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***School Nutrition Dietary Assessment  
Study—III:***

***Volume II: Student Participation and  
Dietary Intakes***

***Executive Summary***



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# School Nutrition Dietary Assessment Study-III: Volume II: Student Participation and Dietary Intakes Executive Summary

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## EXECUTIVE SUMMARY

The U.S. Department of Agriculture (USDA) National School Lunch Program (NSLP) and School Breakfast Program (SBP) provide subsidized meals to children in school, and provide these meals free or at a reduced price to children from low-income families. In school year 2004-2005, these two programs together provided benefits of nearly \$10 billion in cash and commodities. Created in 1946, the NSLP operates in nearly all public and many private schools. On an average school day in 2005, the NSLP provided lunch to 29.6 million children; 59 percent of these lunches were served free or at a reduced price. The SBP, which became a permanent Federal program in 1975, is offered in a somewhat smaller number of schools and serves fewer children per school. In 2005, the SBP provided breakfast to 9.4 million children per school day; the majority of these breakfasts (82 percent) were served free or at a reduced price.

The Food and Nutrition Service (FNS) of USDA sponsored the third School Nutrition Dietary Assessment study (SNDA-III) to provide up-to-date information on the school meal programs, the school environments that affect the food programs, the nutrient content of school meals, and the contributions of school meals to children's diets. During the time SNDA-III was conducted, many State agencies and schools were establishing nutrition policies, supplemental to USDA regulations, to address growing concerns about child obesity. Many of these policies included additional requirements for school meals and for foods that schools often sell in competition with USDA school meals, known as "competitive foods." State agencies and schools were also beginning to plan school wellness policies, required by Congress as of school year 2006-2007, which must include goals for nutrition education and physical activity, as well as nutrition standards for all foods sold on campus, including competitive foods.

### A. BACKGROUND

The SNDA-III study, which is based on data collected in the second half of school year 2004-2005, builds on the methods used in two previous SNDA studies sponsored by FNS and, thus, allows some examination of trends over time:

- The first SNDA study (SNDA-I), in SY 1991-1992, determined that school meals provided targeted levels of vitamins and minerals, but offered, on average, higher levels of fat and saturated fat than recommended in the *Dietary Guidelines for Americans*.
- SNDA-I helped prompt new policies, known as the School Meals Initiative for Healthy Children (SMI), which required school meals to reduce fat and saturated fat levels while providing adequate levels of target nutrients (defined as one-quarter of daily needs at breakfast and one-third at lunch). School Food Authorities (SFAs)—school districts or groups of districts operating the NSLP—were encouraged to use computerized nutrient analysis to plan school meals, but were also given the option of continuing food-based menu planning.

- SNDA-II, conducted in school year 1998-1999, early in the SMI implementation period, showed that schools had reduced fat and saturated fat levels in school meals while maintaining levels of target nutrients. However, school meals were still not consistent with standards for fat and saturated fat content established under SMI.

SNDA-III offers information on how the programs are operating eight years after the start of SMI implementation. It also provides a baseline for FNS to use in determining how best to improve the programs.

This report, the second of three volumes, describes characteristics of students who participate in the school meal programs and those who do not participate, and discusses student and parent satisfaction with school meals. It also compares dietary intakes of school meal program participants and nonparticipants. Volume I describes the characteristics of schools that participate in the school meal programs and the food and nutrient content of NSLP and SBP meals offered and served. Volume III provides in-depth information on the sample design and data collection procedures used in the study.

## **B. RESEARCH QUESTIONS**

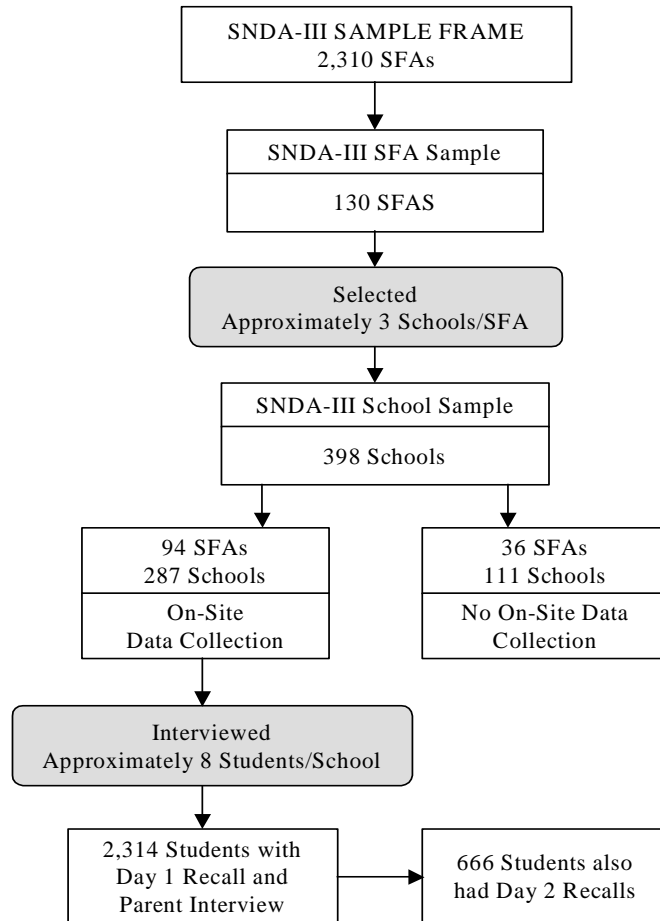
This study examined school meal program operations, foods and nutrients offered and served in school meals, competitive foods, and students' dietary intakes. Key research questions covered in this volume include:

- What are participation rates in the NSLP and SBP, overall and among key population subgroups?
- What are students' and parents' perceptions of and views on the school meal programs, and what factors affect satisfaction with the programs?
- What are the personal and family characteristics of school meal program participants and nonparticipants?
- What factors, including student characteristics, school food service program characteristics, and menu characteristics, are associated with school meal program participation?
- What is the quality of schoolchildren's diets and how do the diets of school meal program participants and nonparticipants compare? What are the roles of school meals and competitive foods in their diets?

## **C. DATA SOURCES**

SNDA-III data represent all public SFAs that offer the NSLP in the contiguous United States, schools in those SFAs, and students in those schools. To represent these groups, the following three-stage sampling process was used: (1) SFAs were selected; (2) schools within these SFAs were selected (one elementary, one middle, and one high school, if possible); and (3) (for some SFAs and schools) students who attended these schools were selected (see Figure 1).

FIGURE 1  
SNDA-III SAMPLES



Note: Samples (when weighted) are representative of all public SFAs, schools, and students in schools offering the NSLP.

SFA = School Food Authority.

Students were selected from lists of those enrolled at each school. Parents (or guardians) of the selected children provided consent for their child's participation, and were also interviewed.

Substantive data for the study were obtained at each of these levels; here, we describe the student-level data used in this volume. A centerpiece of the student data collection was a 24-hour dietary recall, which collected information on all foods and beverages the student had consumed during the preceding 24 hours. Approximately 30 percent of students were also asked to complete a second 24-hour recall the following week; the second recalls were needed to estimate students' usual dietary intakes.

Students were interviewed to collect information about their school meal consumption, opinions about school meals, opinions about the environment in which lunch was eaten (for example, cleanliness, crowding, and other activities during lunch), dietary supplement use, recreational activities, and exercise. Parents were interviewed to collect information about their child's consumption of school meals, their attitudes toward school meals, and perceptions about the availability of certain foods at their child's school. Parents were also asked whether the student was receiving free or reduced-price meals; whether the family had applied for such meals; and about the student's activity level, overall health, dietary habits, food allergies, and consumption of certain foods. Field staff measured students' heights and weights using standardized protocols.

All analyses in this report have been weighted to be representative of schoolchildren in public schools offering the NSLP in the contiguous United States.

## **D. PARTICIPATION IN, AND VIEWS OF, THE SCHOOL MEAL PROGRAMS**

School meal programs can accomplish their policy goals only if students participate in the programs. Therefore, it is important to understand which students participate in the programs and the factors that influence their decisions, including parents' and students' satisfaction with school meals.

### **1. Participation in the NSLP and SBP**

On a typical school day in the 2004-2005 school year, about 62 percent of students participated in the NSLP and about 18 percent participated in the SBP. Nearly three-quarters of children reported participating in the NSLP three or more days per week, and one-quarter reported participating in the SBP three or more days per week.

Participation rates in the school meal programs varied by gender, income, age, and race/ethnicity: boys participated at a higher rate than girls, low-income students participated at a higher rate than higher-income students, elementary school students participated at a higher rate than middle and high school students, and Hispanic and black students participated at much higher rates than non-Hispanic white students and those of other races. The latter finding is likely related to the fact that Hispanic and black students are more likely to be eligible for free or reduced-price meals.

## **2. Students' Reasons for Participation and Nonparticipation**

Leading reasons students gave for participating in the NSLP included being hungry (35 percent), liking the food in general (21 percent), and liking what was served on the menu that day (13 percent). Leading reasons for not participating in the NSLP were bringing lunch from home (28 percent), not liking what was served that day (20 percent), and not liking school lunches in general (9 percent).

Leading reasons students gave for participating in the SBP included convenience (35 percent), liking the food (32 percent), and being hungry (22 percent). Leading reasons for not participating included eating breakfast at home (50 percent) and not having time to eat a school breakfast (26 percent). Fifty-nine percent of students who ate school breakfasts two or fewer days per week said they would eat them more often if breakfast were served in their classrooms.

Students were generally satisfied with their school's lunchtime environment. Almost two-thirds of students reported that tables were always or usually clean, and 54 percent agreed that the noise level was about right. Seventy-nine percent of students reported that there were enough seats and tables available, and 74 percent of students who ever ate a school lunch reported that they had adequate time to eat their lunch. Similarly, 85 percent of students who ever ate a school breakfast reported that they had enough time to eat breakfast before class, and 87 percent reported that the school breakfast was served at an acceptable time.

## **3. Parents' Reasons for Participation and Nonparticipation**

When parents were asked why their child participated in the NSLP, 30 percent reported that it was convenient for them (the parents), 23 percent that their child liked the food, and 18 percent that they believed school lunches were a good value. Convenience was the most commonly cited reason among parents of elementary and middle school students, while value was most commonly cited by parents of high school students. Parents of students who did not participate in the NSLP reported some of the same reasons as students did for this decision—for example, that their child did not like the cafeteria food (68 percent) or preferred to bring a lunch from home (65 percent).

Among parents whose children received a school breakfast fewer than three days per week, 82 percent said that their child preferred to eat at home. The second most commonly cited reason for infrequent participation in the SBP was that students were not given an adequate amount of time to eat breakfast.

## **4. Students' Satisfaction with School Meals**

Overall, about half of students who said they ever ate school lunches reported that they liked the lunches. Opinions of school lunches declined with students' grade level—among those who said they ever ate a school lunch, 56 percent of elementary school students reported liking the lunches, compared with 35 percent of middle school students and 32 percent of high school students.



When asked about specific aspects of school lunches, more than half of students reported that they were only sometimes or never satisfied with the taste, appearance, and smell of the food served at school. Nearly half of students reported that they would like to see more choices available on the daily lunch menu. In contrast, most students were satisfied with the portion sizes and the temperature of milk served.

About half of students who said they ever ate school breakfasts reported that they liked the breakfasts. Opinions of school breakfasts also declined with grade level—among those who said they ever ate a school breakfast, 61 percent of elementary school students reported liking the breakfasts, compared with 49 percent of middle school students and 47 percent of high school students.

## **5. Parents' Satisfaction with School Meals**

In general, parents were satisfied or somewhat satisfied with the NSLP and SBP overall, as well as with specific components of the school meals. Twenty-one percent of parents said they felt school lunches were very healthy, and 68 percent felt the lunches were somewhat healthy. Most parents (81 percent) felt that school lunches were a good or pretty good financial value. Thirty-one percent of parents felt school breakfasts were very healthy and 63 percent felt they were somewhat healthy.

Among parents who expressed dissatisfaction with school lunches, almost half (48 percent) attributed it to their belief that school lunches were not healthy enough. Other reasons included poor quality or taste (38 percent), lack of menu choice (27 percent), and the fact that their child would not eat the food (18 percent).

## **6. Parents' Views on Availability of Competitive Foods**

More than half of parents disapproved of the availability of certain competitive foods in schools. Almost 58 percent thought it was a bad idea to allow fast-food brand products in schools, and 60 percent thought it was a bad idea to allow vending machines. Disapproval of these competitive foods was highest among parents of elementary school students and lowest among parents of high school students.

## **E. CHARACTERISTICS OF SCHOOL MEAL PROGRAM PARTICIPANTS AND NONPARTICIPANTS**

The NSLP and SBP are intended to improve the nutritional status of all schoolchildren, but their main benefits are targeted toward students from low-income families—those who qualify for free or reduced-price meals. The SBP also targets students who have long travel times to school, typically those in rural areas. Understanding the characteristics of those served by the two programs is necessary in order to assess how well the programs are reaching students in need, and where additional outreach efforts might best be targeted.

In the 2004-2005 school year, NSLP participants were generally more disadvantaged than nonparticipants. Participants were more likely to live with a single parent and to attend school in rural districts and in low-income districts. On average, their parents had lower levels of education, and their families had lower incomes and were more likely to participate in other public assistance programs than were the families of nonparticipants. However, the parents of NSLP participants and nonparticipants were equally likely to be employed (in both groups about 75 percent of parents who responded to the survey were working). Consistent with their differences in income, NSLP participants' families were more likely than nonparticipants' families to be food insecure. NSLP participants were also more likely than nonparticipants to be Hispanic or black, and less likely to be white or some other race.

Differences between SBP participants and nonparticipants were generally similar to those observed between NSLP participants and nonparticipants, but the magnitude of the differences tended to be larger. This reflects the fact that SBP participants are a smaller, more disadvantaged group than NSLP participants.

## **F. FACTORS RELATED TO SCHOOL MEAL PROGRAM PARTICIPATION**

A student's decision to participate in the NSLP or SBP is a complex one, influenced by personal and family characteristics and preferences, as well as by program features (such as meal price and menu planning system), characteristics of the school menus (for example, the specific foods offered and the number of choices), and alternative food sources available to the student (availability of competitive foods as well as students' ability to leave school to obtain meals elsewhere). Multivariate regression models were used to examine the relationships between school meal participation, student characteristics, school foodservice program characteristics, and menu characteristics.

NSLP participation rates were higher in schools that used offer-versus-serve (that is, schools that allowed students to refuse some of the foods offered) than in schools that did not use this policy option. Characteristics of the lunches offered, including the percent of calories from fat, whether dessert or French fries were offered frequently, and the average number of fresh fruits and vegetables offered per day, were not significantly associated with NSLP participation. Among students who were ineligible for free or reduced-price meals, a higher meal price was associated with a lower probability of participation.

Several personal and family characteristics were significantly associated with NSLP participation. After controlling for other characteristics, NSLP participation was significantly higher among elementary school students, male students, students who were eligible for free or reduced-price meals, and students whose parents did not attend college than among other students.

Factors associated with SBP participation were generally similar to those noted in the analysis of NSLP participation. In particular, among students who were not eligible for free or reduced-price meals, a higher breakfast price was associated with a lower probability of SBP participation. In addition, SBP participation was significantly higher among elementary school students, male students, students who were eligible for free or reduced-price meals, non-Hispanic black students, and students who spoke Spanish at home than among other students.

## **G. DIETARY INTAKES OF SCHOOL MEAL PROGRAM PARTICIPANTS AND NONPARTICIPANTS**

A key objective of the school meal programs is to provide children with healthy, well-balanced diets. Ideally, we would like to understand the programs' effects on schoolchildren's diets, relative to what the children would have consumed had they not participated. A comparison of the diets of school meal program participants and nonparticipants can provide some sense of these effects, but there are many other differences between participants and nonparticipants that may also influence their dietary intakes (for instance, age, gender, socioeconomic background, and food preferences), making it difficult to identify the causal effects of the programs.

Statistical techniques were used in most analyses of students' dietary intakes in this study to adjust for observable differences between participants and nonparticipants that might affect their nutrient intakes. Multivariate regression was used in analyses that compared mean intakes of participants and nonparticipants at breakfast and lunch (and the extent to which these differences dissipated during the day). Propensity-score matching techniques—in which participants were compared to “matched” nonparticipants who were similar on many observable characteristics—were used to assess the prevalence of inadequate and excessive nutrient intakes among participants and nonparticipants. Even with these statistical controls, unobserved differences between participants and nonparticipants may remain. For this reason, differences in the nutrient intakes of the two groups of students may not be indicative of causal effects of the school meal programs.

To assess the quality and adequacy of students' overall diets—considering foods consumed at school as well as those consumed elsewhere during the school day—students' usual daily intakes were compared to the dietary reference intakes (DRIs). The DRIs are the most up-to-date scientific standards for assessing diets of individuals and population groups. They define standards for different types of nutrients (see box). The DRIs do not include standards for saturated fat and cholesterol, so usual daily intakes of these dietary components were assessed relative to recommendations made in the 2005 *Dietary Guidelines for Americans* (U.S. Department of Health and Human Services/U.S. Department of Agriculture 2005).

## DIETARY REFERENCE INTAKES (DRIs)

**Acceptable Macronutrient Distribution Range (AMDR):** The range of usual daily intakes that is associated with reduced risk of chronic disease while providing adequate intakes of essential nutrients. An AMDR is expressed as a percentage of total energy intake (calories). If an individual's usual daily intake is above or below this range, risks of chronic disease and/or insufficient intake of essential nutrients are increased. *[Used to assess usual daily intakes of total fat.]*

**Estimated Average Requirement (EAR):** The usual daily intake level that is estimated to meet the requirement of half the healthy individuals in a life stage and gender group. The proportion of a group with usual daily intakes less than the EAR is an estimate of the prevalence of inadequate daily intakes in that population group. *[Used to assess usual daily intakes of protein and most vitamins and minerals.]*

**Adequate Intake (AI):** The usual daily intake level of apparently healthy people who are maintaining a defined nutritional state or criterion of adequacy. AIs are used when scientific data are insufficient to establish an EAR. When a population group's mean usual daily intake exceeds the AI, the prevalence of inadequate usual daily intakes is likely to be low. However, mean usual daily intakes that fall below the AI do not indicate that the prevalence of inadequacy is high. *[Used to examine usual daily intakes of calcium, potassium, and fiber].*

**Tolerable Upper Intake Level (UL):** The highest usual daily intake level that is likely to pose no risk of adverse health effects to individuals in the specified life stage group. As usual daily intake increases above the UL, the risk of adverse effects increases. *[Used to assess usual daily intakes of sodium.]*

### 1. Dietary Intakes of NSLP Participants and Nonparticipants

#### a. Mean Intakes of Energy and Nutrients at Lunch

For most student groups, holding other characteristics constant, NSLP participants and nonparticipants consumed similar amounts of energy at lunch. High school students were an exception. On average, lunches consumed by high school NSLP participants were significantly higher in calories than those consumed by high school nonparticipants (733 versus 661 calories).

At all school levels, the average lunch consumed by NSLP participants provided a significantly larger percentage of energy from protein than the lunches consumed by nonparticipants, and a significantly smaller percentage of energy from carbohydrate. In addition, among middle school students, the lunches consumed by NSLP participants provided significantly more fat and saturated fat, as a percentage of total energy, than the lunches consumed by nonparticipants. The overall participant-nonparticipant difference in the percentage of energy provided by saturated fat was also statistically significant (12 versus 11 percent of energy from saturated fat).

The average lunches consumed by NSLP participants at all school levels provided significantly greater amounts of vitamin A, vitamin B<sub>12</sub>, riboflavin, calcium, phosphorus, and potassium than lunches consumed by nonparticipants. This pattern of differences is, in large

part, attributable to the fact that NSLP participants were four times as likely as nonparticipants to consume milk for lunch. Milk was the first or second most important source of all these nutrients in students' lunches.

Among elementary school students, lunches consumed by NSLP participants were lower in vitamins C and E than lunches consumed by nonparticipants. Among middle school students, lunches consumed by NSLP participants provided more cholesterol than lunches consumed by nonparticipants. Middle school NSLP participants also consumed more folate, iron, zinc, and fiber at lunch than nonparticipants. Among high school students, NSLP participants consumed more vitamin C, vitamin B<sub>6</sub>, niacin, thiamin, iron, magnesium, and zinc at lunch than nonparticipants. High school NSLP participants also consumed more sodium at lunch than nonparticipants.

Many of the significant differences in average intakes of NSLP participants and nonparticipants at lunch persisted over 24 hours, although there was substantial variation by school level. Among elementary school students, only the differences in mean intakes of vitamin A and calcium persisted over 24 hours. In addition, over 24 hours, elementary school NSLP participants had significantly lower mean intakes of niacin than nonparticipants. Among high school students, only the differences in the percentage of energy from protein and in mean potassium intakes persisted over 24 hours. In contrast, among middle school students, all the significant differences noted in lunch intakes persisted over 24 hours, except the difference in the percentage of energy from total fat.

## **b. Usual Daily Intakes of Energy and Nutrients**

### ***Usual Daily Intakes of Energy and Macronutrients***

Among elementary and high school students, NSLP participants had significantly higher usual daily intakes of energy than matched nonparticipants. On average, the usual daily energy intakes of NSLP participants in elementary schools were about 100 calories higher than the usual daily energy intakes of elementary school nonparticipants (2,051 versus 1,952 calories). Among high school students, the difference between the usual daily energy intakes of NSLP participants and nonparticipants averaged 265 calories (2,386 versus 2,121 calories). At least part of this difference may be attributable to the fact that NSLP participants, by definition, consumed a lunch. Four percent of elementary school nonparticipants and eight percent of high school nonparticipants did not eat lunch.

Overall, there were no statistically significant differences between NSLP participants and matched nonparticipants in the extent to which usual daily intakes of macronutrients (fat, protein, and carbohydrate) conformed to DRI standards. Seventy-seven percent of NSLP participants and 94 percent of nonparticipants had usual daily fat intakes that fell within the Acceptable Macronutrient Distribution Range (AMDR) defined in the DRIs (25 to 35 percent of total energy) (see box). For both participants and nonparticipants, the usual daily fat intakes of students whose intakes were not within the AMDR were much more likely to exceed the recommended range (includeconsume more fat, as a percentage of energy, than recommended) than to fall below it.

Usual daily saturated fat intakes of both NSLP participants and nonparticipants typically exceeded the *Dietary Guidelines* recommendation. Only 20 percent of both NSLP participants and nonparticipants had usual daily intakes of saturated fat that met the *Dietary Guidelines* recommendation that saturated fat provide less than 10 percent of total calories.

### ***Prevalence of Inadequate Usual Daily Intakes of Vitamins and Minerals***

There were no significant differences between elementary school NSLP participants and nonparticipants in the prevalence of inadequate usual daily intakes of vitamins or minerals. Except for vitamin E, for which the prevalence of inadequacy was high for all groups of students, inadequate usual daily intakes of vitamins and minerals were rare among elementary school students.<sup>1</sup>

Middle school NSLP participants were significantly less likely than nonparticipants to have inadequate usual daily intakes of vitamin A and magnesium. Fewer than 30 percent of middle school NSLP participants had inadequate usual daily intakes of vitamin A, compared to 44 percent of nonparticipants. In addition, 43 percent of middle school NSLP participants had inadequate usual daily intakes of magnesium, compared to 62 percent of nonparticipants. Middle school students in general had a notably higher prevalence of inadequate intakes than elementary school students—this was true for vitamin A, vitamin C, magnesium, phosphorus, and zinc. Analysis of data by school level and gender indicated that the prevalence of inadequacy for all these nutrients was notably higher for girls than for boys.

High school students—who have the highest nutrient requirements, relative to the other age groups considered in this study—had the highest prevalence of inadequate usual daily intakes. Nutrients that were problematic for high school students included vitamin A, vitamin C, vitamin E, magnesium, phosphorus, and zinc. Data analyzed by school level and gender indicate that the prevalence of inadequate intakes was particularly high for high school girls.

High school NSLP participants were significantly less likely than nonparticipants to have inadequate usual daily intakes of vitamin A, vitamin C, vitamin B<sub>6</sub>, folate, thiamin, and phosphorus. Except for vitamin A, the differences between participants and nonparticipants were largely attributable to participant-nonparticipant differences among girls.

### ***Usual Daily Intakes of Calcium and Potassium***

Among middle and high school students, NSLP participants had significantly higher mean usual daily calcium intakes than nonparticipants. Usual daily calcium intakes of middle school and high school NSLP participants, expressed as a percentage of the Adequate Intake Level (AI)

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<sup>1</sup> The high prevalence of inadequate intakes of vitamin E is consistent with most recent studies of vitamin E intake. Devaney and colleagues considered a range of possible reasons for these findings. They point out that the diets of most of the U.S. population do not meet the EAR for vitamin E, yet vitamin E deficiency is rare. They note limitations of both the data used to establish the EAR for vitamin E and the data used to assess vitamin E intakes (Devaney et al. 2007).

averaged 88 and 87 percent, respectively, compared with 64 and 71 percent for middle and high school nonparticipants. This difference in mean usual daily intakes does not necessarily imply that middle and high school NSLP participants had a lower prevalence of inadequate usual daily calcium intakes than nonparticipants (see box). Among elementary school students, mean usual daily intakes of calcium of both NSLP participants and nonparticipants exceeded 100 percent of the AI. This indicates that the prevalence of inadequate usual daily calcium intakes in this age group is likely to be low.

Middle school and high school NSLP participants had significantly greater mean usual daily intakes of potassium than nonparticipants. Middle and high school participants' mean usual daily intakes were 55 and 58 percent of the AI, respectively, while nonparticipants' mean usual daily intakes were 48 and 47 percent of the AI. As noted in the preceding discussion of usual daily calcium intakes, a higher mean usual daily intake does not necessarily indicate that the prevalence of inadequacy is lower. Mean usual daily potassium intakes of students at all school levels were less than their respective AIs.

### ***Usual Daily Intakes of Sodium, Cholesterol, and Fiber***

Mean usual daily sodium intakes of both NSLP participants and nonparticipants exceeded the Tolerable Upper Intake Level (UL) by a substantial margin (see box). Mean usual daily sodium intakes of both NSLP participants and nonparticipants were more than 200 percent of the UL (which is 2,300 mg). More than three-quarters of students in both groups had usual daily sodium intakes that exceeded the UL. This was true for students at all school levels. Among high school students, NSLP participants were significantly more likely than nonparticipants to have usual daily sodium intakes that exceeded the UL (96 versus 78 percent).

There were no significant differences between NSLP participants and nonparticipants in the proportion of students whose usual daily cholesterol intake exceeded the *Dietary Guidelines* recommendation. Overall, fewer than 10 percent of students had usual daily cholesterol intakes that exceeded the recommended maximum of 300 mg. The prevalence of excessive usual daily cholesterol intakes was higher among high school students (16 to 21 percent) than among elementary and middle school students (6 to 7 percent).

NSLP participants had significantly higher mean usual daily fiber intakes than nonparticipants. However, mean usual daily fiber intakes of all groups of students were less than the AI. Overall, the mean usual daily fiber intake of NSLP participants was equal to 51 percent of the AI for fiber, compared with 45 percent of the AI among nonparticipants.

### **c. Food Intakes at Lunch**

There were large differences in beverage consumption patterns of NSLP participants and nonparticipants. NSLP participants were four times more likely than nonparticipants to consume milk at lunch (75 versus 19 percent). This difference persisted over 24 hours, although the disparity between the two groups became smaller (88 versus 69 percent). In contrast NSLP participants were significantly less likely than nonparticipants to consume beverages other than milk or 100% juice at lunch (18 versus 56 percent), including juice drinks, carbonated sodas, and bottled water. Over 24 hours, differences between NSLP participants and nonparticipants in the

proportion of students who consumed fruit drinks and bottled water persisted, but the difference in the consumption of carbonated sodas disappeared.

NSLP participants were more than twice as likely as nonparticipants to consume at least one vegetable (as a distinct food item) at lunch (51 versus 23 percent). These differences were driven primarily by differences in potato consumption. In middle and high schools, NSLP participants were significantly more likely than nonparticipants to consume French fries/tater tots at lunch, and NSLP participants at all three grade levels were significantly more likely than nonparticipants to consume other white potatoes at lunch. Over 24 hours, the significant difference between NSLP participants and nonparticipants in the proportion who consumed at least one vegetable persisted; however, the magnitude of the difference became smaller (72 versus 59 percent). The differences observed over 24 hours were also driven primarily by differences in potato consumption.

NSLP participants were more likely to consume pizza; sandwiches with breaded chicken, fish or meat; hamburgers; hot dogs; and breaded chicken products (such as nuggets, patties, poppers, and tenders) at lunch; while nonparticipants were more likely to consume plain meat sandwiches (such as turkey or ham) and peanut butter sandwiches. These differences persisted over 24 hours.

NSLP participants were significantly less likely than nonparticipants to consume desserts and other snack foods at lunch (38 versus 52 percent). Among elementary school students, NSLP participants were less likely than nonparticipants to consume candy and snack chips. Among middle and high school students, NSLP participants were less likely than nonparticipants to consume snack chips and cereal/granola bars. Many of these differences dissipated during the day; over 24 hours, there was no difference between NSLP participants and nonparticipants in the percentage of students who consumed one or more snack or dessert items or in the percentage who consumed snack chips. The percentage of NSLP participants who consumed candy remained significantly lower than the percentage of nonparticipants, but the size of the difference became smaller.

#### **d. Food Sources of Nutrients**

NSLP participants obtained significantly more of their lunch energy than nonparticipants from milk, pizza, hamburgers and cheeseburgers, condiments, and spreads, and significantly less of their lunch energy from juice drinks, carbonated sodas, peanut butter and plain meat/poultry sandwiches, chips, candy, crackers, and pretzels. NSLP participants also generally obtained a significantly greater share of their saturated fat and carbohydrate intakes at lunch from pizza and milk than nonparticipants, while nonparticipants obtained significantly greater shares of their saturated fat and carbohydrate intakes at lunch from plain meat/poultry sandwiches, peanut butter sandwiches, corn/tortilla chips, candy, other snack chips, and crackers and pretzels.

Milk and pizza products generally made significantly greater contributions to NSLP participants' lunch intakes of vitamin A, vitamin B<sub>6</sub>, vitamin B<sub>12</sub>, calcium, and iron than to nonparticipants' intakes, while plain meat/poultry sandwiches, hamburgers and cheeseburgers,



cheese, and juice drinks generally made significantly greater contributions to nonparticipants' lunch intakes of these nutrients.

Relative to nonparticipants, NSLP participants obtained significantly greater shares of their sodium intakes at lunch from pizza and pizza products, condiments and spreads, 1% flavored milk, and salad dressings, and significantly smaller shares from plain meat/poultry sandwiches, peanut butter sandwiches, crackers and pretzels, and corn/tortilla chips.

#### **e. Competitive Foods**

In recent years, interest in the healthfulness of foods offered in school meal programs has expanded to include competitive foods—foods and beverages sold on an a la carte basis in school cafeterias or through vending machines, snack bars, school stores, or other on-campus venues. Many observers have reasoned that competitive foods in schools—many of which are high in calories and fat and low in nutrients—may be contributing to child obesity. It is therefore important to understand the role of competitive foods in schoolchildren's diets.

Overall, nonparticipants were almost twice as likely as NSLP participants to consume one or more competitive foods (37 versus 19 percent). Consumption of competitive foods increased for both participants and nonparticipants from elementary school to middle school and from middle school to high school. Among high school students, about one-third (34 percent) of NSLP participants and close to one-half (46 percent) of nonparticipants consumed one or more competitive foods. At all school levels, competitive foods were most often consumed at lunch.

Among students who consumed one or more competitive foods, the most commonly consumed food groups (for both NSLP participants and nonparticipants) were dessert/snack items and beverages other than milk. Of students who consumed competitive foods, 50 percent or more consumed a dessert or snack item and 37 to 47 percent consumed a beverage other than milk. Nonparticipants were more likely than participants to consume milk, vegetables (most often French fries), or entree items obtained from competitive food sources. This reflects the fact that many middle school and high school nonparticipants who consumed competitive foods relied on competitive food sources for their lunchtime meal.

Candy was the most commonly consumed competitive food for both NSLP participants and nonparticipants. Candy consumption was reported by 28 percent of the NSLP participants who consumed one or more competitive foods and 24 percent of their nonparticipant counterparts. Cookies, cakes, and brownies were the second most common competitive food for both groups (18 to 19 percent). Carbonated soda and juice drinks were the third and fifth most common competitive foods among participants (16 and 13 percent, respectively) and were tied for the third most common competitive food among nonparticipants (17 percent). Among nonparticipants, milk was also tied for the third most common competitive food. This was primarily due to elementary school nonparticipants, many of whom purchased milk to go with lunches brought from home.

The competitive foods consumed by nonparticipants provided more calories and were significantly higher in fat and saturated fat than the competitive foods consumed by NSLP participants. On average, NSLP participants who consumed competitive foods obtained 218

calories from these foods, compared with 411 calories for nonparticipants. In addition, the competitive foods consumed by NSLP participants were significantly lower in total fat and saturated fat and significantly higher in carbohydrate, as percentages of total energy, than the competitive foods consumed by nonparticipants. This pattern is consistent with the fact that the competitive foods most commonly consumed by NSLP participants were candy; cookies, cakes, and brownies; carbonated sodas, and juice drinks—all likely to be high in sugar. These foods were also common among nonparticipants; however, the competitive foods consumed by nonparticipants were more likely than those consumed by NSLP participants to include milk, French fries, and entree items.

Students who consumed competitive foods obtained more than 150 calories from foods that were low in nutrients and energy dense. Foods considered to be low in nutrients and energy dense include all desserts and snacks; all beverages other than milk or 100% juice; French fries; corn/tortilla chips; and muffins, donuts, sweet rolls, and toaster pastries. Among NSLP participants, on average, 159 of 218 calories (73 percent of competitive food calories) came from these foods. Among nonparticipants, who, as noted above, often obtained their lunch meal from competitive food sources, low-nutrient, energy-dense foods contributed more calories, but a smaller overall proportion of competitive food calories (210 of 411 calories, on average, or 51 percent).

#### **f. Comparison of Data from SNDA-III and SNDA-I**

Between school year 1991-1992, when SNDA-I was conducted, and school year 2004-2005, the average number of calories consumed at lunch declined among NSLP participants, from 762 to 626 calories. The amount of calories consumed at lunch by nonparticipants fell from 679 to 641 over this period, but the decline was not statistically significant. The average amount of fat as a percentage of energy in lunches consumed by NSLP participants also declined over this period, from 37 to 33 percent, while the percent of calories from fat in lunches consumed by nonparticipants remained stable at 33 percent.

Among NSLP participants, there were significant declines in the average amount of several key nutrients consumed at lunch, including vitamin C, vitamin B<sub>6</sub>, vitamin B<sub>12</sub>, niacin, thiamin, iron, magnesium, phosphorous, and zinc. There were also significant declines in sodium and cholesterol consumption. Among nonparticipants, consumption of most nutrients at lunch remained relatively stable over this period, with the exception of significant declines in intakes of vitamin C, thiamin, and sodium.

## **2. Dietary Intakes of SBP Participants and Nonparticipants**

### **a. Mean Intakes of Energy and Nutrients at Breakfast**

After controlling for a number of characteristics that may be associated both with participation in the SBP and with dietary intakes, relatively few significant differences were observed in the mean breakfast intakes of SBP participants and nonparticipants. Breakfasts consumed by SBP participants in high schools and middle schools provided a significantly greater percentage of energy from monounsaturated fat, polyunsaturated fat, and linolenic acid

(an essential polyunsaturated fatty acid) than breakfasts consumed by nonparticipants in these schools.

Among middle school students, breakfasts consumed by SBP participants provided significantly less vitamin A, vitamin B<sub>6</sub>, vitamin B<sub>12</sub>, folate, niacin, riboflavin, iron, and zinc than breakfasts consumed by nonparticipants. Scattered differences were observed for other nutrients among elementary and/or high school students. SBP participants in both elementary schools and middle schools had significantly lower intakes of cholesterol at breakfast than nonparticipants. Among high school students, SBP participants had a significantly lower average intake of fiber at breakfast—on a gram per calorie basis—than nonparticipants. Few of the differences observed in the breakfast intakes of SBP participants and nonparticipants remained significant over 24 hours.

## **b. Usual Daily Intakes of Energy and Nutrients**

### *Usual Daily Intakes of Energy and Macronutrients*

Usual daily intakes of energy and macronutrients were comparable for SBP participants and nonparticipants at all school levels. More than three-quarters of SBP participants and nonparticipants had usual daily total fat intakes that fell within the AMDR of 25 to 35 percent of total energy. In addition, for both SBP participants and nonparticipants, usual daily fat intakes that were not within the AMDR were much more likely to exceed the recommended range (include more fat as a percentage of energy than recommended) than to fall below it. Roughly 70 percent of both SBP participants and nonparticipants had usual daily intakes of saturated fat that exceeded the *Dietary Guidelines* recommendation of less than 10 percent of total energy. Usual daily carbohydrate and protein intakes of both SBP participants and nonparticipants were generally consistent with the respective AMDRs.

### *Prevalence of Inadequate Usual Daily Intakes of Vitamins and Minerals*

Except for vitamin E, the prevalence of inadequate usual daily intakes of vitamins and minerals was low among elementary school students. The prevalence of inadequate usual daily intakes of several vitamins and minerals was notably higher among middle school students, relative to elementary school students. This was true for vitamin A, vitamin E, magnesium, phosphorus, and zinc for both SBP participants and nonparticipants (and for vitamin C, vitamin B<sub>6</sub>, folate, riboflavin, and thiamin for nonparticipants). Among high school students, the prevalence of inadequate usual daily intakes was high for vitamin A, vitamin C, vitamin E, and magnesium.

Although the prevalence of inadequate usual daily intakes was often lower among SBP participants, relative to nonparticipants, few of these differences were statistically significant. Among elementary school students, the prevalence of inadequate usual daily phosphorus intakes was significantly lower for SBP participants than for nonparticipants (4 versus 16 percent). Among middle school students, the prevalence of inadequate usual daily magnesium intakes was significantly lower for SBP participants than for nonparticipants (41 versus 57 percent). There

were no significant differences in the prevalence of inadequate usual daily intakes of vitamins and minerals among high school SBP participants and nonparticipants.

### ***Usual Daily Intakes of Calcium and Potassium***

There were no significant differences between SBP participants and nonparticipants in mean usual daily calcium intakes. Among elementary school students, mean usual daily calcium intakes of both SBP participants and nonparticipants exceeded the AI, suggesting that the prevalence of inadequate usual daily calcium intakes among elementary school students was likely to be low. Among middle and high school students, mean usual daily calcium intakes were less than 100 percent of the AI.

Overall and among elementary school students, mean usual daily potassium intakes were significantly higher for SBP participants than for nonparticipants. Mean usual daily intakes of potassium averaged 63 to 66 percent of the AI for SBP participants, versus 57 to 59 percent of the AI for nonparticipants.

### ***Usual Daily Intakes of Sodium, Cholesterol, and Fiber***

The majority of SBP participants and nonparticipants at all school levels had usual daily sodium intakes that exceeded the UL. SBP participants were significantly more likely than nonparticipants to have usual daily sodium intakes that exceeded the UL. Overall, more than 97 percent of participants and 87 percent of nonparticipants had usual intakes greater than the UL, and among middle school students more than 97 percent of participants and 75 percent of nonparticipants had usual intakes greater than the UL.

There were no significant differences between SBP participants and nonparticipants in the proportion of students whose usual daily cholesterol intake exceeded the *Dietary Guidelines* recommendation. Overall, fewer than 20 percent of SBP participants and nonparticipants had usual daily cholesterol intakes that exceeded the recommended maximum of 300 mg.

Mean usual daily fiber intakes of all groups of students were less than the fiber AI. There were no significant differences between SBP participants and nonparticipants in mean usual daily fiber intakes (53 percent of the AI for participants, 51 percent for nonparticipants).

### **c. Food Intakes at Breakfast**

Overall, SBP participants were more likely than nonparticipants to consume both milk and 100% fruit juice at breakfast. These differences persisted over 24 hours.

Ready-to-eat breakfast cereal was the grain or bread product consumed most often at breakfast by both SBP participants and nonparticipants. Among high school students, SBP participants were less likely than nonparticipants to consume cereal that was unsweetened. Overall, breakfasts consumed by SBP participants were more likely than breakfasts consumed by nonparticipants to include sweet rolls, doughnuts, biscuits, and other higher-fat grain products. These differences persisted over 24 hours. Among middle school students, SBP participants

were less likely than nonparticipants to consume juice drinks or bottled water, both at breakfast and over 24 hours.

#### **d. Food Sources of Nutrients**

SBP participants obtained a significantly smaller share of their carbohydrate intakes at breakfast from cold cereal than nonparticipants, and a significantly greater share of their breakfast carbohydrate intakes from cakes, cookies, and brownies than nonparticipants. Flavored milks and pizza products accounted for significantly greater shares of SBP participants' breakfast intakes of protein, relative to nonparticipants, and cold cereal and unflavored skim/nonfat milk accounted for significantly smaller shares.

The overall contribution of cold cereals to intakes of vitamin B<sub>6</sub>, folate, phosphorus, and potassium was generally greater for nonparticipants than for participants, while fruit juices and sweet rolls, doughnuts, and toaster pastries made significantly greater contributions to SBP participants' breakfast intakes of these nutrients than to nonparticipants' breakfast intakes.

Relative to nonparticipants, SBP participants obtained significantly greater shares of their sodium intakes at breakfast from pizza products and cookies, cakes, and brownies and a significantly smaller share from cold cereals. Cakes, cookies, and brownies also made a significantly larger contribution to SBP participants' breakfast intakes of cholesterol than to nonparticipants' breakfast intakes.

#### **e. Competitive Foods**

Overall, SBP participants were less likely than nonparticipants to consume one or more competitive foods throughout the school day. Competitive foods were most commonly consumed at lunch, and SBP participants were less likely than nonparticipants to consume a competitive food at lunch. Consumption of competitive foods at breakfast was uncommon among elementary school students; however, among high school students, 20 percent of SBP participants and 10 percent of nonparticipants consumed one or more competitive foods at breakfast.

#### **f. Comparison of Data from SNDA-III and SNDA-I**

Between school year 1991-1992, when SNDA-I was conducted, and school year 2004-2005, the average number of calories consumed at breakfast declined among SBP participants from 555 to 464 calories. The amount of calories consumed at breakfast by nonparticipants was lower and remained relatively stable at about 415 calories over this period.

The average amount of fat as a percentage of energy in breakfasts consumed by SBP participants also declined over this period, from 31 to 25 percent, while the percent of calories from fat in breakfasts consumed by nonparticipants remained relatively stable at about 24 percent. Among both groups, the percent of calories from carbohydrate consumed at breakfast increased, while the percent of calories from protein fell.

Among SBP participants, there were significant declines in the average amount of several key nutrients consumed at breakfast, including vitamin C, vitamin B<sub>6</sub>, riboflavin, thiamin, and magnesium. There were significant increases in vitamin B<sub>12</sub> and zinc, and significant declines in sodium consumption. Most of these trends were mirrored in the breakfast intakes of nonparticipants; however, among nonparticipants there were no significant declines in breakfast intakes of vitamin B<sub>6</sub> or riboflavin.