clearly, school-aged children's median fiber intake of 12 g per 24 hours is well below the age-adjusted target. Both mean (234 mg) and median (197 mg) cholesterol intake are well below the suggested upper limit of 300 mg/day. On the other hand, both mean (approximately 3,300 mg) and median (approximately 3,000 mg) total sodium intake levels are well in excess of the suggested upper limit of 2,400 mg/day. The findings on cholesterol and sodium are consistent with those of earlier studies (for example, Devaney et al. 1995; Johnson et al. 1994; and Levine and Guthrie 1997).

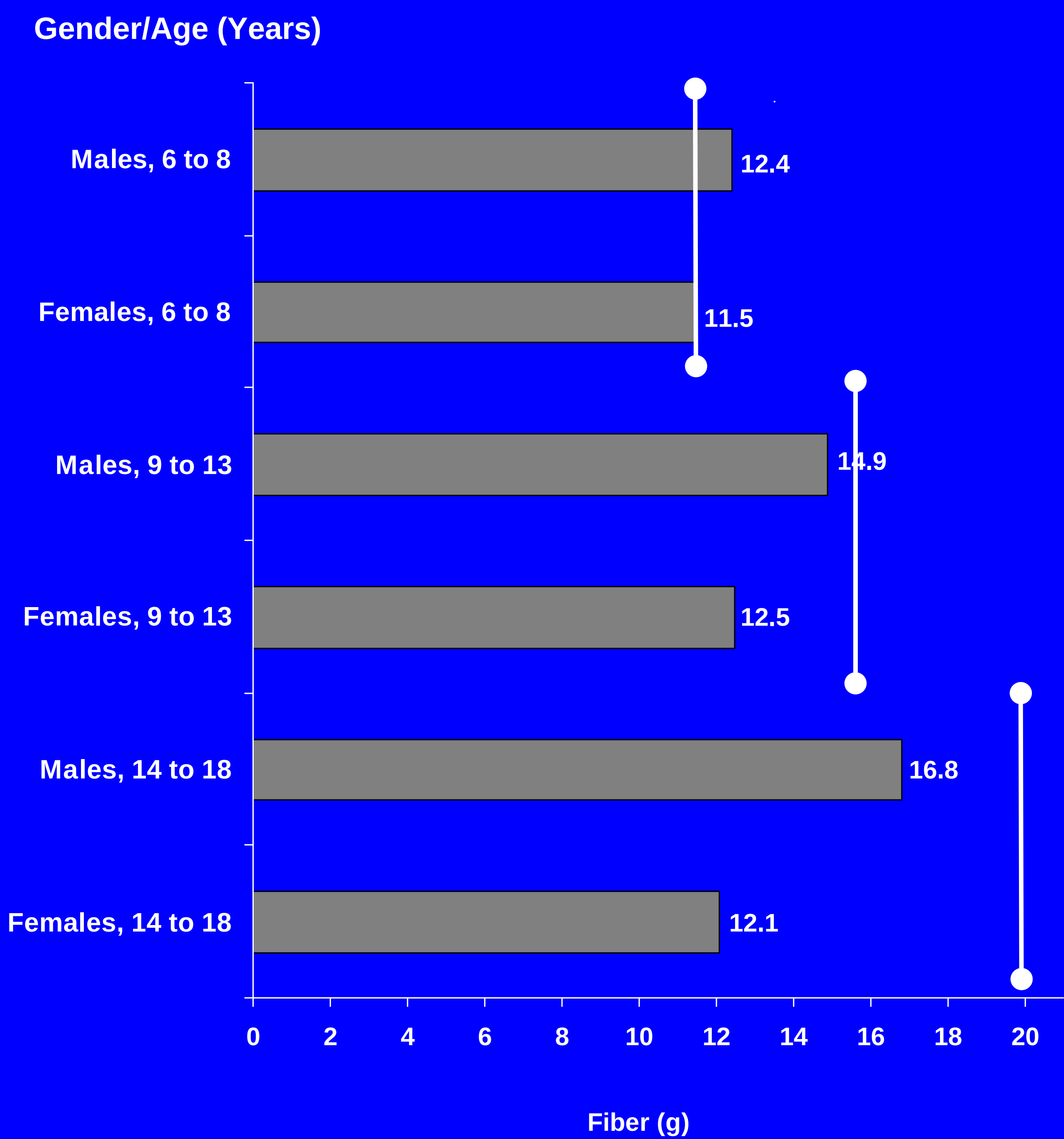
b. Selected Subgroups

Absolute fiber intake is higher for males ages 9 to 13 (15 g/day) and ages 14 to 18 (17 g/day) than for the other age/gender groups (Table III.4). However, both males and females ages 6 to 8 have mean fiber intakes (about 12 g per day) that are closer to the recommended "age plus 5" goal than the mean fiber intakes of older children (Figure III.6). The fiber intakes of Hispanic and non-Hispanic white children exceed those of black and "other" children, and fiber intake is higher for those with household incomes exceeding 300 percent of poverty than for those with lower incomes. A difference in fiber intake is not apparent by food sufficiency status.

Mean cholesterol and sodium intakes increase with age for both males and females. Males ages 14 to 18 have a mean cholesterol intake of 320 mg, which exceeds the target maximum of 300 g. Their mean sodium intake is nearly 4,500 mg, almost twice the target maximum of 2,400 mg (Figure III.7). As is true for their total intake, males ages 14 to 18 also have higher cholesterol and sodium intakes than do the other age/gender groups at both breakfast and lunch (Appendix Tables A.6.A and A.6.B).

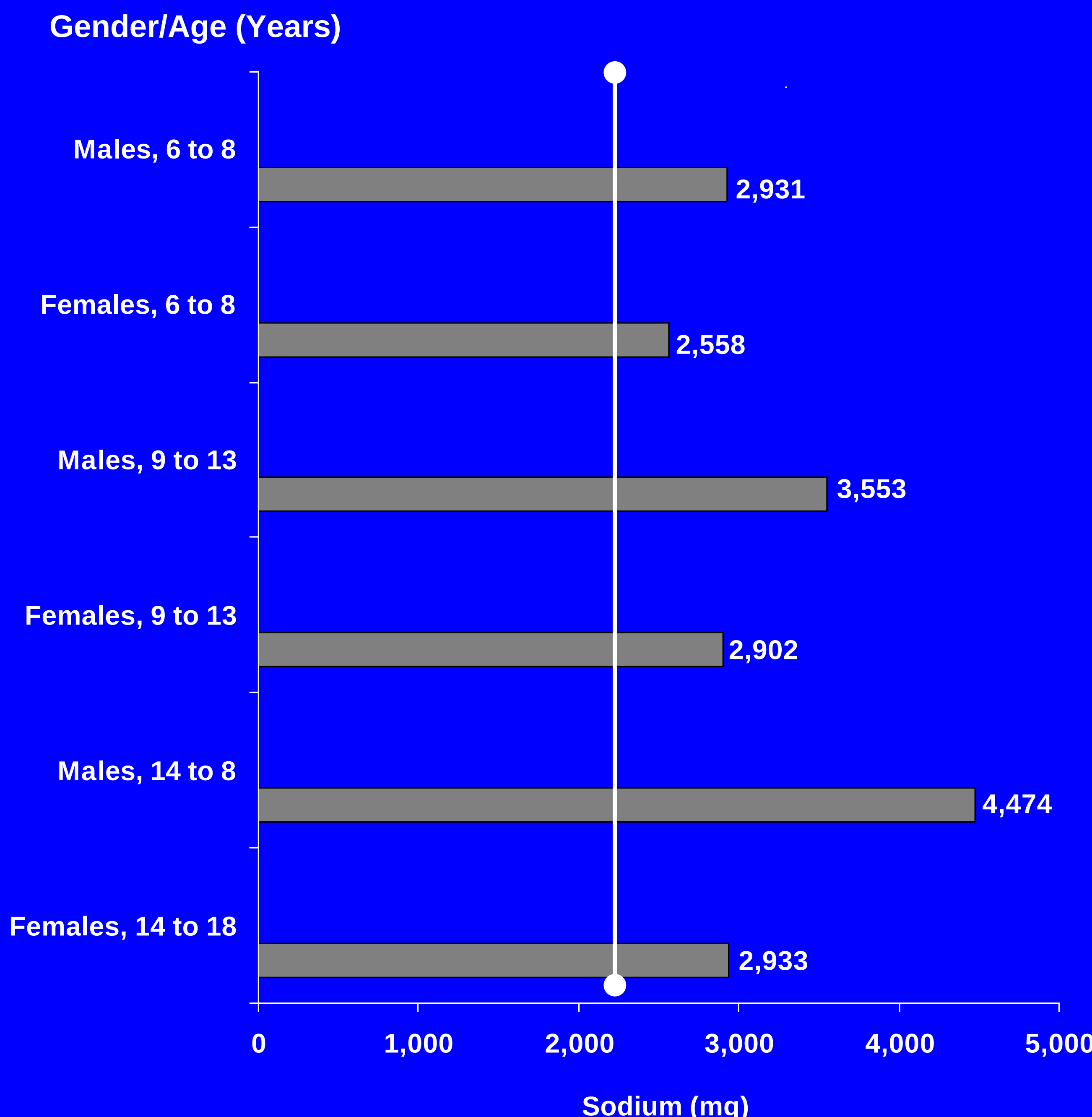
Mean cholesterol intake varies significantly by race/ethnicity (Table III.5). Non-Hispanic whites and "others" have lower cholesterol intakes than Hispanics and non-Hispanic blacks. Cholesterol intake is highest for those with household incomes at 101 to 130 percent of the poverty line and lowest for those in the two highest income groups (Table III.6), but it may be influenced by the differences in racial/ethnic composition of the groups. Similarly, cholesterol intake is significantly higher for the food insufficient (293 mg) than for the food sufficient (232 mg) (Table III.7).

Figure III.6
Mean Fiber Intake, by Gender and Age, 1994-1996 CSFII



Note: The fiber goal (vertical lines) represents an average for the age range in the group. The goal is actually age plus 5 years.

Figure III.7
Mean Sodium Intake Among School-Aged Children, by Gender and Age, 1994-1996 CSFII



Note: The suggested maximum sodium intake is 2,400 mg (vertical line). The sodium intake levels presented here do not include table salt added to foods.

B. ASSESSMENT OF ADEQUACY OF INTAKE

In this section, the adequacy of school-aged children's dietary intake is assessed. For most dietary components, the approach is to compare children's usual intake distribution with selected dietary standards, as described in Chapter II. This allows us to estimate the proportion of children whose usual intake meets or fails to meet specific dietary standards, in other words, to estimate the proportion of children whose diets are at risk of being inadequate in some respect. For food energy, we simply present the full distribution of usual intake.[7]

1. Energy

Table III.9 shows the distribution of usual 24-hour food energy intake in absolute terms and relative to the REA (among all school-aged children and for specific age/gender groups). The table shows a very wide range of usual energy intakes among school-aged children within each of the age/gender groups. The 5th percentile of the distribution among all children is 58 percent of the REA, and the 95th percentile is 135 percent of the REA.[8] The largest range of food energy intake occurs among 14- to 18-year-old males, for whom intake is 1,715 kcal/day at the 5th percentile and 4,412 kcal/day at the 95th percentile. The wide ranges for this and other groups reflect a

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[7]We do not present an assessment of the adequacy of food energy intake by comparing the usual intake distribution to the REA, because the likely underreporting of food energy intake discussed in Chapter I leads to underreporting in the proportion of children whose usual reported food energy intake meets the REA. This type of food energy intake assessment could be misleading. While there is also potential underreporting of the intakes of other dietary components, its extent is much less documented (for example, underreporting of fat intake may or may not be more common than underreporting of vitamin and mineral intake). In addition, the percentage of a group whose usual intake is less than a measure of the average energy requirement (the REA) cannot be used as an estimate of the prevalence of inadequate intake because intakes and requirements for energy are highly correlated (Carriquiry 1999).

[8]Again, this suggests that underreporting of food energy intake or low levels of physical activity are probably more common than overreporting of food energy intake or high levels of physical activity.

TABLE III.9

24-HOUR USUAL FOOD ENERGY INTAKE DISTRIBUTION AMONG SCHOOL-AGED CHILDREN, OVERALL AND BY AGE/GENDER, 1994 TO 1996

	24-Hour Usual Intake Distribution (Percentiles)								
Dietary Component	5th	10th	15th	25th	50th	75th	85th	90th	95th
Food Energy (kcal)									
Overall	1,275	1,424	1,529	1,694	2,045	2,472	2,744	2,549	3,288
Males, 6 to 8	1,301	1,420	1,502	1,624	1,864	2,131	2,292	2,410	2,601
Females, 6 to 8	1,228	1,316	1,378	1,473	1,658	1,857	1,969	2,047	2,165
Males, 9 to 13	1,512	1,655	1,753	1,903	2,199	2,535	2,738	2,888	3,130
Females, 9 to 13	1,160	1,302	1,400	1,550	1,854	2,200	2,409	2,561	2,805
Males, 14 to 18	1,715	1,924	2,073	2,306	2,791	3,364	3,719	3,983	4,412
Females, 14 to 18	1,285	1,404	1,486	1,610	1,857	2,131	2,294	2,412	2,600
Food Energy as Percentage of REA									
Overall	58	66	70	77	91	107	117	124	135
Males, 6 to 8	67	73	77	84	97	111	119	125	136
Females, 6 to 8	65	69	72	77	86	96	102	106	111
Males, 9 to 13	65	72	77	83	97	112	121	128	138
Females, 9 to 13	60	66	70	76	88	101	109	115	124
Males, 14 to 18	60	67	72	80	97	116	129	138	153
Females, 14 to 18	53	59	64	70	84	100	109	116	127

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: Children's usual intake distribution was determined based on two intake days using the Software for Intake Distribution Estimation, developed by Iowa State University (1996).

kcal = kilocalories; REA = Recommended Energy Allowance.

combination of great variation within groups in size and energy expenditure and also some variation in the accuracy of reporting.

At each percentile listed, food energy intakes relative to the REA of females are substantially lower than those of males. Only about 15 percent of females ages 6 to 8 years reach 100 percent of the REA, compared with about half of the males of the same age. Older females have somewhat higher intakes relative to the REA--about 25 percent reach 100 percent of the REA--again compared with about half of older males.

2. Vitamins and Minerals

a. All Children and Age/Gender Subgroups

Table III.10.A shows children's nutrient intake relative to specific dietary standards. The first column of this table identifies the percentages of children whose usual daily intakes (not including dietary supplements) are at or above the EAR. Comparison with the EAR is the recommended approach for assessment, as described in Chapter II, Section B.1. At present, this comparison can be made only for phosphorus, magnesium, and the B vitamins, because EARs have not been set for the remaining vitamins and minerals. For these remaining micronutrients except calcium, the second column shows the percentages of children whose usual daily intakes are at or above 80 percent of the 1989 RDA. Because there is no EAR for calcium and the AI is not intended to be used to assess the adequacy of calcium intake of groups, we simply present the usual intake distribution for calcium as a percentage of the AI (Table III.10.B).

Examination of the first column in Table III.10.A reveals five B vitamins (thiamin, riboflavin, niacin, vitamin B_6, and vitamin B_{12}) for which risk of inadequacy is very low--usual intakes are at or above the EAR for 96 percent or more of the school-aged children. However, usual intakes of

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TABLE III.10.A

PERCENTAGE OF SCHOOL-AGED CHILDREN WHOSE USUAL DAILY NUTRIENT INTAKE IS AT OR ABOVE DIETARY STANDARDS, 1994 TO 1996

	Usual 24-Hour Intake	
Dietary Component	Percentage of Children at or Above EAR[a]	Percentage of Children at or Above 80% of 1989 RDA[a]
Vitamins		
Vitamin A	---	71.9
Vitamin C	---	92.6
Vitamin E	---	59.0
Vitamin B_6	96.1	---
Vitamin B_{12}	98.5	---
Niacin	98.7	---
Thiamin	98.1	---
Riboflavin	97.9	---
Folate	49.4	---
Minerals		
Iron	---	87.6
Magnesium	63.5	---
Phosphorus	80.1	---
Zinc	---	64.4
Sample Size	**2,692**	**2,692**

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: Children’s usual intake distribution was determined based on two intake days using the Software for Intake Distribution Estimation, developed by Iowa State University (1996).

[a] For vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus, the EARs based on the new Dietary Reference Intakes are used. For the remaining nutrients the table shows the percentage of individuals whose intake is at or above 80 percent of the 1989 RDAs (an approximation of the estimated average requirement). The percentages of children meeting the EAR for niacin and folate are underestimated. The intake estimates do not account for the conversion of tryptophan to niacin or for the high bioavailability of synthetic folic acid, as from fortified ready-to-eat cereal, whereas the EARs cover these.

EAR = Estimated Average Requirement; REA = Recommended Energy Allowance.

TABLE III.10.B

24-HOUR USUAL CALCIUM INTAKE DISTRIBUTION AMONG SCHOOL-AGED CHILDREN, OVERALL AND BY SUBGROUP, 1994 TO 1996

	24-Hour Usual Intake Distribution of Calcium as a Percentage of the AI (Percentiles)								
Dietary Component	5th	10th	15th	25th	50th	75th	85th	90th	95th
Overall	36	44	49	58	78	101	116	126	143
Age/Gender									
Males, 6 to 8	65	74	81	91	112	136	150	160	175
Females, 6 to 8	60	68	74	83	101	120	131	139	151
Males, 9 to 13	45	51	56	63	77	94	104	110	121
Females, 9 to 13	37	42	46	53	66	80	89	95	104
Males, 14 to 18	42	50	56	66	86	113	129	142	163
Females, 14 to 18	27	32	35	41	54	69	78	84	94
Race/Ethnicity									
Hispanic	34	41	46	55	74	98	112	123	140
Black	33	39	43	50	63	79	88	95	105
White	41	48	54	63	83	107	122	133	150
Other	23	29	34	43	61	84	99	110	127

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: Children's usual intake distribution was determined based on two intake days using the Software for Intake Distribution Estimation, developed by Iowa State University (1996).

AI = Adequate Intake

*Differences in intake among subgroups significantly different from zero at the .05 level, F-test.
**Differences in intake among subgroups significantly different from zero at the .01 level, F-test.

three nutrients in the first column--folate, magnesium, and phosphorus--are at or above the EAR for much smaller percentages of children.

Folate. The data suggest that a large proportion of children do not meet their folate requirement, since slightly less than half the children have folate intakes at or above the EAR. Interpretation is difficult, because the intake data are expressed in micrograms of folate and the EAR is expressed in micrograms of dietary folate equivalents (DFEs), units that take into account the better absorption of folic acid added to food compared with naturally occurring food folate. Furthermore, there are other reasons to suspect that folate intake is underestimated (Institute of Medicine 1998). Even so, the proportion of children at risk of inadequate folate intake probably remains substantial overall.

Currently, many more children are likely to meet the standard for folate, since the fortification of enriched cereal grains with folic acid provides those who consume grain products with substantially more folate (Crane et al. 1995; and Lewis et al. 1999). Enriched cereal grains provide approximately 1.4 mg of folic acid/kg of grain, which translates to about 15 mcg (bread) to 45 mcg (rice) of folate per serving (using serving sizes specified for the Food Guide Pyramid, which are identical to those used in this report). Using the lower amount of folic acid/serving (15 mcg) and a mean intake of approximately five to nine servings of enriched grains/day (depending on the age/gender group), this corresponds to an additional average increase of approximately 75 to 135 mcg of folic acid daily. In DFEs (Suitor and Bailey, forthcoming), this would be a mean increase of approximately 130 to 230 DFEs daily.

Examination of the percentages meeting the EAR for folate by age/gender group reveals that the risk of inadequate intake is especially high for females ages 14 to 18--only 10 percent have usual folate intakes that equal or exceed the EAR expressed in micrograms of DFEs (Table III.11). About 40 percent of females ages 9 to 13 and of males ages 14 to 18 have favorable folate intakes relative

TABLE III.11

PERCENTAGE OF SCHOOL-AGED CHILDREN WHOSE USUAL DAILY NUTRIENT INTAKE IS AT OR ABOVE DIETARY STANDARDS, BY AGE/GENDER, 1994 TO 1996

		Percentage of Children Whose Usual 24-Hour Intake Is at or Above EAR or 80% of 1989 RDA[a]					
Dietary Component		Males, 6 to 8	Females, 6 to 8	Males, 9 to 13	Females, 9 to 13	Males, 14 to 18	Females, 14 to 18
Food Energy	**	43	18	44	27	45	25
Vitamins							
Vitamin A	**	91	88	74	74	70	56
Vitamin C	*	95	99	98	92	91	86
Vitamin E		62	48	59	60	64	59
Vitamin B_6	*	100	100	100	98	97	85
Vitamin B_{12}		100	100	100	99	100	92
Niacin		100	100	100	100	100	95
Thiamin		100	100	100	100	98	90
Riboflavin		100	100	100	100	97	95
Folate	**	87	86	64	41	42	10
Minerals							
Iron	**	97	97	99	81	98	56
Magnesium	**	99	100	84	67	38	11
Phosphorus	**	100	100	85	63	93	52
Zinc	**	76	60	76	61	73	48
Sample Size		**357**	**336**	**552**	**560**	**446**	**441**

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: Children's usual intake distribution was determined based on two intake days using the Software for Intake Distribution Estimation, developed by Iowa State University (1996).

[a] For vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus, the EARs based on the new Dietary Reference Intakes are used. For the remaining nutrients the table shows the percentage of individuals whose intake is at or above 80 percent of the 1989 RDAs (an approximation of the estimated average requirement). The percentages of children meeting the EAR for niacin and folate are underestimated. The intake estimates do not account for the conversion of tryptophan to niacin or for the high bioavailability of synthetic folic acid, as from fortified ready-to-eat cereal, whereas the EARs cover these.

EAR = Estimated Average Requirement; REA = Recommended Energy Allowance.

*Differences among subgroups significantly different from zero at the .05 level, chi-square test.
**Differences among subgroups significantly different from zero at the .01 level, chi-square test.

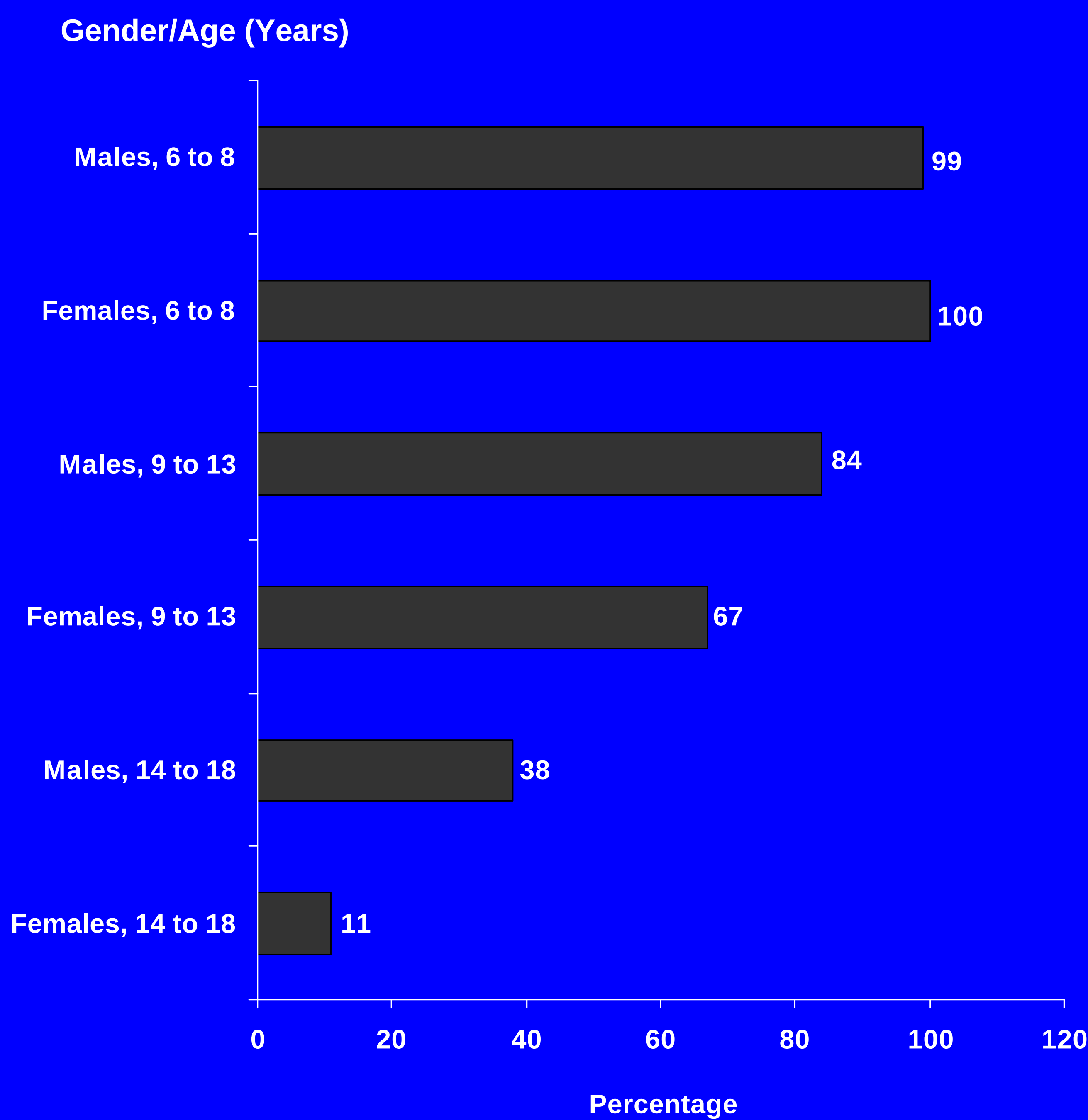
to the EAR. In comparison, younger children are much more likely to have intakes at or above their requirements.

Magnesium. Since only 64 percent of all children have usual magnesium intakes at or above the EAR, the risk of inadequate intake is substantial for this nutrient as well. Again, the risk is greatest for females ages 14 to 18--only 11 percent meet or exceed the EAR (Figure III.8). Males of this age group are also at high risk of inadequate magnesium intake--only 38 percent meet the standard. On the other hand, essentially all the children ages 6 to 8 meet the standard. Relative to body size and energy intake, the EAR for magnesium is much higher for older children than for younger ones.

Phosphorus. Despite the high mean intake of phosphorus (132 percent of the RDA), only 80 percent of all children meet or exceed the EAR for this mineral (Table III.10.A). Examination of the data reveals that the adequacy of phosphorus intake varies greatly by age/gender group. Only 52 percent of females ages 14 to 18 and 63 percent of females ages 9 to 13 have intakes at or above the EAR. On the other hand, all children ages 6 to 8 and 93 percent of males ages 14 to 18 have intakes at or above the EAR for phosphorus.

Nutrients for Which the Estimated Average Requirement Is Not Available. Compared with the assessment of adequacy of intakes of nutrients for which EARs have been set, assessment is less certain for nutrients in the second data column of Table III.10.A. It is not known to what extent 80 percent of the 1989 RDA is consistent with an average requirement, and this may vary from nutrient to nutrient (see Chapter II, Section B.1). For all the nutrients for which EARs have not been established, intakes fall short of the selected standard for more than five percent of the children--in some cases for large percentages of them.

Figure III.8
Percentage of School-Aged Children Meeting the EAR for Magnesium, by Gender and Age, 1994-1996 CSFII



Note: The EAR is the Estimated Average Requirement. The EARs for magnesium are 110 mg for males and females 4 to 8, 200 mg for males and females 9 to 13, 340 mg for males 14 to 18, and 300 mg for females 14 to 18.

The risk of vitamin C inadequacy is relatively small--93 percent of the children have usual intakes that meet the vitamin C standard (Table III.10). The percentages meeting the vitamin C standard are similar for most age/gender groups (Table III.11), although only 86 percent of the females ages 14 to 18 do so. For iron, although 88 percent of all children have usual intakes that meet the standard, only 56 percent of females ages 14 to 18 meet the standard (Table III.11). All the other subgroups are at very low risk (97 percent or more meet the standard) except females ages 9 to 13 (81 percent of whom meet the standard).

The risk of inadequate intake of zinc, vitamin A, and vitamin E is substantial. The percentages of children meeting the standards for these nutrients are much lower than desirable--59 percent for vitamin E, 64 percent for zinc, and 72 percent for vitamin A--assuming that those standards are comparable to the average requirement (Table III.11). Zinc and vitamin E are the two micronutrients for which younger children are at substantial risk of inadequate intake according to the standards used (Table III.11). Among males ages 6 to 8, only 62 percent meet the vitamin E standard, and 76 percent meet the zinc standard. Among females ages 6 to 8, only 48 percent meet the vitamin E standard, and 60 percent meet the zinc standard.

The majority of children have usual intake of calcium that is less than 100 percent of the calcium AI (Table III.10.B), which is an experimentally derived measure of the amount of calcium that appears to sustain a defined nutritional state. The 75th percentile of the distribution of usual calcium intake is 101 percent of the AI, implying that just under 75 percent of children have usual intakes less than 100 percent of the AI. The calcium distribution varies greatly by age and gender. While substantial proportions of 6- to 8-year-old children have calcium intakes at or above 100 percent of the calcium AI, virtually all females ages 9 to 18 have usual calcium intakes below 100 percent of their calcium AI. The 50th percentile (or median) for 14- to 18-year-old females, for example, is 699 mg, while the calcium AI is 1,300 mg.

b. Other Subgroups

Race/Ethnicity. Intakes of thiamin, riboflavin, niacin, vitamin B_6, and vitamin B_{12} meet or exceed standards for all the racial/ethnic groups examined, with the possible exception of riboflavin (91 percent of those of "other" ethnic background meet the standard; see Table III.12). In general, if the risk of inadequate intake is high among all children for a particular nutrient, the risk of inadequate intake is also high among each of the racial/ethnic groups, although non-Hispanic whites tend to have the lowest risk and "others" tend to have the highest risk. Differences by racial/ethnic group are most striking for vitamin A and zinc (with "others" being at highest risk of inadequacy), for folate (with non-Hispanic blacks and "others" at highest risk), and for vitamin E (with Hispanics and "others" at highest risk). The calcium usual intake distributions shows that non-Hispanic whites and Hispanics have higher calcium intake levels than do non-Hispanic blacks and "others" (Table III.10.B).

Household Income and Food Sufficiency Status. Although large differences appear in the percentages of children meeting standards by household income for vitamin A, folate, and calcium, there is not a clear trend of either increasing or decreasing risk with increase in income (Table III.13). Children at all income levels and regardless of food sufficiency status (Table III.14) meet intake standards for all the B vitamins except folate. However, food insufficiency is accompanied by greater risk of not meeting the dietary standard for zinc.

TABLE III.12

PERCENTAGE OF SCHOOL-AGED CHILDREN WHOSE USUAL DAILY NUTRIENT INTAKE IS AT OR ABOVE DIETARY STANDARDS, BY RACE/ETHNICITY, 1994 TO 1996

		Percentage of Children Whose Usual 24-Hour Intake Is at or Above EAR or 80% of 1989 RDA[a]			
Dietary Component		Hispanic	Black	White	Other
Food Energy	**	26	30	39	19
Vitamins					
Vitamin A	**	66	59	78	53
Vitamin C		95	100	91	94
Vitamin E	**	48	65	63	36
Vitamin B_6		96	97	96	97
Vitamin B_{12}		99	98	99	97
Niacin		98	99	99	98
Thiamin		97	98	98	96
Riboflavin		98	98	98	91
Folate	**	53	38	52	37
Minerals					
Iron		85	84	90	79
Magnesium	**	62	54	66	59
Phosphorus	**	77	74	83	69
Zinc		63	61	67	53
Sample Size		**430**	**411**	**1,735**	**116**

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: Children's usual intake distribution was determined based on two intake days using the Software for Intake Distribution Estimation, developed by Iowa State University (1996).

[a] For vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus, the EARs based on the new Dietary Reference Intakes are used. For the remaining nutrients the table shows the percentage of individuals whose intake is at or above 80 percent of the 1989 RDAs (an approximation of the estimated average requirement). The percentages of children meeting the EAR for niacin and folate are underestimated. The intake estimates do not account for the conversion of tryptophan to niacin or for the high bioavailability of synthetic folic acid, as from fortified ready-to-eat cereal, whereas the EARs cover these.

EAR = Estimated Average Requirement; REA = Recommended Energy Allowance.

*Differences among subgroups significantly different from zero at the .05 level, chi-square test.
**Differences among subgroups significantly different from zero at the .01 level, chi-square test.

TABLE III.13

PERCENTAGE OF SCHOOL-AGED CHILDREN WHOSE USUAL DAILY NUTRIENT INTAKE IS AT OR ABOVE DIETARY STANDARDS, BY HOUSEHOLD INCOME, 1994 TO 1996

Dietary Component		Percentage of Children Whose Usual 24-Hour Intake Is at or Above EAR or 80% of 1989 RDA[a]				
		≤ 100% of Poverty Line	101 to 130% of Poverty Line	131 to 185% of Poverty Line	186 to 299% of Poverty Line	≥ 300% of Poverty Line
Food Energy		34	35	29	32	39
Vitamins						
Vitamin A	**	73	44	79	69	76
Vitamin C		96	85	89	96	92
Vitamin E		56	61	54	64	60
Vitamin B_6		96	95	96	96	96
Vitamin B_{12}		99	100	99	98	98
Niacin		98	100	99	99	99
Thiamin		97	99	99	98	98
Riboflavin		97	99	99	98	98
Folate	**	51	36	49	47	53
Minerals						
Iron		87	86	91	87	89
Magnesium		63	55	64	64	65
Phosphorus		80	78	80	80	80
Zinc		62	69	70	63	67
Sample Size		**547**	**196**	**369**	**595**	**985**

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: Children's usual intake distribution was determined based on two intake days using the Software for Intake Distribution Estimation, developed by Iowa State University (1996).

[a] For vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus, the EARs based on the new Dietary Reference Intakes are used. For the remaining nutrients the table shows the percentage of individuals whose intake is at or above 80 percent of the 1989 RDAs (an approximation of the estimated average requirement). The percentages of children meeting the EAR for niacin and folate are underestimated. The intake estimates do not account for the conversion of tryptophan to niacin or for the high bioavailability of synthetic folic acid, as from fortified ready-to-eat cereal, whereas the EARs cover these.

EAR = Estimated Average Requirement; REA = Recommended Energy Allowance.

*Differences among subgroups significantly different from zero at the .05 level, chi-square test.
**Differences among subgroups significantly different from zero at the .01 level, chi-square test.

TABLE III.14

PERCENTAGE OF SCHOOL-AGED CHILDREN WHOSE USUAL DAILY NUTRIENT INTAKE IS AT OR ABOVE DIETARY STANDARDS, BY FOOD SUFFICIENCY STATUS, 1994 TO 1996

	Percentage of Children Whose Usual 24-Hour Intake Is at or Above EAR or 80% of 1989 RDA[a]	
Dietary Component	Food Sufficient	Food Insufficient
Food Energy	36	16
Vitamins		
Vitamin A	72	75
Vitamin C	93	95
Vitamin E	59	49
Vitamin B_6	96	98
Vitamin B_{12}	98	98
Niacin	99	99
Thiamin	98	99
Riboflavin	98	98
Folate	50	45
Minerals		
Iron	88	90
Magnesium	64	57
Phosphorus	80	81
Zinc	65 *	44
Sample Size	**2,596**	**84**

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: Children's usual intake distribution was determined based on two intake days using the Software for Intake Distribution Estimation, developed by Iowa State University (1996).

[a] For vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus, the EARs based on the new Dietary Reference Intakes are used. For all of the remaining nutrients the table shows the percentage of individuals whose intake is at or above 80 percent of the 1989 RDAs (an approximation of the estimated average requirement). The percentages of children meeting the EAR for niacin and folate are underestimated. The intake estimates do not account for the conversion of tryptophan to niacin or for the high bioavailability of synthetic folic acid, as from fortified ready-to-eat cereal, whereas the EARs cover these.

EAR = Estimated Average Requirement; REA = Recommended Energy Allowance.

*Differences among subgroups significantly different from zero at the .05 level, chi-square test.
**Differences among subgroups significantly different from zero at the .01 level, chi-square test.

C. ASSESSMENT OF INTAKE OF MACRONUTRIENTS AND OTHER DIETARY COMPONENTS RELATIVE TO DIETARY GUIDELINES AND OTHER RECOMMENDATIONS

Not only should children's diets be sufficiently high in vitamins and minerals, they should also be sufficiently low in particular macronutrients and other dietary components. In particular, overconsumption of fat, saturated fat, sodium, and cholesterol are concerns that have led to the development of the Dietary Guidelines, and other dietary recommendations as described in Chapter II. The Dietary Guidelines also encourage generous intake of carbohydrates and fiber. This section assesses the extent to which children's diets meet these recommendations.

1. All Children

Few children meet the Dietary Guidelines in terms of limiting fat and saturated fat to below specific levels (Table III.15). Only about one-quarter of children have usual total fat intake that is 30 percent of energy or less, and far fewer (16 percent) limit their saturated fat intake to less than 10 percent of energy. Although the guidelines refer to fat intake in diets consumed over several days rather than to single meals, data on school-aged children's fat intake at breakfast and lunch show that they are more likely to limit fat and saturated fat to their recommended limits at breakfast than they are at lunch. By definition (U.S. Department of Agriculture 1998), most of the fat consumed is categorized as discretionary. With a larger-than-recommended proportion of food energy coming from dietary fat, a substantial proportion of children are not likely to obtain the percentage of energy from carbohydrates recommended in *Diet and Health.* Slightly more than half of all children obtain more than 55 percent of their energy from carbohydrates. As indicated in Table III.1, a substantial percentage of that energy comes from added sugars, whereas the intent of the Dietary Guidelines was to have most of the carbohydrates come from grains, vegetables, and fruits (U.S. Department of

TABLE III.15

PERCENTAGE OF SCHOOL-AGED CHILDREN WHO MEET SELECTED DIETARY RECOMMENDATIONS, 1994 TO 1996

	Percentage Whose Usual Daily Intake Meets the Recommendation		
Dietary Recommendation	Breakfast	Lunch	24 Hours
Percentage of Food Energy			
No more than 30 percent from total fat	73.5	23.8	25.1
Less than 10 percent from saturated fat	53.0	20.6	16.1
More than 55 percent from carbohydrates	82.4	54.3	52.8
Other Dietary Components			
More than (age plus 5) g of dietary fiber	---	---	28.4
No more than 2,400 mg of sodium	---	---	15.0
No more than 300 mg of cholesterol	---	---	78.3
No more than twice the 1989 RDA of protein	---	---	58.5
Sample Size	**2,494**	**2,650**	**2,692**

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: Children's usual intake distribution was determined based on two intake days using the Software for Intake Distribution Estimation, developed by Iowa State University (1996).

RDA = Recommended Dietary Allowance.

*Significantly different from zero at the .05 level, two-tailed test.
**Significantly different from zero at the .01 level, two-tailed test.

Agriculture 1995). Children's relatively high intake of added sugars is a concern because intake of added sugars contributes calories to children's diets that are not accompanied by nutrients.

Children are also unlikely to meet the recommendations for limiting sodium intake or consuming enough dietary fiber (Table III.15). Only slightly more than one-quarter of all children meet the fiber recommendation for their age, and far fewer (15 percent) have sodium intakes at or below the 2,400 mg daily value that appears on the nutrition facts label. In contrast, on a 24-hour basis, most children (78 percent) meet the *Diet and Health* recommendation to limit their cholesterol intake to 300 mg or less. Furthermore, over half (59 percent) meet the *Diet and Health* recommendation to limit their protein intake to no more than twice the 1989 RDA.

2. Selected Subgroups

The percentages of children whose usual intakes meet selected Dietary Guidelines and other dietary recommendations differ substantially by age/gender (Table III.16). Females ages 14 to 18 are most likely to keep fat intake at or below 30 percent of food energy (33 percent), and males ages 9 to 13 are least likely to have a relative fat intake that low (14 percent). Saturated fat intake contributes 10 percent of calories or less for very few of the children, but again the extremes of the range are seen for females ages 14 to 18 (31 percent have intakes at or below the target), and males ages 9 to 13 (6 percent) (Figure III.9). About half the children meet the recommendation that carbohydrates contribute more than 55 percent of energy, except for males ages 9 to 18, who are likely to consume fewer carbohydrates as a percentage of total energy.

The percentage of children meeting the "age plus 5" recommendation for fiber gradually decreases with age, dropping from 54 to 28 percent for males and from 47 to 5 percent for females in the three age groups. This reflects a relatively stable absolute intake of total fiber by children of all ages. Although females ages 14 to 18 are the age/gender group most likely to meet the Dietary

TABLE III.16

PERCENTAGE OF SCHOOL-AGED CHILDREN WHO MEET SELECTED DIETARY STANDARDS, BY AGE/GENDER, 1994 TO 1996

		Percentage of Children Whose Usual 24-Hour Intake Meets the Recommendation					
Dietary Recommendation		Males, 6 to 8	Females, 6 to 8	Males, 9 to 13	Females, 9 to 13	Males, 14 to 18	Females, 14 to 18
Percentage of Food Energy							
No more than 30 percent from total fat		24.6	26.9	14.1	27.1	23.9	32.8
Less than 10 percent from saturated fat	**	10.0	10.2	6.3	14.1	19.6	31.0
More than 55 percent from carbohydrates	*	52.6	52.4	40.2	54.0	40.2	47.4
Other Dietary Components							
More than (age plus 5) g of dietary fiber	**	53.7	46.7	39.8	17.6	28.2	4.6
No more than 2,400 mg of sodium	**	23.8	38.7	5.3	17.0	1.4	19.5
No more than 300 mg of cholesterol	**	88.9	94.0	76.1	90.7	45.8	85.0
No more twice the 1989 RDA of protein	**	24.5	29.0	42.0	71.4	68.8	90.3
Sample Size		**357**	**336**	**552**	**560**	**446**	**441**

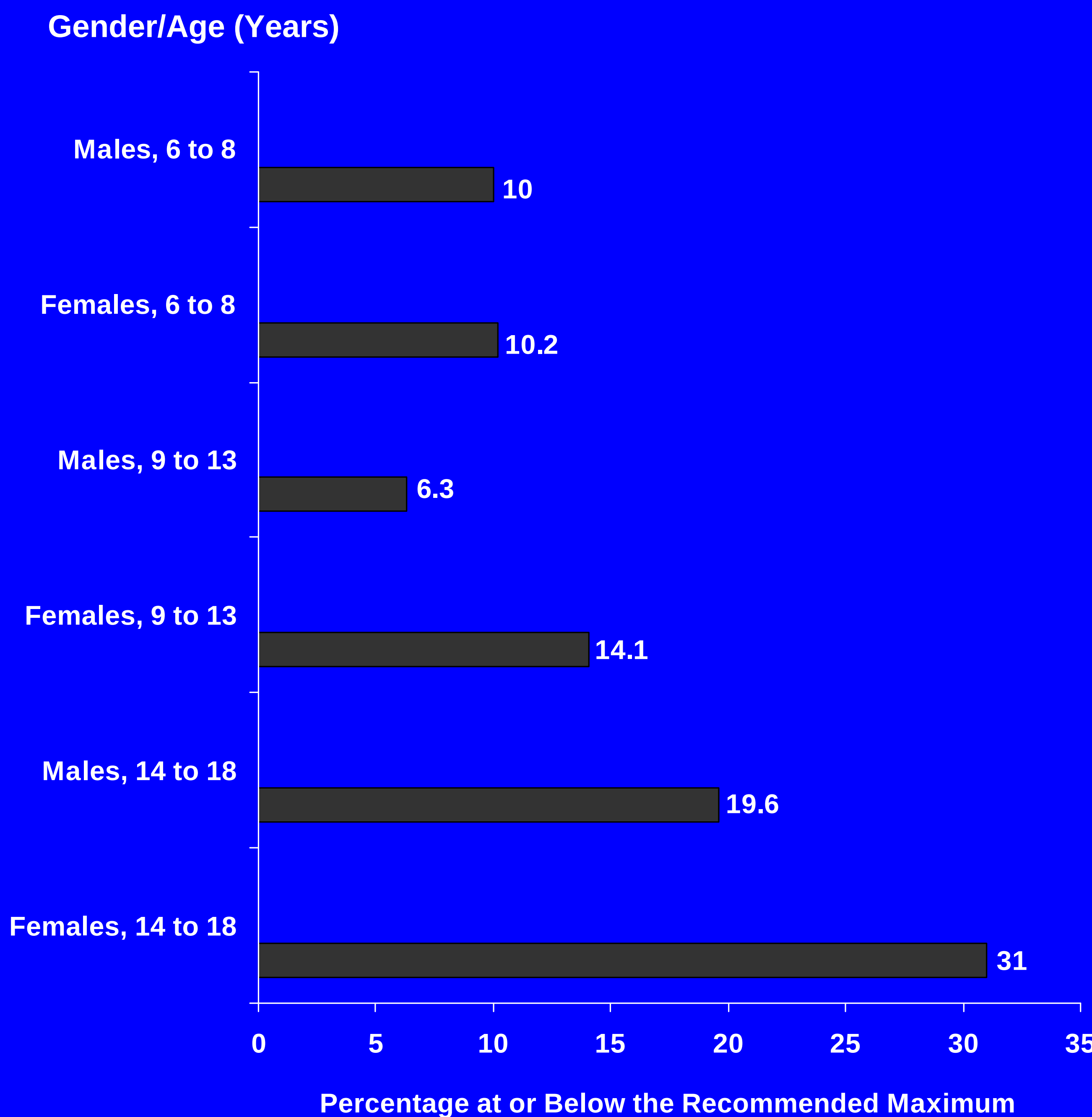
SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: Children's usual intake distribution was determined based on two intake days using the Software for Intake Distribution Estimation, developed by Iowa State University (1996).

RDA = Recommended Dietary Allowance.

*Differences among subgroups significantly different from zero at the .05 level, chi-square test.
**Differences among subgroups significantly different from zero at the .01 level, chi-square test.

Figure III.9
Percentage of School-Aged Children with Saturated Fat at or Below Recommended Maximum, by Gender and Age, 1994-1996 CSFII



Note: The recommended maximum = 10 percent of food energy.

Guidelines for fat and saturated fat, they are least likely to meet the Williams et al. (1995) recommendation for fiber intake.

Sodium is the only essential nutrient for which the recommended intake is the same for all age groups. For males, the percentage who limit sodium intake to 2,400 mg also decreases sharply with age, which probably reflects increases in their total food consumption. While none of the age/gender groups is likely to meet the recommendation for sodium, the percentages doing so are particularly low for males ages 9 to 13 (five percent) and 14 to 18 (one percent). The percentage of females meeting the recommendation is substantially higher than the percentage of males, especially for children ages 14 to 18 (20 percent of females versus 1 percent of males), probably because of lower reported total food intake by females. Finally, while children as a whole are likely to meet the recommendation for cholesterol, fewer than half (46 percent) of males ages 14 to 18 limit their cholesterol intake to less than 300 mg.

Race/Ethnicity. In general, the proportions of non-Hispanic black children meeting the Dietary Guidelines and other dietary recommendations are strikingly low and tend to be much lower than for the other racial/ethnic groups (Table III.17). Children belonging to the "other" group are typically most likely to meet the guidelines.

The percentages of members of the racial/ethnic groups who meet the Dietary Guidelines for total fat and saturated fat differ greatly (Figure III.10). Far fewer non-Hispanic blacks meet the standard for total fat intake (7 percent) than do "others" (52 percent), and a similar spread is reported for saturated fat (6 percent versus 41 percent for the same two groups). Hispanic and non-Hispanic white children fall between these two extremes; for example, 17 percent of Hispanics and 29 percent of whites limit their total fat intake to 30 percent of food energy. The same racial/ethnic patterns

TABLE III.17

PERCENTAGE OF SCHOOL-AGED CHILDREN WHO MEET SELECTED DIETARY STANDARDS, BY RACE/ETHNICITY, 1994 TO 1996

		Percentage of Children Whose Usual 24-Hour Intake Meets the Recommendation			
Dietary Recommendation		Hispanic	Non-Hispanic Black	Non-Hispanic White	Other
Percentage of Food Energy					
No more than 30 percent from total fat	**	17.0	7.2	29.4	51.9
Less than 10 percent from saturated fat	**	10.1	5.7	18.0	40.9
More than 55 percent from carbohydrates	**	30.9	23.6	53.3	58.2
Other Dietary Components					
More than (age plus 5) g of dietary fiber		30.6	16.4	30.6	26.4
No more than 2,400 mg of sodium	*	22.1	10.6	13.2	30.0
No more than 300 mg of cholesterol		72.6	68.9	80.6	90.1
No more than twice the 1989 RDA of protein		59.0	63.1	57.0	62.5
Sample Size		**430**	**411**	**1,735**	**116**

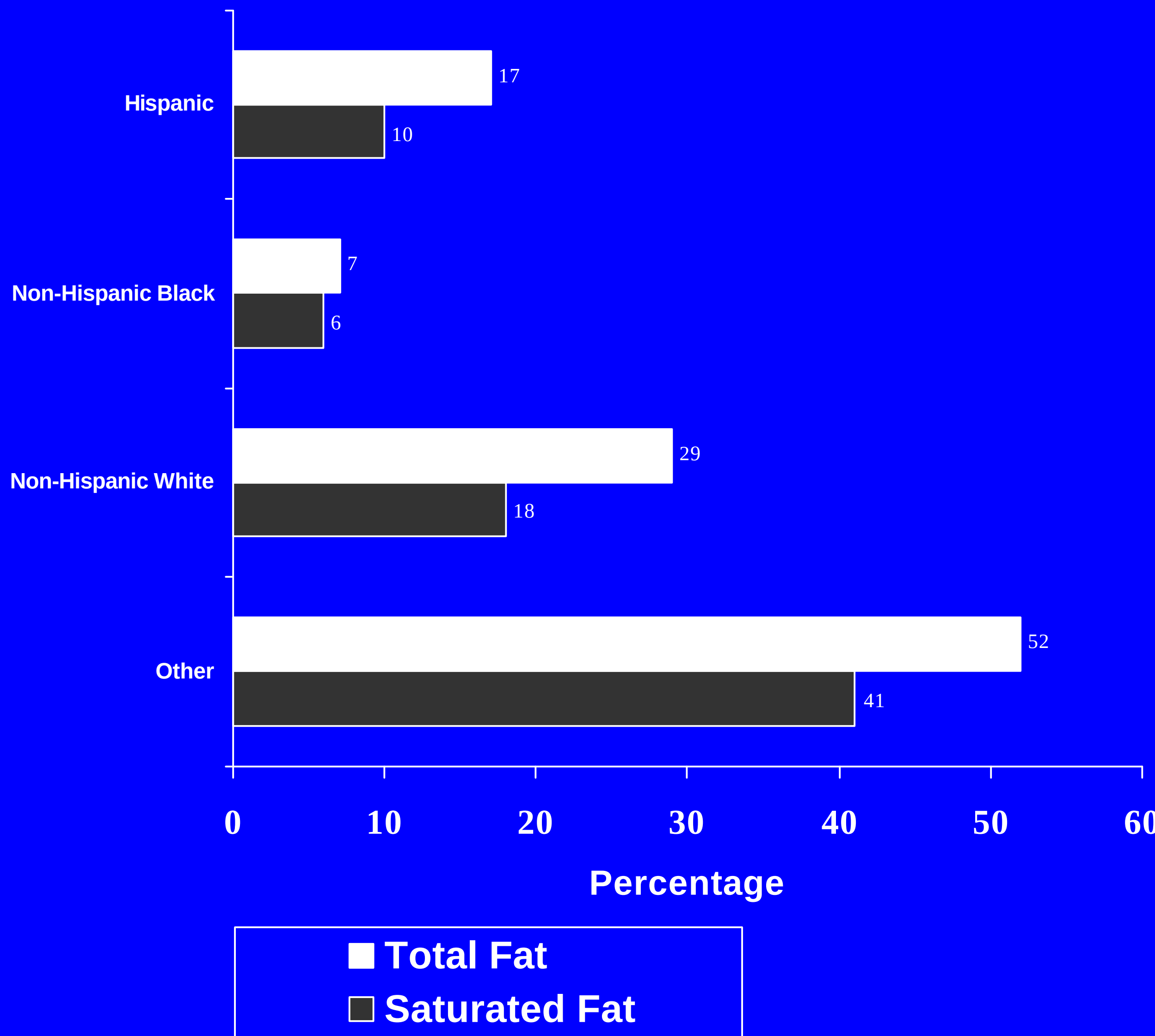
SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: Children's usual intake distribution was determined based on two intake days using the Software for Intake Distribution Estimation, developed by Iowa State University (1996).

RDA = Recommended Dietary Allowance.

*Differences among subgroups significantly different from zero at the .05 level, chi-square test.
**Differences among subgroups significantly different from zero at the .01 level, chi-square test.

Figure III.10
Percentage of School-Aged Children Who Meet Dietary Guidelines for Total Fat and Saturated Fat, by Race/Ethnicity, 1994-1996 CSFII



appear in the percentages of children meeting the *Diet and Health* recommendation for carbohydrate intake.

Non-Hispanic black children were much less likely to meet the age-related standard for fiber intake (16 percent for blacks versus almost 30 percent for the other racial/ethnic groups). Similarly, black children were least likely to meet the recommendations for sodium and cholesterol. Only 11 percent of school-aged black children have usual sodium intakes that are no more than 2,400 mg, compared with 13 percent of whites, 22 percent of Hispanics, and 30 percent of "others." Although a majority of all children meet the standard for cholesterol intake, percentages meeting the standard were highest for non-Hispanic whites (81 percent) and "others" (90 percent).

Household Income and Food Sufficiency Status. The percentages of children whose usual intake meets the recommendations for total fat, saturated fat, dietary fiber, and cholesterol follow a J-shaped curve, with the lowest percentages for children at 101 to 130 percent of the poverty line (Table III.18). For some of the recommendations, the differences in the percentages meeting the recommendation are large. For example, 38 percent of those in the highest-income group limit their total fat intake to no more than 30 percent of food energy, compared with 8 percent of those whose income is 101 to 130 percent of the poverty line. On the other hand, differences are small by food sufficiency status for fat and carbohydrates (Table III.19), but a higher percentage of children in food sufficient households meet the recommendation for dietary fiber and for cholesterol, and a lower percentage do so for sodium and protein.

D. FOOD GROUP INTAKES

Examining the intake of specific foods consumed by school-aged children provides a more complete picture of their diets than focusing on nutrient intake alone. In this section, we first

TABLE III.18

PERCENTAGE OF SCHOOL-AGED CHILDREN WHO MEET SELECTED DIETARY STANDARDS, BY HOUSEHOLD INCOME, 1994 TO 1996

Dietary Recommendation		≤ 100% of Poverty Line	101 to 130% of Poverty Line	131 to 185% of Poverty Line	186 to 299% of Poverty Line	≥ 300% of Poverty Line
		Percentage of Children Whose Usual 24-Hour Intake Meets the Recommendation				
Percentage of Food Energy						
No more than 30 percent from total fat	**	16.9	7.9	14.1	22.4	37.7
Less than 10 percent from saturated fat	**	10.6	3.3	8.8	11.2	26.3
More than 55 percent from carbohydrates	**	30.6	23.6	36.2	44.0	63.0
Other Dietary Components						
More than (age plus 5) g of dietary fiber	*	27.8	17.0	24.1	25.0	33.5
No more than 2,400 mg of sodium		15.8	6.4	11.6	14.1	15.9
No more than 300 mg of cholesterol		66.4	63.4	75.8	83.7	83.4
No more than twice the 1989 RDA of protein	**	54.8	52.4	61.8	58.6	59.6
Sample Size		**527**	**308**	**376**	**524**	**957**

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: Children's usual intake distribution was determined based on two intake days using the Software for Intake Distribution Estimation, developed by Iowa State University (1996).

RDA = Recommended Dietary Allowance.

*Differences among subgroups significantly different from zero at the .05 level, chi-square test.
**Differences among subgroups significantly different from zero at the .01 level, chi-square test.

TABLE III.19

PERCENTAGE OF SCHOOL-AGED CHILDREN WHO MEET SELECTED DIETARY STANDARDS, BY FOOD SUFFICIENCY STATUS, 1994 TO 1996

	Percentage of Children Whose Usual 24-Hour Intake Meets the Recommendation	
Dietary Recommendation	Food Sufficient	Food Insufficient
Percentage of Food Energy		
No more than 30 percent from total fat	25.4	24.0
Less than 10 percent from saturated fat	16.3	17.5
More than 55 percent from carbohydrates	47.4	44.2
Other Dietary Components		
More than (age plus 5) g of dietary fiber	28.6	18.6
No more than 2,400 mg of sodium	14.8	26.5
No more than 300 mg of cholesterol	78.7	72.6
No more than twice the 1989 RDA of protein	58.2	71.6
Sample Size	**2,596**	**84**

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: Children's usual intake distribution was determined based on two intake days using the Software for Intake Distribution Estimation, developed by Iowa State University (1996).

RDA = Recommended Dietary Allowance.

*Differences among subgroups significantly different from zero at the .05 level, chi-square test.
**Differences among subgroups significantly different from zero at the .01 level, chi-square test.

describe the mean intake of various foods by children, and then examine the degree to which their food intake is in line with the USDA Food Guide Pyramid recommendations.

1. Mean Numbers of Servings

a. All Children

Table III.20 presents, for all children, mean numbers of servings of the five major food groups from the Food Guide Pyramid, selected subgroups, fruits and vegetables combined, soda, and fruit and fruit-flavored drinks. The table reports food group servings for breakfast, for lunch, and over 24 hours, although we focus mainly on the 24-hour results here. Examination of the data helps explain and adds context to some of the findings on intake of nutrients reported above, as well as on other food components, as described below.

School-aged children consume an average of seven servings of grain products a day, but nearly all of it is nonwhole grain. The low level of whole grain consumption, together with low fruit and vegetable consumption (about four servings per day), helps explain why children's diets provide low levels of fiber.

Children's mean intakes of both fruits (1.4 servings) and vegetables (2.8 servings) are below the Pyramid's recommended minimum. Furthermore, children consume a larger mean number of servings of potatoes (1.2) than of legumes, other starchy vegetables, and dark-green leafy vegetables combined (0.4 servings); they also consume more potatoes than all remaining vegetables combined (1.1). The mean number of servings of citrus and noncitrus fruits is 0.7 each; total mean fruit intake is well under the recommended two servings per day.

These findings on vegetable and fruit intake are similar to those reported by Krebs-Smith et al. (1996) based on the 1989-1991 CSFII. Using a broader age range and a somewhat more stringent

TABLE III.20

FOOD GROUP INTAKES OF SCHOOL-AGED CHILDREN, 1994 TO 1996

	Mean Number of Servings		
Food Group	Breakfast	Lunch	24 Hours
Grain Products			
Whole grains	0.4	0.3	1.0
Nonwhole grains	1.1	2.0	6.2
Total	1.4	2.2	7.2
Vegetables			
Potatoes	0.04	0.5	1.2
Legumes	0.01	0.0	0.1
Other starchy vegetables	0.00	0.0	0.2
Dark-green leafy vegetables	0.00	0.0	0.1
Other vegetables	0.03	0.3	1.1
Total	0.07	0.9	2.8
Fruit			
Citrus	0.3	0.2	0.7
Noncitrus	0.1	0.3	0.7
Total	0.4	0.4	1.4
Vegetables and Fruit	0.5	1.4	4.2
Milk Products			
Milk			
Whole milk	0.2	0.1	0.4
Low-fat milk	0.3	0.2	0.6
Nonfat milk	0.1	0.0	0.2
Total[a]	0.6	0.4	1.5
Cheese	0.0	0.2	0.5
Other dairy	0.0	0.0	0.0
Total	0.6	0.6	2.0
Meat and Meat Substitutes			
Red meat	0.1	0.3	1.0
Poultry	0.0	0.1	0.4
Fish	0.0	0.0	0.1
Eggs	0.1	0.0	0.1
Nuts and seeds	0.0	0.0	0.1
Total	0.1	0.5	1.6
Soda	0.1	0.4	1.4
Fruit Drinks and Fruit-Flavored Drinks	0.1	0.3	0.8
Sample Size	**2,692**	**2,692**	**2,692**

SOURCE: Weighted tabulations using two days of intake data from respondents of the 1994-1996 CSFII.

[a]The total number of servings of milk includes not only whole, low-fat, and nonfat milk, but also milk whose fat content was not specified.

definition of fruits and vegetables, they reported a mean fruit and vegetable intake of 3.6 servings per day.

Fluid milk contributes three-fourths of the mean number of servings of milk products (2.0/day), with cheese providing most of the remaining servings. On average, children consume twice as much low-fat and nonfat milk combined (0.8 servings) as whole milk (0.4 servings).[9] Mean intake of meat and meat substitutes is 1.6 servings per day. Red meat accounts for more than half of the servings, while poultry is the second major contributor.

Children's consumption of regular and diet soda and fruit drinks and fruit-flavored drinks is high.[10] On average, children consume nearly as much soda as they do milk on a given day. The mean number of servings of regular and diet soda (1.4) equals that for all fruit for the day, while the mean number of servings of fruit drinks and fruit-flavored drinks is more than half that for fruit.[11] This heavy consumption of soda and fruit drinks may help explain the large proportion of food energy that children obtain from added sugars.

b. Selected Subgroups

Age/Gender. The mean number of servings of most of the major food groups increases with age for males, but not necessarily for females (Table III.21). For example, the number increases steadily from 6.5 servings of grain products for the 6- to 8-year-old males to 9.5 for the 14- to

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[9]We could not determine the fat content of all milk products consumed by children in the CSFII. Thus, the average number of servings of whole milk, low-fat milk, and nonfat milk do not sum to the average number of servings of all milk.

[10]We do not distinguish here between regular and diet soda. However, Putnam and Allshouse (1996) found that, in 1994, of the per capita consumption of all soda in the United States of 52.2 gallons, 23 percent (11.9 gallons) was diet soda, and 77 percent (40.3 gallons) was regular soda.

[11]The small amount of fruit juice in the fruit drinks contributes a small portion of the fruit servings for the day.

TABLE III.21

FOOD GROUP INTAKES OF SCHOOL-AGED CHILDREN OVER 24 HOURS, BY AGE/GENDER, 1994 TO 1996

		Mean Number of Servings					
Food Group		Males, 6 to 8	Females, 6 to 8	Males, 9 to 13	Females, 9 to 13	Males, 14 to 18	Females, 14 to 18
Grain Products							
Whole grains	**	0.9	0.8	1.1	1.0	1.1	0.8
Nonwhole grains	**	5.6	5.0	6.5	5.4	8.3	5.5
Total	**	6.5	5.8	7.6	6.4	9.5	6.2
Vegetables							
Potatoes	**	0.9	0.8	1.2	1.1	1.9	1.2
Legumes		0.1	0.1	0.2	0.1	0.2	0.2
Other starchy vegetables	**	0.2	0.2	0.2	0.2	0.2	0.1
Dark-green leafy vegetables	**	0.0	0.1	0.1	0.1	0.1	0.1
Other vegetables	**	0.8	0.8	1.2	1.0	1.5	1.2
Total	**	2.0	2.0	2.8	2.4	3.9	2.8
Fruit							
Citrus		0.7	0.6	0.7	0.7	0.8	0.7
Noncitrus	**	1.0	0.8	0.7	0.7	0.5	0.6
Total		1.6	1.5	1.4	1.5	1.4	1.3
Vegetables and Fruit	**	3.6	3.5	4.3	3.9	5.2	4.1
Milk Products							
Milk							
Whole milk	**	0.5	0.5	0.5	0.4	0.5	0.2
Low-fat milk	**	0.8	0.6	0.8	0.6	0.7	0.3
Nonfat milk		0.1	0.1	0.2	0.2	0.2	0.1
Total[a]	**	1.7	1.5	1.7	1.4	1.7	0.9
Cheese	**	0.4	0.4	0.5	0.5	0.8	0.5
Other dairy		0.0	0.0	0.0	0.0	0.0	0.0
Total	**	2.1	1.9	2.3	1.9	2.5	1.4
Meat and Meat Substitutes							
Red meat	**	0.9	0.7	1.1	0.8	1.5	0.8
Poultry	**	0.3	0.3	0.4	0.3	0.5	0.4
Fish	**	0.1	0.1	0.1	0.1	0.1	0.1
Eggs	*	0.1	0.1	0.1	0.1	0.1	0.1
Nuts and seeds	**	0.1	0.1	0.1	0.1	0.1	0.1
Total	**	1.4	1.2	1.7	1.3	2.3	1.5
Soda	**	0.7	0.6	1.2	1.1	2.6	1.7
Fruit Drinks and Fruit-Flavored Drinks	*	0.9	0.7	0.8	0.6	1.1	0.8
Sample Size		**357**	**336**	**552**	**560**	**446**	**441**

SOURCE: Weighted tabulations using two days of intake data from respondents of the 1994-1996 CSFII.

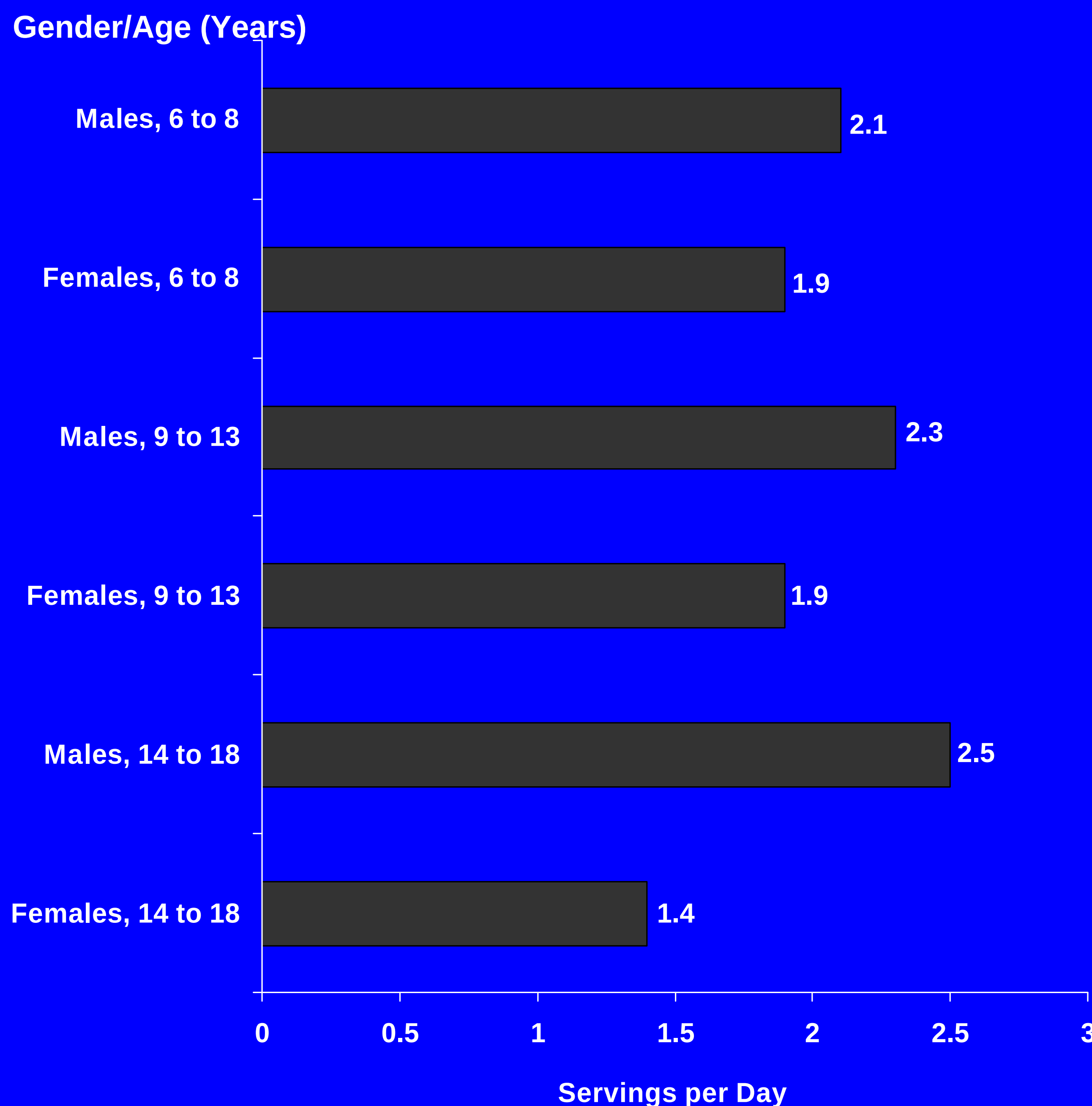
[a]The total number of servings of milk includes not only whole, low-fat, and nonfat milk, but also milk whose fat content was not specified.

*Differences in intake among subgroups significantly different from zero at the .05 level, F-test.
**Differences in intake among subgroups significantly different from zero at the .01 level, F-test.

18-year-old males, while the number increases from 5.8 to 6.4 and then drops to 6.2 for females in the three age groups. Intake of nonwhole grain servings accounts for most of this difference. The mean number of servings of vegetables increases with age for both males and females, but the mean number of servings of fruits decreases slightly but not significantly with age. Total milk product intake increases with age for males and decreases for females (Figure III.11). Females ages 14 to 18 consume particularly low levels of milk, on average. They consume a mean of 0.9 servings, compared with 1.4 to 1.7 for the other age/gender groups (Table III.21). Mean numbers of servings of meat and meat substitutes, soda, and fruit and fruit-flavored drinks are highest for those ages 14 to 18. The number of 1-cup servings of soda by males ages 14 to 18 are substantially higher than those by all other age/gender groups. In particular, this group consumes 2.6 servings of soda a day, on average.

Figure III.12 and Table III.22 show the distribution of soda intake by age/gender and illustrate the large amount of soda consumption among some groups of children. Overall, 56 to 85 percent of children (depending on age and gender) consume soda on a given day. In other words, children are more likely than not to drink soda on a given day. In addition, more than a third of 14- to 18-year-old males consume more than three servings of soda a day (and 20 percent consume more than four servings a day). A substantial proportion of females in this age group are also heavy soda consumers, as 18 percent consume more than three servings a day. By contrast, younger children are much less likely to drink soda. Among 6- to 8-year-olds, only 2 to 3 percent consume more than three servings of soda a day, while 43 to 44 percent consume no soda.

Figure III.11
Milk Product Servings Among School-Aged Children, by Gender and Age, 1994-1996 CSFII



Note: The suggested number of dairy servings is two per day for children up to age 10, and three per day for children older than age 10.

Figure III.12
Daily Diet and Regular Soft Drink Intake Among School-Aged Children, by Gender and Age, 1994-1996 CSFII

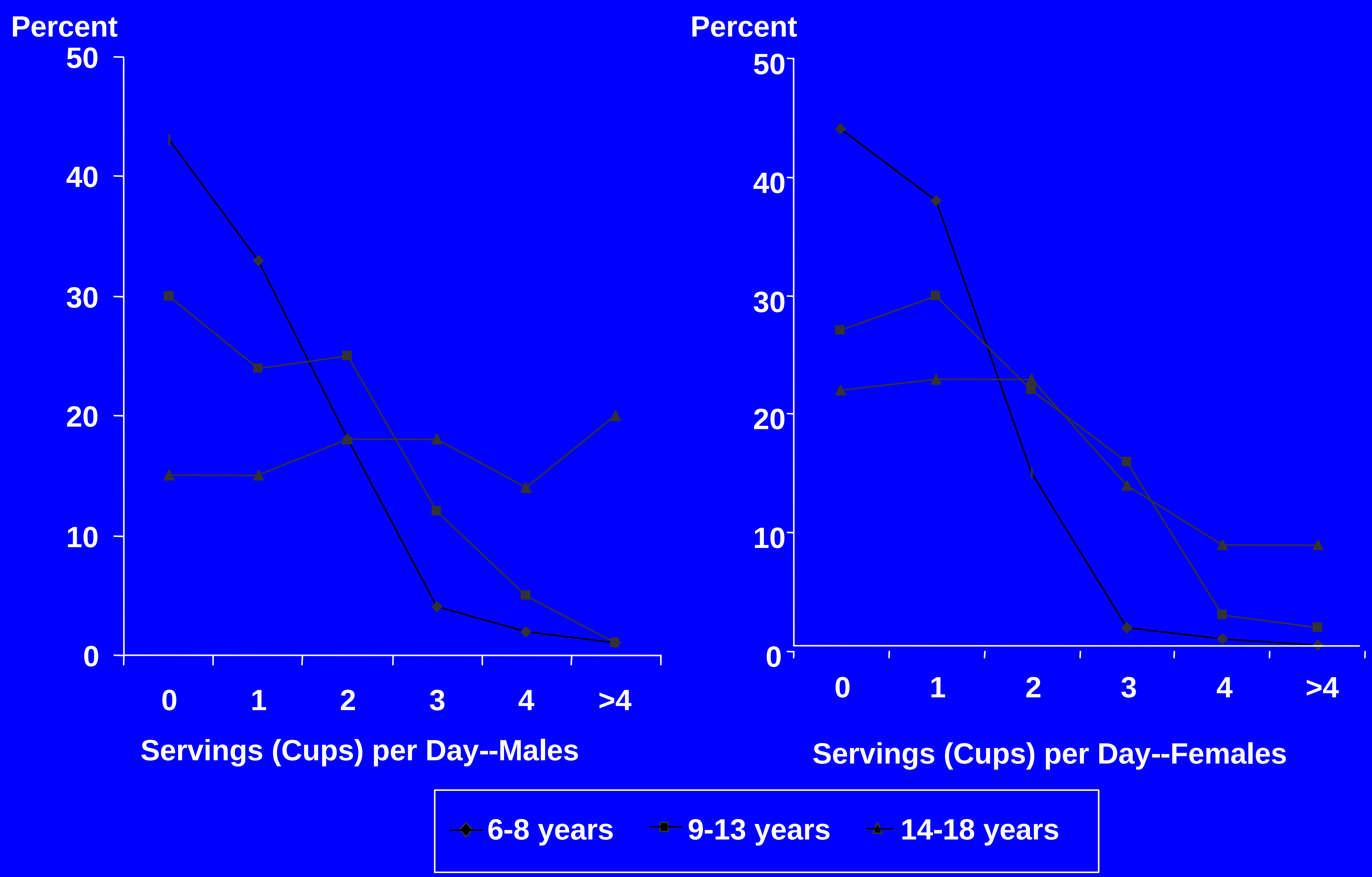


TABLE III.22

DAILY DIET AND REGULAR SOFT DRINK INTAKE AMONG SCHOOL-AGED CHILDREN, BY GENDER AND AGE, 1994-1996 CSFII

	Soft Drink Servings Per Day (Percentages)					
Gender/Age	0	1	2	3	4	More than 4
Males, 6 to 8	43	33	18	4	2	1
Females, 6 to 8	44	38	15	2	1	0
Males, 9 to 13	30	24	25	12	5	4
Females, 9 to 13	27	30	22	16	3	2
Males, 14 to 18	15	15	18	18	14	20
Females, 14 to 18	22	23	23	14	9	9

SOURCE: Weighted tabulations using two days of intake data from respondents of the 1994-1996 CSFII.

Race/Ethnicity. For nearly all the foods listed, statistically significant differences occur in mean intake of servings among the race/ethnicity subgroups (Table III.23). The most notable differences are the following:

- Higher intake of whole grains and total grains by non-Hispanic whites
- Higher intake of legumes and lower intake of dark-green leafy vegetables by Hispanics
- Differences in the major types of dairy products consumed, with whole milk more common among Hispanics and non-Hispanic blacks, and low-fat milk and cheese more common among non-Hispanic whites; total consumption of milk products, especially low-fat and nonfat milk, is particularly low among non-Hispanic blacks.
- Higher intake of poultry by Hispanics and non-Hispanic blacks and lower total intake of meat and meat substitutes by non-Hispanic whites
- Higher intake of soda by non-Hispanic whites, and higher intake of fruit and fruit-flavored drinks by non-Hispanic blacks

Many of these findings have been reported for adults as well (Life Sciences Research Office 1995).

Household Income and Food Sufficiency Status. Although the top family income group had the highest intake of several foods (whole grains, total grains, fruit, vegetables and fruit combined, low-fat milk, cheese, total milk products, and soda), systematic trends of increased intake with increased income are not apparent except for low-fat milk and soda (Appendix Table A.10.A). Compared with the food sufficient group, the food insufficient group had significantly higher intakes of legumes and eggs and lower intakes of dark-green leafy vegetables, low-fat milk, and nuts and seeds (Appendix Table A.10.B). These findings are probably influenced by the different racial/ethnic distributions among the household income and food sufficiency status groups.

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TABLE III.23

FOOD GROUP INTAKES OF SCHOOL-AGED CHILDREN OVER 24 HOURS, BY RACE/ETHNICITY, 1994 TO 1996

		Mean Number of Servings			
Food Group		Hispanic	Non-Hispanic Black	Non-Hispanic White	Other
Grain Products					
Whole grains	**	0.8	0.7	1.1	0.9
Nonwhole grains	*	6.0	5.8	6.3	6.1
Total	**	6.8	6.5	7.4	7.0
Vegetables					
Potatoes		1.1	1.3	1.3	1.2
Legumes		0.4	0.1	0.1	0.1
Other starchy vegetables	**	0.1	0.2	0.2	0.2
Dark-green leafy vegetables	**	0.0	0.2	0.1	0.2
Other vegetables		1.2	1.0	1.1	1.5
Total		2.8	2.8	2.7	3.2
Fruit					
Citus		0.7	0.6	0.7	1.1
Noncitrus	*	0.7	0.6	0.7	0.8
Total	*	1.4	1.2	1.5	1.9
Vegetables and Fruit		4.2	4.0	4.2	5.1
Milk Products					
Milk					
Whole milk	**	0.7	0.6	0.3	0.4
Low-fat milk	**	0.4	0.2	0.8	0.5
Nonfat milk	**	0.1	0.0	0.2	0.1
Total[a]	**	1.5	1.0	1.6	1.2
Cheese	**	0.4	0.4	0.6	0.3
Other dairy	**	0.0	0.0	0.0	0.0
Total	**	1.9	1.5	2.2	1.6
Meat and Meat Substitutes					
Red meat	*	1.0	1.1	0.9	1.0
Poultry	**	0.5	0.5	0.3	0.3
Fish	*	0.1	0.1	0.1	0.2
Eggs	**	0.2	0.1	0.1	0.1
Nuts and seeds	**	0.0	0.0	0.1	0.0
Total	**	1.7	1.9	1.5	1.8
Soda	**	1.2	1.0	1.6	1.0
Fruit Drinks and Fruit-Flavored Drinks	**	0.7	1.2	0.7	0.5
Sample Size		**430**	**411**	**1,735**	**116**

SOURCE: Weighted tabulations using two days of intake data from respondents of the 1994-1996 CSFII.

[a]The total number of servings of milk includes not only whole, low-fat, and nonfat milk, but also milk whose fat content was not specified.

*Differences in intake among subgroups significantly different from zero at the .05 level, F-test.
**Differences in intake among subgroups significantly different from zero at the .01 level, F-test.

2. Distribution of Daily Food Group Servings

a. All Children

Table III.24 presents the percentages of all children consuming specified numbers of servings daily from each of the five major food groups and from fruits and vegetables combined. It also presents the percentage meeting an age/gender-specific target, as specified in the Healthy Eating Index (HEI target; see Table II.7).[12] In each case, the percentage meeting the age/gender-specific HEI target is much lower than the percentage consuming the minimum number of servings specified in the Food Guide Pyramid. For example, although 57 percent of school-aged children consume at least six servings of grain products daily, the recommended intake of grain servings is greater than six for those who need more than 1,600 calories daily--essentially all school-aged children. Thus, only 23 percent meet the HEI target (Figure III.13).

Small proportions of school-aged children meet the age/gender-specific targets for the other food groups (Figure III.13). Only 14 percent meet the HEI target for fruit consumption. Furthermore, nearly two-thirds of all children have no more than one serving of fruit or fruit juice daily--making fruit the food group that has the lowest intake in comparison with recommendations. The proportions meeting the targets for vegetable consumption are only slightly higher--20 percent meet the HEI vegetable target, while 45 percent consume at least three vegetable servings daily. Similarly, only 30 percent of children meet the HEI milk product target, while 60 percent consume the Food Guide Pyramid minimum recommendation of two servings.

Overall, only 2 percent of children consume the minimum number of servings specified in the Food Guide Pyramid for all five major food groups (Appendix Table A.11.A), and just 0.2 percent

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[12]The distribution of foods consumed is based on sample members' average number of food group servings consumed over the two CSFII intake days rather than on their usual intake. The variation of this distribution of two-day average food group consumption is greater than the variation of the distribution of usual food group consumption.

TABLE III.24

DISTRIBUTION OF DAILY NUMBER OF FOOD SERVINGS
AMONG SCHOOL-AGED CHILDREN, 1994 TO 1996

Number of Servings	24 Hours
Grain Products (Percentages)	
0	0
1 to 3	9
4 to 5	25
6 to 11	57
More than 11	8
Percentage meeting age/gender-specific target	23
Vegetables (Percentages)	
0	7
1 to 2	48
3 to 5	37
More than 5	8
Percentage meeting age/gender-specific target	20
Fruit (Percentages)	
0	31
1	34
2 to 4	30
More than 4	5
Percentage meeting age/gender-specific target	14
Vegetables and Fruit (Percentages)	
0	2
1 to 2	26
3 to 4	37
5 to 9	31
More than 9	3
Percentage meeting age/gender-specific target	12
Milk Products (Percentages)	
0	9
1	31
2 to 3	49
More than 3	11
Percentage meeting age/gender-specific target	30

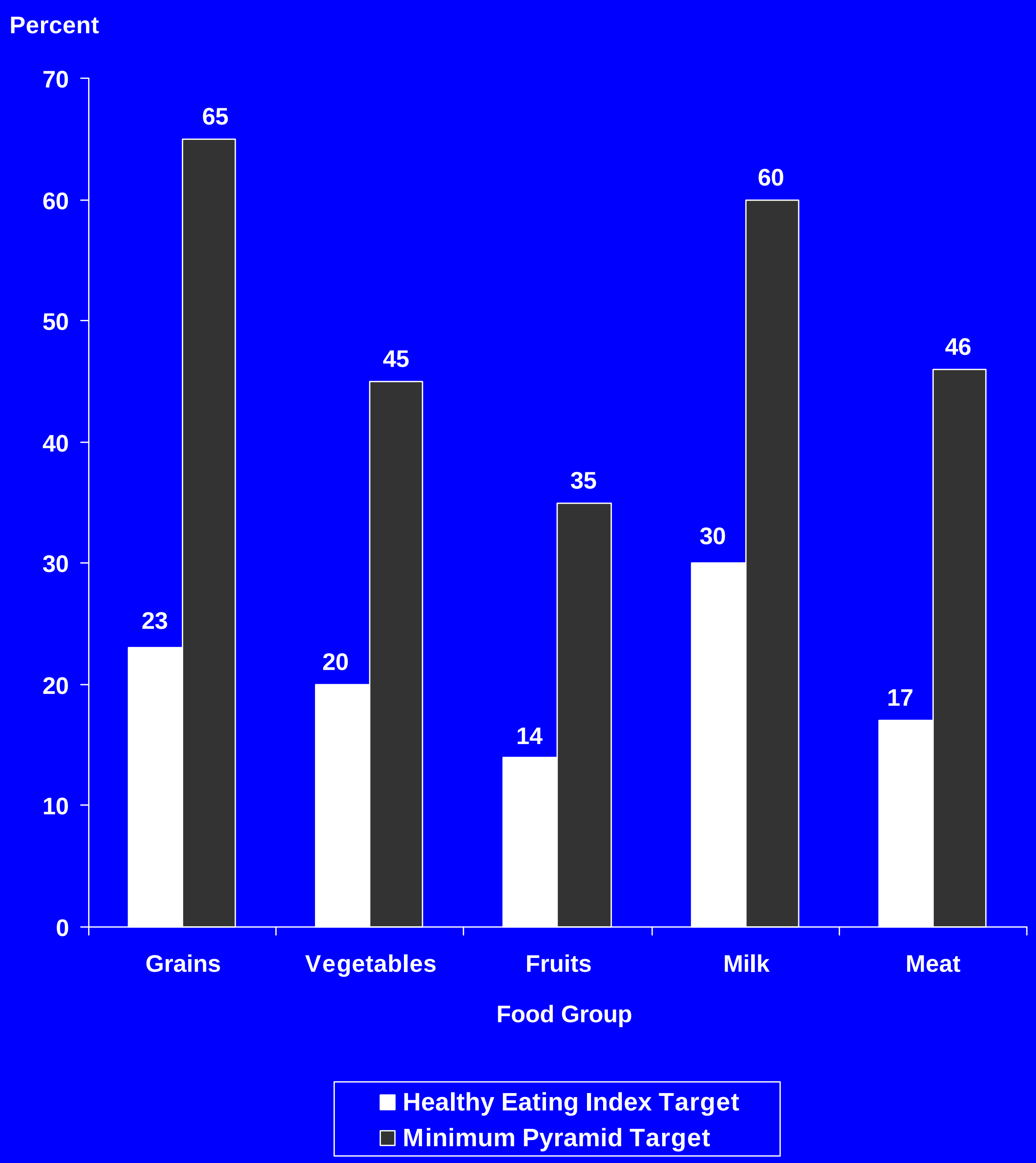
TABLE III.24 *(continued)*

Number of Servings	24 Hours
Meat and Meat Substitutes (Percentages)	
0	8
1	46
2 to 3	41
More than 3	5
Percentage meeting age/gender-specific target	17
Sample Size	**2,692**

SOURCE: Weighted tabulations using two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: Age/gender-specific targets are taken from the targets used in the construction of the Healthy Eating Index (Kennedy et al. 1995).

Figure III.13
Percentage of School-Aged Children Meeting Food Group Targets, 1994-1996 CSFII



Note: Healthy Eating Index considers energy intake by age and gender.

meet the HEI targets for all five food groups (Appendix Table A.11.B). Examined differently, 14 percent do not meet the minimum Pyramid target for any of the food groups, and 25 percent meet this minimum Pyramid target for only one food group. The percentages failing to meet the HEI targets are even greater--42 percent do not meet any of their HEI targets, and 21 percent meet only one. School-aged girls never meet either of the standards for all five major food groups.

b. Selected Subgroups

Age/Gender. For each of the five food groups, there are statistically significant differences among the age/gender groups in both the distribution of intake and the percentage meeting the HEI target (Appendix Table A.12.A). Younger children are much more likely than older children to meet the dairy HEI target (40 to 50 percent of the younger children meet their target, compared with only 9 percent of females ages 14 to 18). In all cases, the target is higher for the older children. Notable trends with increased age include higher percentages of adolescents consuming no fruit and higher intakes of vegetables and meats by adolescent males. Close to 50 percent of children meet none or only one of the minimum targets for numbers of servings from the Food Guide Pyramid, with the exception of males ages nine and older, who have higher intakes (Appendix Table A.11.A). Seventy to 80 percent of females ages nine and older meet their HEI targets for no food group, or for only one (Appendix Table A.11.B). Among children in each age group, but especially among older children, males are more likely than females to meet these food group targets.

Race/Ethnicity. Among the racial/ethnic groups examined, there are also statistically significant differences in the distribution of intake of each of the five major food groups (Appendix Table A.12.B) and in the percentage meeting the HEI target for all except the fruit and vegetable groups. In all cases, however, the percentages meeting the HEI target are small--generally less than one-third of the children. The tendency is for the "other" group to be more likely than the remaining groups to meet the HEI targets for fruits (nearly 20 percent compared with about 10 to 15 percent) and vegetables (30 percent compared with about 20 percent). The HEI target for milk products is more likely to be met by non-Hispanic whites, especially in comparison with non-Hispanic blacks and "others." The percentage meeting the HEI target for meat and meat substitutes is highest for non-Hispanic blacks (28 percent) and lowest for non-Hispanic whites (14 percent).

Household Income and Food Sufficiency. Although there are statistically significant differences among household income groups in the percentages meeting their HEI target for all the major food groups except vegetables, there is no clear trend with increased income (Appendix Table A.12.C). Those with household incomes greater than 300 percent of poverty were more likely to meet their HEI target for grain, fruit, and milk products, but they were least likely to meet the HEI target for meat and meat substitutes. Racial/ethnic differences among the income groups may have affected the findings. The distribution of the number of food servings by food group was similar by food sufficiency status, as was the percentage meeting the HEI target (Appendix Table A.12.D).

E. CONCLUSIONS

This is the first study of child nutrition that assesses the adequacy of intake using intake data adjusted for day-to-day variation in intake and the recently released EARs for phosphorus, magnesium, and the B vitamins, as well as the AI for calcium. This assessment indicates that few children of any age are at risk of inadequate intakes of B vitamins except folate. However, substantial numbers of school-aged children are at risk of inadequate intake of folate, magnesium, zinc, and vitamins A and E.[13] In addition, children's mean and median intake of calcium is well

[13]The risk of inadequate folate intake, although exceedingly high in this survey, may now be lower because of the fortification of enriched grains with folic acid, although it still probably remains substantial. The folate fortification of cereal grains has been mandatory in the United States for enriched grains since January 1, 1998 (Institute of Medicine 1998).

below the AI, but it is not possible to estimate the proportion of children at risk of inadequate calcium intake. The risk of inadequate intake varies markedly by age and gender, with the older children, especially females, at greater risk. Children's mean intakes of fat, saturated fat, and sodium are well above recommended maximum levels, and few children have diets consistent with the recommendations for these components. Children are also unlikely to consume the recommended amount of fiber, and their diets are high in added sugars. On the other hand, most consume cholesterol in amounts consistent with the recommended intake amount. School-aged children's intakes of vegetables and fruit drinks are well below recommended levels, and few meet Food Guide Pyramid targets for food group consumption. On the other hand, children consume large numbers of servings of soda and fruit and fruit-flavored drinks.

Children's dietary intakes frequently differ by age/gender, race/ethnicity, household income, and food sufficiency status. Many of the findings from this study are consistent with and extend those of earlier studies. Several of these findings are of particular note:

- Females ages 14 to 18 have low reported mean energy intakes and appear to be at unusually high risk of nutrient insufficiency. Breakfast skipping is frequent among this group. Their intakes of fruit and dairy products are especially low, and, relative to total intake, their mean intake of soda and of fruit drinks and fruit-flavored drinks is high. This eating pattern is accompanied by high percentages of 14- to 18-year-old females with intakes below the standards for vitamins A and E, folate, calcium, iron, magnesium, phosphorus, zinc, and fiber. On the other hand, their total fat and saturated fat intakes are more likely to be consistent with Dietary Guidelines than are those of other age/gender groups.

- Intakes among racial/ethnic groups differ in two major ways:

    1. Non-Hispanic blacks and "others" have lower calcium intakes and are at greater risk of inadequate intakes of phosphorus and vitamin A than are non-Hispanic whites and Hispanics; the calcium finding corresponds with their lower intakes of dairy products.

2. Non-Hispanic blacks and Hispanics are less likely to meet recommendations for total fat, saturated fat, and cholesterol intake than are non-Hispanic whites and "others."

- Few major differences were found by household income and food sufficiency status. Those that were found may be related to differences in racial/ethnic distribution among the income groups.

- Breakfast differs from lunch in its contribution to the days' nutrient intake. Micronutrient density (vitamin and mineral intake/1,000 kcal) is substantially higher at breakfast than at lunch, with the exception of sodium density (which is lower). At the same time, contributions of breakfast to total fat, saturated fat, and fiber intake are small.

IV. RELATIONSHIP BETWEEN SCHOOL MEAL PROGRAM PARTICIPATION AND DIETARY INTAKE

Since a large number of children eat one or two meals a day at school, an important research topic involves how participation in the SBP and NSLP is related to dietary intake. The previous chapter concluded that substantial numbers of children are at risk of inadequate intake of folate, calcium, iron, magnesium, phosphorus, zinc, and vitamins A and E. The chapter also described children's diets as being too high in fat, saturated fat, and sodium. According to the FNS strategic plan under the Government Performance and Results Act (GPRA), a key goal of the programs is to promote "healthful diets for school-age children." This chapter explores whether the diets of participants in the NSLP and SBP suffer the same problems as children's diets generally. It also compares the diets of program participants and nonparticipants to explore the relationship between eating school breakfasts and/or lunches and children's dietary intakes.

In comparing the dietary intakes of SBP/NSLP participants and nonparticipants, we take into account differences in the basic demographic and socioeconomic characteristics of these two groups, as described in Chapter II. Thus, we can be certain that observed differences in intake do not simply arise from the fact that participants and nonparticipants differ in key characteristics such as age, gender, or family income. However, the resulting "regression-adjusted" estimates of participants' and nonparticipants' dietary intakes do not take into account differences that cannot be observed. Thus, the differences in intake presented in this chapter do not represent estimates of the impact of SBP/NSLP participation on dietary intake. Instead, the chapter presents descriptive findings that are suggestive of what role the meal programs may play in children's diets. Further analysis on additional data is needed to estimate the precise impacts of program participation on dietary intake.

A. PARTICIPATION IN THE NSLP

Between 1994 and 1996, according to the CSFII, about half of all students attending schools that offer the NSLP ate a school lunch on any given day.[1] Among these participating students, 36 percent received free meals and 8 percent received reduced-price meals, with the remainder paying the full price for lunch.

The characteristics of NSLP participants differ somewhat from those of nonparticipants (Table IV.1). Participants are more likely than nonparticipants to be male (55 percent of participants and 47 percent of nonparticipants) and are also more likely to be younger than 14 (74 versus 65 percent). A larger proportion of NSLP participants than nonparticipants are black or Hispanic. Participants are also more likely to be certified for free or reduced-price meals and to have low family incomes--47 percent of participants versus 32 percent of nonparticipants come from families with incomes below 185 percent of the poverty line. In estimating the difference between participants and nonparticipants in dietary intake, regression models are estimated that control for these and other differences in their characteristics.[2]

1. Participants' and Nonparticipants' Mean Nutrient Intakes

NSLP participants consume greater amounts of food energy and of most vitamins and minerals than nonparticipants, on average, even after controlling for income, age/gender, race/ethnicity, and other characteristics (Table IV.2). Over 24 hours, for example, participants' mean food energy

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[1]This includes students absent on that day. This estimate is based on the estimated day one participation rate of 52.1 percent and day two participation rate of 47.9 percent.

[2]The regression models control for age, gender, race/ethnicity, household income, household size and composition, region, urbanicity, body mass index, exercise, television watching, food stamp receipt, and the day, season, and year of intake data collection. See Chapter II for a description of the methodology for controlling for these characteristics.

TABLE IV.1

CHARACTERISTICS OF SBP AND NSLP PARTICIPANTS AND NONPARTICIPANTS, 1994 TO 1996

	NSLP		SBP	
Characteristic	Participants[a]	Nonparticipants	Participants[a]	Nonparticipants
Gender/Age				
Male, 6 to 8	14	12	16	15
Female, 6 to 8	13	12	18*	12
Male, 9 to 13	26**	18	26	22
Female, 9 to 13	21	23	23	21
Male, 14 to 18	15	17	12	15
Female, 14 to 18	11**	17	4**	15
Race/Ethnicity				
Hispanic	17**	10	31**	15
Non-Hispanic, black	18**	12	31**	18
Non-Hispanic, white	60**	74	35**	63
Other	5	4	3	4
Income/Certification Status				
Income <= 130% of poverty				
Certified	30**	12	65**	21
Not certified	3**	8	3	5
Income 131 to 185% of poverty				
Certified	8**	3	13**	6
Not certified	6*	9	3**	9
Income 186 to 299% of poverty				
Certified	5**	2	5	3
Not certified	16	18	3**	18
Income >= 300% of poverty				
Certified	2	2	1	1
Not certified	30**	47	6**	36
Region				
Northeast	16**	21	8	12
Midwest	23	22	12**	19
South	39**	32	44	48
West	22	25	36**	21
Urbanicity				
Urban	29	28	32	30
Suburban	47*	52	29**	46
Rural	24*	20	39**	24
Sample Size	**952**	**914**	**214**	**930**

SOURCE: Weighted tabulations based on one or two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: Sample includes only students attending schools that offer school breakfasts (for the SBP groups) and lunches (for the NSLP groups) on intake days during the school year. Students who had two intake days that were not school days were excluded.

[a] Significance test refers to difference in outcomes among SBP/NSLP participants and nonparticipants.

*Significantly different from zero at the .05 level, two-tailed test.
**Significantly different from zero at the .01 level, two-tailed test.

TABLE IV.2

MEAN REGRESSION-ADJUSTED NUTRIENT INTAKE OF SCHOOL-AGED CHILDREN, BY NSLP PARTICIPATION STATUS, 1994 TO 1996

	Mean Lunch Intake		Mean 24-Hour Intake	
Dietary Component	NSLP Participants[d]	Nonparticipants	NSLP Participants[d]	Nonparticipants
Food Energy				
As percentage of 1989 REA	30**	26	94**	88
As percentage of 24-hour food energy intake	34**	30	n.a.	n.a.
Percentage of Food Energy from:				
Total fat	36.9**	32.3	33.6**	32.0
Saturated fat	14.7**	11.0	12.5**	11.5
Carbohydrates				
Added sugars	13.2**	22.9	17.3**	19.6
Total	48.6**	57.0	52.7**	55.4
Protein	15.8**	12.4	14.9**	14.0
Vitamins (as Percentage of RDA)[a]				
Vitamin A	32**	24	119	120
Vitamin C	43	50	191	199
Vitamin E	28	27	91	86
Vitamin B_6	48**	40	192*	181
Vitamin B_{12}	91**	47	279**	231
Niacin[b]	50	46	185	177
Thiamin	52*	48	196*	187
Riboflavin	81**	53	260**	231
Folate[c]	20*	17	91	86
Minerals (as Percentage of RDA)[a]				
Calcium	37**	20	94**	77
Iron	33*	29	136	130
Magnesium	36**	30	112**	105
Phosphorus	51**	34	146**	128
Zinc	29**	20	99**	87
Other Dietary Components				
Fiber (g)	4.8**	4.0	14.2	13.5
Cholesterol (mg)	67**	46	225*	205
Sodium (mg)	1,117**	901	3,377**	3,065
Sample Size	**952**	**914**	**952**	**914**

SOURCE: Weighted tabulations based on one or two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: Sample includes only students attending schools that offer school lunches on intake days during the school year. Students who had two intake days that were not school days were excluded.

[a] Mean intakes of vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus in this table are measured as a percentage of the RDAs based on the new Dietary Reference Intakes (DRIs). For the remaining vitamins and minerals except calcium, mean intakes are measured as a percentage of the 1989 RDAs. For calcium, mean intake is measured as a percentage of the DRI-based Adequate Intake (AI).

[b] The reported intake of niacin as a percentage of the RDA is an underestimate because intake is reported in mg of niacin and does not include an estimate of the niacin that is contributed by the conversion of tryptophan to niacin. The RDA is given in mg of niacin equivalents and assumes that all niacin will be considered.

[c] The reported intake of folate as a percentage of the RDA is an underestimate because intake is reported in mcg of folate but the RDA is given in mcg of dietary folate equivalents. Expressing intake in mcg of folate does not make allowance for the high bioavailability of synthetic folic acid, as from fortified ready-to-eat cereals. Dietary folate equivalents consider bioavailability.

[d] Significance test refers to difference in outcomes among NSLP participants and nonparticipants. The mean lunch intakes from NSLP participants include contributions from a la carte foods obtained from the school cafeteria and other foods not part of the NSLP lunch.

n.a. = not applicable.

*Significantly different from zero at the .05 level, two-tailed test.
**Significantly different from zero at the .01 level, two-tailed test.

intake is 94 percent of the REA, compared with 88 percent among nonparticipants. At lunch, participants' mean food energy intake (including foods that came as part of the USDA lunch and any other foods consumed at lunch) is 30 percent of the REA, compared with 26 percent among nonparticipants. This difference in food energy intake also extends to most vitamins and minerals. Participants' mean daily intakes of eight micronutrients--vitamin B_6, vitamin B_{12}, thiamin, riboflavin, calcium, magnesium, phosphorus, and zinc--are significantly higher than the mean intakes of nonparticipants. For some of these eight micronutrients, both participants and nonparticipants consume mean amounts that are well above the RDA; for example, mean daily consumption of riboflavin is 260 percent of the RDA for participants and 231 percent for nonparticipants. For others, however, students' mean daily intake of the micronutrient is lower relative to the RDA. For example, participants' mean daily intake of zinc is 99 percent of the RDA, compared with 87 percent for nonparticipants.

In addition to consuming more of these vitamins and minerals, NSLP participants also consume larger average daily amounts of sodium and cholesterol than do nonparticipants (and participants also consume significantly more fiber at lunch than nonparticipants). Participants' mean daily intakes of sodium and cholesterol are 3,377 mg and 225 mg, respectively, compared with 3,065 mg and 205 mg among nonparticipants.

Finally, the macronutrient composition of children's diets differs according to their NSLP participation status. Relative to nonparticipants, participants consume a greater proportion of their calories in the form of total fat, saturated fat, and protein (Table IV.2). Over 24 hours, participants consume an average of 33.6 percent of their food energy from total fat and 12.5 percent from saturated fat; in contrast, nonparticipants consume 32.0 percent from total fat and 11.5 percent from saturated fat. The difference in protein intake is similarly large. These differences are statistically significant at the one percent level.

Although total carbohydrate intake as a percentage of food energy is lower for participants than for nonparticipants (52.7 versus 55.4 percent), carbohydrate intake from starch ("other" carbohydrates) is essentially the same for the two groups. Carbohydrate intake from added sugars account for the difference. In particular, participants' mean intake of added sugars contributes 17.3 percent of their food energy, compared with 19.6 percent for nonparticipants.[3] This 2.3 percentage point difference in the intake of added sugars is roughly mirrored in the 2.7 percentage point difference in total carbohydrate intake.

Although the comparisons described above focus on differences in participants' and nonparticipants' mean dietary intakes over 24 hours, these differences are explained primarily by differences in these groups' mean intakes from the foods they consume at lunch (include both school meals and any other foods consumed). Participants consume significantly more food energy than nonparticipants at lunch, and they also have significantly higher intakes of each of the eight micronutrients listed above for which there is a significant difference in the mean 24-hour intakes of the two groups. In addition to these eight dietary components (vitamin B6, vitamin B12, thiamin, riboflavin, calcium, magnesium, phosphorous, and zinc), NSLP participants have significantly higher lunch intakes than nonparticipants of vitamin A, folate, iron, and fiber but these differences are not sustained over 24 hours.

The differences between participants and nonparticipants in dietary intakes at lunch and over 24 hours are similar in magnitude. For example, while participants' lunch intake of food energy relative to the REA is four percentage points higher than that of nonparticipants, this difference is

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[3]Thus, even though participants' food energy intake is higher than that of nonparticipants, their absolute intake of added sugars is lower (22 versus 24 teaspoons).

only slightly larger (six percentage points) over 24 hours. Participants' intake of calcium relative to the AI is 17 percentage points higher than that of nonparticipants both at lunch and over 24 hours. Participants' and nonparticipants' intakes of other nutrients follow a similar pattern. The implication is that, while NSLP participants consume larger amounts of food energy, vitamins and minerals, and other dietary components from all foods they eat at lunch, the two groups consume similar amounts at other meals during the entire day.

Differences in participants' and nonparticipants' macronutrient intakes at lunch are more striking than differences in their 24-hour intakes. At lunch, mean total fat intake as a percentage of food energy is 36.9 percent for NSLP participants and 32.3 percent for nonparticipants, and saturated fat intake as a percentage of food energy is 14.7 percent for participants and 11.0 percent for nonparticipants. The difference in added sugar intake at lunch is even larger--nonparticipants consume 22.9 percent of their lunchtime food energy in the form of added sugar, compared with only 13.2 percent for participants. As was the case over 24 hours, there is little difference in participants' and nonparticipants' lunchtime carbohydrate intake, except for added sugar.

As with micronutrient intakes, the lunch differences in fat intake as a percentage of food energy almost entirely explain the 24-hour differences. Participants and nonparticipants have similar intakes of total fat and saturated fat (as a percentage of food energy) at meals other than lunch. Thus, the large difference in lunchtime fat intakes becomes smaller over 24 hours. With respect to added sugar, participants actually consume slightly higher amounts than nonparticipants at meals other than lunch (reversing the lunchtime trend). As a result, the very large difference between the two groups in lunchtime added sugar intake becomes much smaller over 24 hours, although, as described above, it remains substantial and statistically significant.

The difference between the regression-adjusted comparison and the unadjusted comparison of participants' and nonparticipants' mean intakes (Appendix Table B.1.A) is small.[4] Both cases lead to the same conclusion: on average, participants consume larger amounts of food energy, many vitamins and minerals, and fat and saturated fat than do nonparticipants.

2. Percentages of Participants and Nonparticipants Meeting Dietary Standards

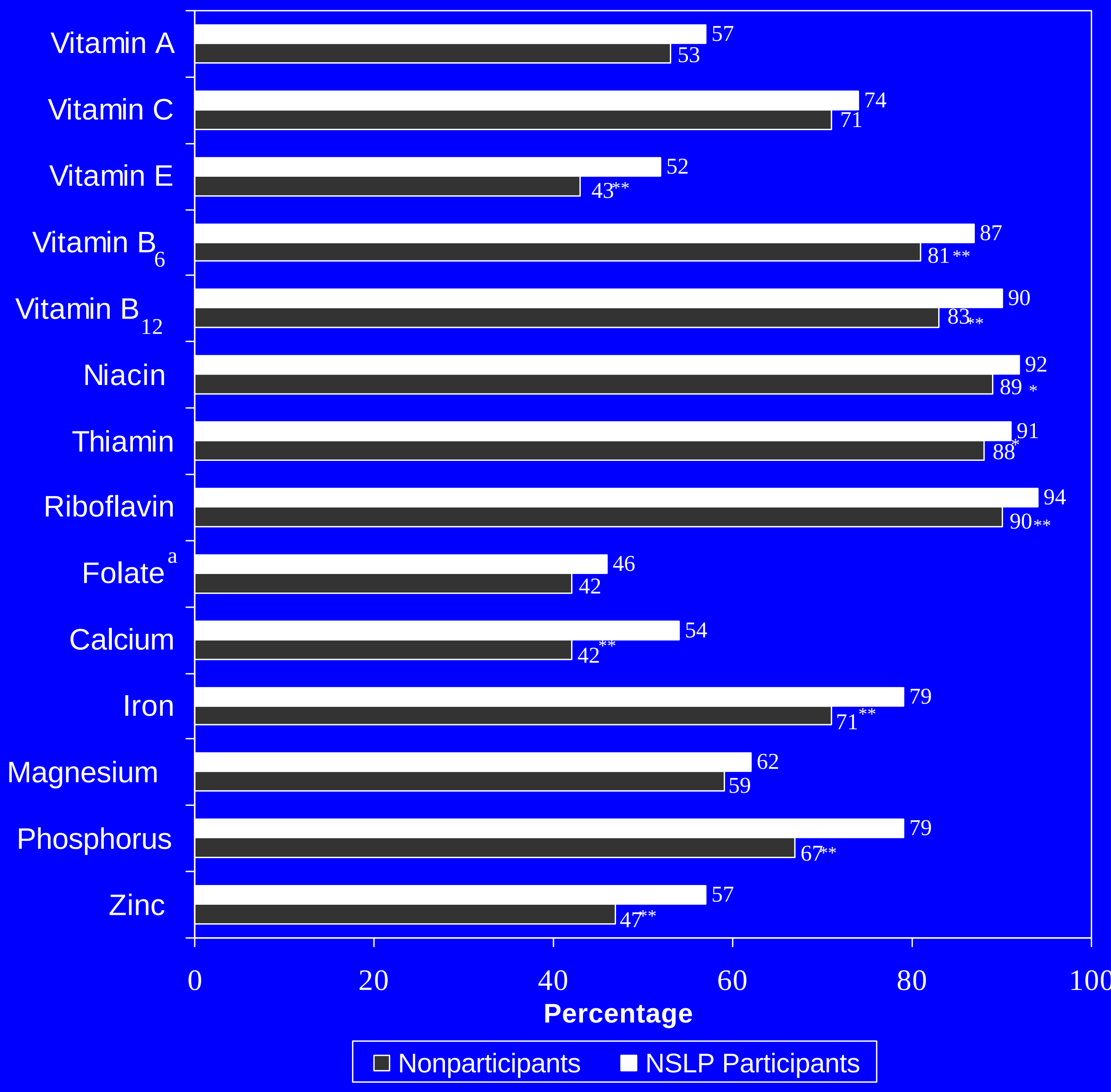
Although Table IV.2 clearly shows that NSLP participants' vitamin and mineral average intakes are greater than those of nonparticipants, this does not indicate whether participants are more likely to meet dietary standards for particular nutrients. For some nutrients (riboflavin, for example), mean intake levels of both participants and nonparticipants may be so high that all or nearly all of both groups have adequate intakes. Alternatively, participants may have higher mean intakes of particular nutrients because of a difference among those at the upper end of the distribution; that is, compared with nonparticipants, a larger proportion of participants might consume very high amounts of the nutrient. In this case, the mean intake of participants could exceed that of nonparticipants even if the same proportion of both groups had inadequate intake levels. Ideally, we would examine directly the proportions of NSLP participants and nonparticipants whose usual vitamin and mineral intake falls below specific dietary standards.

Figure IV.1 shows what percentages of the two groups have observed single-day vitamin and mineral intakes that equal or exceed given dietary standards (the EAR, 80 percent of the RDA, or 80 percent of the AI). Since these percentages are based on observed single-day intakes rather than usual intakes, they are not estimates of the percentage of participants and nonparticipants whose

[4]See Table B.1.B for participants' and nonparticipants' mean intakes under alternative definitions of NSLP participation.

Figure IV.1

Percentage Whose Daily Vitamin and Mineral Intake Exceeds Standard, By NSLP Participation Status, 1994 to 1996



NOTE: For vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus, the Estimated Average Requirements (EARs) based on the new Dietary Reference Intakes are used. For the remaining nutrients except calcium, the chart shows the percentage of people whose intake is above 80 percent of the 1989 Recommended Dietary Allowances (an approximation of the EAR). For calcium, the table shows the percentage of people whose intake is above 80 percent of the Adequate Intake.

[a]The percentage of children whose daily calcium intake exceeds 80 percent of the AI should not be interpreted as an estimate of the percentage whose intake is adequate (Institute of Medicine 2000).

* Significantly different from zero at the .05 level, two-tailed test

** Significantly different from zero at the .01 level, two-tailed test.

usual intake is adequate. Rather, they are measures of the single-day intake distribution and are likely to be imperfectly correlated with the percentage whose usual intake is adequate.[5]

Differences in NSLP participants' and nonparticipants' mean 24-hour vitamin and mineral intakes clearly translate into differences in the percentages of these groups whose observed single-day intakes meet dietary standards for vitamin and mineral intake. For each of the 14 vitamins and minerals we examined, the percentage of participants meeting the dietary standard exceeds the percentage of nonparticipants meeting the standard. This difference is statistically significant for 9 of the 14 vitamins and minerals. Furthermore, these nutrients include several identified in Chapter III as ones for which inadequate intake is a problem in the population. For example, while only 43 percent of nonparticipants meet the standard for vitamin E intake (on a given day), 52 percent of participants meet this standard. Similarly, NSLP participation is associated with an increase in the percentage meeting the iron standard from 71 to 79 percent, an increase in the percentage meeting the phosphorus standard from 67 to 79 percent, and an increase in the percentage meeting the calcium standard from 42 to 54 percent.

Differences in NSLP participants' and nonparticipants' 24-hour intake of fat, carbohydrates, protein, and sodium also translate into differences in the percentage meeting the recommendations

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[5]Appendix Table B.2 presents the numbers upon which Figure IV.1 is based. These estimates are regression adjusted for differences in participants' and nonparticipants' characteristics, but they are based upon single-day observations of the groups' daily intake rather than their usual daily intake. Appendix Table B.3 presents estimates of participants' and nonparticipants' usual daily intake, although these estimates have not been regression adjusted to account for differences in the groups' characteristics. For most nutrients, these *unadjusted* percentages of participants and nonparticipants whose *usual* intakes meet the EAR or 80 percent of the RDA are greater than the *regression-adjusted* percentages whose *daily* intakes meet the standards. In both cases, however, larger percentages of participants than nonparticipants meet the standard for each of the 14 vitamins and minerals we examined. Thus, our conclusions would be similar no matter which set of numbers we used.

for these dietary components. Figure IV.2 shows that participants are significantly less likely than nonparticipants to meet the following dietary recommendations:

- Limit total fat intake to no more than 30 percent of food energy.
- Limit saturated fat intake to less than 10 percent of food energy.
- Have carbohydrate intake of more than 55 percent of food energy.
- Limit sodium intake to no more than 2,400 mg.
- Limit protein intake to no more than twice the 1989 RDA for protein.

In each case, the percentage of nonparticipants whose daily intake meets the dietary standards is about 10 percentage points higher than the percentage of participants meeting the standard.[6]

3. Food Intake

The foods that NSLP participants eat for lunch are different from those that nonparticipants eat, which may explain some of the differences in nutrient intake described above. Table IV.3 shows the two groups' mean consumption of different foods at lunch and over 24 hours, after controlling for observable characteristics.[7] On average, participants consume more than twice the number of servings of vegetables as do nonparticipants for lunch (1.3 versus 0.6). This difference arises largely

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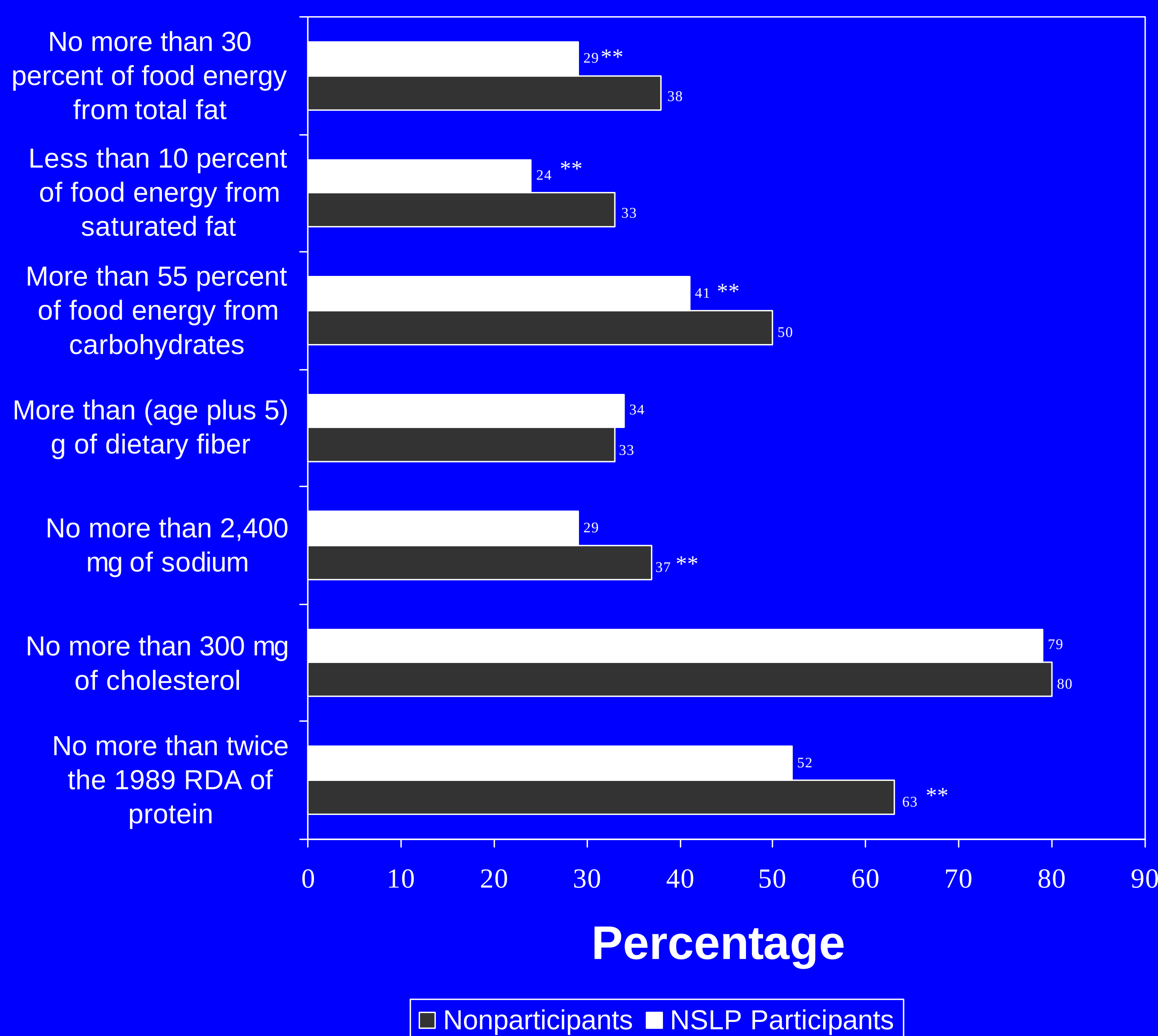
[6]Appendix Table B.4 presents the numbers upon which Figure IV.2 is based. Again, these are regression-adjusted estimates based on single-day observations of participants' and nonparticipants' daily intakes. Appendix Table B.5 presents *unadjusted* estimates of the percentage of participants and nonparticipants whose *usual* intakes meet the dietary recommendations. The differences between participants and nonparticipants in the unadjusted percentages whose usual intakes meet the dietary recommendations for fat, saturated fat, and carbohydrate are much larger than the differences between the groups in the regression-adjusted percentages whose daily intakes meet these dietary recommendations. However, both sets of comparisons show that participants are less likely than nonparticipants to meet these recommendations.

[7]Appendix Table B.6 shows the unadjusted comparison in the mean food intakes of participants and nonparticipants.

Figure IV.2
Percentage of School-Aged Children Who Meet Selected Dietary Recommendations, By NSLP Participation Status, 1994 to 1996



* Difference between NSLP participants' and nonparticipants' intakes is significantly different from zero at the .05 level, two-tailed test.

**Difference between NSLP participants' and nonparticipants' intakes is significantly different from zero at the .01 level, two-tailed test.

TABLE IV.3

REGRESSION-ADJUSTED MEAN FOOD GROUP INTAKES OF SCHOOL-AGED CHILDREN, BY NSLP PARTICIPATION STATUS, 1994 TO 1996

	Mean Number of Servings			
	Lunch		24 Hours	
Food Group	NSLP Participants[a]	Nonparticipants	NSLP Participants[a]	Nonparticipants
Grain Products				
Whole grains	0.1**	0.4	0.9*	1.1
Nonwhole grains	1.9	1.8	6.2	6.0
Total	2.0*	2.2	7.0	7.0
Vegetables				
Potatoes	0.7**	0.4	1.4**	1.1
Other starchy vegetables	0.1	0.0	0.2	0.2
Legumes	0.0	0.0	0.1	0.1
Dark-green leafy vegetables	0.0	0.0	0.1	0.1
Other vegetables	0.4**	0.2	1.2*	1.0
Total	1.3**	0.6	3.1**	2.5
Fruit				
Citrus	0.1	0.1	0.5*	0.7
Noncitrus	0.4	0.3	0.8	0.8
Total	0.5	0.5	1.3	1.4
Vegetables and Fruit	1.7**	1.1	4.4**	3.9
Milk Products				
Milk				
Whole milk	0.2**	0.1	0.6**	0.4
Low-fat milk	0.4**	0.1	0.9**	0.6
Nonfat milk	0.0	0.0	0.1	0.2
Total[b]	0.8**	0.2	2.0**	1.4
Cheese	0.3**	0.2	0.6*	0.5
Other dairy	0.0	0.0	0.0	0.0
Total	1.1**	0.4	2.6**	2.1
Meat and Meat Substitutes				
Red meat	0.4	0.3	1.0*	0.9
Poultry	0.1	0.1	0.4	0.4
Fish	0.0	0.0	0.1	0.1
Eggs	0.0**	0.0	0.1	0.1
Nuts and seeds	0.0**	0.1	0.0**	0.1
Total	0.5*	0.4	1.6*	1.5
Soda	0.2**	0.4	1.0	1.2
Fruit Drinks and Fruit-Flavored Drinks	0.1**	0.3	0.7	0.8
Sample Size	**952**	**914**	**952**	**914**

SOURCE: Weighted tabulations using one or two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: Sample includes only students attending schools that offer school lunches on intake days during the school year. Students who had two intake days that were not school days were excluded.

[a]Significance test refers to difference in outcomes among NSLP participants and nonparticipants.

[b]The total number of servings of milk includes not only whole, low-fat, and nonfat milk, but also milk whose fat content was not specified.

*Significantly different from zero at the .05 level, two-tailed test.
**Significantly different from zero at the .01 level, two-tailed test.

from potatoes, as participants consume an average of 0.7 servings of potatoes versus 0.4 among nonparticipants. However, participants also consume significantly more “other vegetables” than nonparticipants. The difference in vegetable consumption may partially explain the difference between the groups in vitamin and mineral intake.

Participants and nonparticipants also differ substantially in the consumption of milk products, which could account for the difference in calcium (and part of the difference in fat) intake. Participants consume much larger amounts of whole milk and low-fat milk. This, together with a higher intake of milk of unspecified type (not shown), leads to their overall mean milk consumption being four times as large as that of nonparticipants (0.8 versus 0.2 servings). On average, participants also consume larger amounts of cheese and meat or meat substitutes than nonparticipants.

On the other hand, at lunch, nonparticipants consume greater average amounts of grain products, particularly whole grains, than do NSLP participants. In addition, instead of drinking milk at lunch, nonparticipants appear to be more likely to consume soda and/or fruit drinks in greater quantities than participants. Nonparticipants consume an average of 0.4 servings of soda and 0.3 servings of fruit drinks at lunch, compared with 0.2 and 0.1 for participants. This difference may account for the fact that nonparticipants get a larger proportion of their food energy from added sugars than do participants.

With the exception of total intake of grain products, soda, and fruit drinks, the differences in participants’ and nonparticipants’ lunch food group consumption is mirrored by the differences in their 24-hour food group consumption and remain statistically significant. Furthermore, the magnitude of the differences in 24-hour consumption is similar to the magnitude of the differences in lunchtime consumption. For example, participants consume an average of 0.7 more servings of vegetables for lunch than nonparticipants and consume 0.6 more servings of vegetables over 24 hours. Similarly, participants consume 0.6 more servings of milk for lunch than nonparticipants, and the difference over 24 hours is exactly the same. This is further evidence that differences in NSLP participants' and nonparticipants' dietary intakes arise almost entirely from differences in their lunch intakes. The two groups' diets are similar over the remainder of the day (after controlling for observable characteristics).

B. PARTICIPATION IN THE SBP

Between 1994 and 1996, according to the CSFII, about 15 percent of all students attending schools that offer the SBP ate a school breakfast on any given day.[8] Most SBP participants (77 percent) received free breakfasts, while 9 percent received reduced-price breakfasts. Only 14 percent of SBP participants paid the full price for breakfast during this period.

Differences between the characteristics of participants and nonparticipants in the SBP are larger than was the case with the NSLP (Table IV.1). In particular, SBP participants are much more likely than nonparticipants to be racial/ethnic minorities and to have low incomes. Nearly one-third of SBP participants are Hispanics, and nearly another one-third are black, while only 15 and 18 percent of nonparticipants are Hispanic and black, respectively. Furthermore, the vast majority of SBP participants are from low-income families--68 percent have incomes below 130 percent of the poverty line, and more than 85 percent have incomes below 185 percent of the poverty line. Among nonparticipants, meanwhile, 26 percent have incomes below 130 percent of the poverty line, and 41 percent have incomes below 185 percent of the poverty line. Finally, SBP participants tend to be

[8]This includes students absent from school on that day. The total estimate is based on an estimated day one participation rate of 15.1 percent and day two participation rate of 15.2 percent. Administrative data suggest a slightly higher SBP participation rate over this period (see Chapter II).

younger than nonparticipants, especially among females. While only 4 percent of participants are 14- to 18-year-old females, 15 percent of nonparticipants fall into this category.

1. Does the Availability of the SBP Lead to More Breakfast Eating?

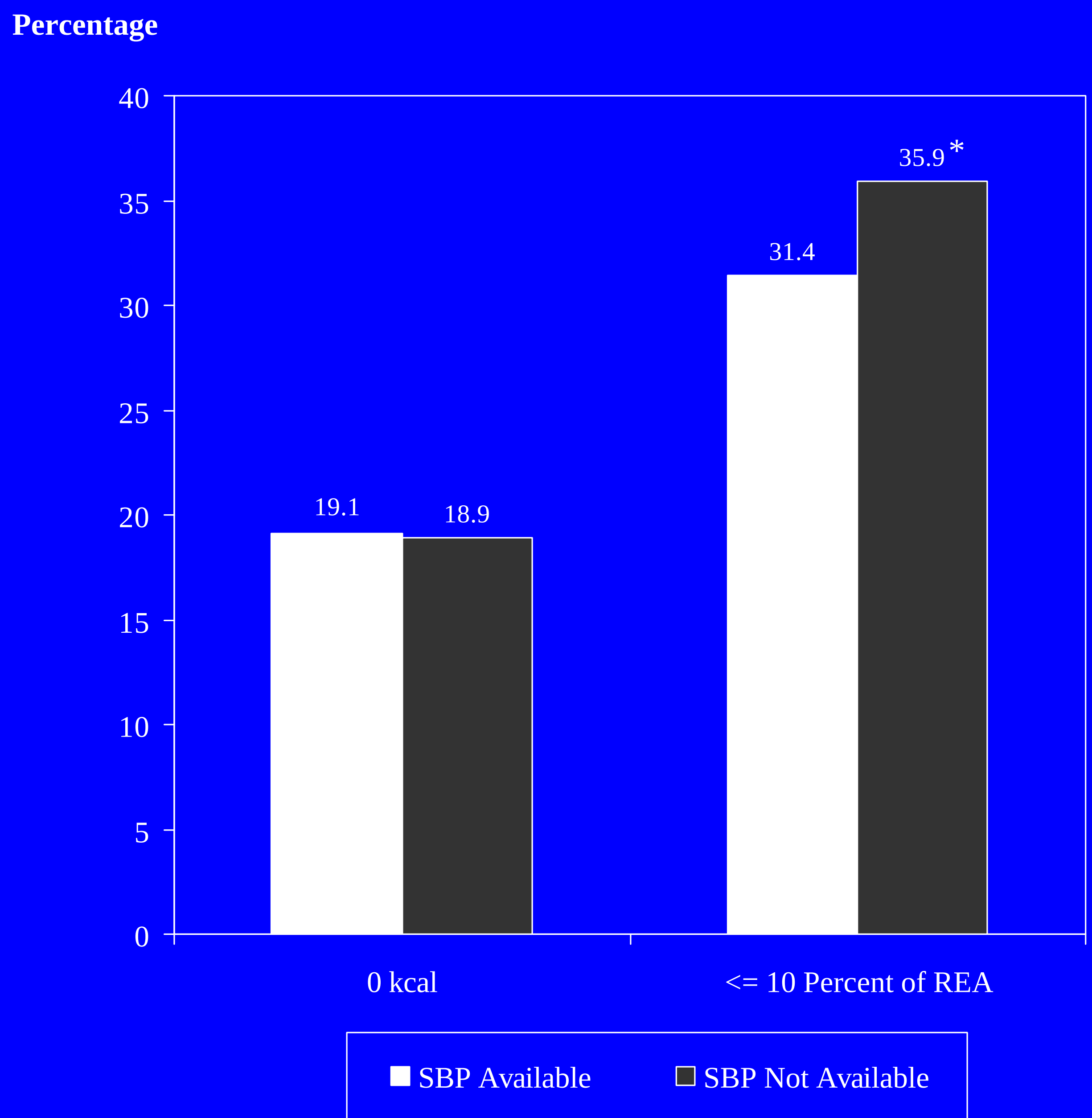
Chapter III described the extent to which school-aged children eat breakfast (using alternative definitions of breakfast eating). This analysis showed that, on any given day, breakfast skipping is common, with anywhere from one-fifth to one-third of children not eating breakfast (depending on which definition is used). An important research issue involves whether the availability of the SBP in a child's school causes that student to be more likely to eat breakfast. As summarized in Chapter II, recent research suggests that, among low-income children, the availability of the SBP is associated with an increased likelihood of breakfast eating when the definition of breakfast excludes very-low-calorie food intake from being considered breakfast (Devaney and Stuart 1998). The CSFII data give us an opportunity to address this issue using a new data source.

CSFII data confirm the basic results of Devaney and Stuart (1998). When breakfast eating is defined as eating any food for breakfast, there is no relationship between the availability of the SBP and breakfast eating (Figure IV.3). However, when breakfast eating is defined as having food energy intake of at least 10 percent of the REA, significantly fewer children attending SBP schools than attending non-SBP schools skip breakfast on a given day (31 and 36 percent, respectively).

2. Participants' and Nonparticipants' Mean Nutrient Intakes

After controlling for relevant characteristics, SBP participants consume more food energy on a given day than nonparticipants, on average (Table IV.4). Participants' regression-adjusted mean intake over 24 hours is 96 percent of the REA, compared with 90 percent among nonparticipants. This difference arises entirely out of a difference in the two groups' mean food energy intakes at

Figure IV.3
Percentage of School-Aged Children Skipping Breakfast, by Availability of SBP in School, 1994 to 1996 CSFII



REA = Recommended Energy Allowance.

* Significantly different from zero at the .05 level, two-tailed test.
** Significantly different from zero at the .01 level, two-tailed test.

TABLE IV.4

REGRESSION-ADJUSTED MEAN NUTRIENT INTAKE OF SCHOOL-AGED CHILDREN, BY SBP PARTICIPATION STATUS, 1994 TO 1996

	Mean Breakfast Intake		Mean 24-Hour Intake	
Dietary Component	SBP Participants[d]	Nonparticipants	SBP Participants[d]	Nonparticipants
Food Energy				
As percentage of 1989 REA	22**	15	96*	90
As percentage of 24-hour food energy intake	23**	17	n.a.	n.a.
Percentage of Food Energy from:				
Total fat	26.8	24.6	33.4	33.1
Saturated fat	11.0*	10.0	12.4	12.2
Carbohydrates				
Added sugars	16.3*	20.4	18.0	18.5
Total	61.9	64.8	53.3	53.6
Protein	13.0	12.4	14.5	14.6
Vitamins (as Percentage of RDA)[a]				
Vitamin A	40	37	109	118
Vitamin C	93**	50	225**	182
Vitamin E	17	15	83	89
Vitamin B_6	57	62	180	188
Vitamin B_{12}	69	63	255	264
Niacin[b]	42	46	177	181
Thiamin	63	57	197	190
Riboflavin	95*	77	263	244
Folate[c]	35	37	85	89
Minerals (as Percentage of RDA)[a]				
Calcium	33**	20	100**	83
Iron	40	44	126	133
Magnesium	30**	22	114	108
Phosphorus	43**	28	152**	132
Zinc	23	23	95	95
Other Dietary Components				
Fiber (g)	2.9**	2.0	14.3	13.9
Cholesterol (mg)	48	47	223	220
Sodium (mg)	623**	465	3,461	3,210
Sample Size	**214**	**930**	**214**	**930**

SOURCE: Weighted tabulations based on one or two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: Sample includes only students attending schools that offer school breakfasts on intake days during the school year. Students who had two intake days that were not school days were excluded.

[a] Mean intakes of vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus in this table are measured as a percentage of the RDAs based on the new Dietary Reference Intakes (DRIs). For the remaining vitamins and minerals except calcium, mean intakes are measured as a percentage of the 1989 RDAs. For calcium, mean intake is measured as a percentage of the DRI-based Adequate Intake (AI).

[b] The reported intake of niacin as a percentage of the RDA is an underestimate because intake is reported in mg of niacin and does not include an estimate of the niacin that is contributed by the conversion of tryptophan to niacin. The RDA is given in mg of niacin equivalents and assumes that all niacin will be considered.

[c] The reported intake of folate as a percentage of the RDA is an underestimate because intake is reported in mcg of folate but the RDA is given in mcg of dietary folate equivalents. Expressing intake in mcg of folate does not make allowance for the high bioavailability of synthetic folic acid, as from fortified ready-to-eat cereals. Dietary folate equivalents consider bioavailability.

[d] Significance test refers to difference in outcomes among SBP participants and nonparticipants.

*Significantly different from zero at the .05 level, two-tailed test.
**Significantly different from zero at the .01 level, two-tailed test.

breakfast (22 percent of the REA among participants and 15 percent among nonparticipants).[9] Again, the breakfast consumption of SBP participants may include both foods that are part of the school breakfast and other foods consumed during the morning eating period. Excluding breakfast, SBP participants and nonparticipants have similar food energy intakes.

On the other hand, SBP participants and nonparticipants consume similar mean amounts of many vitamins and minerals. The three micronutrients for which mean daily intake and SBP participation are positively and significantly related are vitamin C, calcium, and phosphorus (Table IV.4). In particular, participants consume an average of 225 percent of the vitamin C RDA, 100 percent of the calcium AI, and 152 percent of the phosphorus RDA each day. In contrast, nonparticipants consume 182 percent of the vitamin C RDA, 83 percent of the calcium AI, and 132 percent of the phosphorus RDA. Differences in participants' and nonparticipants' breakfast intakes of these three nutrients are similar in magnitude to these 24-hour differences, which again suggests that breakfast accounts for all or nearly all of the 24-hour difference between the groups (after controlling for relevant characteristics). Furthermore, SBP participants consume significantly more riboflavin and magnesium at breakfast than nonparticipants, although the 24-hour differences between the groups in these nutrients' intakes are not statistically significant.

On average, SBP participants consume more fiber and sodium at breakfast and over 24 hours than nonparticipants. However, only the difference in the two groups' intakes at breakfast is statistically significant; the 24-hour difference in fiber and sodium intake is not statistically

[9]The regression-adjusted mean breakfast intakes reported in this section are based on the full sample of students attending SBP schools. Except for the outcomes measured as percentages of food energy intake (which are undefined for breakfast skippers), the sample includes children who skipped breakfast. These children are included in the sample because of the potential for the SBP to lessen breakfast skipping. In supplemental regressions that excluded breakfast skippers, SBP participation was found to be positively and significantly associated with children's intakes of food energy, saturated fat, vitamin C, calcium, and phosphorus, and negatively and significantly associated with intakes of added sugars, vitamin A, vitamin B_6, niacin, folate, iron, and zinc.

significant at the five percent level. SBP participants and nonparticipants have similar mean intakes of cholesterol, both at breakfast and over 24 hours.

Unlike NSLP participation, SBP participation is not associated with large differences in children's fat, saturated fat, carbohydrate, and protein intakes (as percentages of food energy intake) over 24 hours, once relevant characteristics are taken into account. SBP participants' 24-hour total fat intake as a percentage of food energy is slightly higher than that of nonparticipants (33.4 versus 33.1 percent), but this difference is not statistically significant. Nor are there significant differences between the two groups' intakes of saturated fat (12.4 versus 12.2 percent), added sugar (18.0 versus 18.5 percent), carbohydrates (53.3 versus 53.6 percent), or protein (14.5 versus 14.6). At breakfast alone, however, SBP participants consume significantly more saturated fat as a percentage of food energy than nonparticipants (11.0 versus 10.0 percent) and significantly less in added sugars as a percentage of food energy (16.3 versus 20.4 percent).

Overall, the relationship between SBP participation and children's dietary intake is similar to the relationship between NSLP participation and children's dietary intake. However, differences between participants' and nonparticipants' dietary intakes tend to be smaller and are less likely to be statistically significant in the case of the SBP than in the case of the NSLP. In particular, NSLP participation is significantly related to the intake of a broader range of vitamins and minerals. In addition, the relationship between NSLP participation and children's intake of fat and sugar is much stronger than the relationship between SBP participation and these outcomes.[10]

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[10]Another difference between the SBP and NSLP in this analysis is that the regression adjustment of mean intakes among participants and nonparticipants appears to have a larger effect on the results in the case of the SBP. Appendix Table B.7 shows mean dietary intakes among SBP participants and nonparticipants that have not been regression adjusted. The unadjusted differences between participants and nonparticipants tend to be larger and are more likely to be statistically significant than the regression-adjusted differences. This is particularly true for macronutrient intake as a percentage of food energy.

3. Percentages of Participants and Nonparticipants Meeting Dietary Standards

Figure IV.4 shows the percentages of SBP participants and nonparticipants whose daily intakes meet the dietary standards for vitamins and minerals.[11] As was the case with measures of mean micronutrient intake, SBP participation is positively and significantly related to meeting the dietary standard for only a few vitamins and minerals. In particular, significantly larger percentages of SBP participants than nonparticipants have observed single-day intakes that meet the dietary standard for four micronutrients: (1) vitamin C, (2) vitamin B_{12}, (3) thiamin, and (4) calcium. The most relevant of these differences are for vitamin C and calcium, since nearly all children have *usual* intakes of vitamin B_{12} and thiamin that meet the EAR.[12] For vitamin C, 82 percent of SBP participants versus 70 percent of nonparticipants have daily intakes exceeding 80 percent of the RDA. Meanwhile, 58 percent of SBP participants versus 46 percent of nonparticipants have single-day intakes above the dietary standard used for calcium. For the vitamins and minerals other than the four listed above, differences between SBP participants and nonparticipants in the percentages with daily intakes meeting the dietary standard are small and statistically insignificant.

SBP participants and nonparticipants do not differ significantly in the percentages meeting the dietary recommendations for total and saturated fat, carbohydrates, fiber, sodium, cholesterol,

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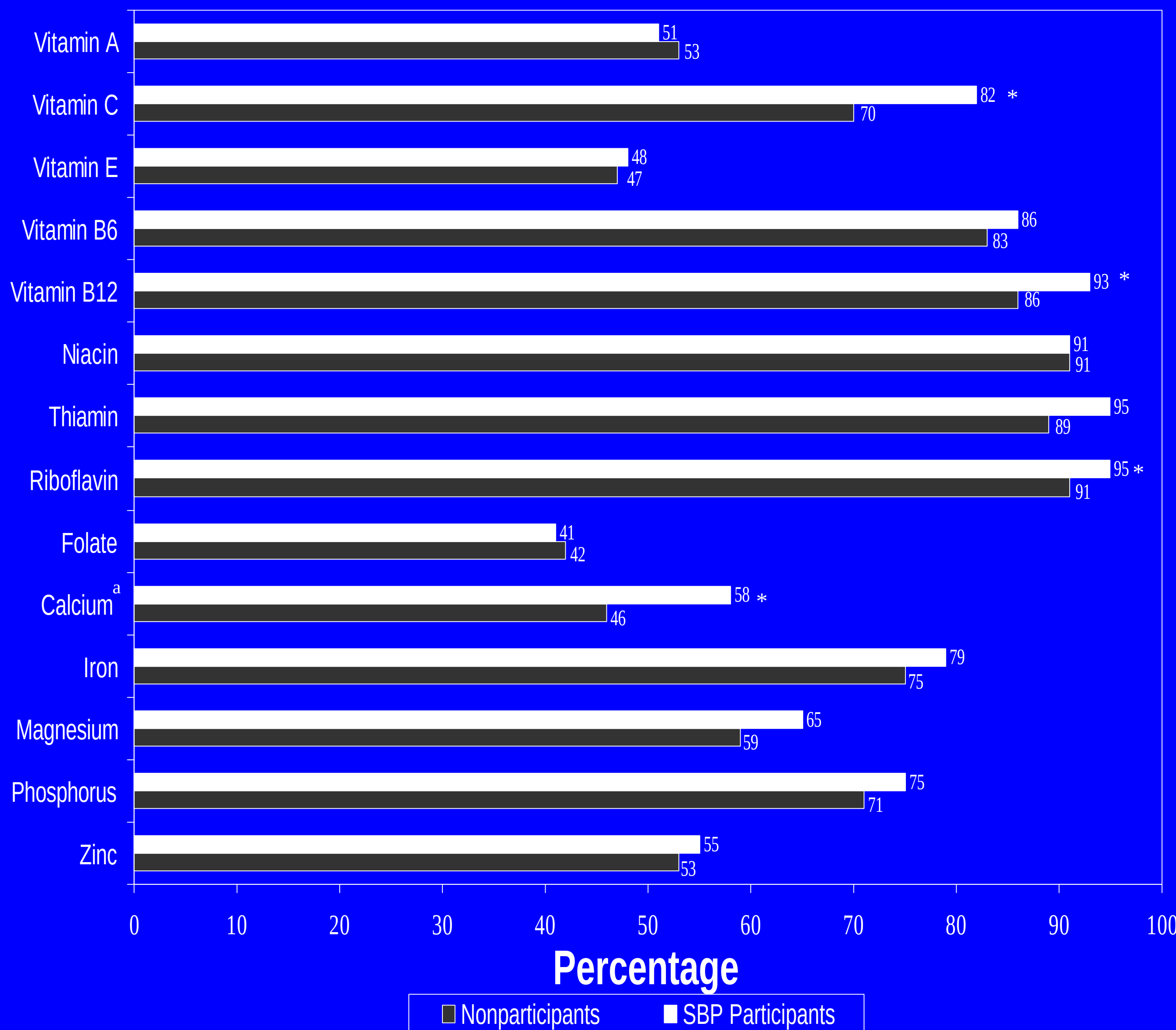
[11]Appendix Table B.8 presents in tabular form the numbers upon which Figure IV.4 is based. These estimates are regression adjusted for differences in participants' and nonparticipants' characteristics, but they are based on single-day observations of the groups' daily intake rather than their usual daily intake. Appendix Table B.9 presents estimates based on participants' and nonparticipants' usual daily intake, although these estimates have not been regression adjusted to account for differences in the groups' characteristics.

[12]According to Table III.10, over 98 percent of all school-aged children have usual nutrient intakes above the EAR for each of these nutrients. The percentages with one-day intakes above the EAR are lower because of day-to-day variation in intake.

Figure IV.4
Percentage of School-Aged Children Whose Daily Vitamin and Mineral Intake Exceeds Standard, by SBP Participation Status, 1994 to 1996 CSFII



NOTE: For vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus, the Estimated Average Requirements (EARs) based on the new Dietary Reference Intakes are used. For the remaining nutrients except calcium, the chart shows the percentage of people whose intake is above 80 percent of the 1989 Recommended Dietary Allowances (an approximation of the EAR). For calcium, the table shows the percentage of people whose intake is above 80 percent of the Adequate Intake.

[a] The percentage of children whose daily calcium intake exceeds 80 percent of the AI should not be interpreted as an estimate of the percentage whose intake is adequate (Institute of Medicine 2000).

* Significantly different from zero at the .05 level, two-tailed test

**Significantly different from zero at the .01 level, two-tailed test.

and protein (Figure IV.5).[13] In each case (except for fiber), a larger percentage of nonparticipants than participants meet the dietary recommendation, but each of these differences is statistically insignificant.[14]

4. Food Intake

As was the case with the NSLP, differences between SBP participants and nonparticipants in the foods they consume can account to some extent for differences in their nutrient intake. After controlling for relevant characteristics, one difference in the two groups' food intakes is that SBP participants consume more servings of fruit than nonparticipants, on average. At breakfast, participants consume an average of 0.8 servings of fruit, compared with 0.3 servings among nonparticipants (Table IV.5).[15] The differences at breakfast translate into similar differences over 24 hours--participants consume an average of 1.8 servings of fruit a day, and nonparticipants consume an average of 1.2 servings a day. SBP participants' higher consumption of fruit probably accounts for the fact that their vitamin C intake is significantly higher than that of nonparticipants.

Another big difference in the two groups' food intakes is that participants consume more milk than nonparticipants, on average. At breakfast, participants' mean milk intake is 1.0 servings, compared with 0.6 among nonparticipants. Over the remainder of the day, each group consumes an average of one more serving, so the 24-hour milk intakes are 2.0 servings among participants and 1.6 servings among nonparticipants. This difference in milk consumption may help explain the

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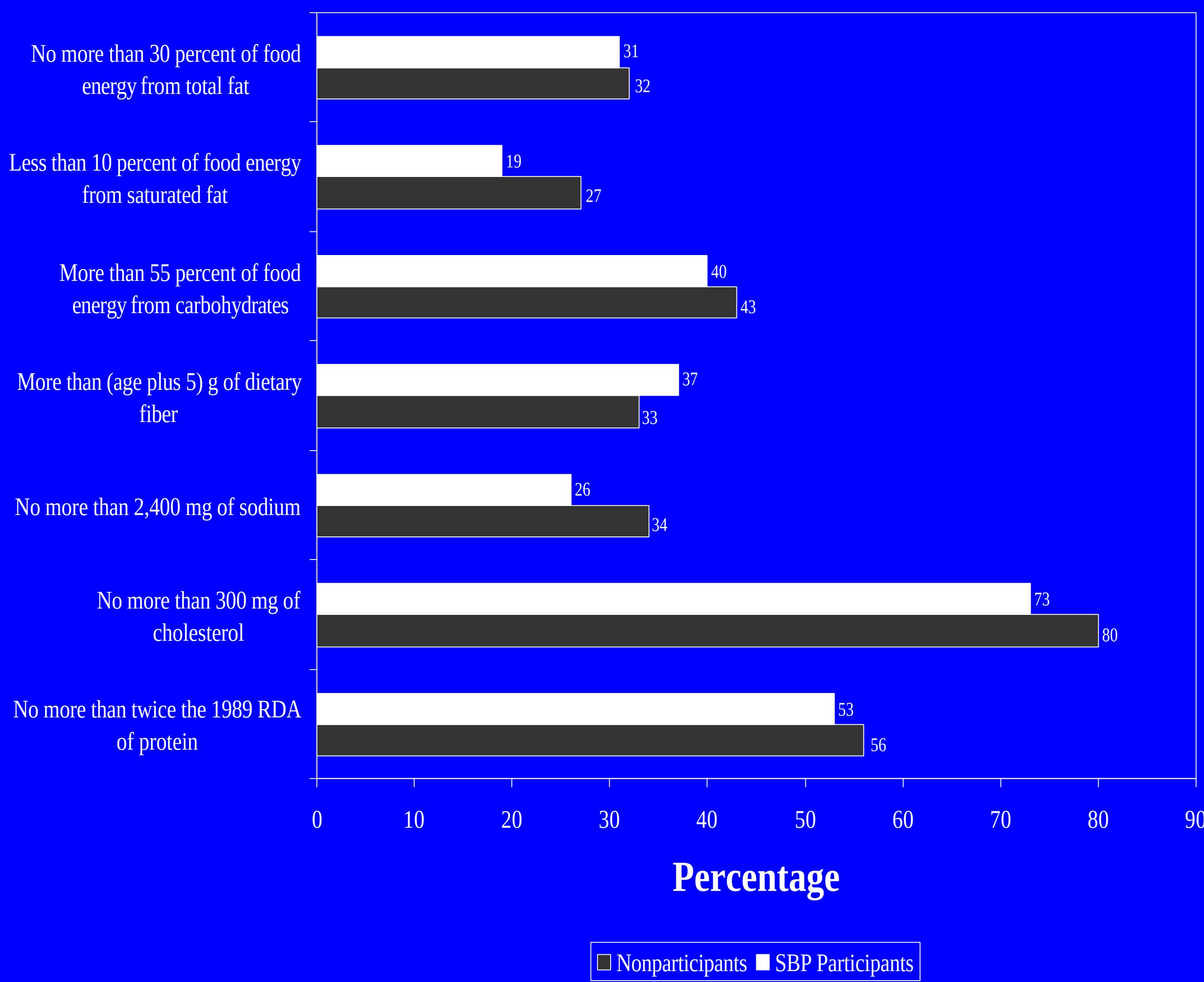
[13]Appendix Table B.10 presents the numbers upon which Figure IV.5 is based.

[14]By contrast, differences (that have not been regression adjusted) between SBP participants and nonparticipants in the percentage whose *usual* intake meets the dietary guideline are larger and more likely to be statistically significant (see Appendix Table B.11).

[15]Appendix Table B.12 shows the mean food intakes of participants and nonparticipants that have not been regression adjusted.

Figure IV.5
Percentage of School-Aged Children Who Meet Selected Dietary Recommendations, by SBP Participation Status, 1994 to 1996 CSFII



NOTE: None of the differences shown above are statistically significant.

TABLE IV.5

REGRESSION-ADJUSTED MEAN FOOD GROUP INTAKES OF SCHOOL-AGED CHILDREN, BY SBP PARTICIPATION STATUS, 1994 TO 1996

	Mean Number of Servings			
	Breakfast		24 Hours	
Food Group	SBP Participants[a]	Nonparticipants	SBP Participants[a]	Nonparticipants
Grain Products				
Whole grains	0.3	0.4	0.9	1.0
Nonwhole grains	1.3**	0.9	6.3	5.9
Total	1.6	1.3	7.2	6.9
Vegetables				
Potatoes	0.0	0.0	1.2	1.2
Other starchy vegetables	0.0	0.0	0.2	0.2
Legumes	0.0	0.0	0.1	0.2
Dark-green leafy vegetables	0.0	0.0	0.0*	0.1
Other vegetables	0.0	0.0	1.1	1.2
Total	0.1	0.0	2.7	2.8
Fruit				
Citrus	0.4**	0.2	0.9**	0.5
Noncitrus	0.3**	0.1	0.8	0.7
Total	0.8**	0.3	1.8**	1.2
Vegetables and Fruit	0.8**	0.3	4.4	4.0
Milk Products				
Milk				
Whole milk	0.3	0.2	0.6	0.6
Low-fat milk	0.5**	0.2	0.9*	0.7
Nonfat milk	0.0*	0.1	0.1	0.1
Total[b]	1.0**	0.6	2.0**	1.6
Cheese	0.0	0.0	0.6*	0.5
Other dairy	0.0	0.0	0.0	0.0
Total	1.0	0.6	2.7**	2.2
Meat and Meat Substitutes				
Red meat	0.1	0.0	1.0	1.0
Poultry	0.0	0.0	0.4	0.4
Fish	0.0	0.0	0.1	0.1
Eggs	0.0	0.0	0.1	0.1
Nuts and seeds	0.0	0.0	0.0	0.1
Total	0.1	0.1	1.6	1.6
Soda	0.0	0.0	0.9*	1.1
Fruit Drinks and Fruit-Flavored Drinks	0.0*	0.1	0.8	0.8
Sample Size	**214**	**930**	**214**	**930**

SOURCE: Weighted tabulations using one or two days of intake data from the 1994-1996 CSFII.

NOTE: Sample includes only students attending schools that offer school breakfasts on intake days during the school year. Students who had two intake days that were not school days were excluded.

[a]Significance test refers to difference in outcomes among SBP participants and nonparticipants.

[b]The total number of servings of milk includes not only whole, low-fat, and nonfat milk, but also milk whose fat content was not specified.

*Significantly different from zero at the .05 level, two-tailed test.
**Significantly different from zero at the .01 level, two-tailed test.

difference in the groups' calcium intake described earlier. Furthermore, the difference in milk consumption is due primarily to a difference in the consumption of low-fat milk. As a result, the higher milk consumption of SBP participants does not translate into significantly higher fat intake among this group (as was the case for NSLP participants).

C. OVERALL ROLE OF THE SCHOOL MEAL PROGRAMS IN CHILDREN'S DIETS

The previous two sections have described how the food and nutrient intakes of SBP and NSLP participants differ from those of nonparticipants. These comparisons provide information that suggests the importance of the school meal programs and other foods consumed at school in the diets of school-aged children. This section further examines the overall role of the school meal programs and other foods available at school in children's diets from three perspectives. First, it compares the diets of children who participate in both the SBP and NSLP with the diets of children who participate in neither program. Second, it examines the proportion of children's diets that comes from foods they obtain from the school cafeteria, including foods that are part of school meals and a la carte foods available in the cafeteria. The larger this proportion, the greater the potential effect of the meal programs and other changes in cafeteria food policies on children's diets. Third, using information on children's diets overall and on the diets of SBP/NSLP participants and nonparticipants, the degree to which the FNS objectives under the strategic goal of providing more healthful meals for school-aged children had been met as of the 1994 to 1996 period is assessed.

1. Participation in Both the SBP and NSLP

Table IV.6 shows the regression-adjusted mean intake values among students who participate in both the SBP and NSLP versus those who participate in neither program, although they attend schools that offer both programs. SBP/NSLP participants and nonparticipants differ substantially in their dietary intakes, both over 24 hours and at breakfast and lunch. Participants' breakfast and lunch food energy intake is 55 percent of the REA, compared with 40 percent among nonparticipants. Nonparticipants do not "catch up" over the remainder of the day, and participants' 24-hour food energy intake is also significantly higher than that of nonparticipants (100 versus 86 percent of the REA).

SBP/NSLP participants also have higher intakes of many vitamins and minerals. At breakfast and lunch, participants have higher regression-adjusted mean intakes of each of the 14 vitamins and minerals we examine, and 12 of these differences are statistically significant. Over 24 hours, participants have significantly higher intake levels of 7 of the 14 vitamins and minerals. Many of these differences are quite large. After controlling for relevant characteristics, for example, participants consume an average of 224 percent of the vitamin C RDA, compared with 179 percent among nonparticipants. Mean calcium intake among participants is 109 percent of the AI, compared with 73 percent among nonparticipants.

Participants' 24-hour intakes of fiber and sodium are also significantly higher than those of nonparticipants (Table IV.6). On average, participants consume 15.2 grams of fiber and 3,668 milligrams of sodium, while nonparticipants consume 13.0 grams of fiber and 3,026 milligrams of sodium.

TABLE IV.6

REGRESSION-ADJUSTED MEAN NUTRIENT INTAKE OF SCHOOL-AGED CHILDREN, BY SBP AND NSLP PARTICIPATION STATUS, 1994 TO 1996

	Mean Intake at Breakfast and Lunch		Mean 24-Hour Intake	
Dietary Component	SBP and NSLP Participants[d]	Nonparticipants	SBP and NSLP Participants[d]	Nonparticipants
Food Energy				
As percentage of 1989 REA	55**	40	100**	86
As percentage of 24-hour food energy intake	58**	46		
Percentage of Food Energy from:				
Total fat	33.8**	30.3	34.3**	32.4
Saturated fat	13.5**	10.8	13.0**	11.7
Carbohydrates				
Added sugars	14.6**	20.6	16.3**	19.9
Total	53.0**	58.8	51.7**	54.8
Protein	14.6**	12.6	15.2*	14.0
Vitamins (as Percentage of RDA)[a]				
Vitamin A	75**	57	110	117
Vitamin C	142**	96	224**	179
Vitamin E	48**	40	85	86
Vitamin B_6	111*	97	190	179
Vitamin B_{12}	173**	106	283	237
Niacin[b]	95	89	184	177
Thiamin	122**	100	204*	184
Riboflavin	185**	124	282**	226
Folate[c]	59*	51	89	86
Minerals (as Percentage of RDA)[a]				
Calcium	75**	37	109**	73
Iron	76	70	132	130
Magnesium	72**	50	121**	103
Phosphorus	102**	61	164**	125
Zinc	55**	42	103**	88
Other Dietary Components				
Fiber (g)	8.4**	5.8	15.2**	13.0
Cholesterol (mg)	125*	98	237	214
Sodium (mg)	1,899**	1,333	3,668**	3,026
Sample Size	**195**	**517**	**195**	**517**

SOURCE: Weighted tabulations based on one or two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: Sample includes only students attending schools that offer school breakfasts and lunches on intake days during the school year. Students who had two intake days that were not school days were excluded.

[a] Mean intakes of vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus in this table are measured as a percentage of the RDAs based on the new Dietary Reference Intakes (DRIs). For the remaining vitamins and minerals except calcium, mean intakes are measured as a percentage of the 1989 RDAs. For calcium, mean intake is measured as a percentage of the DRI-based Adequate Intake (AI).

[b] The reported intake of niacin as a percentage of the RDA is an underestimate because intake is reported in mg of niacin and does not include an estimate of the niacin that is contributed by the conversion of tryptophan to niacin. The RDA is given in mg of niacin equivalents and assumes that all niacin will be considered.

[c] The reported intake of folate as a percentage of the RDA is an underestimate because intake is reported in mcg of folate but the RDA is given in mcg of dietary folate equivalents. Expressing intake in mcg of folate does not make allowance for the high bioavailability of synthetic folic acid, as from fortified ready-to-eat cereals. Dietary folate equivalents consider bioavailability.

[d] Significance test refers to difference in outcomes among SBP/NSLP participants and nonparticipants.

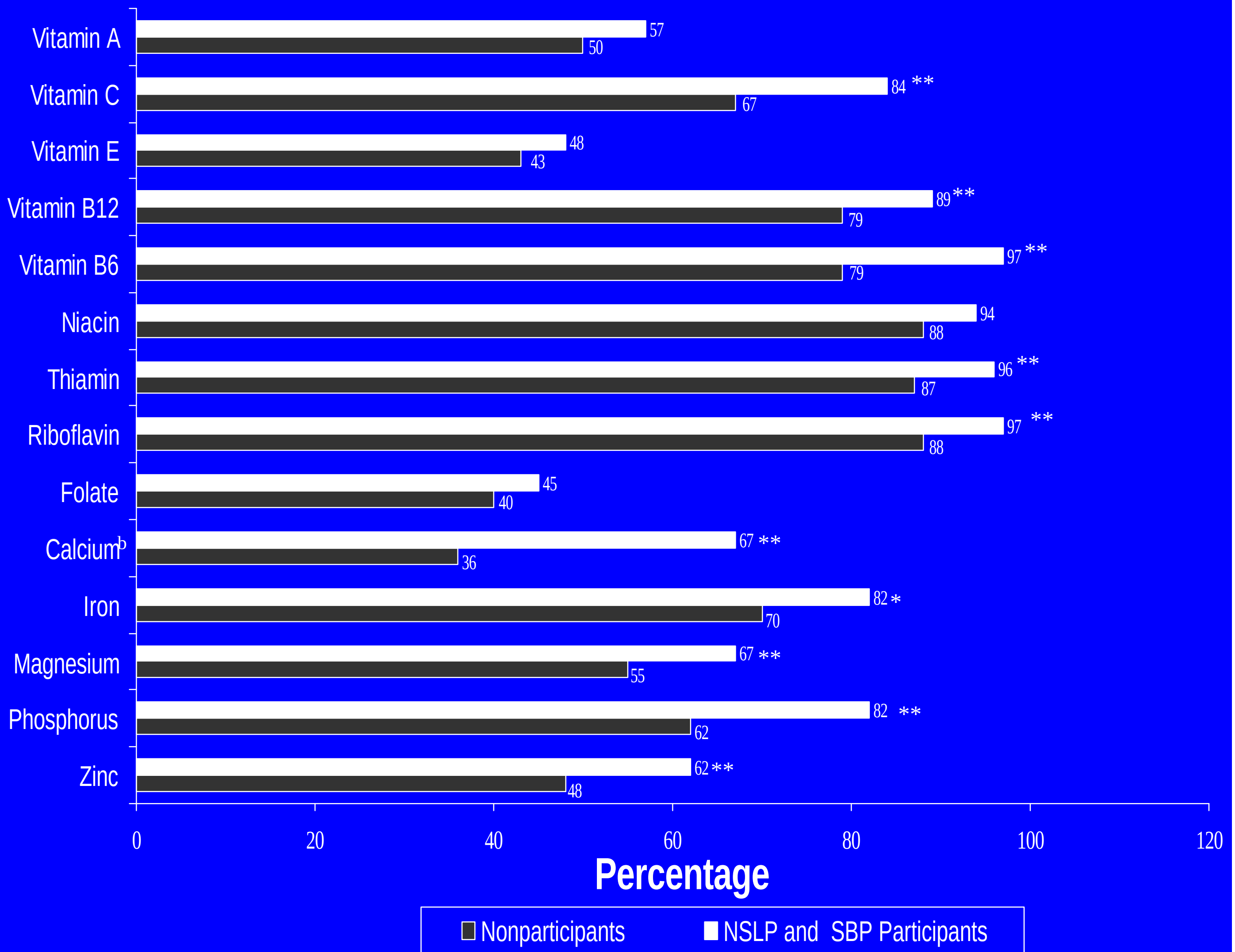
*Significantly different from zero at the .05 level, two-tailed test.
**Significantly different from zero at the .01 level, two-tailed test.

Finally, there are substantial differences in participants' and nonparticipants' macronutrient intakes. Participants' mean 24-hour total fat intake as a percentage of food energy is 1.9 percentage points higher than that of nonparticipants (34.3 versus 32.4 percent), their mean saturated fat intake is 1.3 percentage points higher (13.0 versus 11.7 percent), their added sugar intake is 3.6 percentage points lower (16.3 versus 19.9 percent), and their protein intake is 1.2 percentage points higher (15.2 versus 14.0 percent).

The differences in mean dietary intake translate into significant differences in the percentage of SBP/NSLP participants versus nonparticipants whose daily intakes meet various standards. Figure IV.6 shows that participants are significantly more likely to meet the dietary standards for the intake of vitamin C, vitamin B_6, vitamin B_{12}, thiamin, riboflavin, calcium, iron, magnesium, and phosphorus. Figure IV.7 shows that participants are significantly more likely to meet the dietary standard for fiber but significantly less likely to meet the dietary standards for total fat, saturated fat, carbohydrate, sodium, and protein. For example, only 15 percent of SBP/NSLP participants have daily intakes of saturated fat that are less than 10 percent of food energy, compared with 32 percent of nonparticipants.

Finally, SBP/NSLP participants and nonparticipants differ greatly in their food intakes, particularly in the foods they consume for breakfast and lunch. For example, participants consume nearly three servings of fruit and/or vegetables for breakfast and lunch, more than twice as many servings as nonparticipants, on average (Table IV.7). Similarly, participants consume 1.9 servings of milk for these two meals, compared with 0.7 servings among nonparticipants. Instead of milk,

Figure IV.6
Percentage of School-Aged Children Whose Daily Vitamin and Mineral Intake Exceeds Standard, by School Meal Program Participation, 1994 to 1996 CSFII



NOTE: For vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus, the Estimated Average Requirements (EARs) based on the new Dietary Reference Intakes are used. For the remaining nutrients except calcium, the chart shows the percentage of people whose intake is above 80 percent of the 1989 Recommended Dietary Allowance (an approximation of the EAR). For calcium, the table shows the percentage of people whose intake is above 80 percent of the Adequate Intake.

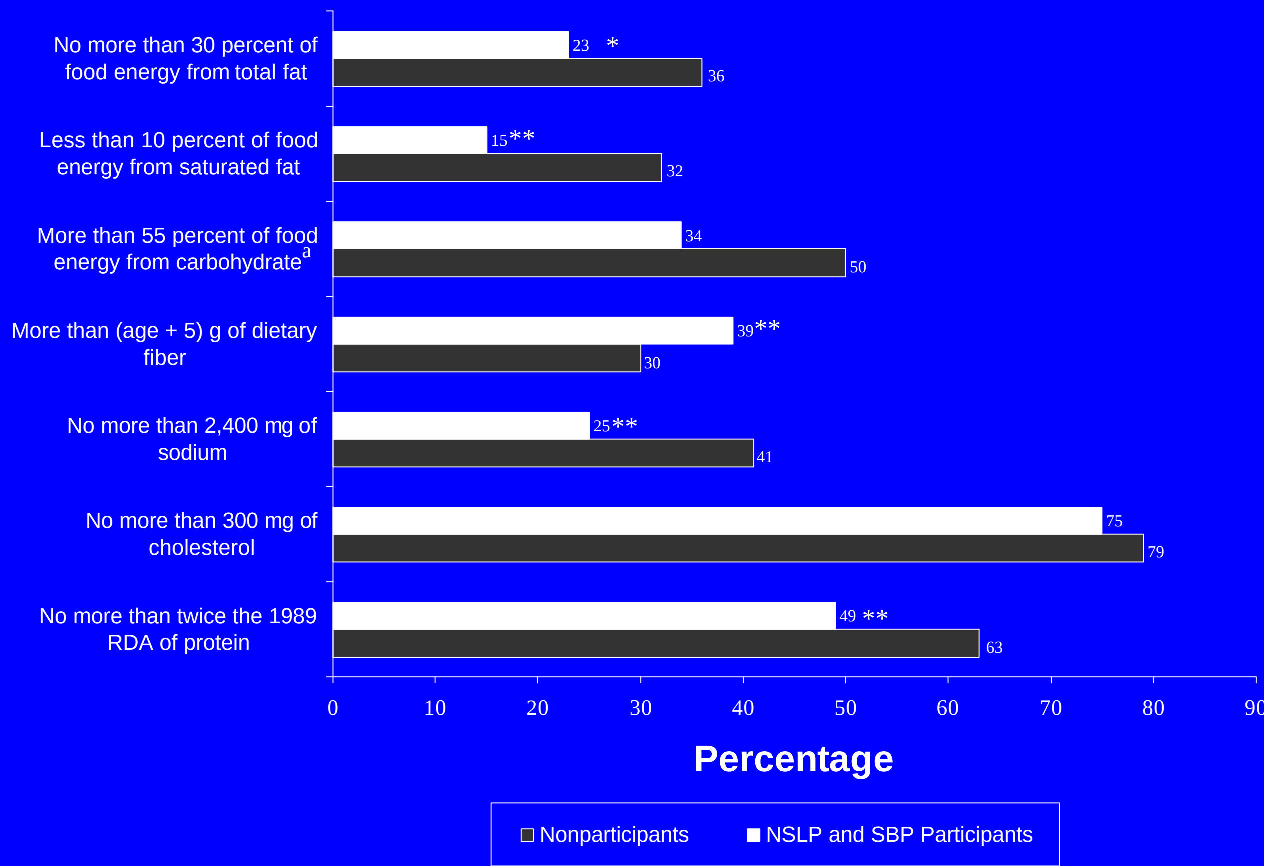
[a]The percentages meeting the dietary standards are based on children's 24-hour intakes rather than their intakes at breakfast and/or lunch alone.

[b]The percentage of children whose daily calcium intake exceeds 80 percent of the AI should not be interpreted as an estimate of the percentage whose intake is adequate (Institute of Medicine 2000).

*Difference between NSLP participants' and nonparticipants' intakes is significantly different from zero at the .05 level, two-tailed test.

**Difference between NSLP participants' and nonparticipants' intakes is significantly different from zero at the .01 level, two-tailed test.

Figure IV.7
Percentage of School-Aged Children Who Meet Selected Dietary Recommendations, by NSLP and SBP Participation Status, 1994 to 1996 CSFII



NOTE: The percentages meeting the dietary recommendations are based on children's 24-hour intakes rather than their intakes at breakfast and/or lunch alone.

[a]The carbohydrate intake totals upon which those figures are based include added sugars. The larger proportion of nonparticipants meeting the carbohydrate recommendation results from the larger percentage of added sugars in their diets.

* Difference between NSLP participants' and nonparticipants' intakes is significantly different from zero at the .05 level, two-tailed test.

** Difference between NSLP participants' and nonparticipants' intakes is significantly different from zero at the .01 level, two-tailed test.

TABLE IV.7

FOOD GROUP INTAKES OF SCHOOL-AGED CHILDREN, BY SBP AND NSLP PARTICIPATION STATUS, 1994 TO 1996 CSFII

	Mean Number of Servings			
	Breakfast and Lunch		24 Hours	
Food Group	SBP and NSLP Participants[a]	Nonparticipants	SBP and NSLP Participants[a]	Nonparticipants
Grain Products				
Whole grains	0.4**	0.7	0.8*	1.1
Nonwhole grains	3.1*	2.8	6.1	5.9
Total	3.6	3.5	6.9	7.0
Vegetables				
Potatoes	0.8**	0.3	1.3	1.1
Other starchy vegetables	0.1**	0.0	0.2	0.2
Legumes	0.0	0.1	0.2	0.1
Dark-green leafy vegetables	0.0	0.0	0.1	0.1
Other vegetables	0.5**	0.2	1.1	1.1
Total	1.5**	0.6	2.9**	2.5
Fruit				
Citrus	0.5**	0.3	0.8	0.6
Noncitrus	0.7**	0.4	0.9	0.7
Total	1.3**	0.7	1.7*	1.3
Vegetables and Fruit	2.7**	1.3	4.5**	3.8
Milk Products				
Milk				
Whole milk	0.7**	0.3	0.9**	0.5
Low-fat milk	0.8**	0.3	1.0**	0.5
Non-fat milk	0.0*	0.1	0.0*	0.1
Total[b]	1.9**	0.7	2.4**	1.3
Cheese	0.3**	0.2	0.6*	0.5
Other dairy	0.0	0.0	0.0	0.0
Total	2.2**	0.9	3.0**	1.8
Meat and Meat Substitutes				
Red meat	0.4*	0.3	1.1*	0.9
Poultry	0.1	0.1	0.4	0.4
Fish	0.0	0.0	0.1	0.1
Eggs	0.1	0.1	0.1	0.1
Nuts and seeds	0.0**	0.1	0.0**	0.1
Total	0.6	0.6	1.7	1.5
Soda	0.1**	0.5	0.6**	1.3
Fruit Drinks and Fruit-Flavored Drinks	0.1**	0.4	0.7	0.7
Sample Size	**243**	**632**	**243**	**632**

SOURCE: Weighted tabulations using one or two days of intake data from the 1994-1996 CSFII.

NOTE: Sample includes only students attending schools that offer school lunches on intake days during the school year. Students who had two intake days that were not school days were excluded.

[a]Significance test refers to difference in outcomes among SBP/NSLP participants and nonparticipants.

[b]The total number of servings of milk includes not only whole, low-fat, and nonfat milk, but also milk whose fat content was not specified.

*Significantly different from zero at the .05 level, two-tailed test.
**Significantly different from zero at the .01 level, two-tailed test.

nonparticipants consume soda and fruit drinks for breakfast and lunch--an average of 0.9 servings compared with 0.2 servings among participants.

2. Where Children Obtain Their Food

Another indication of the role of the school meal programs in children's diets is the proportion of those diets that comes from the school cafeteria. Table IV.8 shows children's dietary intakes on a typical school day from foods they obtain from the school cafeteria and from foods they obtain elsewhere (and includes both children who participate in one or both meal programs and those who do not). These figures can be used to calculate the proportion of children's dietary intake (where dietary intake can be measured in a variety of ways) that comes from the school cafeteria. It is important to realize that foods coming from the school cafeteria may or may not be part of school lunches or breakfasts. Most schools offer children the option of purchasing a la carte items outside the regular school meal.[16]

On school days, the foods that students obtain from the school cafeteria provide an average of 17 percent of the daily REA, while the foods they obtain elsewhere provide 74 percent. Since their total average daily food energy intake is 91 percent of the REA, school-aged children get 19 percent of their daily food energy from school cafeteria foods. Children attending schools that offer the SBP also get an average of 19 percent of their breakfast food energy from the school cafeteria. School lunches play a larger role in children's lunch diets, however, as 54 percent of children's lunchtime food energy is provided by school cafeteria foods. For most vitamins and minerals, the proportions of the daily, lunch, and breakfast intakes that come from school cafeteria foods are roughly similar

[16]According to the School Food Purchase Study (Daft et al. 1998), 54 percent of public NSLP schools and 27 percent of public SBP schools offered a la carte items for lunch during the 1996-1997 school year. Because larger schools are more likely to offer a la carte items, 90 percent of students have access to a la carte items.

TABLE IV.8

MEAN NUTRIENT INTAKE OF SCHOOL-AGED CHILDREN, BY WHERE FOODS WERE OBTAINED, 1994 TO 1996 CSFII

	Mean Intake					
	Breakfast		Lunch		24 Hours	
Dietary Component	Foods Obtained from School Cafeteria	Other Foods	Foods Obtained from School Cafeteria	Other Foods	Foods Obtained from School Cafeteria	Other Foods
Food Energy						
As percentage of 1989 REA	3	13	15	13	17	74
As percentage of 24-hour food energy intake	3	14	17	15	n.a.	n.a.
Percentage of Food Energy from:						
Total fat	27.6	24.7	36.6	30.6	35.7	31.6
Saturated fat	11.8	10.0	15.0	10.1	14.7	11.3
Carbohydrates						
Added sugars	15.8	19.7	12.7	25.4	13.7	19.3
Total	61.2	64.6	48.5	59.9	50.0	55.4
Protein	12.7	12.5	16.1	11.5	15.5	14.3
Vitamins (as Percentage of RDA)[a]						
Vitamin A	5	32	16	11	19	101
Vitamin C	12	43	22	26	29	169
Vitamin E	2	13	14	14	15	72
Vitamin B_6	8	54	24	20	29	160
Vitamin B_{12}	11	56	47	21	52	215
Niacin[b]	6	40	24	23	28	153
Thiamin	9	50	27	23	32	161
Riboflavin	14	68	43	25	50	196
Folate[c]	5	32	10	9	13	77
Minerals (as Percentage of RDA)[a]						
Calcium	5	18	20	9	22	64
Iron	5	38	16	15	19	113
Magnesium	5	19	19	15	21	88
Phosphorus	7	25	27	16	30	108
Zinc	3	19	14	10	16	76
Other Dietary Components						
Fiber (g)	0.4	1.8	2.3	2.0	2.6	11.3
Cholesterol (mg)	8	42	34	22	38	176
Sodium (mg)	87	409	551	442	591	2,609
Sample Size (Person-Days)	**1,509**	**1,509**	**2,339**	**2,339**	**2,484**	**2,484**

SOURCE: Weighted tabulations based on one or two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: The column labeled "Foods Obtained from School Cafeteria" shows mean intakes in children from those foods, and the column labeled "Other Foods" shows mean intakes for the same sample from other foods. Figures in the two columns can be added to determine overall mean intakes. The sample includes only students attending schools that offer school lunches on intake days during the school year. Intake days that were not school days were excluded.

[a] Mean intakes of vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus in this table are measured as a percentage of the RDAs based on the new Dietary Reference Intakes (DRIs). For the remaining vitamins and minerals except calcium, mean intakes are measured as a percentage of the 1989 RDAs. For calcium, mean intake is measured as a percentage of the DRI-based Adequate Intake (AI).

[b] The reported intake of niacin as a percentage of the RDA is an underestimate because intake is reported in mg of niacin and does not include an estimate of the niacin that is contributed by the conversion of tryptophan to niacin. The RDA is given in mg of niacin equivalents and assumes that all niacin will be considered.

[c] The reported intake of folate as a percentage of the RDA is an underestimate because intake is reported in mcg of folate but the RDA is given in mcg of dietary folate equivalents. Expressing intake in mcg of folate does not make allowance for the high bioavailability of synthetic folic acid, as from fortified ready-to-eat cereals. Dietary folate equivalents consider bioavailability.

n.a. = not applicable.

to these percentages for food energy. Exceptions to this include riboflavin, phosphorus, calcium, and vitamin B_{12}, of which 63 to 69 percent comes from the school cafeteria.

Examining the dietary intake from school cafeteria foods versus other foods among SBP and NSLP participants alone is also useful. Appendix Table B.13 shows dietary intake from school cafeteria and other foods among NSLP participants. Not surprisingly, NSLP participants obtain nearly all their food energy at lunch from school cafeteria foods. Over 24 hours, NSLP participants consume an average of 32 percent of the REA in food energy from school cafeteria foods and 61 percent from other foods. Thus, they get just over one-third of their food energy from school cafeteria foods. SBP participants consume an even larger proportion--about half--of their food energy over 24 hours from school cafeteria foods (Appendix Table B.14). This is probably because a large proportion of SBP participants also eat a school lunch on a given day.

3. Achieving the Objectives of FNS's Strategic Plan Under GPRA

As described in Chapter I, the strategic plan for FNS under GPRA includes the goal of "promoting more healthful diets among school-aged children." The plan includes specific objectives for meeting this goal and contains performance measures, along with targets, for assessing progress toward the goal. The performance measures and target values are based on baseline measures derived from the 1992 SNDA-1 data. The data provided in this report present more recent information on the degree to which children have "more healthful diets."

Before presenting information from the CSFII on these performance measures, we must emphasize four important caveats. First, the CSFII data shed light on the performance measures but do not always match the measures exactly. For example, several measures refer to the nutrient content of meals offered to students. However, the CSFII provides no information on SBP and NSLP meals offered to students, so we rely on information on meals consumed by SBP and NSLP participants. The second caveat is related to the first: since the CSFII does not distinguish between food consumed as part of school meals and a la carte foods that students get from the cafeteria. Thus, the reported 1994 to 1996 value includes foods over which school meal regulations per se have little control.

Second, we have not designed this analysis to compare directly the CSFII data with the original baseline measures based on SNDA-1 data. Since different surveys use different methodologies, differences between SNDA-1 and CSFII in the value of a particular measure might be due either to these methodological differences or to behavioral change over time.

Third, the performance measures we are using are based on a strategic plan covering the years 1997 through 2002, while our data cover the years 1994 to 1996. Thus, the values of the performance measures presented here cannot truly be used to assess the progress of FNS toward meeting their strategic objectives, since the objectives under this plan did not exist when the data were collected. The values of the performance measures based on the CSFII should more appropriately be considered as additional and more recent baseline measures.

a. Objective 1: Ensure That School Meals Are Consistent with the Dietary Guidelines for Americans and the RDAs

Table IV.9 lists the performance measures, targets, and 1994 to 1996 values for this objective. It is important to emphasize that the 1994 to 1996 values of the performance measures indicate the dietary *intakes* for breakfast and lunch of SBP and NSLP participants. By contrast, the performance measures themselves and the original 1992 baseline values refer to the dietary content of SBP breakfasts and NSLP lunches as offered to students. The meals consumed and the meals offered may differ for a number of reasons; for example, SBP/NSLP participants may consume foods for breakfast or lunch that are not part of the meals offered, or they may not consume foods that are part

TABLE IV.9

1994 TO 1996 VALUES OF GPRA PERFORMANCE MEASURES INDICATING EXTENT TO WHICH SBP AND NSLP MEALS CONSUMED ARE CONSISTENT WITH DIETARY GUIDELINES AND RDAs, 1994-1996 CSFII

Performance Measure	Target (Percent)	Proxy Measure: 1994 to 1996 Value for Meals from the School Environment Consumed by NSLP/SBP Participants (including NSLP/SBP Foods and a la carte foods)[a] (Percent)
Total Fat as a Percentage of Calories in NSLP Lunches	30	36.9
Total Fat as a Percentage of Calories in SBP Breakfasts	30	26.8
Saturated Fat as a Percentage of Calories in NSLP Lunches	10	14.7
Saturated Fat as a Percentage of Calories in SBP Breakfasts	10	11.0
Food Energy Intake as a Percentage of the REA in NSLP Lunches	33	30.0
Food Energy Intake as a Percentage of the REA in SBP Breakfasts	25	22.0
Vitamin and Mineral Intake as a Percentage of RDA in NSLP Lunches	33	All met target except: - Vitamin A: 32% - Vitamin E: 28% - Folate: 20%[b] - Zinc: 29%
Vitamin and Mineral Intake as a Percentage of RDA in SBP Breakfasts	33	All met target except: - Vitamin E: 17% - Magnesium: 30% - Zinc: 23%

SOURCE: Weighted tabulations using one or two days of intake data from the 1994-1996 CSFII.

[a] The 1994 to 1996 values of these performance measures indicate the mean dietary *intake* of NSLP and SBP participants rather than the mean dietary *content* of NSLP lunches and SBP breakfasts as offered to students. Furthermore, the mean intake of NSLP and SBP participants may include foods items not included as part of the school lunches or breakfasts.

[b] Folate intake as a percentage of the RDA presented here is based on the new, 1998 RDA rather than the 1989 RDA. Since the 1998 RDA for folate is about twice as large as the 1989 RDA, the target value of 33 percent would have been met if we had used the 1989 RDA.

of the meals offered. Furthermore, students may be more likely to consume the high fat foods that are offered as part of school meals than they are to consume lower fat foods. The meals consumed by participants are proxies for the meals offered to students but are not exact measures.

Like the 1992 baseline values, the 1994 to 1996 values of total fat as a percentage of calories for lunch and saturated fat as a percentage of calories for breakfast do not satisfy the targets, and the values for lunch are particularly far off. Whereas the target is for lunches to have 30 percent of calories from total fat and 10 percent from saturated fat, NSLP participants consume an average of 37 percent of calories from total fat and 15 percent from saturated fat.[17] These values are about the same as the 1992 baseline measures. On the other hand, the SBP appears to meet the total fat goal and is close to meeting the saturated fat goal, as SBP participants consume 27 percent of calories from fat and 11 percent from saturated fat. These are improvements over the 1992 baseline measures of the total and saturated fat content of SBP breakfasts offered to students.

However, whereas the 1992 baseline measures indicated that SBP breakfasts and NSLP lunches met the targets for food energy and vitamin and mineral content, the 1994 to 1996 values fall short in a few cases.[18] Mean food energy intake at lunch among NSLP participants in 1994 to 1996 is 30 percent of the REA, compared with a target of 33 percent, and mean food energy intake at breakfast among SBP participants is 22 percent of the REA, compared with a target of 25 percent. Participants' intakes of most vitamins and minerals meet the goal of 33 percent of the RDA, but exceptions include vitamin A and folate for lunch and vitamin E and zinc for both meals. It is

[17]The intake values for participants and nonparticipants presented in this section have not been regression adjusted to control for differences in the groups' characteristics.

[18]Given the likelihood of underreporting of food intake in the 1994-1996 CSFII, the failure of participants to meet these goals may be an artifact of the data collection methodology. Since the 1993 baseline measures use information on meals served to students, there is a smaller chance of underreporting.

possible, however, that the SBP breakfasts and NSLP lunches offered to students contained larger amounts of food energy, vitamins, and minerals than are reported here as being consumed by students because of plate waste.

b. Objective 2: Children Make Food Choices for a Healthy Diet

The CSFII data are more appropriate for constructing the performance measures under this objective than under the previous objective. These performance measures refer to children's usual daily dietary intake. Furthermore, the CSFII data allow us to construct performance measures more accurately based on the percentage of children whose usual intakes meet particular targets, since there are multiple intake days for many children and we have estimated the distribution of usual intake using CSFII data. The 1993 baseline measures were based on a single day of intake data and thus reflect the distribution of one intake day rather than usual intake.

The target of the first performance measure under this objective is that at least 24 percent of children meet the Dietary Guideline for total fat intake. By the 1994 to 1996 period, 25 percent of children had met this guideline (Table IV.10). Although the GPRA target had already been met by this time, three out of four children were still failing to meet the Dietary Guideline for total fat. The target for the percentage of children meeting the saturated fat Dietary Guideline was 18 percent, and by 1994 to 1996, 16 percent of children had met this target.

Another performance measure target under this objective is that at least 50 percent of children meet the RDA for each vitamin and mineral. In 1994 to 1996, this was true for every vitamin and mineral we studied except vitamin E (29 percent), folate (32 percent), zinc (36 percent), and calcium (38 percent). Note that this standard (that children meet the RDA) differs from the standard presented in previous parts of this report (that the best indicator of adequate versus inadequate nutrient intake is the percentage of children meeting the EAR or 80 percent of the RDA).

TABLE IV.10

1994 TO 1996 VALUES OF GPRA PERFORMANCE MEASURES INDICATING EXTENT TO WHICH CHILDREN MAKE FOOD CHOICES FOR A HEALTHY DIET, 1994-1996 CSFII

Performance Measure	Target	1994-to-1996 Value[a]
Percentage of Children Meeting the Dietary Guideline for Total Fat Intake	24	25.1
Percentage of Children Meeting the Dietary Guideline for Saturated Fat Intake	18	16.1
Percentage of Children Meeting the RDA for Each Vitamin and Mineral	50	All met target except: - Vitamin E: 29% - Folate: 32%[a] - Zinc: 36% - Calcium: 38%
Average Food Energy Intake as a Percentage of REA	100	91

SOURCE: Weighted tabulations using one or two days of intake data from the 1994-1996 CSFII.

NOTE: The percentage of children meeting the dietary guidelines and RDAs use the children's usual nutrient intake, calculated using the Software for Intake Distribution Estimation, developed by Iowa State University (1996).

[a] The percentage of children meeting the RDA for folate uses the 1998 RDA for folate. If the 1989 RDA for folate had been used, then the target of 50 percent of children meeting the RDA would have been met.

Finally, children were falling short of the food energy performance measure in 1994 to 1996 as well. While the target indicates that children's average food energy intake as a percentage of the REA should be 100 percent, the CSFII indicates that the average was 91 percent among children during 1994 to 1996. However, this result should be interpreted with caution. It is likely that this estimate of mean food energy intake is negatively biased as a result of underreporting of food intake. Children may be much closer to meeting this goal than Table IV.10 suggests.

D. CONCLUSIONS

In this chapter, we have used the most recently available data to compare the food and nutrient intakes of SBP/NSLP participants and nonparticipants. In addition to using recent data, the analysis presented here has been the first to summarize the effects of participation by comparing children who participated in both the SBP and NSLP with those who participated in neither program. Furthermore, it is among the first studies to describe and assess children's diets using the new Dietary Reference Intakes (RDAs and EARs) and to correctly estimate the distribution of children's usual dietary intake.

Some of the findings from this study are consistent with findings from earlier research, while other findings are new. Findings consistent with the previous research include the following:

- NSLP participation is positively related to the lunch intakes of vitamin A, vitamin B_6, vitamin B_{12}, thiamin, riboflavin, folate, iron, calcium, phosphorus, magnesium, and zinc. Differences between participants and nonparticipants in their 24-hour intakes are statistically significant for most of these nutrients.

- NSLP participation is associated with higher intakes of total fat, saturated fat, and sodium and with lower intake of total carbohydrates.

- NSLP participants are more likely than nonparticipants to drink milk at lunch and less likely to drink soda.

- SBP participation is associated with higher intakes of food energy, calcium, and phosphorus, both at breakfast and over 24 hours. However, SBP participation is not significantly related to fat, sodium, or cholesterol intake.

- SBP participants are more likely than nonparticipants to eat fruit and drink milk.

- The availability of the SBP in a student's school is positively associated with students eating breakfast, as long as breakfast is defined as consuming at least 10 percent of the daily REA

.

Notable new findings from this study include the following:

- NSLP participation is associated with substantially lower intake of added sugars as a percentage of food energy, both at lunch and over 24 hours.

- NSLP participants are more likely than nonparticipants to consume vegetables, milk products, and meat and meat substitutes, both at lunch and over 24 hours.

- SBP participation is associated with higher intakes of vitamin C, both at breakfast and over 24 hours.

- Students who participate in both the SBP and NSLP have higher intakes of food energy, seven vitamins and minerals, total fat, saturated fat, fiber, and sodium than nonparticipants; participants have lower intakes of added sugars.

- Students who participate in both programs are more likely than nonparticipants to have daily nutrient intakes that meet the dietary standards for ten vitamins and minerals, but they are less likely to meet guidelines related to fat and sodium intake.

- Students who participate in both programs consume substantially more fruit, vegetables, and milk products than nonparticipants, and they consume less soda.

On average, children who participate in the NSLP get one-third of their food during school days from the school cafeteria, while SBP participants get one-half of their food from the cafeteria. Clearly, the school meal programs can play a substantial role in influencing children's dietary intake, especially for children who participate in both programs. Although participation is linked with higher intakes of many nutrients and with higher percentages of children meeting dietary standards for vitamin and mineral intake, these most recent data indicate that there is still a need for schools to find ways to increase the availability of high-fiber foods and to reduce the average total fat, saturated fat, and sodium content of foods in a manner that will be well accepted by children. Thus, monitoring the overall effects of recent initiatives to improve the nutritional content of school meals (such as the recent Team Nutrition Initiative) and continuing to monitor FNS's strategic goal of promoting more healthful diets among children is essential to ensure that school nutrition programs are benefiting the overall nutrition of as many children as possible.

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APPENDIX A

SUPPLEMENTARY TABLES FOR CHAPTER III

TABLE A.1.A

24-HOUR USUAL NUTRIENT INTAKE DISTRIBUTION AMONG MALES, AGES 6 TO 8, 1994 TO 1996

	24-Hour Usual Intake Distribution (Percentiles)								
Dietary Component	5th	10th	15th	25th	50th	75th	85th	90th	95th
Food Energy (kcal)	1,301	1,420	1,502	1,624	1,864	2,131	2,292	2,410	2,601
Total fat (g)	45	50	53	58	67	78	85	89	97
Saturated fat (g)	16	18	19	21	25	29	32	33	36
Carbohydrates (g)	178	195	206	223	256	293	315	332	360
Protein (g)	41	46	49	54	64	76	83	89	98
Added sugar (tsp)	12	14	15	17	21	27	30	32	36
Discretionary fat (g)	35	39	41	45	52	61	66	69	75
Vitamins									
Vitamin A (mcg RE)	462	535	589	677	870	1,112	1,268	1,385	1,579
Vitamin C (mg)	35	44	51	63	90	127	150	169	199
Vitamin E (mg)	3.9	4.3	4.6	5.1	6.1	7.3	8.1	8.7	9.6
Vitamin B_6 (mg)	1.0	1.1	1.2	1.4	1.7	2.1	2.3	2.4	2.7
Vitamin B_{12} (mcg)	2.1	2.5	2.7	3.1	3.9	5.0	5.8	6.3	7.2
Niacin (mg)	11	13	14	16	20	24	26	28	31
Thiamin (mg)	1.1	1.2	1.2	1.4	1.6	1.9	2.1	2.2	2.4
Riboflavin (mg)	1.3	1.4	1.5	1.7	2.1	2.5	2.7	2.9	3.2
Folate (mcg)	131	152	167	192	247	315	358	390	441
Minerals									
Calcium (mg)	519	593	645	728	897	1,085	1,198	1,276	1,397
Iron (mg)	8.5	9.6	10.4	11.6	14.2	17.5	19.6	21.3	23.9
Magnesium (mg)	148	163	174	190	224	263	286	303	329
Phosphorus (mg)	754	836	894	984	1,171	1,382	1,505	1,593	1,731
Zinc (mg)	6.0	6.7	7.3	8.1	9.8	11.9	13.2	14.2	15.8
Other Dietary Components									
Fiber (g)	8	9	9	10	12	14	16	17	18
Cholesterol (mg)	114	129	140	158	198	249	282	306	346
Sodium (mg)	1,855	2,058	2,202	2,423	2,874	3,391	3,704	3,934	4,302

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: Children's usual intake distribution was determined based on two intake days using the Software for Intake Distribution Estimation, developed by Iowa State University (1996).

g = grams; kcal = kilocalories; mcg= micrograms; mg= milligrams; RE= retinol equivalent.

TABLE A.1.B

24-HOUR USUAL NUTRIENT INTAKE DISTRIBUTION AMONG FEMALES, AGES 6 TO 8, 1994 TO 1996

	24-Hour Usual Intake Distribution (Percentiles)								
Dietary Component	5th	10th	15th	25th	50th	75th	85th	90th	95th
Food Energy (kcal)	1,228	1,316	1,378	1,473	1,658	1,857	1,969	2,047	2,165
Total fat (g)	42	45	48	52	60	68	73	76	82
Saturated fat (g)	14	16	17	19	22	26	28	30	32
Carbohydrates (g)	161	175	184	199	228	259	277	289	308
Protein (g)	43	46	48	51	58	64	68	71	75
Added sugar (tsp)	8	10	11	13	18	23	27	29	32
Discretionary fat (g)	32	35	37	41	47	55	59	62	66
Vitamins									
Vitamin A (mcg RE)	423	488	536	615	794	1,030	1,189	1,312	1,522
Vitamin C (mg)	48	55	60	69	87	109	122	131	146
Vitamin E (mg)	4.2	4.4	4.7	5.0	5.6	6.2	606	6.8	7.2
Vitamin B_6 (mg)	0.9	1.0	1.1	1.2	1.4	1.6	1.8	1.9	2.0
Vitamin B_{12} (mcg)	2.4	2.6	2.7	3.0	3.5	4.2	4.6	5.0	5.8
Niacin (mg)	12	13	13	14	17	19	20	21	23
Thiamin (mg)	0.9	1.0	1.1	1.2	1.4	1.6	1.7	1.8	1.9
Riboflavin (mg)	1.2	1.3	1.4	1.5	1.8	2.1	2.3	2.5	2.7
Folate (mcg)	137	152	163	180	216	257	282	299	327
Minerals									
Calcium (mg)	478	543	590	662	806	962	1,051	1,113	1,208
Iron (mg)	8.6	9.3	9.8	10.7	12.4	14.5	15.7	16.7	18.1
Magnesium (mg)	147	159	167	180	205	231	247	257	273
Phosphorus (mg)	747	811	857	925	1,061	1,206	1,288	1,344	1,431
Zinc (mg)	5.7	6.2	6.6	7.2	8.5	9.9	10.8	11.4	12.4
Other Dietary Components									
Fiber (g)	8	9	9	10	12	14	15	15	17
Cholesterol (mg)	104	118	128	145	181	225	253	274	309
Sodium (mg)	1,778	1,930	2,038	2,207	2,553	2,945	3,176	3,340	3,597

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994 to 1996 CSFII.

NOTE: Children’s usual intake distribution was determined based on two intake days using the Software for Intake Distribution Estimation, developed by Iowa State University (1996).

g = grams; kcal = kilocalories; mcg = micrograms; mg = milligrams; RE = retinol equivalent.

TABLE A.1.C

24-HOUR USUAL NUTRIENT INTAKE DISTRIBUTION AMONG MALES, AGES 9 TO 13, 1994 TO 1996

Dietary Component	24-Hour Usual Intake Distribution (Percentiles)								
	5th	10th	15th	25th	50th	75th	85th	90th	95th
Food Energy (kcal)	1,512	1,655	1,753	1,903	2,199	2,535	2,738	2,888	3,130
Total fat (g)	54	59	63	69	81	95	103	110	119
Saturated fat (g)	20	22	23	25	29	34	37	39	42
Carbohydrates (g)	194	215	230	252	296	347	377	398	433
Protein (g)	52	57	61	66	77	89	97	102	110
Added sugar (tsp)	12	14	16	19	26	33	38	42	47
Discretionary fat (g)	41	45	48	53	63	74	81	86	94
Vitamins									
Vitamin A (mcg RE)	480	556	612	702	902	1,153	1,315	1,437	1,640
Vitamin C (mg)	48	57	63	74	99	129	148	162	184
Vitamin E (mg)	4.3	4.8	5.2	5.9	7.4	9.6	11.1	12.3	146
Vitamin B_6 (mg)	1.1	1.3	1.4	1.6	1.9	2.2	2.5	2.6	2.8
Vitamin B_{12} (mcg)	2.9	3.2	3.4	3.9	4.8	5.9	6.7	7.2	8.2
Niacin (mg)	15	17	18	19	23	26	28	30	32
Thiamin (mg)	1.2	1.3	1.4	1.5	1.8	2.1	2.3	2.5	2.7
Riboflavin (mg)	1.4	1.6	1.7	1.9	2.3	2.8	3.0	3.2	3.5
Folate (mcg)	163	183	199	225	284	355	399	431	481
Minerals									
Calcium (mg)	585	666	725	817	1,006	1,221	1,346	1,436	1,575
Iron (mg)	10.8	12.0	12.9	14.3	17.2	20.9	23.3	25.1	28.2
Magnesium (mg)	164	184	197	219	262	213	341	363	397
Phosphorus (mg)	890	990	1,060	1,166	1,378	1617	1,759	1,862	2,027
Zinc (mg)	8.4	9.1	9.7	10.5	12.3	14.3	15.5	16.4	17.9
Other Dietary Components									
Fiber (g)	9	10	11	12	15	18	20	22	24
Cholesterol (mg)	153	170	183	202	245	297	329	353	392
Sodium (mg)	2,380	2,609	2,772	3,024	3,539	4,130	4,486	4,746	5,161

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994 to 1996 CSFII.

NOTE: Children's usual intake distribution was determined based on two intake days using the Software for Intake Distribution Estimation, developed by Iowa State University (1996).

g = grams; kcal = kilocalories; mcg = micrograms; mg = milligrams; RE = retinol equivalent.

TABLE A.1.D

24-HOUR USUAL NUTRIENT INTAKE DISTRIBUTION AMONG FEMALES, AGES 9 TO 13, 1994 TO 1996

	24-Hour Usual Intake Distribution (Percentiles)								
Dietary Component	5th	10th	15th	25th	50th	75th	85th	90th	95th
Food Energy (kcal)	1,285	1,404	1,486	1,610	1,857	2,131	2,294	2,412	2,600
Total fat (g)	44	49	52	57	67	78	85	90	98
Saturated fat (g)	15	17	18	20	24	29	31	33	36
Carbohydrate (g)	168	186	198	217	255	299	325	344	374
Protein (g)	43	47	50	54	63	73	78	82	89
Added sugar (tsp)	10	12	14	17	23	31	36	39	46
Discretionary fat (g)	30	35	38	42	52	63	69	74	81
Vitamins									
Vitamin A (mcg RE)	398	466	517	599	786	1,035	1,205	1,339	1,571
Vitamin C (mg)	32	41	48	59	85	119	141	158	185
Vitamin E (mg)	4.0	4.5	4.8	5.4	6.5	8.0	9.0	9.7	11.1
Vitamin B_6 (mg)	0.9	1.0	1.1	1.3	1.5	1.8	2.0	2.2	2.4
Vitamin B_{12} (mcg)	2.1	2.3	2.6	2.9	3.6	4.6	5.3	5.8	6.8
Niacin (mg)	1.2	13	14	15	18	21	23	24	26
Thiamin (mg)	1.0	1.1	1.2	1.3	1.5	1.7	1.9	2.0	2.1
Riboflavin (mg)	1.2	1.3	1.4	1.6	1.9	2.3	2.5	2.6	2.8
Folate (mcg)	129	148	161	183	231	288	324	350	391
Minerals									
Calcium (mg)	480	552	603	684	852	1,041	1,152	1,231	1,353
Iron (mg)	8.7	9.6	10.3	11.4	13.7	16.4	18.1	19.3	21.3
Magnesium (mg)	149	163	174	189	221	258	280	297	323
Phosphorus (mg)	754	833	889	973	1,143	1,330	1,440	1,518	1,642
Zinc (mg)	6.2	6.9	7.3	8.1	9.6	11.4	12.6	13.4	14.8
Other Dietary Components									
Fiber (g)	8	9	9	10	12	15	16	17	19
Cholesterol (mg)	112	127	139	157	195	243	273	296	333
Sodium (mg)	2,064	2,236	2,358	2,544	2,916	3,320	3,550	3,712	3,960

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994 to 1996 CSFII.

NOTE: Children's usual intake distribution was determined based on two intake days using the Software for Intake Distribution Estimation, developed by Iowa State University (1996).

g = grams; kcal = kilocalories; mcg = micrograms; mg = milligrams; RE = retinol equivalent.

TABLE A.1.E

24-HOUR USUAL NUTRIENT INTAKE DISTRIBUTION AMONG MALES, AGES 14 TO 18, 1994 TO 1996

Dietary Component	24-Hour Usual Intake Distribution (Percentiles)								
	5th	10th	15th	25th	50th	75th	85th	90th	95th
Food Energy (kcal)	1,715	1,924	2,073	2,306	2,791	3,364	3,719	3,983	4,412
Total fat (g)	60	68	74	83	103	126	140	151	168
Saturated fat (g)	20	23	26	29	36	45	51	55	62
Carbohydrates (g)	219	248	268	301	371	456	509	547	609
Protein (g)	63	70	75	83	98	117	127	135	147
Added sugar (tsp)	14	18	21	25	34	46	54	60	69
Discretionary fat (g)	43	50	55	63	80	100	112	121	136
Vitamins									
Vitamin A (mcg RE)	462	554	625	742	1,016	1,385	1,629	1,815	2,120
Vitamin C (mg)	39	50	58	73	107	155	187	211	252
Vitamin E (mg)	5.3	6.0	6.5	7.2	8.9	10.9	12.1	13.0	14.4
Vitamin B_6 (mg)	1.2	1.4	1.5	1.8	2.3	2.9	3.2	3.5	3.9
Vitamin B_{12} (mcg)	3.1	3.5	3.9	4.4	5.6	7.1	8.0	8.6	9.7
Niacin (mg)	17	19	20	23	28	34	38	41	46
Thiamin (mg)	1.2	1.4	1.5	1.7	2.2	2.7	3.0	3.3	3.7
Riboflavin (mg)	1.3	1.5	1.7	2.0	2.5	3.3	3.8	4.1	4.8
Folate (mcg)	146	173	192	225	301	402	469	519	603
Minerals									
Calcium (mg)	551	653	729	852	1,123	1,463	1,682	1,848	2,123
Iron (mg)	11.3	12.7	13.8	15.5	19.4	24.6	28.0	30.5	34.8
Magnesium (mg)	184	208	225	252	310	381	425	458	510
Phosphorus (mg)	993	1,117	1,205	1,343	1,633	1,980	2,197	2,360	2,626
Zinc (mg)	9.0	10.0	10.7	11.8	14.4	17.6	19.6	21.1	23.6
Other Dietary Components									
Fiber (g)	10	11	12	14	17	21	24	26	29
Cholesterol (mg)	181	204	221	249	310	385	430	463	515
Sodium (mg)	2,848	3,164	3,389	3,743	4,483	5,357	5,896	6,295	6,941

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994 to 1996 CSFII.

NOTE: Children's usual intake distribution was determined based on two intake days using the Software for Intake Distribution Estimation, developed by Iowa State University (1996).

g = grams; kcal = kilocalories; mcg = micrograms; mg = milligrams; RE = retinol equivalent.

TABLE A.1.F

24-HOUR USUAL NUTRIENT INTAKE DISTRIBUTION AMONG FEMALES, AGES 14 TO 18, 1994 TO 1996

	24-Hour Usual Intake Distribution (Percentiles)								
Dietary Component	5th	10th	15th	25th	50th	75th	85th	90th	95th
Food Energy (kcal)	1,160	1,302	1,400	1,550	1,854	2,200	2,409	2,561	2,805
Total fat (g)	41	46	50	56	67	80	87	93	102
Saturated fat (g)	13	15	16	19	23	28	31	33	37
Carbohydrates (g)	145	166	181	205	251	305	338	362	403
Protein (g)	42	47	50	55	65	77	84	89	97
Added sugar (tsp)	10	12	14	17	22	29	33	36	41
Discretionary fat (g)	34	38	40	44	53	62	68	72	78
Vitamins									
Vitamin A (mcg RE)	303	366	414	494	682	938	1,114	1,252	1,492
Vitamin C (mg)	33	41	48	59	86	123	148	166	197
Vitamin E (mg)	4.4	4.9	5.2	5.8	6.8	8.0	8.7	9.2	10.1
Vitamin B_6 (mg)	0.8	0.9	1.0	1.1	1.4	1.8	2.0	2.2	2.4
Vitamin B_{12} (mcg)	1.8	2.1	2.3	2.7	3.6	4.9	5.8	6.5	7.8
Niacin (mg)	11	12	14	15	19	22	25	27	30
Thiamin (mg)	0.8	0.9	1.0	1.1	1.3	1.6	1.8	2.0	2.2
Riboflavin (mg)	0.9	1.0	1.1	1.3	1.6	2.0	2.2	2.4	2.7
Folate (mcg)	110	126	138	159	206	266	304	331	376
Minerals									
Calcium (mg)	350	414	461	537	699	891	1,008	1,092	1,225
Iron (mg)	7.3	8.3	9.0	10.2	12.7	15.8	18.0	19.6	22.4
Magnesium (mg)	125	142	154	173	212	258	286	306	340
Phosphorus (mg)	649	731	790	881	1,067	1,274	1,393	1,478	1,609
Zinc (mg)	5.4	6.2	6.8	7.6	9.5	11.7	13.0	14.0	15.7
Other Dietary Components									
Fiber (g)	7	8	9	10	12	15	17	18	20
Cholesterol (mg)	120	137	150	170	214	267	300	324	362
Sodium (mg)	1,956	2,149	2,291	2,521	3,013	3,575	3,900	4,128	4,478

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994 to 1996 CSFII.

NOTE: Children’s usual intake distribution was determined based on two intake days using the Software for Intake Distribution Estimation, developed by Iowa State University (1996).

g = grams; kcal = kilocalories; mcg = micrograms; mg = milligrams; RE = retinol equivalent.

TABLE A.2

PERCENTAGE OF SCHOOL-AGED CHILDREN WHOSE USUAL DAILY NUTRIENT INTAKE IS AT OR ABOVE VARIOUS DIETARY STANDARDS, 1994 TO 1996

	Dietary Standards Based on New DRI Values		
	Usual 24-Hour Intake		
Dietary Component	Percentage of Children at or Above RDA	Percentage of Children at or Above EAR	Percentage of Children at or Above 80% of EAR
Vitamins			
Vitamin B_6	91	96	99
Vitamin B_{12}	97	98	99
Niacin	94	99	100
Thiamin	95	98	99
Riboflavin	97	98	99
Folate	32	49	68
Minerals			
Calcium[a]	26	47	73
Magnesium	48	63	80
Phosphorus	68	80	91

	Dietary Standards Based on 1989 RDA Values		
	Usual 24-Hour Intake		
Dietary Component	Percentage of Children at or Above 1989 RDA	Percentage of Children at or Above 80% of 1989 RDA	Percentage of Children at or Above 60% of 1989 RDA
Food Energy	35	71	95
Vitamins			
Vitamin A	54	72	88
Vitamin C	86	93	97
Vitamin E	29	59	89
Vitamin B_6	65	85	97
Vitamin B_{12}	98	99	100
Niacin	86	96	100
Thiamin	89	97	100
Riboflavin	88	96	99
Folate	90	96	99
Minerals			
Calcium	38	60	81
Iron	72	88	97
Magnesium	52	72	90
Phosphorus	73	89	97
Zinc	36	64	90
Sample Size	**2,692**	**2,692**	**2,692**

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: Children's usual intake distribution was determined based on two intake days using the Software for Intake Distribution Estimation, developed by Iowa State University (1996).

[a] For calcium, the table shows the percentage of individuals whose intake is at or above (1) Adequate Intake (AI), (2) 80 percent of the AI, and (3) 67 percent of the AI.

DRI = Dietary Reference Intake; EAR = Estimates Average Requirement; RDA = Recommended Dietary Allowance.

TABLE A.3.A

MEAN ABSOLUTE NUTRIENT INTAKE LEVELS AMONG SCHOOL-AGED CHILDREN, 1994 TO 1996

	Mean Intake		
Dietary Component	Breakfast	Lunch	24 Hours
Food Energy (kcal)	370.9	636.8	2,075.2
Total fat (g)	11.3	24.6	75.6
Saturated fat (g)	4.3	8.7	27.2
Carbohydrates (g)	57.2	83.8	281.9
Protein (g)	11.6	22.1	72.9
Added sugar (tsp)	4.5	7.7	25.7
Discretionary fat (g)	8.8	19.2	58.8
Vitamins			
Vitamin A (mcg RE)	298.3	202.1	895.4
Vitamin C (mg)	30.2	24.8	98.2
Vitamin E (mg)	1.2	2.2	7.2
Vitamin B_6 (mg)	0.6	0.4	1.7
Vitamin B_{12} (mcg)	1.1	1.2	4.5
Niacin (mg)	5.2	5.9	21.1
Thiamin (mg)	0.5	0.4	1.7
Riboflavin (mg)	0.7	0.5	2.1
Folate (mcg)	102.6	56.4	255.7
Minerals			
Calcium (mg)	238.6	275.8	921.2
Iron (mg)	5.0	3.9	15.4
Magnesium (mg)	51.9	70.0	242.3
Phosphorus (mg)	285.3	373.9	1,267.0
Zinc (mg)	2.5	3.1	11.1
Other Dietary Components			
Fiber (g)	2.2	4.2	13.6
Cholesterol (mg)	57.9	63.4	234.2
Sodium (mg)	532.8	1,058.9	3,309.0
Sample Size	**2,692**	**2,692**	**2,692**

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994-1996 CSFII.

g = grams; kcal = kilocalories; mcg = micrograms; mg = milligrams; RE = retinol equivalent.

TABLE A.3.B

24-HOUR USUAL NUTRIENT INTAKE DISTRIBUTION AMONG SCHOOL-AGED CHILDREN, 1994 TO 1996

Dietary Component	24-Hour Usual Intake Distribution (Percentiles)								
	5th	10th	15th	25th	50th	75th	85th	90th	95th
Food Energy (kcal)	1,275	1,424	1,529	1,694	2,045	2,472	2,744	2,549	3,288
Total fat (g)	44	50	54	61	75	92	102	110	123
Saturated fat (g)	15	18	19	21	27	33	37	40	45
Carbohydrate (g)	167	188	203	227	277	339	378	407	455
Protein (g)	44	49	53	59	71	87	96	103	115
Added sugar (tsp)	10	13	15	18	25	33	39	43	50
Discretionary fat (g)	33	38	42	47	59	72	80	87	97
Vitamins									
Vitamin A (mcg RE)	399	473	529	622	837	1,124	1,318	1,469	1,726
Vitamin C (mg)	37	46	53	65	93	130	154	172	202
Vitamin E (mg)	4.1	4.7	5.0	5.7	7.0	8.6	9.8	10.6	12.1
Vitamin B_6 (mg)	1.0	1.1	1.2	1.4	1.7	2.1	2.4	2.6	2.9
Vitamin B_{12} (mcg)	2.2	2.5	2.8	3.2	4.2	5.5	6.4	7.1	8.4
Niacin (mg)	12.2	13.8	15.0	16.8	20.7	25.4	28.5	30.7	34.4
Thiamin (mg)	1.0	1.1	1.2	1.3	1.6	2.0	2.3	2.4	2.7
Riboflavin (mg)	1.1	1.3	1.4	1.6	2.1	2.6	2.9	3.1	3.5
Folate (mcg)	130	150	166	192	249	321	367	401	459
Minerals									
Calcium (mg)	461	544	604	700	902	1,141	1,289	1,398	1,577
Iron (mg)	8.8	9.7	10.6	12.0	15.0	18.9	21.4	23.4	26.7
Magnesium (mg)	145	163	176	197	240	293	327	351	392
Phosphorus (mg)	742	839	910	1,022	1,254	1,520	1,683	1,805	2,005
Zinc (mg)	6.3	7.1	7.7	8.6	10.7	13.3	15.0	16.3	18.5
Other Dietary Components									
Fiber (g)	7.9	8.9	9.7	10.9	13.5	16.8	18.8	20.3	22.8
Cholesterol (mg)	122	140	154	176	225	288	329	360	411
Sodium (mg)	1,996	2,231	2,401	2,673	3,256	3,963	4,405	4,733	5,268
Sample Size					**2,692**				

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: Children's usual intake distribution was determined based on two intake days using the Software for Intake Distribution Estimation developed by Iowa State University (1996).

g = grams; kcal = kilocalories; mcg = micrograms; mg = milligrams; RE = retinol equivalent.

TABLE A.3.C

24-HOUR USUAL NUTRIENT INTAKE (RELATIVE TO THE RDA) DISTRIBUTION AMONG SCHOOL-AGED CHILDREN, 1994 TO 1996

	24-Hour Usual Intake Distribution (Percentiles)								
Dietary Component	5th	10th	15th	25th	50th	75th	85th	90th	95th
Food Energy (KCAL)	58	66	70	77	91	107	117	124	135
Vitamins (mg RE)									
Vitamin A (mg)	48	57	64	76	105	145	172	193	230
Vitamin C (mg)	71	89	103	126	183	256	306	343	402
Vitamin E (mg)	53	59	63	70	85	104	116	126	142
Vitamin B_6 (mg)	87	103	115	134	176	229	262	287	328
Vitamin B_{12} (mg)	109	130	146	171	228	304	357	400	478
Niacin (mg)	98	112	122	139	174	217	243	262	293
Thiamin (mg)	101	117	128	146	185	232	262	284	319
Riboflavin (mg)	112	133	148	173	228	295	337	367	416
Folate (mcg)	38	45	51	60	82	110	128	142	165
Minerals									
Calcium (mg)	36	44	49	58	78	101	116	126	143
Iron (mg)	65	76	84	97	126	164	188	208	240
Magnesium (mg)	44	54	60	72	97	131	152	168	194
Phosphorus (mg)	58	69	77	91	123	165	194	217	254
Zinc (mg)	54	60	65	73	89	110	123	132	148
Sample Size					**2,692**				

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994-1996 CSFII.

g = grams; kcal = kilocalories; mcg = micrograms; mg = milligrams; RE = retinol equivalent.

TABLE A.4.A

SCHOOL-AGED CHILDREN'S DAY TWO MEAL SKIPPING USING VARIOUS DEFINITIONS OF BREAKFAST/LUNCH, BY SELECTED CHARACTERISTICS, 1994 TO 1996

	Percentage of Children Whose Breakfast Food Energy Intake Is:			Percentage of Children Whose Lunch Food Energy Intake Is:		
Population Group	0 kcal	< 50 kcal	< 10% of REA	0 kcal	< 50 kcal	< 10% of REA
Overall	21	22	36	8	9	15
Age/Gender	**	**	**	**	**	**
Males, 6 to 8	7	7	17	5	5	9
Females, 6 to 8	10	10	25	2	3	10
Males, 9 to 13	18	19	31	7	8	14
Females, 9 to 13	21	22	39	6	6	12
Males, 14 to 18	29	29	41	14	14	19
Females, 14 to 18	34	34	52	11	12	20
Race/Ethnicity				**	**	*
Hispanic	21	21	34	11	12	22
Non-Hispanic, black	26	26	37	14	14	18
Non-Hispanic, white	20	21	36	6	7	12
Other	25	25	43	8	10	14
Household Income						
<= 100% of poverty line	24	24	36	12	13	18
101 to 130% of poverty line	17	18	28	9	10	15
131 to 185% of poverty line	19	19	34	8	9	17
186 to 299% of poverty line	23	24	37	7	7	12
> = 300% of poverty line	21	21	38	7	7	14
Type of Day		*		*	**	**
School day	20	20	37	6	7	12
Summer day	20	20	33	12	13	20
Weekend day or holiday during school year	27	27	38	18	8	15
Food Sufficiency Status						
Food sufficient	21	22	36	8	8	14
Food insufficient	21	21	39	10	10	16
NSLP Availability in School				*		
NSLP available	20	21	35	8	8	14
NSLP not available	20	21	35	4	5	10
NSLP Participation Status				**	**	**
Participants	16	16	33	0	0	3
Nonparticipant	21	22	38	10	11	18
SBP Availability in School			**			
SBP available	19	19	32	8	8	14
SBP not available	22	23	39	7	8	14
SBP Participation Status	**	**	**	**	**	**
Participant	0	0	7	0	0	2
Nonparticipant	21	21	37	5	6	11

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994 to 1996 CSFII.

NOTE: See Chapter II, Section B.4, for definitions of SBP and NSLP participation status.

NSLP = National School Lunch Program; REA = Recommended Energy Allowance; SBP = School Breakfast Program.

*Differences in intake among subgroups significantly different from zero at the .05 level, chi-square test.
**Differences in intake among subgroups significantly different from zero at the .01 level, chi-square test.

TABLE A.4.B

SCHOOL-AGED CHILDREN'S TWO-DAY AVERAGE MEAL SKIPPING USING VARIOUS DEFINITIONS OF BREAKFAST/LUNCH, BY SELECTED CHARACTERISTICS, 1994 TO 1996

	Percentage of Children Whose Breakfast Food Energy Intake Is:			Percentage of Children Whose Lunch Food Energy Intake Is:		
Population Group	0 kcal	< 50 kcal	< 10% of REA	0 kcal	< 50 kcal	< 10% of REA
Overall	9	10	30	2	2	9
Age/Gender	**	**	**	**	**	**
Males, 6 to 8	2	3	13	1	2	5
Females, 6 to 8	3	4	17	0	1	4
Males, 9 to 13	6	7	23	1	1	7
Females, 9 to 13	8	9	29	1	1	7
Males, 14 to 18	13	15	39	4	4	12
Females, 14 to 18	16	19	47	3	4	15
Race/Ethnicity						
Hispanic	10	11	30	2	3	10
Non-Hispanic, black	11	13	30	4	4	12
Non-Hispanic, white	8	9	29	1	2	8
Other	12	14	42	2	3	9
Household Income	**	**				
<= 100% of poverty line	13	14	32	2	3	8
101 to 130% of poverty line	5	7	22	2	2	9
131 to 185% of poverty line	4	5	27	1	2	7
186 to 299% of poverty line	11	12	31	2	2	9
> = 300% of poverty line	8	10	30	1	2	9
Food Sufficiency Status						
Food sufficient	8	10	29	2	2	9
Food insufficient	15	18	37	1	1	5
NSLP Availability in School				**	**	
NSLP available	8	10	28	1	2	8
NSLP not available	7	8	28	0	0	9
NSLP Participation Status	*	*		**	**	**
Participate 0 days	8	10	29	2	3	12
Participate 1 day	4	7	27	0	0	5
Participate 2 days	11	12	26	0	0	0
SBP Availability in School						
SBP available	8	9	26	2	2	8
SBP not available	8	10	31	1	1	9
SBP Participation Status	**	**	**	*	**	*
Participate 0 days	8	9	28	1	1	7
Participate 1 day	0	0	16	1	1	4
Participate 2 days	0	0	0	0	0	1

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994 to 1996 CSFII.

NOTE: See Chapter II, Section B.4, for definitions of SBP and NSLP participation status.

NSLP = National School Lunch Program; REA = Recommended Energy Allowance; SBP = School Breakfast Program.

*Differences in intake among subgroups significantly different from zero at the .05 level, chi-square test.
**Differences in intake among subgroups significantly different from zero at the .01 level, chi-square test.

TABLE A.5.A

SCHOOL-AGED CHILDREN'S DAILY INTAKE OF DISCRETIONARY FAT AND ADDED SUGAR, BY SELECTED CHARACTERISTICS, 1994 TO 1996

	24-Hour Intake	
Dietary Component	Discretionary Fat (g)	Added Sugar (tsp)
Overall	59	26
Year		
1994	60	26
1995	59	26
1996	58	25
Gender/Age		
Males, 6 to 8	53	21
Females, 6 to 8	47	19
Males, 9 to 13	63	26
Females, 9 to 13	52	23
Males, 14 to 18	79	36
Females, 14 to 18	51	24
Race/Ethnicity		
Hispanic	55	21
Non-Hispanic, black	60	23
Non-Hispanic, white	60	28
Other	46	17
Household Income		
≤ 100% of poverty line	59	23
101 to 130% of poverty line	61	24
131 to 185% of poverty line	56	25
186 to 299% of poverty line	59	26
≥ 300% of poverty line	59	28
Type of Day		
School day	59	24
Summer day	58	27
Weekend day or holiday during school year	60	27
Food Sufficiency Status		
Food sufficient	59	26
Food insufficient	56	22

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994 to 1996 CSFII.

TABLE A.5.B

SCHOOL-AGED CHILDREN'S DAILY INTAKE OF DISCRETIONARY FAT AND ADDED SUGAR AS A PERCENTAGE OF FOOD ENERGY, BY SELECTED CHARACTERISTICS, 1994 TO 1996

	24-Hour Intake as Percentage of Food Energy Intake		
Dietary Component	Discretionary Fat	Added Sugar	Sum of Discretionary Fat and Added Sugar
Overall	25.2	19.4	44.6
Year			
1994	25.4	19.3	44.7
1995	25.1	19.7	44.7
1996	25.1	19.4	44.5
Gender/Age			
Males, 6 to 8	25.2	18.4	43.6
Females, 6 to 8	25.6	17.7	43.4
Males, 9 to 13	25.3	18.7	44.0
Females, 9 to 13	25.1	19.6	44.6
Males, 14 to 18	25.2	20.7	45.9
Females, 14 to 18	25.0	20.5	45.5
Race/Ethnicity			
Hispanic	24.9	17.4	42.3
Non-Hispanic, black	26.8	18.9	45.7
Non-Hispanic, white	25.1	20.3	45.5
Other	21.8	14.2	36.0
Household Income			
≤ 100% of poverty line	25.6	17.6	43.1
101 to 130% of poverty line	26.7	19.0	45.7
131 to 185% of poverty line	25.2	19.9	45.2
186 to 299% of poverty line	25.5	19.6	45.1
≥ 300% of poverty line	24.5	20.1	44.6
Type of Day			
School day	25.2	18.2	43.4
Summer day	24.4	20.8	45.2
Weekend day or holiday during school year	24.9	20.6	45.6
Food Sufficiency Status			
Food sufficient	25.2	19.5	44.7
Food insufficient	25.0	17.1	42.2
Sample Size	**2,692**	**2,692**	**2,692**

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994 to 1996 CSFII.

TABLE A.6.A

MEAN NUTRIENT INTAKE AT BREAKFAST AMONG SCHOOL-AGED CHILDREN, BY AGE/GENDER, 1994 to 1996

		Mean Breakfast Intake					
Dietary Component		Males, 6 to 8	Females, 6 to 8	Males, 9 to 13	Females, 9 to 13	Males, 14 to 18	Females, 14 to 18
Food Energy							
As percentage of 1989 REA	**	20	17	18	15	17	13
As percentage of 24-hour food energy	**	21	20	19	18	17	16
Percentage of Food Energy from:							
Total fat		26.2	25.0	25.4	25.8	26.7	26.5
Saturated fat		10.5	10.2	10.3	10.2	9.8	9.4
Carbohydrate							
Added sugars	**	18.9	18.3	19.0	18.6	22.7	20.4
Total		62.6	64.1	63.4	63.5	63.0	63.3
Protein		12.8	12.7	12.8	12.6	12.0	11.9
Vitamins (as Percentage of RDA)[a]							
Vitamin A	**	58	45	42	36	33	25
Vitamin C	**	66	60	67	58	62	49
Vitamin E		18	13	15	16	15	13
Vitamin B_6	**	109	84	66	50	49	31
Vitamin B_{12}	**	104	82	73	56	55	30
Niacin[b]	**	73	56	50	38	39	26
Thiamin	**	92	72	63	49	49	35
Riboflavin	**	132	103	89	69	61	44
Folate[c]	**	60	46	41	32	29	18
Minerals (as Percentage of RDA)[a]							
Calcium	**	35	29	21	18	21	12
Iron	**	56	46	53	37	47	23
Magnesium	**	43	38	24	20	15	11
Phosphorus	**	64	53	26	21	28	16
Zinc	**	28	22	24	21	19	15
Other Dietary Components							
Fiber (g)	**	2.4	2.1	2.5	2.0	2.7	1.7
Cholesterol (mg)	**	62	47	62	51	78	41
Sodium (mg)	**	563	457	584	465	699	397
Sample Size		**357**	**336**	**552**	**560**	**446**	**441**

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994 to 1996 CSFII.

[a] Mean intakes of vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus in this table are measured as a percentage of the Recommended Dietary Allowances (RDAs) based on the new Dietary Reference Intakes (DRIs). For the remaining vitamins and minerals except calcium, mean intakes are measured as a percentage of the 1989 RDAs. For calcium, mean intake is measured as a percentage of the DRI-based Adequate Intake.

[b] The reported intake of niacin as a percentage of the RDA is an underestimate because intake is reported in mg of niacin and does not include an estimate of the niacin that is contributed by the conversion of tryptophan to niacin. The RDA is given in mg of niacin equivalents and assumes that all niacin will be considered.

[c] The reported intake of folate as a percentage of the RDA is an underestimate because intake is reported in mcg of folate but the RDA is given in mcg of dietary folate equivalents. Expressing intake in mcg of folate does not make allowance for the high bioavailability of synthetic folic acid, as from fortified ready-to-eat cereals. Dietary folate equivalents consider bioavailability.

REA = Recommended Energy Allowance.

*Differences in intake among subgroups significantly different from zero at the .05 level, F-test.
**Differences in intake among subgroups significantly different from zero at the .01 level, F-test.

TABLE A.6.B

MEAN NUTRIENT INTAKE AT LUNCH AMONG SCHOOL-AGED CHILDREN, BY AGE/GENDER, 1994 TO 1996

		Mean Lunch Intake					
Dietary Component		Males, 6 to 8	Females, 6 to 8	Males, 9 to 13	Females, 9 to 13	Males, 14 to 18	Females, 14 to 18
Food Energy							
As percentage of 1989 REA	**	30	28	30	27	29	26
As percentage of 24-hour food energy intake		31	32	31	32	30	31
Percentage of Food Energy from:							
Total fat	*	34.5	34.7	34.5	33.3	33.8	32.5
Saturated fat	**	12.7	12.9	12.7	12.0	12.0	10.9
Carbohydrates							
Added sugars	**	17.3	16.1	18.5	19.7	22.7	21.6
Total	**	52.8	52.2	52.4	54.6	53.3	55.5
Protein	**	14.2	14.5	14.5	13.7	14.0	13.2
Vitamins (as Percentage of RDA)[a]							
Vitamin A	**	30	38	25	25	22	24
Vitamin C	**	60	55	52	50	47	38
Vitamin E		30	27	27	30	27	25
Vitamin B_6	**	61	60	45	39	43	31
Vitamin B_{12}	**	89	88	73	57	64	40
Niacin[b]	**	64	60	52	45	48	39
Thiamin	**	67	64	53	47	48	38
Riboflavin	**	85	84	66	58	51	45
Folate[c]	**	25	24	20	18	18	13
Minerals (as Percentage of RDA)[a]							
Calcium	**	34	33	23	20	25	16
Iron	**	33	31	37	29	42	23
Magnesium	**	51	49	31	28	21	16
Phosphorus	**	69	67	32	27	38	25
Zinc	**	27	25	27	25	27	22
Other Dietary Components							
Fiber (g)	**	4.1	3.8	4.5	4.0	4.9	3.6
Cholesterol (mg)	**	54	53	68	51	86	59
Sodium (mg)	**	971	848	1136	961	1365	936
Sample Size		**357**	**336**	**552**	**560**	**446**	**441**

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994 to 1996 CSFII.

[a] Mean intakes of vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus in this table are measured as a percentage of the Recommended Dietary Allowances (RDAs) based on the new Dietary Reference Intakes (DRIs). For the remaining vitamins and minerals except calcium, mean intakes are measured as a percentage of the 1989 RDAs. For calcium, mean intake is measured as a percentage of the DRI-based Adequate Intake.

[b] The reported intake of niacin as a percentage of the RDA is an underestimate because intake is reported in mg of niacin and does not include an estimate of the niacin that is contributed by the conversion of tryptophan to niacin. The RDA is given in mg of niacin equivalents and assumes that all niacin will be considered.

[c] The reported intake of folate as a percentage of the RDA is an underestimate because intake is reported in mcg of folate but the RDA is given in mcg of dietary folate equivalents. Expressing intake in mcg of folate does not make allowance for the high bioavailability of synthetic folic acid, as from fortified ready-to-eat cereals. Dietary folate equivalents consider bioavailability.

REA = Recommended Energy Allowance.

*Differences in intake among subgroups significantly different from zero at the .05 level, F-test.
**Differences in intake among subgroups significantly different from zero at the .01 level, F-test.

TABLE A.7.A

MEAN NUTRIENT INTAKE AT BREAKFAST AMONG SCHOOL-AGED CHILDREN, BY RACE/ETHNICITY, 1994 TO 1996

Dietary Component		Mean Breakfast Intake			
		Hispanic	Non-Hispanic Black	Non-Hispanic White	Other
Food Energy					
As percentage of 1989 REA		17	17	16	14
As percentage of 24-hour food energy intake	*	20	19	18	17
Percentage of Food Energy from:					
Total fat	**	28.7	30.3	24.5	25.4
Saturated fat	**	11.8	11.6	9.4	10.3
Carbohydrates					
Added sugars	**	16.3	19.3	20.9	14.1
Total	**	59.1	58.9	65.3	61.1
Protein	**	13.8	12.2	12.1	14.7
Vitamins (as Percentage of RDA)[a]					
Vitamin A	**	36	31	41	31
Vitamin C		60	62	60	51
Vitamin E	**	14	13	16	11
Vitamin B_6	*	57	53	63	47
Vitamin B_{12}		65	58	65	54
Niacin[b]	*	43	41	47	36
Thiamin		56	54	59	46
Riboflavin		82	70	80	66
Folate[c]	**	33	29	38	27
Minerals (as Percentage of RDA)[a]					
Calcium	**	23	18	22	21
Iron	**	39	37	46	32
Magnesium	**	25	19	23	22
Phosphorus		33	28	31	28
Zinc		22	18	22	18
Other Dietary Components					
Fiber (g)	**	2.3	1.8	2.4	1.9
Cholesterol (mg)	**	80	75	50	52
Sodium (mg)		548	585	517	533
Sample Size		**430**	**411**	**1,735**	**116**

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994-1996 CSFII.

[a] Mean intakes of vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus in this table are measured as a percentage of the Recommended Dietary Allowances (RDAs) based on the new Dietary Reference Intakes (DRIs). For the remaining vitamins and minerals except calcium, mean intakes are measured as a percentage of the 1989 RDAs. For calcium, mean intake is measured as a percentage of the DRI-based Adequate Intake.

[b] The reported intake of niacin as a percentage of the RDA is an underestimate because intake is reported in mg of niacin and does not include an estimate of the niacin that is contributed by the conversion of tryptophan to niacin. The RDA is given in mg of niacin equivalents and assumes that all niacin will be considered.

[c] The reported intake of folate as a percentage of the RDA is an underestimate because intake is reported in mcg of folate but the RDA is given in mcg of dietary folate equivalents. Expressing intake in mcg of folate does not make allowance for the high bioavailability of synthetic folic acid, as from fortified ready-to-eat cereals. Dietary folate equivalents consider bioavailability.

REA = Recommended Energy Allowance.

*Differences in intake among subgroups significantly different from zero at the .05 level, F-test.
**Differences in intake among subgroups significantly different from zero at the .01 level, F-test.

TABLE A.7.B

MEAN NUTRIENT INTAKE AT LUNCH AMONG SCHOOL-AGED CHILDREN, BY RACE/ETHNICITY, 1994 TO 1996

		Mean Lunch Intake			
Dietary Component		Hispanic	Non-Hispanic Black	Non-Hispanic White	Other
Food Energy					
As percentage of 1989 REA	*	26	26	29	25
As percentage of 24-hour food energy intake		30	30	31	31
Percentage of Food Energy from:					
Total fat	**	34.2	35.9	33.5	30.4
Saturated fat	*	12.5	12.7	12.0	10.8
Carbohydrate					
Added sugars	**	17.1	19.0	20.7	14.0
Total	**	52.0	50.9	54.4	54.7
Protein	**	14.9	14.3	13.6	16.3
Vitamins (as Percentage of RDA)[a]					
Vitamin A	**	29	18	28	25
Vitamin C		54	52	48	43
Vitamin E	**	24	25	29	23
Vitamin B_6		47	42	44	47
Vitamin B_{12}		66	65	66	70
Niacin[b]		48	47	50	52
Thiamin		50	48	52	54
Riboflavin	*	61	55	64	57
Folate[c]	**	20	16	19	19
Minerals (as Percentage of RDA)[a]					
Calcium	**	24	20	26	20
Iron		31	29	34	34
Magnesium	*	30	26	31	30
Phosphorus	*	39	34	41	38
Zinc		26	24	26	28
Other Dietary Components					
Fiber (g)	*	4.3	3.6	4.3	4.0
Cholesterol (mg)		72	67	61	65
Sodium (mg)	*	981	980	1,096	1,007
Sample Size		**430**	**411**	**1,735**	**116**

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994-1996 CSFII.

[a] Mean intakes of vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus in this table are measured as a percentage of the Recommended Dietary Allowances (RDAs) based on the new Dietary Reference Intakes (DRIs). For the remaining vitamins and minerals except calcium, mean intakes are measured as a percentage of the 1989 RDAs. For calcium, mean intake is measured as a percentage of the DRI-based Adequate Intake.

[b] The reported intake of niacin as a percentage of the RDA is an underestimate because intake is reported in mg of niacin and does not include an estimate of the niacin that is contributed by the conversion of tryptophan to niacin. The RDA is given in mg of niacin equivalents and assumes that all niacin will be considered.

[c] The reported intake of folate as a percentage of the RDA is an underestimate because intake is reported in mcg of folate but the RDA is given in mcg of dietary folate equivalents. Expressing intake in mcg of folate does not make allowance for the high bioavailability of synthetic folic acid, as from fortified ready-to-eat cereals. Dietary folate equivalents consider bioavailability.

REA = Recommended Energy Allowance.

*Differences in intake among subgroups significantly different from zero at the .05 level, F-test.
**Differences in intake among subgroups significantly different from zero at the .01 level, F-test.

TABLE A.8.A

MEAN NUTRIENT INTAKE AT BREAKFAST AMONG SCHOOL-AGED CHILDREN, BY HOUSEHOLD INCOME, 1994 TO 1996

Dietary Component		Mean Breakfast Intake				
		≤ 100% of Poverty Line	101 to 130% of Poverty Line	131 to 185% of Poverty Line	186 to 299% of Poverty Line	≤ 300% of Poverty Line
Food Energy						
As percentage of 1989 REA		15	18	17	15	15
As percentage of 24-hour food energy intake	*	17	20	19	17	17
Percentage of Food Energy from:						
Total fat	**	28.5	30.4	27.2	25.6	23.5
Saturated fat	**	11.5	11.7	10.7	9.9	8.9
Carbohydrates						
Added sugars		21.6	24.9	20.7	20.9	22.6
Total	**	60.0	58.7	61.9	63.8	66.3
Protein		13.0	12.3	12.6	12.2	12.2
Vitamins (as Percentage of RDA)[a]						
Vitamin A		33	32	39	38	39
Vitamin C		54	62	55	54	62
Vitamin E		12	15	17	13	15
Vitamin B_6	*	52	48	64	58	61
Vitamin B_{12}		58	58	72	60	59
Niacin[b]		39	37	47	43	45
Thiamin		51	49	60	54	56
Riboflavin		72	70	86	76	75
Folate[c]	*	30	27	38	35	36
Minerals (as Percentage of RDA)[a]						
Calcium		20	19	23	20	21
Iron	**	37	33	46	41	44
Magnesium		22	21	23	21	23
Phosphorus		30	30	33	29	29
Zinc		18	18	24	19	21
Other Dietary Components						
Fiber (g)		2.0	2.0	2.1	2.0	2.4
Cholesterol (mg)	**	68	89	65	51	41
Sodium (mg)		502	624	538	592	491
Sample Size		**547**	**196**	**369**	**595**	**985**

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994-1996 CSFII.

[a] Mean intakes of vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus in this table are measured as a percentage of the Recommended Dietary Allowances (RDAs) based on the new Dietary Reference Intakes (DRIs). For the remaining vitamins and minerals except calcium, mean intakes are measured as a percentage of the 1989 RDAs. For calcium, mean intake is measured as a percentage of the DRI-based Adequate Intake.

[b] The reported intake of niacin as a percentage of the RDA is an underestimate because intake is reported in mg of niacin and does not include an estimate of the niacin that is contributed by the conversion of tryptophan to niacin. The RDA is given in mg of niacin equivalents and assumes that all niacin will be considered.

[c] The reported intake of folate as a percentage of the RDA is an underestimate because intake is reported in mcg of folate but the RDA is given in mcg of dietary folate equivalents. Expressing intake in mcg of folate does not make allowance for the high bioavailability of synthetic folic acid, as from fortified ready-to-eat cereals. Dietary folate equivalents consider bioavailability.

REA = Recommended Energy Allowance.

*Differences in intake among subgroups significantly different from zero at the .05 level, F-test.
**Differences in intake among subgroups significantly different from zero at the .01 level, F-test.

TABLE A.8.B

MEAN NUTRIENT INTAKE AT LUNCH AMONG SCHOOL-AGED CHILDREN, BY HOUSEHOLD INCOME, 1994 TO 1996

		Mean Lunch Intake				
Dietary Component		≤ 100% of Poverty Line	101 to 130% of Poverty Line	131 to 185% of Poverty Line	186 to 299% of Poverty Line	≤ 300% of Poverty Line
Food Energy						
As percentage of 1989 REA		27	26	28	28	29
As percentage of 24-hour food energy intake		31	29	32	31	31
Percentage of Food Energy from:						
Total fat	**	34.4	35.6	34.2	34.4	32.8
Saturated fat	**	12.6	13.2	12.3	12.3	11.6
Carbohydrates						
Added sugars	**	16.8	18.6	21.9	18.7	21.0
Total	**	51.7	50.3	53.3	52.7	55.4
Protein	**	14.8	15.0	13.8	14.2	13.4
Vitamins (as Percentage of RDA)[a]						
Vitamin A	*	28	20	26	23	28
Vitamin C		51	42	52	44	51
Vitamin E	*	25	24	26	27	29
Vitamin B_6		45	40	44	43	45
Vitamin B_{12}		67	72	70	67	62
Niacin[b]		48	47	48	50	51
Thiamin		51	46	51	49	53
Riboflavin		63	59	61	60	63
Folate[c]		19	17	18	17	20
Minerals (as Percentage of RDA)[a]						
Calcium		25	22	23	24	25
Iron	*	32	30	32	31	34
Magnesium		29	27	30	31	31
Phosphorus		40	37	39	39	39
Zinc		25	25	27	25	25
Other Dietary Components						
Fiber (g)	**	4.1	3.6	4.1	4.1	4.4
Cholesterol (mg)	*	74	67	68	59	59
Sodium (mg)		1,027	970	1,051	1,050	1,093
Sample Size		**547**	**196**	**369**	**595**	**985**

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994-1996 CSFII.

[a] Mean intakes of vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus in this table are measured as a percentage of the Recommended Dietary Allowances (RDAs) based on the new Dietary Reference Intakes (DRIs). For the remaining vitamins and minerals except calcium, mean intakes are measured as a percentage of the 1989 RDAs. For calcium, mean intake is measured as a percentage of the DRI-based Adequate Intake.

[b] The reported intake of niacin as a percentage of the RDA is an underestimate because intake is reported in mg of niacin and does not include an estimate of the niacin that is contributed by the conversion of tryptophan to niacin. The RDA is given in mg of niacin equivalents and assumes that all niacin will be considered.

[c] The reported intake of folate as a percentage of the RDA is an underestimate because intake is reported in mcg of folate but the RDA is given in mcg of dietary folate equivalents. Expressing intake in mcg of folate does not make allowance for the high bioavailability of synthetic folic acid, as from fortified ready-to-eat cereals. Dietary folate equivalents consider bioavailability.

REA = Recommended Energy Allowance.

*Differences in intake among subgroups significantly different from zero at the .05 level, F-test.
**Differences in intake among subgroups significantly different from zero at the .01 level, F-test.

TABLE A.9.A

MEAN BREAKFAST NUTRIENT INTAKE AMONG SCHOOL-AGED CHILDREN, BY FOOD SUFFICIENCY STATUS, 1994 TO 1996

Dietary Component		Mean Breakfast Intake: Food Sufficient	Food Insufficient
Food Energy			
As percentage of 1989 REA		16	15
As percentage of 24-hour food energy intake		18	17
Percentage of Food Energy from:			
Total fat	*	25.8	30.7
Saturated fat	*	10.0	12.2
Carbohydrate			
Added sugars		20.0	16.3
Total	*	63.6	57.0
Protein	*	12.4	13.8
Vitamins (as Percentage of RDA)[a]			
Vitamin A		39	31
Vitamin C	*	60	43
Vitamin E	*	15	12
Vitamin B_6		61	49
Vitamin B_{12}		64	53
Niacin[b]		45	35
Thiamin		57	46
Riboflavin		79	68
Folate[c]		36	27
Minerals (as Percentage of RDA)[a]			
Calcium		21	20
Iron	*	43	32
Magnesium		23	21
Phosphorus		31	30
Zinc		22	16
Other Dietary Components			
Fiber (g)	*	2.3	1.7
Cholesterol (mg)		57	82
Sodium (mg)		534	483
Sample Size		**2,596**	**84**

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: The food sufficiency status of the child's family is assessed by a single CSFII question on whether members of the child's family got enough food to eat over the previous three months.

[a] Mean intakes of vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus in this table are measured as a percentage of the Recommended Dietary Allowances (RDAs) based on the new Dietary Reference Intakes (DRIs). For the remaining vitamins and minerals except calcium, mean intakes are measured as a percentage of the 1989 RDAs. For calcium, mean intake is measured as a percentage of the DRI-based Adequate Intake.

[b] The reported intake of niacin as a percentage of the RDA is an underestimate because intake is reported in mg of niacin and does not include an estimate of the niacin that is contributed by the conversion of tryptophan to niacin. The RDA is given in mg of niacin equivalents and assumes that all niacin will be considered.

[c] The reported intake of folate as a percentage of the RDA is an underestimate because intake is reported in mcg of folate but the RDA is given in mcg of dietary folate equivalents. Expressing intake in mcg of folate does not make allowance for the high bioavailability of synthetic folic acid, as from fortified ready-to-eat cereals. Dietary folate equivalents consider bioavailability.

REA = Recommended Energy Allowance.

*Differences in intake among subgroups significantly different from zero at the .05 level, F-test.
**Differences in intake among subgroups significantly different from zero at the .01 level, F-test.

TABLE A.9.B

MEAN NUTRIENT INTAKE AT LUNCH AMONG SCHOOL-AGED CHILDREN, BY FOOD SUFFICIENCY STATUS, 1994 TO 1996

Dietary Component		Mean Lunch Intake	
		Food Sufficient	Food Insufficient
Food Energy			
As percentage of 1989 REA		28	26
As percentage of 24-hour food energy intake		31	31
Percentage of Food Energy from:			
Total fat		33.7	35.1
Saturated fat		12.1	13.1
Carbohydrates			
Added sugars		19.9	14.7
Total	**	53.7	49.7
Protein	**	13.9	16.2
Vitamins (as Percentage of RDA)[a]			
Vitamin A		26	36
Vitamin C		50	43
Vitamin E	*	28	24
Vitamin B_6		44	45
Vitamin B_{12}		66	76
Niacin[b]		50	46
Thiamin		51	49
Riboflavin		62	65
Folate[c]		19	19
Minerals (as Percentage of RDA)[a]			
Calcium		24	29
Iron	*	33	28
Magnesium		30	29
Phosphorus		39	43
Zinc		25	25
Other Dietary Components			
Fiber (g)		4.2	3.9
Cholesterol (mg)		63	81
Sodium (mg)		1,061	982
Sample Size		**2,596**	**84**

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: The food sufficiency status of the child's family is assessed by a single CSFII question on whether members of the child's family got enough food to eat over the previous three months.

[a] Mean intakes of vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus in this table are measured as a percentage of the Recommended Dietary Allowances (RDAs) based on the new Dietary Reference Intakes (DRIs). For the remaining vitamins and minerals except calcium, mean intakes are measured as a percentage of the 1989 RDAs. For calcium, mean intake is measured as a percentage of the DRI-based Adequate Intake.

[b] The reported intake of niacin as a percentage of the RDA is an underestimate because intake is reported in mg of niacin and does not include an estimate of the niacin that is contributed by the conversion of tryptophan to niacin. The RDA is given in mg of niacin equivalents and assumes that all niacin will be considered.

[c] The reported intake of folate as a percentage of the RDA is an underestimate because intake is reported in mcg of folate but the RDA is given in mcg of dietary folate equivalents. Expressing intake in mcg of folate does not make allowance for the high bioavailability of synthetic folic acid, as from fortified ready-to-eat cereals. Dietary folate equivalents consider bioavailability.

REA = Recommended Energy Allowance.

*Differences in intake among subgroups significantly different from zero at the .05 level, F-test.
**Differences in intake among subgroups significantly different from zero at the .01 level, F-test.

TABLE A.10.A

FOOD GROUP INTAKES OF SCHOOL-AGED CHILDREN OVER 24 HOURS, BY HOUSEHOLD INCOME, 1994 TO 1996

		Mean Number of Servings				
Food Groups		≤ 100% of Poverty Line	101 to 130% of Poverty Line	131 to 185% of Poverty Line	186 to 299% of Poverty Line	≤ 300% of Poverty Line
Grain Products						
Whole grains	**	0.8	0.6	0.9	0.9	1.2
Nonwhole grains	*	6.1	6.0	5.9	6.1	6.4
Total	**	6.9	6.5	6.8	7.0	7.6
Vegetables						
Potatoes		1.3	1.3	1.2	1.3	1.2
Legumes		0.2	0.2	0.2	0.1	0.1
Other starchy vegetables	**	0.1	0.2	0.2	0.2	0.2
Dark-green leafy vegetables		0.1	0.1	0.1	0.1	0.1
Other vegetables		1.2	1.0	1.1	1.1	1.2
Total		2.9	2.8	2.7	2.7	2.8
Fruit						
Citrus	*	0.7	0.6	0.6	0.6	0.8
Noncitrus	**	0.6	0.6	0.6	0.7	0.8
Total	**	1.4	1.1	1.2	1.3	1.7
Vegetables and Fruit	*	4.2	3.9	3.9	4.0	4.4
Milk Products						
Milk						
Whole milk	**	0.7	0.6	0.5	0.4	0.3
Low-fat milk	**	0.4	0.4	0.6	0.6	0.8
Nonfat milk	**	0.1	0.1	0.1	0.1	0.2
Total[a]		1.4	1.3	1.4	1.5	1.5
Cheese	**	0.5	0.4	0.5	0.5	0.6
Other dairy	**	0.0	0.0	0.0	0.0	0.0
Total	**	1.9	1.7	1.9	2.0	2.2
Meat and Meat Substitutes						
Red meat	*	1.1	1.2	1.0	0.9	0.9
Poultry		0.4	0.4	0.3	0.4	0.4
Fish		0.1	0.1	0.1	0.1	0.1
Eggs	**	0.2	0.2	0.1	0.1	0.1
Nuts and seeds	**	0.0	0.0	0.1	0.1	0.1
Total	**	1.8	1.8	1.6	1.5	1.6
Soda	**	1.2	1.3	1.3	1.5	1.6
Fruit Drinks and Fruit-Flavored Drinks		1.0	0.9	0.8	0.8	0.7
Sample Size		**547**	**196**	**369**	**595**	**985**

SOURCE: Weighted tabulations using two days of intake data from respondents of the 1994-1996 CSFII.

[a]The total number of servings of milk includes not only whole, low-fat, and nonfat milk, but also milk whose fat content was not specified.

*Differences in intake among subgroups significantly different from zero at the .05 level, F-test.
**Differences in intake among subgroups significantly different from zero at the .01 level, F-test.

TABLE A.10.B

FOOD GROUP INTAKES OF SCHOOL-AGED CHILDREN, BY FOOD SUFFICIENCY STATUS, 1994 TO 1996

Food Groups		Mean Number of Servings: Food Sufficient	Mean Number of Servings: Food Insufficient
Grain Products			
Whole grains		1.0	0.7
Nonwhole grains		6.2	6.0
Total		7.2	6.7
Vegetables			
Potatoes		1.2	1.1
Legumes		0.1	0.4
Other starchy vegetables	*	0.2	0.1
Dark-green leafy vegetables	**	0.1	0.0
Other vegetables		1.1	1.0
Total		2.8	2.7
Fruit			
Citrus		0.7	0.6
Noncitrus		0.7	0.6
Total		1.4	1.2
Vegetables and Fruit		4.2	3.9
Milk Products			
Milk			
Whole milk		0.4	0.7
Low-fat milk		0.6	0.5
Nonfat milk	**	0.2	0.0
Total[a]		1.5	1.4
Cheese		0.5	0.5
Other dairy	**	0.0	0.0
Total		2.0	2.0
Meat and Meat Substitutes			
Red meat		1.0	0.9
Poultry		0.4	0.4
Fish		0.1	0.1
Eggs	**	0.1	0.2
Nuts and seeds	**	0.1	0.0
Total		1.6	1.6
Soda		1.4	1.5
Fruit Drinks and Fruit-Flavored Drinks		0.8	0.8
Sample Size		**2,596**	**84**

SOURCE: Weighted tabulations using two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: The food sufficiency status of the child's family is assessed by a single CSFII question on whether members of the child's family got enough food to eat over the previous three months.

[a]The total number of servings of milk includes not only whole, low-fat, and nonfat milk, but also milk whose fat content was not specified.

*Differences in intake among subgroups significantly different from zero at the .05 level, F-test.
**Differences in intake among subgroups significantly different from zero at the .01 level, F-test.

TABLE A.11.A

NUMBER OF PYRAMID SERVINGS FOOD GROUP TARGETS MET BY SCHOOL-AGED CHILDREN, BY SELECTED CHARACTERISTICS, 1994 TO 1996

		Number of Food Group Targets Met					
Population Group		0	1	2	3	4	5
Overall		14	25	30	20	10	2
Gender/Age	**						
Males, 6 to 8		14	28	34	17	6	1
Females, 6 to 8		17	42	28	11	1	0
Males, 9 to 13		8	21	31	27	12	2
Females, 9 to 13		17	32	29	16	6	0
Males, 14 to 18		6	12	26	29	22	5
Females, 14 to 18		23	25	30	15	5	0
Race/Ethnicity							
Hispanic		12	24	31	21	10	2
Non-Hispanic, black		19	28	25	19	8	2
Non-Hispanic, white		13	31	26	20	9	1
Other		17	16	34	19	14	0
Household Income	**						
≤ 100% of poverty line		14	25	28	21	11	1
101 to 130% of poverty line		13	34	27	20	4	2
131 to 185% of poverty line		16	30	24	19	9	1
186 to 299% of poverty line		17	26	29	20	8	1
≤ 300% of poverty line		11	22	33	21	11	2
Type of Day							
School day		10	25	31	23	9	2
Summer day		11	24	32	23	9	1
Weekend day or holiday during school year		12	26	32	20	8	2
Food Sufficiency Status							
Food sufficient		14	25	30	20	10	2
Food insufficient		14	25	31	20	9	1
NSLP Participation Status	*						
Participants		7	23	31	24	11	3
Nonparticipant		11	27	33	21	7	1
SBP Participation Status							
Participant		5	20	33	24	15	3
Nonparticipant		10	26	32	23	8	2

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994 to 1996 CSFII.

NOTE: Target defined according to the lower limit of the range specified in the pyramid servings recommendations. These targets are defined to be the same for all age/gender groups. See Chapter II, Section B4 for definitions of SBP and NSLP participation status.

NSLP = National School Lunch Program; REA = Recommended Energy Allowance; SBP = School Breakfast Program.

*Differences among subgroups significantly different from zero at the .05 level, chi-square test.
**Differences among subgroups significantly different from zero at the .01 level, chi-square test.

TABLE A.11.B

NUMBER OF AGE/GENDER-SPECIFIC PYRAMID SERVINGS FOOD GROUP TARGETS MET BY SCHOOL-AGED CHILDREN, BY SELECTED CHARACTERISTICS, 1994 TO 1996

		Number of Food Group Targets Met					
Population Group		0	1	2	3	4	5
Overall		42	21	23	10	3	0.2
Gender/Age	**						
Males, 6 to 8		33	12	32	18	4	0.2
Females, 6 to 8		37	20	29	12	1	0.0
Males, 9 to 13		37	17	30	13	3	0.0
Females, 9 to 13		51	21	19	7	3	0.0
Males, 14 to 18		34	28	20	11	6	1.0
Females, 14 to 18		55	27	14	3	1	0.1
Race/Ethnicity	*						
Hispanic		43	21	22	10	3	0.3
Non-Hispanic, black		47	29	17	5	3	0.0
Non-Hispanic, white		41	19	25	12	3	0.3
Other		41	27	21	10	1	0.0
Household Income	*						
≤ 100% of poverty line		40	26	20	10	3	0.1
101 to 130% of poverty line		46	25	21	6	2	0.0
131 to 185% of poverty line		52	16	19	10	2	0.0
186 to 299% of poverty line		48	19	22	8	3	0.2
≤ 300% of poverty line		36	22	26	12	4	0.5
Type of Day	*						
School day		36	20	26	13	5	0.2
Summer day		41	23	22	10	3	0.3
Weekend day or holiday during school year		39	24	24	10	3	0.5
Food Sufficiency Status							
Food Sufficient		42	21	23	10	3	0.2
Food Insufficient		37	24	28	7	2	0.8
NSLP Participation Status	**						
Participants		29	16	31	16	8	0.2
Nonparticipant		40	23	23	11	3	0.0
SBP Participation Status	*						
Participant		20	12	39	18	11	0.3
Nonparticipant		37	21	25	13	5	0.1

SOURCE: Weighted tabulations based on two days of intake data from respondents of the 1994 to 1996 CSFII.

NOTE: Target defined using age and gender specific values from the Healthy Eating Index (see Chapter II, Table II.7). See Chapter II, Section B_4 for definitions of SBP and NSLP participation status.

NSLP = National School Lunch Program; REA = Recommended Energy Allowance; SBP = School Breakfast Program.

*Differences among subgroups significantly different from zero at the .05 level, chi-square test.
**Differences among subgroups significantly different from zero at the .01 level, chi-square test.

TABLE A.12.A

DISTRIBUTION OF DAILY NUMBER OF FOOD SERVINGS AMONG SCHOOL-AGED CHILDREN, BY AGE/GENDER, 1994 TO 1996

Number of Servings		24 Hours					
		Males, 6 to 8	Females, 6 to 8	Males, 9 to 13	Females, 9 to 13	Males, 14 to 18	Females, 14 to 18
Grain Products (Percentages)	**						
0		0	0	0	0	0	0
1 to 3		7	14	5	10	2	16
4 to 5		28	35	17	28	14	29
6 to 11		60	50	68	58	58	50
More than 11		5	1	9	4	25	5
Percentage meeting age/gender-specific target	**	27	20	25	17	32	14
Vegetables (Percentages)	**						
0		9	10	6	6	5	8
1 to 2		61	58	46	53	28	41
3 to 5		27	30	38	36	44	45
More than 5		3	2	9	5	23	7
Percentage meeting age/gender-specific target	**	12	15	20	18	29	21
Fruit (Percentages)	**						
0		26	21	28	25	43	38
1		34	38	35	40	26	32
2 to 4		36	37	34	31	23	25
More than 4		5	3	4	4	8	5
Percentage meeting age/gender-specific target	**	21	16	10	14	10	14
Vegetables and Fruit (Percentages)	**						
0		1	2	3	2	3	3
1 to 2		32	28	22	29	18	23
3 to 4		36	42	36	38	27	41
5 to 9		28	27	35	29	43	29
More than 9		2	1	4	2	9	3
Percentage meeting age/gender-specific target		13	9	10	14	12	12
Milk Products (Percentages)	**						
0		4	6	5	7	8	21
1		29	30	24	36	24	42
2 to 3		56	57	56	48	48	31
More than 3		12	7	15	9	20	6
Percentage meeting age/gender-specific target	**	51	41	38	25	30	9
Meat and Meat Substitutes (Percentages)	**						
0		12	12	5	10	4	10
1		49	65	43	57	22	47
2 to 3		38	23	48	31	59	40
More than 3		1	0	4	2	15	3
Percentage meeting age/gender-specific target	**	14	7	21	7	32	16
Sample Size		**357**	**336**	**552**	**560**	**446**	**441**

SOURCE: Weighted tabulations using two days of intake data from respondents of the 1994 to 1996 CSFII.

NOTE: Age/gender-specific targets are taken from the targets used in the construction of the Healthy Eating Index (Kennedy et al. 1995).

*Differences among subgroups significantly different from zero at the .05 level, chi-square test.
**Differences among subgroups significantly different from zero at the .01 level, chi-square test.

TABLE A.12.B

DISTRIBUTION OF DAILY NUMBER OF FOOD SERVINGS AMONG SCHOOL-AGED CHILDREN, BY RACE/ETHNICITY, 1994 TO 1996

Number of Servings		24 Hours			
		Hispanic	Non-Hispanic Black	Non-Hispanic White	Other
Grain Products (Percentages)	**				
0		0	0	0	0
1 to 3		12	11	8	13
4 to 5		28	31	23	22
6 to 11		52	52	60	58
More than 11		8	6	9	7
Percentage meeting age/gender-specific target	**	22	14	25	18
Vegetables (Percentages)					
0		5	9	7	6
1 to 2		47	44	50	47
3 to 5		39	40	36	34
More than 5		9	8	7	13
Percentage meeting age/gender-specific target		21	21	19	30
Fruit (Percentages)	**				
0		25	32	33	22
1		41	38	32	34
2 to 4		29	28	30	35
More than 4		5	1	5	9
Percentage meeting age/gender-specific target		11	10	15	19
Vegetables and Fruit (Percentages)					
0		1	3	2	3
1 to 2		25	24	27	20
3 to 4		39	39	36	32
5 to 9		30	30	31	37
More than 9		4	2	3	8
Percentage meeting age/gender-specific target		11	9	12	23
Milk Products (Percentages)	**				
0		9	15	6	17
1		35	43	28	36
2 to 3		47	39	52	43
More than 3		10	3	14	3
Percentage meeting age/gender-specific target	**	29	15	35	19
Meat and Meat Substitutes (Percentages)	**				
0		9	5	7	7
1		47	37	46	43
2 to 3		39	50	41	44
More than 3		4	8	6	7
Percentage meeting age/gender-specific target	**	20	28	14	20
Sample Size		**430**	**411**	**1,735**	**116**

SOURCE: Weighted tabulations using two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: Age/gender-specific targets are taken from the targets used in the construction of the Healthy Eating Index (Kennedy et al. 1995).

*Differences among subgroups significantly different from zero at the .05 level, chi-square test.
**Differences among subgroups significantly different from zero at the .01 level, chi-square test.

TABLE A.12.C

DISTRIBUTION OF DAILY NUMBER OF FOOD SERVINGS AMONG SCHOOL-AGED CHILDREN, BY HOUSEHOLD INCOME, 1994 TO 1996

		24 Hours				
Number of Servings		≤ 100% of Poverty Line	101 to 130% of Poverty Line	131 to 185% of Poverty Line	186 to 299% of Poverty Line	≤ 300% of Poverty Line
Grain Products (Percentages)	*					
0		0	0	0	0	0
1 to 3		12	9	10	9	7
4 to 5		29	34	25	24	22
6 to 11		52	50	57	59	61
More than 11		7	7	7	8	10
Percentage meeting age/gender-specific target	*	20	17	17	23	26
Vegetables (Percentages)	**					
0		7	9	9	4	7
1 to 2		44	44	45	53	50
3 to 5		39	41	39	37	34
More than 5		9	7	8	6	9
Percentage meeting age/gender-specific target		23	20	17	18	21
Fruit (Percentages)	**					
0		32	35	35	36	26
1		36	39	33	32	34
2 to 4		27	23	29	28	34
More than 4		4	3	4	4	6
Percentage meeting age/gender-specific target	**	11	9	8	11	19
Vegetables and Fruit (Percentages)						
0		3	3	3	2	2
1 to 2		27	31	27	29	23
3 to 4		38	38	37	36	37
5 to 9		28	27	31	31	34
More than 9		5	3	2	3	4
Percentage meeting age/gender-specific target		11	11	8	10	14
Milk Products (Percentages)	**					
0		11	9	7	8	8
1		32	39	38	29	29
2 to 3		49	46	45	53	49
More than 3		9	7	10	10	14
Percentage meeting age/gender-specific target	**	27	19	27	29	36
Meat and Meat Substitutes (Percentages)	**					
0		4	4	7	9	11
1		42	37	49	46	47
2 to 3		46	53	40	41	38
More than 3		7	6	4	3	5
Percentage meeting age/gender-specific target	**	24	27	16	13	15
Sample Size		**547**	**196**	**369**	**595**	**985**

SOURCE: Weighted tabulations using two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: Age/gender-specific targets are taken from the targets used in the construction of the Healthy Eating Index (Kennedy et al. 1995).

*Differences among subgroups significantly different from zero at the .05 level, chi-square test.
**Differences among subgroups significantly different from zero at the .01 level, chi-square test.

TABLE A.12.D

DISTRIBUTION OF DAILY NUMBER OF FOOD SERVINGS AMONG SCHOOL-AGED CHILDREN, BY FOOD SUFFICIENCY STATUS, 1994 TO 1996

	24 Hours	
Number of Servings	Food Sufficient	Food Insufficient
Grain Products (Percentages)		
0	0	0
1 to 3	9	15
4 to 5	25	23
6 to 11	58	54
More than 11	8	8
Percentage meeting age/gender-specific target	23	24
Vegetables (Percentages)		
0	7	8
1 to 2	48	46
3 to 5	37	35
More than 5	8	11
Percentage meeting age/gender-specific target	20	22
Fruit (Percentages)		
0	31	29
1	34	33
2 to 4	30	36
More than 4	5	2
Percentage meeting age/gender-specific target	14	10
Vegetables and Fruit (Percentages)		
0	2	4
1 to 2	26	24
3 to 4	37	38
5 to 9	31	32
More than 9	3	2
Percentage meeting age/gender-specific target	12	9
Milk Products (Percentages)		
0	9	6
1	31	35
2 to 3	49	50
More than 3	11	10
Percentage meeting age/gender-specific target	30	31
Meat and Meat Substitutes (Percentages)		
0	8	4
1	46	46
2 to 3	41	47
More than 3	5	3
Percentage meeting age/gender-specific target	17	23
Sample Size	**2,596**	**84**

SOURCE: Weighted tabulations using two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: Age/gender-specific targets are taken from the targets used in the construction of the Healthy Eating Index (Kennedy et al. 1995). The food sufficiency status of the child's family is assessed by a single CSFII question on whether members of the child's family got enough food to eat over the previous three months.

APPENDIX B

SUPPLEMENTARY TABLES FOR CHAPTER IV

TABLE B.1.A

MEAN NUTRIENT INTAKE OF SCHOOL-AGED CHILDREN,
BY NSLP PARTICIPATION STATUS, 1994 TO 1996

	Mean Lunch Intake		Mean 24-Hour Intake	
Dietary Component	NSLP Participants[d]	Nonparticipants	NSLP Participants[d]	Nonparticipants
Food Energy				
As percentage of 1989 REA	30**	26	94**	87
As percentage of 24-hour food energy intake	34**	30	n.a.	n.a.
Percentage of Food Energy from:				
Total fat	36.6**	32.1	33.7**	31.8
Saturated fat	14.6**	10.9	12.6**	11.4
Carbohydrates				
Added sugars	13.1**	22.7	17.0**	19.7
Total	48.9**	57.1	52.7**	55.6
Protein	15.8**	12.5	14.8**	14.0
Vitamins (as Percentage of RDA)[a]				
Vitamin A	32**	24	121	121
Vitamin C	45	50	199	193
Vitamin E	28	27	91*	85
Vitamin B_6	49**	40	197*	182
Vitamin B_{12}	92**	46	298**	231
Niacin[b]	50*	46	186**	176
Thiamin	54**	46	201**	186
Riboflavin	82**	52	267**	228
Folate[c]	20**	17	94*	86
Minerals (as Percentage of RDA)[a]				
Calcium	37**	19	96**	77
Iron	33**	29	136	128
Magnesium	37**	29	115**	104
Phosphorus	52**	34	149**	129
Zinc	29**	20	98**	87
Other Dietary Components				
Fiber (g)	4.9**	3.9	14.5**	13.3
Cholesterol (mg)	66**	47	229**	203
Sodium (mg)	1,101**	884	3,404**	3,017
Sample Size	**952**	**914**	**952**	**914**

SOURCE: Weighted tabulations based on one or two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: Sample includes only students attending schools that offer school lunches on intake days during the school year. Students who had two intake days that were not school days were excluded. Mean values presented in table are not regression adjusted.

[a] Mean intakes of vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus in this table are measured as a percentage of the Recommended Dietary Allowances (RDAs) based on the new Dietary Reference Intakes (DRIs). For the remaining vitamins and minerals except calcium, mean intakes are measured as a percentage of the 1989 RDAs. For calcium, mean intake is measured as a percentage of the DRI-based Adequate Intake.

[b] The reported intake of niacin as a percentage of the RDA is an underestimate because intake is reported in mg of niacin and does not include an estimate of the niacin that is contributed by the conversion of tryptophan to niacin. The RDA is given in mg of niacin equivalents and assumes that all niacin will be considered.

[c] The reported intake of folate as a percentage of the RDA is an underestimate because intake is reported in mcg of folate but the RDA is given in mcg of dietary folate equivalents. Expressing intake in mcg of folate does not make allowance for the high bioavailability of synthetic folic acid, as from fortified ready-to-eat cereals. Dietary folate equivalents consider bioavailability.

[d] Significance test refers to difference in outcomes among NSLP participants and nonparticipants.

n.a. = not applicable; NSLP = National School Lunch Program; REA = Recommended Energy Allowance.

*Significantly different from zero at the .05 level, two-tailed test.
**Significantly different from zero at the .01 level, two-tailed test.

TABLE B.1.B

NUTRIENT INTAKE OF NSLP PARTICIPANTS RELATIVE TO DIETARY STANDARDS, ALTERNATIVE DEFINITIONS OF PARTICIPATION

	Mean 24-Hour Intake							
	Definition 1 (Usually participates at least 1 time a week)		Definition 2 (Usually participates at least 3 times a week)		Definition 3 (Usually participates 5 times a week)		Definition 4[a] (Participates on the intake day)	
Dietary Component	NSLP Participants	Non-participants	NSLP Participants	Non-participants	NSLP Participants	Non-participants	NSLP Participants	Non-participants
Food Energy as percentage of 1989 REA	92	87	91	89	91	90	94**	87
Percentage of Food Energy from:								
Total fat	33.0*	31.8	33.3**	31.6	33.4**	31.8	33.7**	31.8
Saturated fat	12.2**	11.3	12.3**	11.4	12.4**	11.5	12.6**	11.4
Carbohydrate								
Added sugars	18.1	19.2	18.0	19.1	17.9	18.9	17.0**	19.7
Total	53.6**	55.8	53.2**	55.8	53.0**	55.5	52.7**	55.6
Protein	14.6**	13.9	14.7**	14.1	14.7**	14.2	14.8**	14.0
Vitamins (as Percentage of RDA)[b]								
Vitamin A	119	131	115*	133	112*	132	121	121
Vitamin C	196	192	197	193	190	202	199	193
Vitamin E	88	86	88	88	87	89	91*	85
Vitamin B_6	193	181	192	187	189	192	197*	182
Vitamin B_{12}	273	240	276	246	281	248	298**	231
Niacin[c]	184	173	183	179	182	182	186**	176
Thiamin	196	185	196	190	194	193	201**	186
Riboflavin	255**	226	254	237	252	244	267**	228
Folate[d]	91	86	90	89	89	91	94*	86
Minerals (as Percentage of RDA)[b]								
Calcium	89**	76	89**	81	88	84	96**	77
Iron	134	128	133	130	133	131	136	128
Magnesium	112*	102	111	109	108	112	115**	104
Phosphorus	143**	125	142	134	141	138	149**	129
Zinc	95**	85	96**	87	96*	89	98**	87
Other Dietary Components								
Fiber (g)	13.9	14.0	14.0	13.8	13.9	13.9	14.5**	13.3
Cholesterol (mg)	226**	185	230**	193	231**	200	229**	203
Sodium (mg)	3,269*	3,029	3,314**	3,033	3,343*	3,066	3,404**	3,017
Sample Size	**1,841**	**488**	**1,545**	**784**	**1,297**	**1,032**	**1,197**	**1,142**

SOURCE: Weighted (non-regression adjusted) tabulations based on 1994-1996 CSFII.

[a] This is the definition of participation used throughout the text.

[b] Mean intakes of vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus in this table are measured as a percentage of the RDAs based on the new Dietary Reference Intakes (DRIs). For the remaining vitamins and minerals except calcium, mean intakes are measured as a percentage of the 1989 RDAs. For calcium, mean intake is measured as a percentage of the DRI-based Adequate Intake (AI).

[c] The reported intake of niacin as a percentage of the RDA is an underestimate because intake is reported in mg of niacin and does not include an estimate of the niacin that is contributed by the conversion of tryptophan to niacin. The RDA is given in mg of niacin equivalents and assumes that all niacin will be considered.

[d] The reported intake of folate as a percentage of the RDA is an underestimate because intake is reported in mcg of folate but the RDA is given in mcg of dietary folate equivalents. Expressing intake in mcg of folate does not make allowance for the high bioavailability of synthetic folic acid, as from fortified ready-to-eat cereals. Dietary folate equivalents consider bioavailability.

*Significantly different from zero at the .05 level, two-tailed test.
**Significantly different from zero at the .01 level, two-tailed test.

TABLE B.2

REGRESSION-ADJUSTED PERCENTAGE OF SCHOOL-AGED CHILDREN WHOSE DAILY NUTRIENT INTAKE IS AT OR ABOVE DIETARY STANDARDS, BY NSLP PARTICIPATION STATUS, 1994 TO 1996

	Daily 24-Hour Intake			
	Percentage of Children at or Above EAR[a]		Percentage of Children at or Above 80% of 1989 RDA[a]	
Dietary Component	NSLP Participants[b]	Nonparticipants	NSLP Participants[b]	Nonparticipants
Vitamins				
Vitamin A	n.a.	n.a.	57	53
Vitamin C	n.a.	n.a.	74	71
Vitamin E	n.a.	n.a.	52**	43
Vitamin B_6	87**	81	n.a.	n.a.
Vitamin B_{12}	90**	83	n.a.	n.a.
Niacin	92*	89	n.a.	n.a.
Thiamin	91*	88	n.a.	n.a.
Riboflavin	94**	90	n.a.	n.a.
Folate	46	42	n.a.	n.a.
Minerals				
Calcium	n.a.	n.a.	54**	42
Iron	n.a.	n.a.	79**	71
Magnesium	62	59	n.a.	n.a.
Phosphorus	79**	67	n.a.	n.a.
Zinc	n.a.	n.a.	57**	47
Sample Size	**952**	**914**	**952**	**914**

SOURCE: Weighted tabulations based on one or two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: Sample includes only students attending schools that offer school lunches on intake days during the school year. Students who had two intake days that were not school days were excluded.

[a] For vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus, the EARs based on the new Dietary Reference Intakes are used. For all of the remaining nutrients except calcium, the table shows the percentage of individuals whose intake is above 80 percent of the 1989 RDAs (an approximation of the estimated average requirement). For calcium, the table shows the percentage of individuals whose intake is above 80 percent of the Adjusted Intake.

[b] Significance test refers to difference in outcomes among NSLP participants and nonparticipants.

n.a. = not applicable; EAR = Estimated Average Requirements; NSLP = National School Lunch Program; RDA = Recommended Dietary Allowance.

*Significantly different from zero at the .05 level, two-tailed test.
**Significantly different from zero at the .01 level, two-tailed test.

TABLE B.3

PERCENTAGE OF SCHOOL-AGED CHILDREN WHOSE USUAL DAILY NUTRIENT INTAKE IS AT OR ABOVE DIETARY STANDARDS, BY NSLP PARTICIPATION STATUS, 1994 TO 1996

	Usual 24-Hour Intake			
	Percentage of Children at or Above EAR[a]		Percentage of Children at or Above 80% of 1989 RDA[a]	
Dietary Component	NSLP Participants[b]	Nonparticipants	NSLP Participants[b]	Nonparticipants
Vitamins				
Vitamin A	n.a.	n.a.	68	63
Vitamin C	n.a.	n.a.	92	84
Vitamin E	n.a.	n.a.	59	49
Vitamin B_6	97	93	n.a.	n.a.
Vitamin B_{12}	100	97	n.a.	n.a.
Niacin	99	98	n.a.	n.a.
Thiamin	99	98	n.a.	n.a.
Riboflavin	99	96	n.a.	n.a.
Folate	55	46	n.a.	n.a.
Minerals				
Calcium	n.a.	n.a.	64	40
Iron	n.a.	n.a.	90	87
Magnesium	72	61	n.a.	n.a.
Phosphorus	90	75	n.a.	n.a.
Zinc	n.a.	n.a.	74	57
Sample Size	**952**	**914**	**952**	**914**

SOURCE: Weighted tabulations based on one or two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: Sample includes only students attending schools that offer school lunches on intake days during the school year. Students who had two intake days that were not school days were excluded. Children's usual intake distribution was determined based on two intake days using the Software for Intake Distribution Estimation, developed by Iowa State University (1996). Percentages are not regression adjusted.

[a] For vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus, the EARs based on the new DRIs are used. For all of the remaining nutrients except calcium, the table shows the percentage of individuals whose intake is above 80 percent of the 1989 RDAs (an approximation of the estimated average requirement). For calcium, the table shows the percentage of individuals whose intake is above 80 percent of the AI.

[b]No significance tests were conducted on the numbers in this table.

EAR = Estimated Average Requirements; n.a. = not applicable; NSLP = National School Lunch Program; RDA = Recommended Dietary Allowance.

TABLE B.4

REGRESSION-ADJUSTED PERCENTAGE OF SCHOOL-AGED CHILDREN WHO MEET SELECTED DIETARY RECOMMENDATIONS, BY NSLP PARTICIPATION STATUS, 1994 TO 1996

	Percentage Whose Daily Intake Meets the Recommendation	
Dietary Recommendation	NSLP Participants[a]	Nonparticipants
Percentage of Food Energy		
No more than 30 percent from total fat	29**	38
Less than 10 percent from saturated fat	24**	33
More than 55 percent from carbohydrates	41**	50
Other Dietary Components		
More than (age plus 5) g of dietary fiber	34	33
No more than 2,400 mg of sodium	29**	37
No more than 300 mg of cholesterol	79	80
No more than twice the 1989 RDA of protein	52**	63
Sample Size	**952**	**914**

SOURCE: Weighted tabulations based on one or two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: Sample includes only students attending schools that offer school lunches on intake days during the school year. Students who had two intake days that were not school days were excluded.

[a]Significance test refers to difference in outcomes among NSLP participants and nonparticipants.

NSLP = National School Lunch Program; RDA = Recommended Dietary Allowance.

*Significantly different from zero at the .05 level, two-tailed test.
**Significantly different from zero at the .01 level, two-tailed test.

TABLE B.5

PERCENTAGE OF SCHOOL-AGED CHILDREN WHOSE USUAL DIETARY INTAKE MEETS SELECTED DIETARY RECOMMENDATIONS, BY NSLP PARTICIPATION STATUS, 1994 TO 1996

	Percentage Whose Daily Intake Meets the Recommendation	
Dietary Recommendation	NSLP Participants[a]	Nonparticipants
Percentage of Food Energy		
No more than 30 percent from total fat	13	35
Less than 10 percent from saturated fat	3	23
More than 55 percent from carbohydrates	26	53
Other Dietary Components		
More than (age plus 5) g of dietary fiber	34	28
No more than 2,400 mg of sodium	13	23
No more than 300 mg of cholesterol	89	85
No more than twice the 1989 RDA of protein	48	62
Sample Size	**952**	**914**

SOURCE: Weighted tabulations based on one or two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: Sample includes only students attending schools that offer school lunches on intake days during the school year. Students who had two intake days that were not school days were excluded. Children's usual intake distribution was determined based on two intake days using the Software for Intake Distribution Estimation, developed by Iowa State University (1996).

[a]No significance tests were conducted on the numbers in this table.

NSLP = National School Lunch Program; RDA = Recommended Dietary Allowance.

TABLE B.6

MEAN FOOD GROUP INTAKES OF SCHOOL-AGED CHILDREN,
BY NSLP PARTICIPATION STATUS, 1994 TO 1996

	Mean Number of Servings			
	Lunch		24 Hours	
Food Group	NSLP Participants[a]	Nonparticipants	NSLP Participants[a]	Nonparticipants
Grain Products				
Whole grains	0.1**	0.4	0.8*	1.0
Nonwhole grains	1.9	1.8	6.1	5.9
Total	2.0	2.2	6.9	7.0
Vegetables				
Potatoes	0.7**	0.3	1.4**	1.1
Other starchy vegetables	0.1**	0.0	0.2	0.2
Legumes	0.0	0.0	0.2*	0.1
Dark-green leafy vegetables	0.0*	0.0	0.1	0.1
Other vegetables	0.5**	0.2	1.2*	1.0
Total	1.3**	0.6	3.1**	2.5
Fruit				
Citrus	0.1	0.2	0.5	0.6
Noncitrus	0.4	0.3	0.8	0.8
Total	0.5	0.5	1.4	1.4
Vegetables and Fruit	1.8**	1.1	4.5**	3.9
Milk Products				
Milk				
Whole milk	0.2**	0.1	0.7**	0.4
Low-fat milk	0.4**	0.1	0.9**	0.6
Nonfat milk	0.0	0.0	0.1	0.1
Total[b]	0.8**	0.2	2.0**	1.4
Cheese	0.3**	0.2	0.5*	0.5
Other dairy	0.0**	0.0	0.0	0.0
Total	1.1**	0.4	2.6**	1.9
Meat and Meat Substitutes				
Red meat	0.3	0.3	1.0**	0.8
Poultry	0.1	0.1	0.4	0.4
Fish	0.0	0.0	0.1	0.1
Eggs	0.0**	0.0	0.1	0.1
Nuts and seeds	0.0	0.1	0.0**	0.1
Total	0.5	0.4	1.6	1.5
Soda	0.1**	0.4	0.9**	1.3
Fruit Drinks and Fruit-Flavored Drinks	0.1**	0.3	0.7	0.8
Sample Size	**952**	**914**	**952**	**914**

SOURCE: Weighted tabulations using one or two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: Sample includes only students attending schools that offer school lunches on intake days during the school year. Students who had two intake days that were not school days were excluded. The mean values presented in the table are not regression-adjusted.

[a]Significance test refers to difference in outcomes among NSLP participants and nonparticipants.

[b]The total number of servings of milk includes not only whole, low-fat, and nonfat milk, but also milk whose fat content was not specified.

NSLP = National School Lunch Program; RDA = Recommended Dietary Allowance.

*Significantly different from zero at the .05 level, two-tailed test.
**Significantly different from zero at the .01 level, two-tailed test.

TABLE B.7

MEAN NUTRIENT INTAKE OF SCHOOL-AGED CHILDREN,
BY SBP PARTICIPATION STATUS, 1994 TO 1996

	Mean Breakfast Intake		Mean 24-Hour Intake	
Dietary Component	SBP Participants[d]	Nonparticipants	SBP Participants[d]	Nonparticipants
Food Energy				
As percentage of 1989 REA	22**	15	97**	90
As percentage of 24-hour food energy intake	23**	17	n.a.	n.a.
Percentage of Food Energy from:				
Total fat	28.0*	24.8	34.4*	32.9
Saturated fat	11.9**	10.1	13.0**	12.0
Carbohydrates				
Added sugars	14.6**	19.9	15.3**	18.6
Total	60.3**	64.6	51.4**	54.0
Protein	13.4*	12.4	15.4*	14.4
Vitamins (as Percentage of RDA)[a]				
Vitamin A	38	37	118	121
Vitamin C	86**	49	222*	184
Vitamin E	17	15	88	89
Vitamin B_6	63	63	207	190
Vitamin B_{12}	75	65	300	279
Niacin[b]	45	46	194	181
Thiamin	68	57	217*	192
Riboflavin	102**	78	295**	245
Folate[c]	37	37	99	90
Minerals (as Percentage of RDA)[a]				
Calcium	34**	20	109**	83
Iron	41	44	134	133
Magnesium	33**	22	128**	109
Phosphorus	47**	29	170**	136
Zinc	24	23	104*	94
Other Dietary Components				
Fiber (g)	2.6**	2.0	14.6	14.0
Cholesterol (mg)	58	48	246*	220
Sodium (mg)	625**	473	3501*	3212
Sample Size	**214**	**930**	**214**	**930**

SOURCE: Weighted tabulations based on one or two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: Sample includes only students attending schools that offer school breakfasts on intake days during the school year. Students who had two intake days that were not school days were excluded. Mean values presented in this table are not regression adjusted.

[a] Mean intakes of vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus in this table are measured as a percentage of the Recommended Dietary Allowances (RDAs) based on the new Dietary Reference Intakes (DRIs). For the remaining vitamins and minerals except calcium, mean intakes are measured as a percentage of the 1989 RDAs. For calcium, mean intake is measured as a percentage of the DRI-based Adequate Intake.

[b]The reported intake of niacin as a percentage of the RDA is an underestimate because intake is reported in mg of niacin and does not include an estimate of the niacin that is contributed by the conversion of tryptophan to niacin. The RDA is given in mg of niacin equivalents and assumes that all niacin will be considered.

[c]The reported intake of folate as a percentage of the RDA is an underestimate because intake is reported in mcg of folate but the RDA is given in mcg of dietary folate equivalents. Expressing intake in mcg of folate does not make allowance for the high bioavailability of synthetic folic acid, as from fortified ready-to-eat cereals. Dietary folate equivalents consider bioavailability.

[d]Significance test refers to difference in outcomes among SBP participants and nonparticipants.

REA = Recommended Energy Allowance; SBP = School Breakfast Program.

*Significantly different from zero at the .05 level, two-tailed test.
**Significantly different from zero at the .01 level, two-tailed test.

TABLE B.8

REGRESSION-ADJUSTED PERCENTAGE OF SCHOOL-AGED CHILDREN WHOSE DAILY NUTRIENT INTAKE IS AT OR ABOVE DIETARY STANDARDS, BY SBP PARTICIPATION STATUS, 1994 TO 1996

	24-Hour Intake			
	Percentage of Children at or Above EAR[a]		Percentage of Children at or Above 80% of 1989 RDA[a]	
Dietary Component	SBP Participants[b]	Nonparticipants	SBP Participants[b]	Nonparticipants
Vitamins				
Vitamin A	n.a.	n.a.	51	53
Vitamin C	n.a.	n.a.	82*	70
Vitamin E	n.a.	n.a.	48	47
Vitamin B_6	86	83	n.a.	n.a.
Vitamin B_{12}	93*	86	n.a.	n.a.
Niacin	91	91	n.a.	n.a.
Thiamin	95*	89	n.a.	n.a.
Riboflavin	95	91	n.a.	n.a.
Folate	41	42	n.a.	n.a.
Minerals				
Calcium	n.a.	n.a.	58*	46
Iron	n.a.	n.a.	79	75
Magnesium	65	59	n.a.	n.a.
Phosphorus	75	71	n.a.	n.a.
Zinc	n.a.	n.a.	55	53
Sample Size	**214**	**930**	**214**	**930**

SOURCE: Weighted tabulations based on one or two intake days from respondents of the 1994-1996 CSFII.

NOTE: Sample includes only students attending schools that offer school breakfasts on intake days during the school year. Students who had two intake days that were not school days were excluded.

[a] For vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus, the EARs based on the new Dietary Reference Intakes are used. For all of the remaining nutrients except calcium, the table shows the percentage of individuals whose intake is above 80 percent of the 1989 RDAs (an approximation of the estimated average requirement). For calcium, the table shows the percentage of individuals whose intake is above 80 percent of the Adjusted Intake.

[b]Significance test refers to difference in outcomes among SBP participants and nonparticipants.

EAR = Estimated Average Requirement; n.a. = not applicable; RDA = Recommended Dietary Allowance; SBP = School Breakfast Program.

*Significantly different from zero at the .05 level, two-tailed test.
**Significantly different from zero at the .01 level, two-tailed test.

TABLE B.9

PERCENTAGE OF SCHOOL-AGED CHILDREN WHOSE USUAL DAILY NUTRIENT INTAKE IS AT OR ABOVE DIETARY STANDARDS, BY SBP PARTICIPATION STATUS, 1994 TO 1996

	Usual 24-Hour Intake			
	Percentage of Children at or Above EAR[a]		Percentage of Children at or Above 80% of 1989 RDA[a]	
Dietary Component	SBP Participants[b]	Nonparticipants	SBP Participants[b]	Nonparticipants
Vitamins				
Vitamin A	n.a.	n.a.	68	64
Vitamin C	n.a.	n.a.	94	92
Vitamin E	n.a.	n.a.	75	56
Vitamin B_6	98	95	n.a.	n.a.
Vitamin B_{12}	100	99	n.a.	n.a.
Niacin	100	99	n.a.	n.a.
Thiamin	100	98	n.a.	n.a.
Riboflavin	100	98	n.a.	n.a.
Folate	55	49	n.a.	n.a.
Minerals				
Calcium	n.a.	n.a.	82	46
Iron	n.a.	n.a.	93	87
Magnesium	85	66	n.a.	n.a.
Phosphorus	95	81	n.a.	n.a.
Zinc	n.a.	n.a.	74	67
Sample Size	**214**	**930**	**214**	**930**

SOURCE: Weighted tabulations based on one or two intake days from respondents of the 1994-1996 CSFII.

NOTE: Sample includes only students attending schools that offer school breakfasts on intake days during the school year. Students who had two intake days that were not school days were excluded. Children's usual intake distribution was determined based on two intake days using the Software for Intake Distribution Estimation, developed by Iowa State University (1996). Percentages are not regression adjusted.

[a] For vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus, the EARs based on the new Dietary Reference Intakes are used. For the remaining nutrients except calcium, the table shows the percentage of individuals whose intake is above 80 percent of the 1989 RDAs (an approximation of the estimated average requirement). For calcium, the table shows the percentage of individuals whose intake is above 80 percent of the Adjusted Intake.

[b] No significance tests were conducted on the numbers in this table.

EAR = Estimated Average Requirement; n.a. = not applicable; RDA = Recommended Dietary Allowance; SBP = School Breakfast Program.

TABLE B.10

REGRESSION-ADJUSTED PERCENTAGE OF SCHOOL-AGED CHILDREN WHOSE DAILY INTAKES MEET SELECTED DIETARY RECOMMENDATIONS, BY SBP PARTICIPATION STATUS, 1994 TO 1996

	Percentage Whose Daily Intake Meets the Recommendation	
Dietary Recommendation	SBP Participants[a]	Nonparticipants
Percentage of Food Energy		
No more than 30 percent from total fat	31	32
Less than 10 percent from saturated fat	19	27
More than 55 percent from carbohydrates	40	43
Other Dietary Components		
More than (age plus 5) g of dietary fiber	37	33
No more than 2,400 mg of sodium	26	34
No more than 300 mg of cholesterol	73	80
No more than twice the 1989 RDA of protein	53	56
Sample Size	**214**	**930**

SOURCE: Weighted tabulations based on one or two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: Sample includes only students attending schools that offer school breakfasts and lunches on intake days during the school year. Students who had two intake days that were not school days were excluded.

[a]Significance test refers to difference in outcomes among SBP participants and nonparticipants.

RDA = Recommended Dietary Allowance; SBP = School Breakfast Program.

*Significantly different from zero at the .05 level, two-tailed test.
**Significantly different from zero at the .01 level, two-tailed test.

TABLE B.11

PERCENTAGE OF SCHOOL-AGED CHILDREN WHOSE USUAL DAILY INTAKES MEET SELECTED DIETARY RECOMMENDATIONS, BY SBP PARTICIPATION STATUS, 1994 TO 1996

	Percentage Whose Usual Daily Intake Meets the Recommendation	
Dietary Recommendation	SBP Participants[a]	Nonparticipants
Percentage of Food Energy		
No more than 30 percent from total fat	13	23
Less than 10 percent from saturated fat	3	12
More than 55 percent from carbohydrates	24	41
Other Dietary Components		
More than (age plus 5) g of dietary fiber	39	33
No more than 2,400 mg of sodium	12	18
No more than 300 mg of cholesterol	87	83
No more than twice the 1989 RDA of protein	35	57
Sample Size	**214**	**930**

SOURCE: Weighted tabulations based on one or two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: Sample includes only students attending schools that offer school breakfasts and lunches on intake days during the school year. Students who had two intake days that were not school days were excluded. Children's usual intake distribution was determined based on two intake days using the Software for Intake Distribution Estimation, developed by Iowa State University (1996). Percentages are not regression adjusted.

[a]No significance tests were conducted on the numbers in this table.

RDA = Recommended Dietary Allowance; SBP = School Breakfast Program.

TABLE B.12

MEAN FOOD GROUP INTAKES OF SCHOOL-AGED CHILDREN,
BY SBP PARTICIPATION STATUS, 1994 TO 1996

	Mean Number of Servings			
	Breakfast		24 Hours	
Food Group	SBP Participants[a]	Nonparticipants	SBP Participants[a]	Nonparticipants
Grain Products				
Whole grains	0.3	0.4	0.7*	1.0
Nonwhole grains	1.3**	1.0	6.1	5.9
Total	1.6**	1.3	6.8	6.9
Vegetables				
Potatoes	0.04	0.02	1.2	1.3
Other starchy vegetables	0.00	0.00	0.2	0.2
Legumes	0.00	0.01	0.2	0.2
Dark-green leafy vegetables	0.00	0.00	0.1	0.1
Other vegetables	0.02	0.02	1.1	1.1
Total	0.06	0.04	2.8	2.9
Fruit				
Citrus	0.4**	0.2	0.8**	0.5
Noncitrus	0.3**	0.1	0.9	0.8
Total	0.7**	0.3	1.7**	1.3
Vegetables and Fruit	0.8**	0.3	4.5	4.1
Milk Products				
Milk				
Whole milk	0.4*	0.2	0.9*	0.6
Low-fat milk	0.4**	0.2	1.0*	0.7
Nonfat milk	0.0**	0.1	0.0**	0.1
Total[b]	1.0**	0.6	2.3**	1.6
Cheese	0.0*	0.0	0.6	0.5
Other dairy	0.0	0.0	0.0	0.0
Total	1.0**	0.6	2.9**	2.1
Meat and Meat Substitutes				
Red meat	0.1*	0.0	1.1	1.0
Poultry	0.0*	0.0	0.4	0.3
Fish	0.0	0.0	0.1	0.1
Eggs	0.0	0.1	0.1	0.1
Nuts and seeds	0.0	0.0	0.0**	0.1
Total	0.1	0.1	1.7	1.5
Soda	0.0*	0.1	0.6**	1.2
Fruit Drinks and Fruit-Flavored Drinks	0.0**	0.1	0.7	0.8
Sample Size	**214**	**930**	**214**	**930**

SOURCE: Weighted tabulations using one or two days of intake data from the 1994-1996 CSFII.

NOTE: Sample includes only students attending schools that offer school breakfasts on intake days during the school year. Students who had two intake days that were not school days were excluded. The mean values presented in the table are not regression adjusted.

[a]Significance test refers to difference in outcomes among SBP participants and nonparticipants.

[b]The total number of servings of milk includes not only whole, low-fat, and nonfat milk, but also milk whose fat content was not specified.

SBP = School Breakfast Program.

*Significantly different from zero at the .05 level, two-tailed test.
**Significantly different from zero at the .01 level, two-tailed test.

TABLE B.13

MEAN NUTRIENT INTAKE OF NSLP PARTICIPANTS, BY WHERE FOODS WERE OBTAINED, 1994 TO 1996

	Mean Intake Among NSLP Participants			
	Lunch		24 Hours	
Dietary Component	Foods Obtained from School Cafeteria	Other Foods	Foods Obtained from School Cafeteria	Other Foods
Food Energy				
As percentage of 1989 REA	28	2	32	61
As percentage of 24-hour food energy intake	31	2	n.a.	n.a.
Percentage of Food Energy from:				
Total fat	37.1	23.3	36.4	31.8
Saturated fat	15.0	7.6	14.7	11.3
Carbohydrates				
Added Sugars	11.8	39.4	12.3	19.4
Total	47.8	73.5	49.0	54.9
Protein	16.2	6.2	15.8	14.6
Vitamins (as Percentage of RDA)[a]				
Vitamin A	31	1	38	83
Vitamin C	41	4	57	141
Vitamin E	26	2	30	61
Vitamin B_6	46	3	58	139
Vitamin B_{12}	89	3	102	196
Niacin[b]	47	3	55	131
Thiamin	51	3	63	138
Riboflavin	79	3	98	169
Folate[c]	19	2	25	68
Minerals (as Percentage of RDA)[a]				
Calcium	36	1	42	53
Iron	30	3	38	98
Magnesium	35	2	41	74
Phosphorus	50	2	58	90
Zinc	28	1	32	66
Other Dietary Components				
Fiber (g)	4.6	0.3	5.1	9.3
Cholesterol (mg)	64	2	75	154
Sodium (mg)	1,050	52	1,167	2,227
Sample Size	**1,197**	**1,197**	**1,197**	**1,197**

SOURCE: Weighted tabulations based on one or two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: The column labeled "Foods Obtained from School Cafeteria" shows mean intakes in children from those foods, and the column labeled "Other Foods" shows mean intakes for the same sample from other foods. Figures in the two columns can be added to determine overall mean intakes. The sample includes only students attending schools that offer school lunches on intake days during the school year. Intake days that were not school days were excluded.

[a] Mean intakes of vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus in this table are measured as a percentage of the Recommended Dietary Allowances (RDAs) based on the new Dietary Reference Intakes (DRIs). For the remaining vitamins and minerals except calcium, mean intakes are measured as a percentage of the 1989 RDAs. For calcium, mean intake is measured as a percentage of the DRI-based Adequate Intake.

[b] The reported intake of niacin as a percentage of the RDA is an underestimate because intake is reported in mg of niacin and does not include an estimate of the niacin that is contributed by the conversion of tryptophan to niacin. The RDA is given in mg of niacin equivalents and assumes that all niacin will be considered.

[c] The reported intake of folate as a percentage of the RDA is an underestimate because intake is reported in mcg of folate but the RDA is given in mcg of dietary folate equivalents. Expressing intake in mcg of folate does not make allowance for the high bioavailability of synthetic folic acid, as from fortified ready-to-eat cereals. Dietary folate equivalents consider bioavailability.

NSLP = National School Lunch Program.

TABLE B.14

MEAN NUTRIENT INTAKE OF SBP PARTICIPANTS, BY WHERE FOODS WERE OBTAINED, 1994 TO 1996

	Mean Intake Among SBP Participants			
	Breakfast		24 Hours	
Dietary Component	Foods Obtained from School Cafeteria	Other Foods	Foods Obtained from School Cafeteria	Other Foods
Food Energy				
As percentage of 1989 REA	20	2	48	49
As percentage of 24-hour food energy intake	21	2	--	--
Percentage of Food Energy from:				
Total fat	28.3	22.2	34.1	33.3
Saturated fat	12.1	9.4	14.0	11.5
Carbohydrates				
Added sugars	14.4	15.7	12.7	18.3
Total	60.1	67.1	52.2	51.5
Protein	13.0	13.2	15.0	16.0
Vitamins (as Percentage of RDA)[a]				
Vitamin A	32	5	68	49
Vitamin C	77	9	121	100
Vitamin E	15	1	43	45
Vitamin B_6	54	9	104	102
Vitamin B_{12}	68	7	165	133
Niacin[b]	38	6	86	107
Thiamin	58	10	112	105
Riboflavin	90	12	174	120
Folate[c]	32	5	52	47
Minerals (as Percentage of RDA)[a]				
Calcium	31	3	70	38
Iron	35	6	66	68
Magnesium	29	3	69	59
Phosphorus	42	5	98	72
Zinc	22	2	51	52
Other Dietary Components				
Fiber (g)	2.3	0.3	7.2	7.4
Cholesterol (mg)	52	6	119	127
Sodium (mg)	555	67	1,605	1,900
Sample Size	**266**	**266**	**266**	**266**

SOURCE: Weighted tabulations based on one or two days of intake data from respondents of the 1994-1996 CSFII.

NOTE: The column labeled "Foods Obtained from School Cafeteria" shows mean intakes in children from those foods, and the column labeled "Other Foods" shows mean intakes for the same sample from other foods. Figures in the two columns can be added to determine overall mean intakes. The sample includes only students attending schools that offer school lunches on intake days during the school year. Students who had two intake days that were not school days were excluded.

[a] Mean intakes of vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus in this table are measured as a percentage of the Recommended Dietary Allowances (RDAs) based on the new Dietary Reference Intakes (DRIs). For the remaining vitamins and minerals except calcium, mean intakes are measured as a percentage of the 1989 RDAs. For calcium, mean intake is measured as a percentage of the DRI-based Adequate Intake.

[b] The reported intake of niacin as a percentage of the RDA is an underestimate because intake is reported in mg of niacin and does not include an estimate of the niacin that is contributed by the conversion of tryptophan to niacin. The RDA is given in mg of niacin equivalents and assumes that all niacin will be considered.

[c] The reported intake of folate as a percentage of the RDA is an underestimate because intake is reported in mcg of folate but the RDA is given in mcg of dietary folate equivalents. Expressing intake in mcg of folate does not make allowance for the high bioavailability of synthetic folic acid, as from fortified ready-to-eat cereals. Dietary folate equivalents consider bioavailability.

SBP = School Breakfast Program.

APPENDIX C

STANDARD ERRORS FOR SELECTED TABLES FROM CHAPTERS III AND IV

TABLE C.1

STANDARD ERRORS ASSOCIATED WITH THE ESTIMATES IN TABLE III.1

	Standard Error of Mean Intake		
Dietary Component	Breakfast	Lunch	24 Hours
Food Energy			
As percentage of REA	0.4	0.4	1.0
As percentage of 24-hour food energy intake	0.3	0.4	--
Percentage of Food Energy from:			
Total fat	0.3	0.2	0.1
Saturated fat	0.1	0.1	0.1
Carbohydrates			
Added sugars	0.5	0.5	0.2
Total	0.4	0.3	0.2
Protein	0.1	0.1	0.1
Vitamins (as Percentage of RDA)[a]			
Vitamin A	1.1	0.9	2.6
Vitamin C	2.1	1.2	4.8
Vitamin E	1.0	0.7	1.8
Vitamin B_6	1.7	0.8	2.6
Vitamin B_{12}	2.3	1.7	5.8
Niacin	1.2	0.8	2.2
Thiamin	1.4	0.7	2.5
Riboflavin	1.9	1.0	3.3
Folate	1.1	0.4	1.6
Minerals (as Percentage of RDA)[a]			
Calcium	0.6	0.5	1.3
Iron	1.3	0.5	1.9
Magnesium	0.5	0.5	1.4
Phosphorus	0.8	0.6	1.9
Zinc	0.7	0.5	1.3
Other Dietary Components			
Fiber (g)	0.1	0.1	0.2
Cholesterol (mg)	2.3	1.5	4.0
Sodium (mg)	14.5	15.5	45.9
Sample Size	**2,692**	**2,692**	**2,692**

SOURCE: 1994 to 1996 CSFII.

NOTE: Standard errors have been calculated after controlling for the complex sample design of the CSFII using the SUDAAN statistical software package.

[a] Mean intakes of vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus in this table are measured as a percentage of the RDAs based on the new Dietary Reference Intakes (DRIs). For the remaining vitamins and minerals except calcium, mean intakes are measured as a percentage of the 1989 RDAs. For calcium, mean intake is measured as a percentage of the DRI-based Adequate Intake (AI).

RDA = Recommended Dietary Allowance.

TABLE C.2

STANDARD ERRORS ASSOCIATED WITH THE ESTIMATES IN TABLE III.4

	Standard Error of Mean 24-Hour Intake					
Dietary Component	Males, 6 to 8	Females, 6 to 8	Males, 9 to 13	Females, 9 to 13	Males, 14 to 18	Females, 14 to 18
Food Energy (as Percentage of REA)	1.3	1.3	1.6	1.6	2.1	1.8
Percentage of Food Energy from:						
Total fat	0.4	0.3	0.2	0.2	0.3	0.4
Saturated fat	0.2	0.2	0.1	0.1	0.2	0.2
Carbohydrates						
Added sugars	0.6	0.5	0.4	0.3	0.6	0.6
Total	0.5	0.4	0.3	0.4	0.4	0.5
Protein	0.2	0.2	0.2	0.2	0.2	0.2
Vitamins (as Percentage of RDA)[a]						
Vitamin A	6.9	8.8	3.8	5.1	3.8	4.7
Vitamin C	9.1	6.1	6.4	8.3	10.7	8.9
Vitamin E	2.6	1.5	3.1	4.4	3.0	2.4
Vitamin B_6	8.7	5.3	4.0	4.8	4.5	3.4
Vitamin B_{12}	12.2	18.5	6.0	13.9	6.7	7.7
Niacin	6.2	3.7	3.7	4.4	3.7	3.2
Thiamin	6.0	4.5	4.0	4.5	4.4	3.5
Riboflavin	7.4	6.4	4.8	6.1	5.2	3.5
Folate	4.5	3.0	2.3	3.1	3.0	1.8
Minerals (as Percentage of RDA)[a]						
Calcium	2.9	2.5	1.8	1.9	2.5	1.7
Iron	3.7	2.9	4.1	3.9	4.2	2.3
Magnesium	3.6	2.5	1.8	2.0	1.9	1.4
Phosphorus	4.3	3.7	1.9	2.1	2.9	1.9
Zinc	2.5	2.2	2.2	3.0	2.7	2.0
Other Dietary Components						
Fiber (g)	0.3	0.3	0.3	0.3	0.5	0.4
Cholesterol (mg)	6.1	7.2	7.8	9.0	8.8	5.8
Sodium (mg)	52.8	55.8	66.7	49.6	113.2	65.8
Sample Size	**357**	**336**	**552**	**560**	**446**	**441**

SOURCE: 1994 to 1996 CSFII.

NOTE: Standard errors have been calculated after controlling for the complex sample design of the CSFII using the SUDAAN statistical software package.

[a] Mean intakes of vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus in this table are measured as a percentage of the RDAs based on the new Dietary Reference Intakes (DRIs). For the remaining vitamins and minerals except calcium, mean intakes are measured as a percentage of the 1989 RDAs. For calcium, mean intake is measured as a percentage of the DRI-based Adequate Intake (AI).

RDA = Recommended Dietary Allowance.

TABLE C.3

STANDARD ERRORS ASSOCIATED WITH THE ESTIMATES IN TABLE III.5

	Mean 24-Hour Intake			
Dietary Component	Hispanic	Non-Hispanic Black	Non-Hispanic White	Other
Food Energy (as Percentage of REA)	1.8	1.7	1.2	3.7
Percentage of Food Energy from:				
Total fat	0.3	0.4	0.2	1.0
Saturated fat	0.2	0.2	0.1	0.4
Carbohydrates				
Added sugars	0.4	0.6	0.3	1.2
Total	0.6	0.6	0.2	1.0
Protein	0.2	0.2	0.1	0.4
Vitamins (as Percentage of RDA)[a]				
Vitamin A	8.4	4.7	3.3	8.3
Vitamin C	9.7	8.4	6.1	19.7
Vitamin E	3.0	2.5	2.4	4.7
Vitamin B_6	6.9	4.6	3.7	9.5
Vitamin B_{12}	29.9	14.3	6.1	19.4
Niacin	4.9	5.0	2.8	8.5
Thiamin	6.0	4.6	3.3	11.0
Riboflavin	7.2	4.6	4.2	12.8
Folate	3.5	2.1	2.2	5.1
Minerals (as Percentage of RDA)[a]				
Calcium	2.8	1.9	1.7	4.9
Iron	4.6	2.8	2.5	7.6
Magnesium	3.8	2.4	1.8	5.3
Phosphorus	4.8	2.9	2.5	7.2
Zinc	2.7	2.0	1.7	5.6
Other Dietary Components				
Fiber (g)	0.5	0.4	0.2	1.0
Cholesterol (mg)	10.7	9.6	5.8	14.9
Sodium (mg)	89.0	70.0	61.7	164.9
Sample Size	**430**	**411**	**1,735**	**116**

SOURCE: 1994 to 1996 CSFII.

NOTE: Standard errors have been calculated after controlling for the complex sample design of the CSFII using the SUDAAN statistical software package.

[a] Mean intakes of vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus in this table are measured as a percentage of the RDAs based on the new Dietary Reference Intakes (DRIs). For the remaining vitamins and minerals except calcium, mean intakes are measured as a percentage of the 1989 RDAs. For calcium, mean intake is measured as a percentage of the DRI-based Adequate Intake (AI).

RDA = Recommended Dietary Allowance.

TABLE C.4

STANDARD ERRORS ASSOCIATED WITH THE ESTIMATES IN TABLE III.10

Dietary Component	Standard Error of: Percentage of Children at or Above EAR[a]	Percentage of Children at or Above 80% of 1989 RDA[a]
Vitamins		
Vitamin A	n.a.	1.6
Vitamin C	n.a.	1.3
Vitamin E	n.a.	1.7
Vitamin B_6	0.8	n.a.
Vitamin B_{12}	0.5	n.a.
Niacin	0.4	n.a.
Thiamin	0.5	n.a.
Riboflavin	0.4	n.a.
Folate	1.2	n.a.
Minerals		
Calcium	n.a.	1.1
Iron	n.a.	1.2
Magnesium	1.0	n.a.
Phosphorus	1.1	n.a.
Zinc	n.a.	1.6
Sample Size	**2,692**	**2,692**

SOURCE: 1994 to 1996 CSFII.

NOTE: Children's usual intake distribution and its standard errors were determined based on two intake days using the Software for Intake Distribution Estimation, developed by Iowa State University (1996).

[a] For vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus, the EARs based on the new DRIs are used. For all of the remaining nutrients except calcium, the table shows the percentage of individuals whose intake is at or above 80 percent of the 1989 RDAs (an approximation of the estimated average requirement). For calcium, the table shows the percentage of individuals whose intake is at or above 80 percent of the AI. The percentages of children meeting the EAR for niacin and folate are underestimated. The intake estimates do not account for the conversion of tryptophan to niacin or for the high bioavailability of synthetic folic acid as from fortified ready-to-eat cereal, whereas the EARs cover these.

AI = Adequate Intake; DRI = Dietary Reference Intake; EAR = Estimated Average Requirement; n.a. = not applicable; RDA = Recommended Dietary Allowance.

TABLE C.5

STANDARD ERRORS ASSOCIATED WITH THE ESTIMATES IN TABLE III.11

	Percentage of Children Whose Usual 24-Hour Intake Is at or Above EAR or 80% of 1989 RDA[a]					
Dietary Component	Males, 6 to 8	Females, 6 to 8	Males, 9 to 13	Females, 9 to 13	Males, 14 to 18	Females, 14 to 18
Vitamins						
Vitamin A	4.2	5.2	3.9	4.0	4.1	3.7
Vitamin C	2.8	1.8	1.8	2.8	3.3	4.7
Vitamin E	5.1	6.2	3.2	3.5	3.9	5.7
Vitamin B_6	n.a.	n.a.	n.a.	1.5	2.0	4.4
Vitamin B_{12}	n.a.	n.a.	n.a.	0.9	n.a.	4.8
Niacin	n.a.	n.a.	n.a.	n.a.	n.a.	2.9
Thiamin	n.a.	n.a.	n.a.	n.a.	1.3	3.7
Riboflavin	n.a.	n.a.	n.a.	n.a.	1.6	2.5
Folate	3.5	6.0	4.0	3.2	3.2	3.9
Minerals						
Calcium	4.4	4.7	3.0	3.6	3.0	3.8
Iron	2.2	2.5	1.1	3.3	1.3	3.1
Magnesium	0.6	n.a.	3.5	3.5	3.2	3.7
Phosphorus	n.a.	n.a.	3.5	3.2	2.7	3.5
Zinc	5.0	4.2	4.2	3.5	5.2	3.4
Sample Size	**357**	**336**	**552**	**560**	**446**	**441**

SOURCE: 1994 to 1996 CSFII.

NOTE: Children's usual intake distribution and its standard errors were determined based on two intake days using the Software for Intake Distribution Estimation, developed by Iowa State University (1996).

[a] For vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus, the EARs based on the new DRIs are used. For all of the remaining nutrients except calcium, the table shows the percentage of individuals whose intake is at or above 80 percent of the 1989 RDAs (an approximation of the estimated average requirement). For calcium, the table shows the percentage of individuals whose intake is at or above 80 percent of the AI. The percentages of children meeting the EAR for niacin and folate are underestimated. The intake estimates do not account for the conversion of tryptophan to niacin or for the high bioavailability of synthetic folic acid as from fortified ready-to-eat cereal, whereas the EARs cover these.

AI = Adequate Intake; DRI = Dietary Reference Intake; EAR = Estimated Average Requirement; n.a. = not applicable; RDA = Recommended Dietary Allowance.

TABLE C.6

STANDARD ERRORS ASSOCIATED WITH THE ESTIMATES IN TABLE III.12

	Percentage of Children Whose Usual 24-Hour Intake Is at or Above EAR or 80% of 1989 RDA[a]			
Dietary Component	Hispanic	Black	White	Other
Vitamins				
Vitamin A	3.6	4.4	2.1	6.1
Vitamin C	3.1	n.a.	1.7	6.5
Vitamin E	3.4	7.0	2.2	8.8
Vitamin B_6	2.0	2.0	0.9	3.9
Vitamin B_{12}	1.1	1.6	0.6	4.2
Niacin	1.2	0.8	0.4	3.0
Thiamin	1.5	1.4	0.5	3.7
Riboflavin	1.1	1.4	0.5	4.5
Folate	3.1	3.5	1.4	6.3
Minerals				
Calcium	2.8	4.2	1.4	5.5
Iron	3.3	3.3	1.5	6.6
Magnesium	2.6	2.7	1.3	5.2
Phosphorus	2.7	3.1	1.3	5.3
Zinc	3.7	4.1	2.1	6.3
Sample Size	**430**	**411**	**1,735**	**116**

SOURCE: 1994 to 1996 CSFII.

NOTE: Children's usual intake distribution and its standard errors were determined based on two intake days using the Software for Intake Distribution Estimation, developed by Iowa State University (1996).

[a] For vitamin B_6, vitamin B_{12}, niacin, thiamin, riboflavin, folate, magnesium, and phosphorus, the EARs based on the new DRIs are used. For all of the remaining nutrients except calcium, the table shows the percentage of individuals whose intake is at or above 80 percent of the 1989 RDAs (an approximation of the estimated average requirement). For calcium, the table shows the percentage of individuals whose intake is at or above 80 percent of the AI. The percentages of children meeting the EAR for niacin and folate are underestimated. The intake estimates do not account for the conversion of tryptophan to niacin or for the high bioavailability of synthetic folic acid as from fortified ready-to-eat cereal, whereas the EARs cover these.

AI = Adequate Intake; DRI = Dietary Reference Intake; EAR = Estimated Average Requirement; n.a. = not applicable; RDA = Recommended Dietary Allowance.

TABLE C.7

STANDARD ERRORS ASSOCIATED WITH THE ESTIMATES IN TABLE III.15

	Standard Error of the Percentage Whose Usual Daily Intake Meets the Recommendation		
Dietary Recommendation	Breakfast	Lunch	24 Hours
Percentage of Food Energy			
No more than 30 percent from total fat	2.1	3.7	2.2
Less than 10 percent from saturated fat	1.3	3.2	2.4
More than 55 percent from carbohydrates	2.2	2.0	1.5
Other Dietary Components			
More than (age 5) g of dietary fiber	n.a.	n.a.	1.5
No more than 2,400 mg of sodium	n.a.	n.a.	1.6
No more than 300 mg of cholesterol	n.a.	n.a.	2.1
No more than twice the 1989 RDA of protein	n.a.	n.a.	1.2
Sample Size	**2,494**	**2,650**	**2,692**

SOURCE: 1994 to 1996 CSFII.

NOTE: Children’s usual intake distribution and its standard error was determined based on two intake days using the Software for Intake Distribution Estimation, developed by Iowa State University (1996).

n.a. = not applicable.

TABLE C.8

STANDARD ERRORS ASSOCIATED WITH THE ESTIMATES IN TABLE III.16

	Standard Error of Percentage of Children Whose Usual 24-Hour Intake Meets the Recommendation					
Dietary Recommendation	Males, 6 to 8	Females, 6 to 8	Males, 9 to 13	Females, 9 to 13	Males, 14 to 18	Females, 14 to 18
Percentage of Food Energy						
No more than 30 percent from total fat	7.8	5.5	7.2	4.2	5.1	4.4
Less than 10 percent from saturated fat	7.2	5.5	5.6	5.4	4.9	4.9
More than 55 percent from carbohydrates	4.5	4.2	4.4	3.2	4.2	3.7
Other Dietary Components						
More than (age 5) g of dietary fiber	4.1	4.3	3.3	3.9	4.5	2.9
No more than 2,400 mg of sodium	4.4	4.7	2.9	5.0	1.3	5.9
No more than 300 mg of cholesterol	5.6	4.4	6.2	4.4	4.4	6.5
No more twice the 1989 RDA of protein	4.1	6.5	2.8	2.9	4.2	4.5
Sample Size	**357**	**336**	**552**	**560**	**446**	**441**

SOURCE: 1994 to 1996 CSFII.

NOTE: Children’s usual intake distribution and its standard error was determined based on two intake days using the Software for Intake Distribution Estimation, developed by Iowa State University (1996).

TABLE C.9

STANDARD ERRORS ASSOCIATED WITH THE ESTIMATES IN TABLE III.17

	Percentage of Children Whose Usual 24-Hour Intake Meets the Recommendation			
Dietary Recommendation	Hispanic	Black	White	Other
Percentage of Food Energy				
No more than 30 percent from total fat	8.6	5.4	2.4	9.1
Less than 10 percent from saturated fat	7.5	4.7	2.8	7.6
More than 55 percent from carbohydrates	8.3	6.5	1.8	7.9
Other Dietary Components				
More than (age 5) g of dietary fiber	3.6	4.9	1.8	6.6
No more than 2,400 mg of sodium	3.9	5.0	1.9	6.7
No more than 300 mg of cholesterol	6.9	4.9	2.6	9.7
No more than twice the 1989 RDA of protein	2.8	3.7	1.5	6.2
Sample Size	**430**	**411**	**1,735**	**116**

SOURCE: 1994 to 1996 CSFII.

NOTE: Children's usual intake distribution and its standard error was determined based on two intake days using the Software for Intake Distribution Estimation, developed by Iowa State University (1996).

TABLE C.10

STANDARD ERRORS ASSOCIATED WITH THE ESTIMATES IN TABLE III.20

	Standard Errors of Mean Number of Servings		
Food Group	Breakfast	Lunch	24 Hours
Grain Products			
Whole grains	0.02	0.02	0.04
Nonwhole grains	0.03	0.03	0.09
Total	0.03	0.03	0.09
Vegetables			
Potatoes	0.01	0.02	0.04
Legumes	0.00	0.00	0.01
Other starchy vegetables	0.00	0.00	0.01
Dark-green leafy vegetables	0.00	0.00	0.01
Other vegetables	0.01	0.01	0.03
Total	0.01	0.04	0.06
Fruit			
Citrus	0.02	0.01	0.04
Noncitrus	0.01	0.01	0.03
Total	0.02	0.02	0.06
Vegetables and Fruit	0.02	0.04	0.08
Milk Products			
Milk			
Whole milk	0.01	0.01	0.03
Low-fat milk	0.02	0.01	0.03
Nonfat milk	0.01	0.01	0.02
Total	0.02	0.01	0.04
Cheese	0.00	0.01	0.02
Other dairy	0.00	0.00	0.00
Total	0.02	0.01	0.04
Meat and Meat Substitutes			
Red meat	0.01	0.01	0.02
Poultry	0.00	0.01	0.01
Fish	0.00	0.00	0.01
Eggs	0.00	0.00	0.00
Nuts and seeds	0.00	0.00	0.00
Total	0.01	0.01	0.03
Soda	0.01	0.02	0.05
Fruit Drinks and Fruit-Flavored Drinks	0.01	0.02	0.04
Sample Size	**2,692**	**2,692**	**2,692**

SOURCE: 1994 to 1996 CSFII.

NOTE: Standard errors have been calculated after controlling for the complex sample design of the CSFII using the SUDAAN statistical software package.

TABLE C.11

STANDARD ERRORS ASSOCIATED WITH THE ESTIMATES IN TABLE III.21

Food Group	Mean Number of Servings: Males, 6 to 8	Females, 6 to 8	Males, 9 to 13	Females, 9 to 13	Males, 14 to 18	Females, 14 to 18
Grain Products						
Whole grains	0.06	0.05	0.06	0.07	0.08	0.06
Nonwhole grains	0.12	0.12	0.14	0.11	0.19	0.15
Total	0.13	0.13	0.15	0.13	0.19	0.15
Vegetables						
Potatoes	0.06	0.06	0.08	0.07	0.12	0.08
Legumes	0.02	0.02	0.02	0.01	0.02	0.02
Other starchy vegetables	0.01	0.02	0.02	0.02	0.03	0.02
Dark-green leafy vegetables	0.01	0.02	0.01	0.01	0.02	0.01
Other vegetables	0.04	0.05	0.06	0.05	0.06	0.06
Total	0.08	0.09	0.13	0.09	0.15	0.11
Fruit						
Citrus	0.07	0.06	0.06	0.06	0.10	0.06
Noncitrus	0.06	0.06	0.05	0.04	0.05	0.07
Total	0.10	0.09	0.08	0.08	0.03	0.10
Vegetables and Fruit	0.13	0.11	0.14	0.12	0.20	0.18
Milk Products						
Milk						
Whole milk	0.05	0.05	0.04	0.04	0.05	0.03
Low-fat milk	0.05	0.05	0.07	0.05	0.07	0.03
Nonfat milk	0.03	0.03	0.04	0.03	0.03	0.02
Total	0.06	0.06	0.05	0.06	0.09	0.05
Cheese	0.03	0.02	0.03	0.02	0.05	0.03
Other dairy	0.01	0.01	0.00	0.00	0.00	0.00
Total	0.07	0.06	0.07	0.07	0.10	0.06
Meat and Meat Substitutes						
Red meat	0.04	0.03	0.04	0.03	0.05	0.04
Poultry	0.03	0.02	0.03	0.02	0.04	0.03
Fish	0.02	0.01	0.02	0.01	0.02	0.02
Eggs	0.01	0.01	0.01	0.01	0.01	0.01
Nuts and seeds	0.01	0.01	0.01	0.01	0.01	0.00
Total	0.05	0.04	0.05	0.04	0.06	0.04
Soda	0.06	0.04	0.07	0.07	0.14	0.07
Fruit Drinks and Fruit-Flavored Drinks	0.06	0.05	0.05	0.06	0.11	0.07
Sample Size	**357**	**336**	**552**	**560**	**446**	**441**

SOURCE: 1994 to 1996 CSFII.

NOTE: Standard errors have been calculated after controlling for the complex sample design of the CSFII using the SUDAAN statistical software package.

TABLE C.12

STANDARD ERRORS ASSOCIATED WITH THE ESTIMATES IN TABLE III.22

	Standard Error of Mean Number of Servings			
Food Group	Hispanic	Non-Hispanic Black	Non-Hispanic White	Other
Grain Products				
Whole grains	0.07	0.05	0.05	0.18
Nonwhole grains	0.17	0.11	0.11	0.38
Total	0.21	0.14	0.11	0.41
Vegetables				
Potatoes	0.07	0.12	0.05	0.21
Legumes	0.01	0.03	0.01	0.06
Other starchy vegetables	0.04	0.03	0.01	0.06
Dark-green leafy vegetables	0.01	0.03	0.01	0.07
Other vegetables	0.07	0.07	0.04	0.21
Total	0.11	0.11	0.08	0.39
Fruit				
Citus	0.06	0.05	0.04	0.34
Noncitrus	0.06	0.04	0.04	0.11
Total	0.11	0.06	0.07	0.32
Vegetables and Fruit	0.14	0.13	0.10	0.53
Milk Products				
Milk				
Whole milk	0.06	0.08	0.02	0.08
Low-fat milk	0.07	0.03	0.04	0.12
Nonfat milk	0.01	0.01	0.02	0.03
Total	0.08	0.06	0.05	0.12
Cheese	0.03	0.04	0.02	0.06
Other dairy	0.01	0.00	0.00	0.01
Total	0.08	0.08	0.05	0.16
Meat and Meat Substitutes				
Red meat	0.05	0.05	0.02	0.13
Poultry	0.04	0.04	0.02	0.05
Fish	0.02	0.02	0.01	0.06
Eggs	0.01	0.01	0.01	0.02
Nuts and seeds	0.01	0.01	0.00	0.01
Total	0.07	0.08	0.03	0.10
Soda	0.11	0.06	0.07	0.14
Fruit Drinks and Fruit-Flavored Drinks	0.07	0.12	0.05	0.09
Sample Size	**430**	**411**	**1,735**	**116**

SOURCE: 1994 to 1996 CSFII.

NOTE: Standard errors have been calculated after controlling for the complex sample design of the CSFII using the SUDAAN statistical software package.