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# School Nutrition Dietary Assessment Study-III

## Summary of Findings



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**Public-use datafiles from SNDA-III can be obtained by writing or calling us at:**

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## Summary of Findings

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## Table of Contents

<b>Overview</b> .....	1
Key Findings About School Meals and Competitive Foods .....	1
Key Findings About Students’ Dietary Intake .....	2
<b>I. Background</b> .....	3
Data .....	4
<b>II. Program Operations and Meals Offered and Served</b> .....	5
Program Operations .....	5
Meals Offered and Served: Comparison to Benchmarks .....	7
<b>III. Competitive Foods</b> .....	15
Availability .....	15
Consumption .....	16
<b>IV. Students’ Dietary Intakes</b> .....	19
Dietary Intakes of NSLP Participants and Nonparticipants .....	19
Dietary Intakes of SBP Participants and Nonparticipants.....	24
<b>V. For More Information</b> .....	27
<b>Endnotes</b> .....	29

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Major parts of the study design and instrumentation were developed as part of a design study funded by USDA Economic Research Service, Food Assistance and Nutrition Research Program.

SNDA-III findings are considered to be “influential scientific information” because they can have a clear and substantial impact on important public policies or private sector decisions, as well the potential to influence the actions of state and local agencies. FNS therefore conducted a formal peer review in compliance with the standards in the Office of Management and Budget Final Information Quality Bulletin for Peer Review issued December 15, 2004.



## Overview of the Third School Nutrition Dietary Assessment Study (SNDA III)

A key objective of the U.S. Department of Agriculture (USDA) for its National School Lunch Program (NSLP) and School Breakfast Program (SBP) is to ensure that children have access to healthy, well-balanced meals. The Food and Nutrition Service (FNS) of USDA sponsored the third SNDA study to provide up-to-date information on the school meal programs, the school environment that affects the programs, the nutrient content of school meals, and the contributions of school meals to students' diets. Data were collected from a nationally representative sample of districts, schools, and students in school year (SY) 2004-2005. The nutrient content of school meals offered and served was compared to USDA's current regulatory standards. Students' diets were assessed using the Dietary Reference Intakes (DRIs), the most up-to-date scientific standards for assessing dietary status.

### Key Findings About School Meals and Competitive Foods

**In SY 2004-2005, NSLP lunches offered and served by most schools met USDA goals for target nutrients over a typical week and were lower in saturated fat than meals offered and served in SY 1998-1999.**

- Over 85 percent of schools offered lunches that met the USDA standard for each of the key target nutrients—protein, vitamin A, vitamin C, calcium, and iron. Taking students' selection patterns into account, more than 70 percent of schools served lunches that met the USDA standards for each nutrient.
- Fewer than one-third of public schools offered and served school lunches that met the USDA standards for total fat (no more than 30 percent of calories) or saturated fat (less than 10 percent of calories). On average, schools offered and served lunches containing 34 percent of calories from fat and 11 percent of calories from saturated fat.
- The percentage of schools serving lunches meeting the total fat standard (approximately one-quarter of schools) did not change significantly from SY 1998-1999 to SY 2004-2005. However, the percentage of schools serving lunches meeting the USDA standard for saturated fat doubled over this time period—from 15 to 34 percent in elementary schools and from 13 to 26 percent in secondary schools.

**In SY 2004-2005, most schools offered and served SBP breakfasts that met USDA standards.**

- More than two-thirds of schools offered and served school breakfasts that met each of the following USDA standards: protein, vitamin A, vitamin C, calcium, iron, total fat, and saturated fat. Compared to SY 1998-1999, larger proportions of elementary schools met the standards for total fat and saturated fat, and a larger proportion of secondary schools met the standard for saturated fat.

**Foods sold in competition with USDA school meals were widely available on campus, particularly in secondary schools.** The most common sources of competitive foods were a la carte sales in the cafeteria, fundraisers, and vending machines.

- Roughly one-third of elementary schools and close to two-thirds of middle and high schools had foods or beverages other than milk for sale a la carte during lunch.
- Fundraisers that were focused on food or beverage sales occurred in 37 percent of elementary schools and 50 to 60 percent of middle and high schools.
- Vending machines were available in 17 percent of elementary schools, 82 percent of middle schools, and 97 percent of high schools.

### **Key Findings About Students' Dietary Intake**

**NSLP participants consumed more nutrients at lunch than nonparticipants.** Compared to lunches of nonparticipants, the average lunches consumed by NSLP participants at all school levels provided significantly greater amounts of the following nutrients—protein, vitamin A, vitamin B12, riboflavin, calcium, phosphorus, and potassium. 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 at lunch.

**Participants also were more likely than nonparticipants to have adequate usual daily intakes of key nutrients.**

- Among elementary school students, there were no significant differences in the percentages of NSLP

participants and nonparticipants with inadequate usual daily intakes of vitamins and minerals. However, among middle school students, participants were significantly more likely than nonparticipants to have adequate usual daily intakes of vitamin A and magnesium.

- Among high school students, NSLP participants were significantly more likely than nonparticipants to have adequate usual daily intakes of vitamin A, vitamin C, vitamin B<sub>6</sub>, folate, thiamin, iron, and phosphorus.
- No significant differences were found in the proportion of NSLP participants and nonparticipants whose usual daily intakes of total fat exceeded the acceptable range, as defined in the DRIs, or in the proportion whose usual daily intakes of saturated fat exceeded the standard.

**Breakfast intakes of SBP participants and nonparticipants were generally similar, as was the prevalence of inadequate usual daily intakes.** Few significant differences in mean breakfast intakes were found for elementary and high school SBP participants and nonparticipants. Middle school SBP participants had significantly lower intakes of vitamins and minerals at breakfast than nonparticipants, largely because they were less likely to consume fortified cereals. However, these differences dissipated over the course of the day. The proportions of SBP participants and nonparticipants with usual daily intakes of total fat and saturated fat above acceptable ranges were comparable.

**Competitive foods were consumed by fewer NSLP participants than nonparticipants. The most popular choices for both groups were energy dense and relatively low in nutrients.**

- NSLP participants were less likely than nonparticipants to consume competitive foods in school (19 percent of participants versus 37 percent of nonparticipants).
- Among both participants and nonparticipants, the competitive food categories most frequently consumed were desserts/snacks and beverages other than milk. Many of these foods are low in nutrients and energy dense—the most popular choices included candy, cookies, carbonated soft drinks, and sweetened juice drinks.



## Background

The U.S. Department of Agriculture (USDA) National School Lunch Program (NSLP) and School Breakfast Program (SBP) provide subsidized meals to children in school. In school year (SY) 2004-2005, these two programs together provided benefits of nearly \$10 billion in cash and commodities. The NSLP operates in nearly all public and many private schools throughout the country, providing reimbursement for lunches served to 27.5 million children each school day in 2005. The NSLP's companion program, the SBP, is implemented in a somewhat smaller proportion of schools (85 percent of public schools with the NSLP) and serves fewer children per school; in 2005, it provided about 8.7 million children per school day with breakfast.

USDA subsidizes lunches and breakfasts for American schoolchildren at levels that vary by family income. Students from families with incomes at or below 130 percent of the Federal poverty level are eligible for free meals, those with family incomes greater than 130 percent but no more than 185 percent of the poverty level are eligible for reduced-price meals, and children from higher-income families must pay "full price" for their meals (but such meals are also subsidized).

A key objective of these programs is to ensure that children have access to healthy, well-balanced meals. 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, aspects of the school environment (such as school schedules, other foods available, nutrition education offered) that affect the meal 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. These agencies and schools were also beginning to plan school wellness policies, required by Congress as of SY 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.

The SNDA-III study, which is based on data collected in the second half of SY 2004-2005, builds on the methods used in

two previous SNDA studies sponsored by FNS and thus allows some examination of trends over time.<sup>1</sup> The findings of the previous research have informed school meal program development. In particular:

- 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 total fat and saturated fat than recommended.
- SNDA-I helped prompt new policies, known as the School Meals Initiative for Healthy Children (SMI), which updated the previous nutrient standards to incorporate limits on total and saturated fat based on the *Dietary Guidelines for Americans*. School Food Authorities (SFAs)—school districts or groups of districts operating the NSLP—were able to use computerized nutrient analysis to plan school meals, but they were also given the option of continuing food-group-based menu planning, as long as their meals met the SMI nutrient standards.
- SNDA-II, in SY 1998-1999, early in the SMI implementation period, showed that school meals had reduced fat and saturated fat while maintaining levels of target nutrients, but they had not reached the SMI goals.

Since SMI was implemented, new scientific knowledge has led to changes in key dietary standards. The Dietary Reference Intakes (DRIs) provide the best measures of nutrient adequacy or inadequacy for people to achieve a healthy diet and prevent disease. Because the DRIs have not yet been adapted for menu planning, and because school meals were required to meet SMI standards during the study period, SMI standards are used to evaluate the nutrients provided in NSLP lunches and SBP breakfasts. The DRIs are used to assess children's dietary intakes, however, to provide an up-to-date picture of the adequacy of their diets.

## Data

SNDA-III data are representative of all public SFAs that offer the NSLP in the contiguous United States, schools in those SFAs, and students in those schools (and their parents).

Data were collected from 129 SFAs, 398 schools in those SFAs, and 2,314 children attending those schools (and their parents). SFA directors provided information on districtwide policies (such as menu-planning systems) and operations (such as food purchasing). School foodservice managers completed a Menu Survey, providing detailed information on all foods offered as part of reimbursable meals during a selected week, including, for each food, a detailed description, portion size offered, and, for the analysis of meals as selected or served, the number of servings provided as part of a reimbursable meal. The managers also completed a brief telephone or in-person interview regarding their school's foodservice operations and policies on competitive foods available in or near the foodservice area. Principals in each school were interviewed concerning school schedules and rules about student mobility, nutrition education offered, and availability of competitive foods outside the foodservice area.

In the representative subsample of 287 schools in which student-level data were collected, study staff (on site to interview students) also completed checklists based on their observations of competitive food sources and foods available through each major source—a la carte, vending machines, school stores, snack bars, and other sources.

Students participated in an interview that included a 24-hour dietary recall—a structured set of questions to help them recall (1) all foods and beverages consumed during a school day, (2) approximate portion sizes, and (3) the time of each eating occasion. The interview also asked questions about their views of school meals. In addition, the students had their height and weight measured. Parents assisted elementary school students when the children were interviewed about foods eaten outside of school. Middle and high school students were also asked questions about their physical activities, TV and computer use, eating habits, and smoking. Parent interviews covered family socioeconomic characteristics, parents' views of the school meal programs, family eating habits, and their child's health and physical activities.





## Program Operations and Meals Offered and Served

### Program Operations

#### Participation Rates and Prices

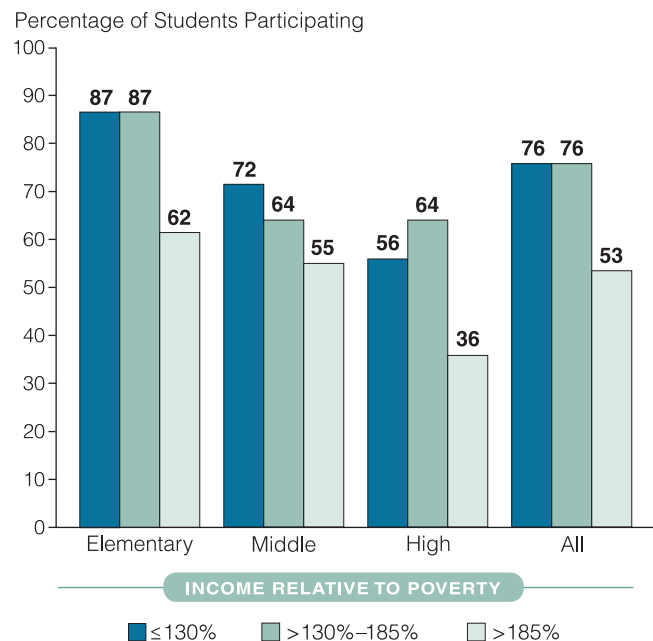
Among public schools offering the NSLP, most (85 percent) also offered the SBP in SY 2004-2005. The SBP has grown extensively since the early 1990s; in SY 1991-1992, at the time of SNDA-I, about half of all schools offered the SBP; at the time of SNDA-II (SY 1998-1999), 76 percent of public NSLP schools offered it. Factors behind the expansion include research suggesting that breakfast affects children's learning and campaigns by anti-hunger groups and the school health community. Legislatures in 26 States have passed laws requiring some or all schools to offer the SBP.<sup>2</sup>

A student's likelihood of NSLP and SBP participation decreased as the student's age or family income increased. Overall, 62 percent of students participated in the NSLP and 18 percent participated in the SBP on a typical school day in SY 2004-2005. Among students in schools offering the SBP, the average SBP participation rate was 21 percent. However, elementary school students and students eligible for free or reduced-price meals participated at much higher rates than did older students and higher-income students (Figures 1 and 2). Participation rates for both pro-

grams were higher among boys than girls, and among non-Hispanic blacks and Hispanics than among non-Hispanic

Figure 1

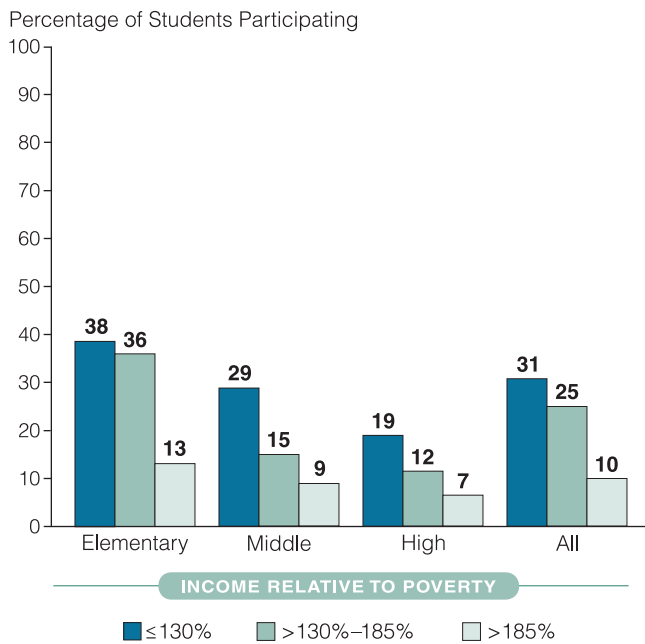
#### Low-Income and Elementary Students Participate in the NSLP at Higher Rates



Source: School Nutrition Dietary Assessment-III, Dietary Recalls and Student Interviews (see Volume II, Table II.1).

Figure 2

**Low-Income and Elementary Students Are More Likely to Participate in the SBP**



Source: School Nutrition Dietary Assessment-III, Dietary Recalls and Student Interviews (see Volume II, Table II.2). Sample is students in public schools offering the NSLP.

whites and other races/ethnicities. Participants and nonparticipants were equally likely to have an employed parent (75 percent did).

**Participation in school meals was related to price.**

Students not eligible for free or reduced-price meals were more likely to purchase school meals in schools that charged lower prices. To encourage participation and reduce administrative costs, approximately 15 percent of schools (usually those with high proportions of students certified for free or reduced-price meals) offered the meals free to all students under special rules.<sup>3</sup>

**Menu-Planning Systems**

FNS requires schools to plan their menus to ensure that USDA-subsidized meals meet specific nutrition standards. Traditionally, schools used food-based menu planning—which required school meals to offer set numbers of servings from specific food groups, with minimum portion sizes that varied by age. For example, NSLP lunches were required to

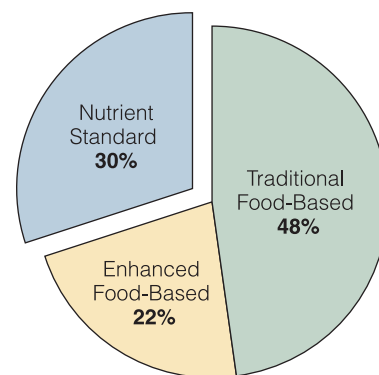
offer one serving of meat or meat alternate (cheese, beans); one serving of grains or bread; two servings of different fruits and/or vegetables; and one serving of fluid milk. The proposed SMI provided a new menu-planning system—nutrient-standard menu planning (NSMP)—which allowed districts greater flexibility in the types of foods offered, but required use of nutritional analysis software to analyze and plan menus that met age-/grade-appropriate nutrient standards. The 1995 final SMI regulations included both NSMP and the traditional food-based meal-planning system as options, as well as an enhanced food-based system that called for larger fruit/vegetable servings and more grains and breads. However, SFAs using any of the menu-planning systems must meet SMI nutrient standards.

**More than two-thirds of schools still used food-based menu planning.** Nearly half (48 percent) of schools in SY 2004-2005 used the traditional food-based menu-planning system, and 22 percent used the enhanced food-based menu-planning system (Figure 3). NSMP, used in 30 percent of schools, is more often used in larger, urban districts. The proportion of schools using NSMP (30 percent) was similar to that found in SY 1998-1999 (27 percent), but more schools in SY 2004-2005 report using the traditional versus the enhanced food-based systems (48 versus 41 percent using traditional in 1998-1999; 22 versus 28 percent using enhanced in 1998-1999).

Figure 3

**Most Schools Use Food-Based Menu Planning**

Percentage of Schools Using Menu-Planning System



Source: School Nutrition Dietary Assessment-III, Initial Contact Survey (see Volume I, Table II.5).

**Across all menu-planning systems, about two-thirds of schools were in districts that conducted ongoing nutrient analysis of their menus.** Thirty percent of schools were in districts that conducted only “weighted” analyses, 19 percent were in districts that conducted only “unweighted” (also known as “simple averaging”) analyses, and 19 percent were in districts that conducted both types of analyses. The SMI regulations specified that schools would be evaluated based on a weighted analysis of the nutrient content of their menus in a typical school week. Nutrients in each food would be weighted by the proportion of students that selected that item. However, because it is challenging for many schools to collect the production data needed for weighted analysis, USDA allows use of an unweighted nutrient analysis under a waiver provided by Congress, which is available until September 30, 2009. The unweighted (simple averaging) menu analysis gives equal weight to all choices in each food group in computing the average nutrients for that food group. These findings suggest that many districts have the software available to conduct nutrient analyses, even if they choose to plan menus using a food-based system.

### ***Meal Production and Service***

**Most schools prepared food on site.** More than two-thirds of schools (70 percent) prepared meals on site for consumption only on site, 19 percent of schools received fully or partially prepared meals from a base or central kitchen, and 11 percent of schools prepared meals on site for service on site and shipment to other schools. About 5 percent of SFAs used central or commissary kitchens, including 15 percent of large SFAs (more than 5,000 students enrolled).

**Nationally, 13 percent of SFAs contracted with foodservice management companies.** These contracts were more common in large or medium-sized districts than in small districts and in low-poverty areas than in higher poverty areas.

**Offer-versus-serve (OVS) was used at lunch in 83 percent of elementary schools and 93 percent of middle schools in SY 2004-2005.** OVS is a school meal program policy under which students may refuse one or two components of a reimbursable school meal. All high schools were required to use OVS.

## **Meals Offered and Served: Comparison to Benchmarks**

### ***SMI Standards and Related Benchmarks Used to Assess School Meals***

Before SMI, FNS recommended that school meals provide one-quarter of a student’s daily nutrient needs at breakfast and required that they meet one-third of a student’s daily nutrient needs at lunch. SMI formalized these requirements for energy, protein, vitamin A, vitamin C, calcium, and iron (Table 1). Standards for total fat and saturated fat were based on the 1995 *Dietary Guidelines for Americans*. SMI regulations recommended reducing sodium and cholesterol and increasing fiber in school meals, but no quantitative standards were established. To assess the levels of these dietary components, as in the previous SNDA studies, benchmarks for sodium and cholesterol were based on the National Research Council’s 1989 *Diet and Health* study. The benchmark for fiber was based on a standard recommended by the Institute for Cancer Prevention—grams of fiber should be at least equal to age in years plus 5.

### ***Methods for Analysis of Nutrients Offered and Served***

Analyses of nutrients offered and served in school meals are similar to the unweighted and weighted nutrient analyses used by FNS to monitor whether school meals are meeting requirements. Analyses both of nutrients offered and of those served are based on food groups in food-based menu planning (meat/meat alternate, grain/bread, fruit/vegetable, milk) and on “menu items”—entrees, side dishes, and milk—under NSMP. Both types of analyses use the same data from the Menu Survey, except that only the analysis of meals served or selected adds data on how frequently items were served/selected. For unweighted analysis, nutrients in all the items offered that count for the same food group or menu item are simply averaged, and the average nutrients in each group or item are summed. This is interpreted as the average nutrients in the meal as *offered*, on the assumption that students could select any of the options. In weighted analysis, for each food group or menu item, the nutrients in different options are weighted by how frequently they were served or selected, and then weighted averages for the meal components are summed. These results are interpreted as represent-

Table 1

## SMI Nutrient Standards and Related Benchmarks Used to Evaluate NSLP Lunches and SBP Breakfasts

NUTRIENT	STANDARD/RECOMMENDATION	
	Lunch	Breakfast
<b>SMI Nutrient Standards</b>		
<b>Based on 1989 RDAs</b>		
Food energy (calories)	One-third of the REA	One-fourth of the REA
Protein, vitamin A, vitamin C, calcium, and iron	One-third of the RDA	One-fourth of the RDA
<b>Based on 1995 <i>Dietary Guidelines for Americans (DGA)</i></b>		
Total fat	≤ 30 percent of total calories	≤ 30 percent of total calories
Saturated fat	< 10 percent of total calories	< 10 percent of total calories
<b>Other Nutrition Benchmarks</b>		
<b>Based on National Research Council (NRC) 1989 Recommendations:</b>		
Cholesterol	< 100 mg	< 75 mg
Sodium	< 800 mg	< 600 mg
<b>Based on Institute for Cancer Prevention Recommendation:</b>		
Dietary fiber	One-third of daily target	One-fourth of daily target

Note: “Other Nutrition Benchmarks” are not USDA requirements, but benchmarks used to assess dietary components for which USDA regulations do not provide a quantitative standard. Cholesterol and sodium benchmarks are one-third of the NRC daily recommendations for lunch and one-fourth of the NRC daily recommendations for breakfast.

RDA = Recommended Dietary Allowance; REA = Recommended Energy Allowance; SMI = School Meals Initiative for Healthy Children. Daily target for fiber = (age + 5) grams; 2005 DGA recommendation is considerably higher: 14 grams per 1,000 calories.

ing the average nutrients in meals *as served to, or selected by* students.<sup>4</sup>

### Lunches Offered and Served in Public NSLP Schools

Using data on lunch menus provided by school foodservice managers, the study analyzed the types of foods offered in NSLP lunches, the proportion of schools offering meals that met the SMI standards, and the proportion of schools that offered students the *opportunity* to consume a meal meeting SMI standards for total fat or saturated fat, if they selected items that would minimize the fat or saturated fat content of their meal.

### Food Choices

**Students usually had a range of choices at lunch, particularly in secondary schools.** More than half the schools (58 percent) offered students some type of fresh fruit and/or raw vegetables every day. The median number of *all* fruit and vegetable options (including canned fruit and cooked vegetables) offered over the course of a week was 13 in secondary schools, and the percentage of menus offering only the minimum of two fruit/vegetable options per day was 27 percent, down from 37 percent at the time of SNDA-II.

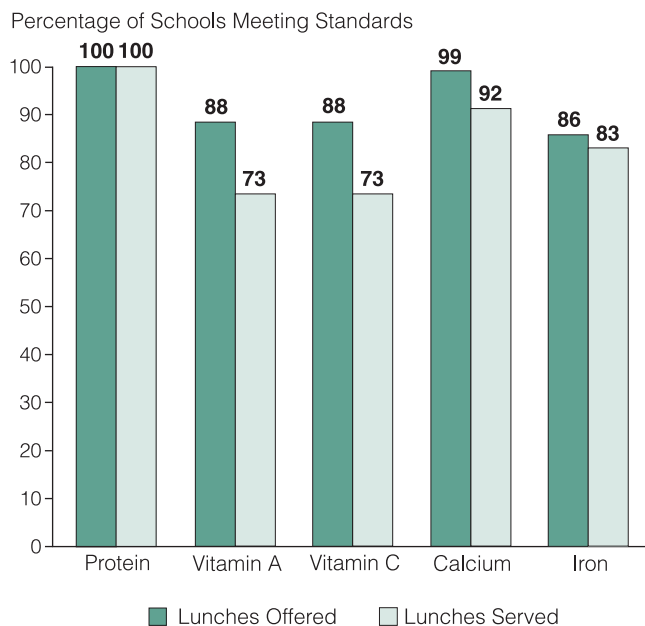
**Food bars were available at least once a week in 47 percent of high schools, 30 percent of middle schools, and 20 percent of elementary schools.** Food bars allow students

to serve themselves and may include many options—thus, they are another approach to offering more variety to students. Most of these food bars were salad bars (available in 37 percent of high schools, 23 percent of middle schools, and 19 percent of elementary schools), which could be either entrees or side dishes. Eighteen percent of secondary schools and 13 percent of elementary schools offered a salad bar every day.

### Nutrients Offered and Served in NSLP Lunches Relative to SMI Standards

**More than two-thirds of schools offered and served lunches that met SMI standards for protein, vitamins, and minerals at lunch.** More than 85 percent of schools offered lunches that met these standards on average over a typical week, but slightly fewer served lunches that met the standards (Figure 4). Although 71 percent of schools offered the required minimum for energy, only half of them served meals that met the energy standard. Elementary schools were more likely than middle or high schools to meet the energy standard both for meals offered and for meals served.

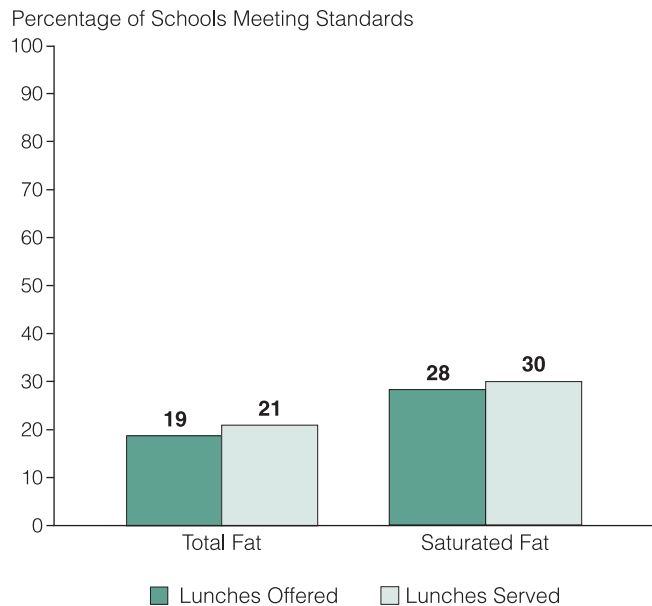
Figure 4  
**Large Proportions of Schools Met SMI Standards for Key Nutrients Offered and Served in NSLP Lunches**



Source: School Nutrition Dietary Assessment-III, Menu Survey (see Volume I, Tables VI.3 and VI.6).

**In most schools, lunches offered and served did not meet standards for fat and saturated fat.** About 20 percent of schools offered and served lunches that met the total fat standard, and about 30 percent offered and served lunches that met the saturated fat standard (Figure 5). On average, schools both offered and served lunches that contained about 34 percent of energy from total fat and about 11 percent of energy from saturated fat. Thus, students' selections appear not to have affected the average percentage of energy from fat or saturated fat in their meals relative to what was offered.

Figure 5  
**Less than One-Third of Schools Met the SMI Standards for Fat and Saturated Fat in NSLP Lunches**



Source: School Nutrition Dietary Assessment-III, Menu Survey (see Volume I, Tables VI.3 and VI.6).

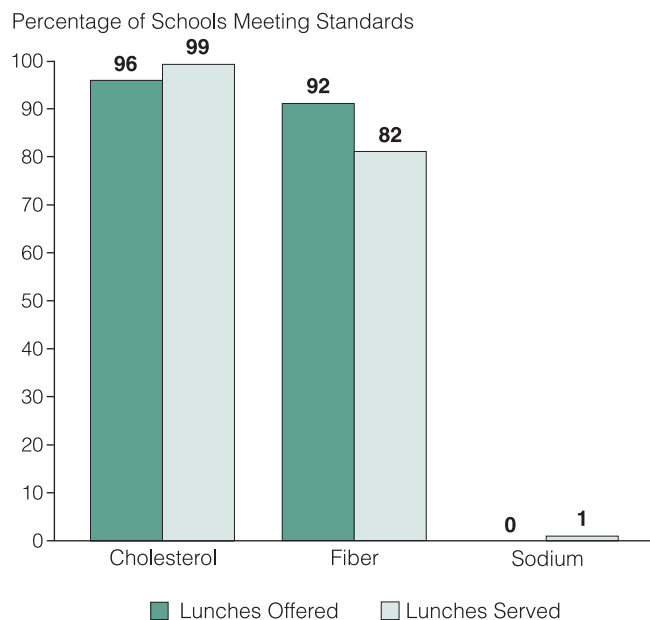
**Few schools (6 to 7 percent) offered or served NSLP lunches that met all of the SMI standards.** The primary reason was that one-third to one-half of schools offered or served lunches that did not meet the energy standard, and two-thirds or more offered or served lunches that did not meet the standards for fat and saturated fat. Elementary schools were significantly more likely than middle and high schools to meet all standards for meals served.

**Essentially no schools offered or served lunches that met the sodium benchmark, but almost all schools offered**

and served lunches consistent with benchmarks for fiber and cholesterol (Figure 6). However, these results should be viewed in context. Other studies have found that Americans of all ages consume much more sodium than recommended. Although fiber benchmarks were usually met, only about 5 percent of lunch menus offered foods made from whole grains or dried beans, which are excellent sources of fiber.

Figure 6

**Almost All Schools Met Benchmarks for Cholesterol and Fiber in NSLP Lunches; Almost No Schools Met the Benchmark for Sodium**



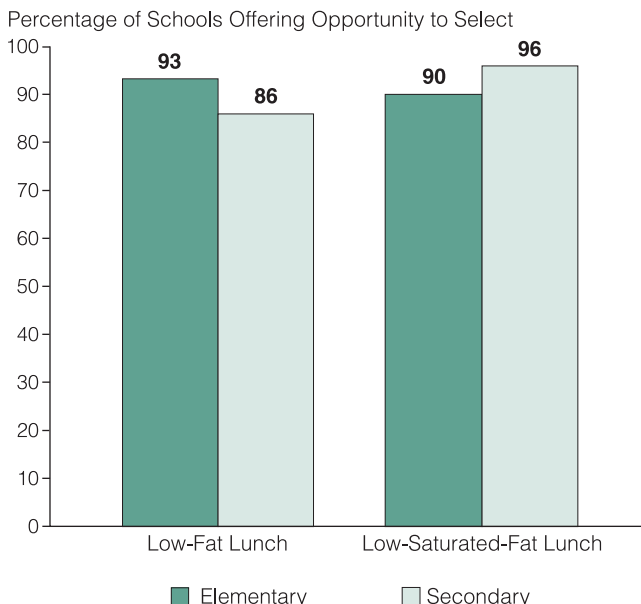
Source: School Nutrition Dietary Assessment-III, Menu Survey (see Volume I, Tables VI.3 and VI.6).

Note: Benchmarks are not requirements under SMI.

**Both low-fat and low-saturated-fat options were widely available.** That is, students usually could select a lunch that met SMI standards for fat and saturated fat (defined as full lunches that contained 30 percent of calories from fat or less, and less than 10 percent of calories from saturated fat, respectively) if they made appropriate food choices. On a typical day, 93 percent of elementary schools and 86 percent of secondary schools offered students the *opportunity to select* a low-fat lunch, and 90 percent of elementary schools and 96 percent of secondary schools offered students the *opportunity to select* a low-saturated-fat lunch (Figure 7).

Figure 7

**Low-Fat and Low-Saturated-Fat Lunch Options Were Widely Available**



Source: School Nutrition Dietary Assessment-III, Menu Survey (see Volume I, Tables VIII.6, VIII.7, and VIII.9).

**SBP Breakfasts Offered and Served in Public NSLP Schools**

Schools were more likely to offer and serve SBP breakfasts that met SMI standards for target nutrients than NSLP lunches.

**Foods Offered**

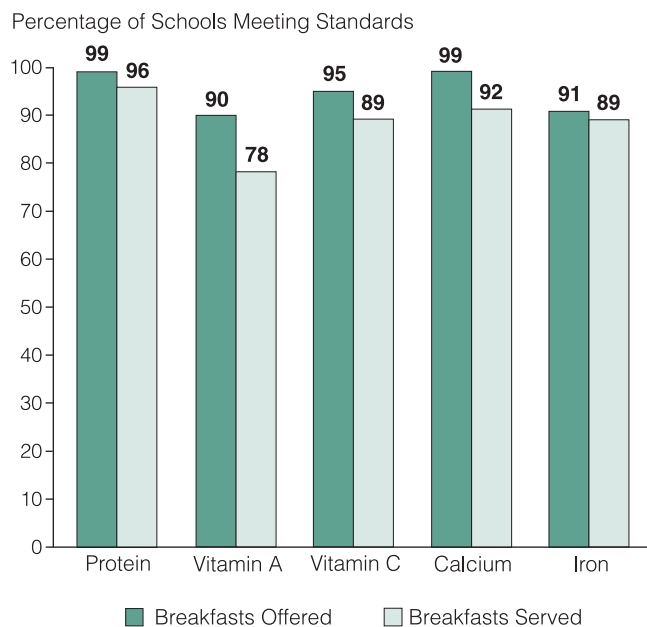
**Breakfast tends to have less varied menus than lunch; for example, more than three-quarters of menus offered juice and cold cereal.** Breakfasts are not required to include entrees (in NSMP) or meat/meat alternates (in food-based menu planning). NSMP breakfasts must offer fluid milk and two side dishes. Food-based menu planning requires fluid milk; one serving of fruit or vegetable or 100% fruit or vegetable juice; and two servings of bread/grains, two servings of meats/meat alternates, or one serving of each. The fruit/vegetable serving was usually juice (available on 88 percent of breakfast menus). Grains/breads were almost always available (on 95 percent of menus), particularly cold cereals (on 78 percent of breakfast menus). In contrast, meats or meat alternates and combination entrees were available on 40 and 35 percent of breakfast menus, respectively.

The most popular meat/meat alternates were sausage (on 17 percent of menus) and yogurt (on 13 percent), while the most popular meat/grain combinations were breakfast sandwiches (on 13 percent). In general, schools offered only one meat/meat alternate or combination meat/bread option at breakfast per day.

### Nutrients Offered and Served in SBP Breakfasts Relative to Standards

**Most schools offered and served breakfasts that met the SMI standards for targeted nutrients.** Schools offered and served breakfasts that usually met standards for key nutrients (in more than 90 percent of schools for breakfasts offered, in more than 75 percent for breakfasts served) (Figure 8). However, less than one-third of schools met the standard for energy (23 percent of schools met the standard for breakfasts offered, and 31 percent met the standard for breakfasts served). Both elementary and secondary schools were more likely to meet the energy standard for breakfasts served than breakfasts offered, which suggests that students selected more energy-dense options at breakfast.

Figure 8  
**High Proportions of Schools Satisfied the SMI Standard for Key Nutrients for SBP Breakfasts**



Source: School Nutrition Dietary Assessment-III, Menu Survey (see Volume I, Tables VII.3 and VII.6).

### Schools usually offered and served breakfasts that met the SMI standards for both total fat and saturated fat.

The proportions meeting the standards for total and saturated fat, respectively, were 88 and 75 percent for breakfasts offered and 81 and 69 percent for breakfasts served. Fifty-eight percent of schools offered, but only 43 percent of schools served, breakfasts that met the sodium benchmark.

### Comparisons to SNDA-II

SNDA-III used data collection and analytic methods similar to those of SNDA-II, to make it easier to analyze trends in the nutrient content of school meals over time. At the same time, some differences could not be avoided. Thus, differences in the nutrient content of the meals may reflect differences in the nutrient databases used, in coding of recipes and pre-prepared foods, or other factors. Nonetheless, differences discussed are large enough that they seem likely to reflect real trends. Because resources were not available to reanalyze the SNDA-II data, comparisons focus on the nutrient content of meals *as served*, as some relevant data on meals *as offered* are not available in the SNDA-II report.

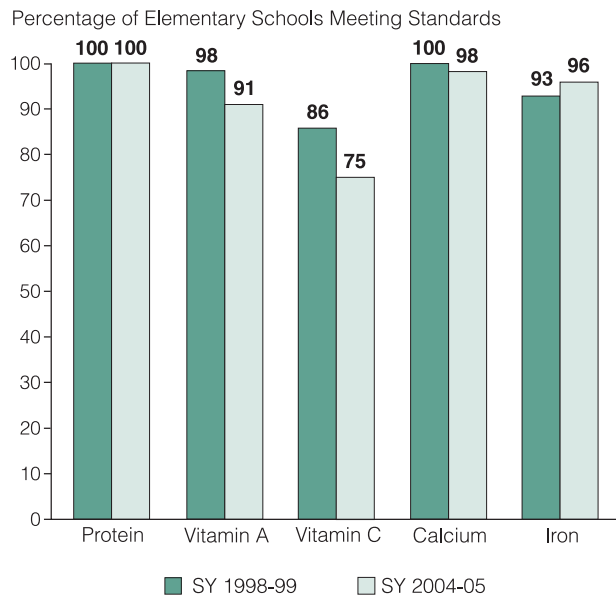
### Lunch

**There were no significant changes in the proportion of schools serving lunches that met SMI standards for most targeted nutrients between SY 1998-1999 (SNDA-II) and SY 2004-2005 (SNDA-III), particularly among elementary schools (Figure 9A).** Among secondary schools, there was a statistically significant decline in the percentage of schools meeting the vitamin A standard (Figure 9B).

**In contrast, some improvement occurred in saturated fat content.** The proportion of elementary schools whose average lunch met the standard for saturated fat (less than 10 percent of energy) more than doubled, from 15 percent in SY 1998-1999 to 34 percent in SY 2004-2005 (Figure 10A); for secondary schools, the percentage of schools meeting the standard nearly doubled, from 13 to 24 percent (Figure 10B). The percentage of schools meeting the total fat standard had not changed significantly since SY 1998-1999; 26 percent of elementary schools and 12 percent of secondary schools served lunches that met the total fat standard in SY 2004-2005.

Figure 9A

**Similar Proportions of Elementary Schools Met SMI Standards for Key Nutrients Served at Lunch in SNDA-III (SY 2004-05) and in SNDA-II (SY 1998-99)**

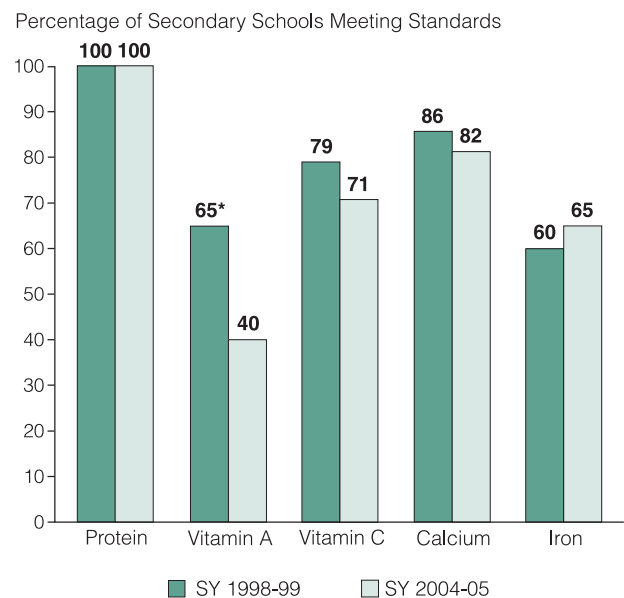


Source: School Nutrition Dietary Assessment-III, Menu Survey (Volume I, Table VIII.1) and School Nutrition Dietary Assessment-II, Menu Survey (Fox et al. 2001).



Figure 9B

**Similar Proportions of Secondary Schools Met SMI Standards for Key Nutrients Served at Lunch (Except Vitamin A) in SNDA-III (SY 2004-05) and in SNDA-II (SY 1998-99)**



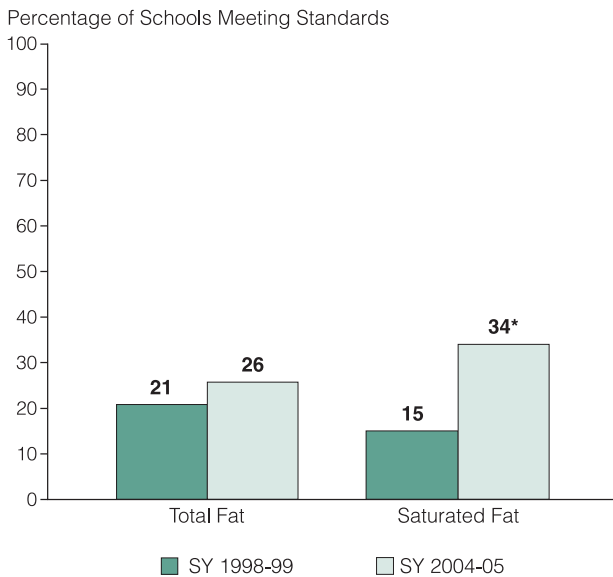
Source: School Nutrition Dietary Assessment-III, Menu Survey (Volume I, Table VIII.1) and School Nutrition Dietary Assessment-II, Menu Survey (Fox et al. 2001).

\*SNDA-III result is significantly different from the SNDA-II result at the .05 level.





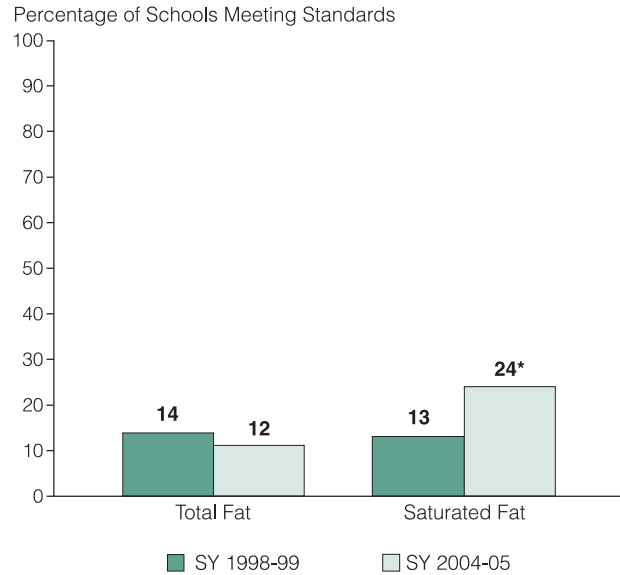
Figure 10A  
**Significantly More Elementary Schools Served Lunches Meeting the SMI Standard for Saturated Fat in SNDA-III (SY 2004-05) than in SNDA-II (SY 1998-99); No Significant Change in Total Fat**



Source: School Nutrition Dietary Assessment-III, Menu Survey (Volume I, Table VIII.1) and School Nutrition Dietary Assessment-II, Menu Survey (Fox et al. 2001).

\*SNDA-III result is significantly different from the SNDA-II result at the .05 level.

Figure 10B  
**Significantly More Secondary Schools Served Lunches Meeting the SMI Standard for Saturated Fat in SNDA-III (SY 2004-05) than in SNDA-II (SY 1998-99); No Significant Change in Total Fat**



Source: School Nutrition Dietary Assessment-III, Menu Survey (Volume I, Table VIII.1) and School Nutrition Dietary Assessment-II, Menu Survey (Fox et al. 2001).

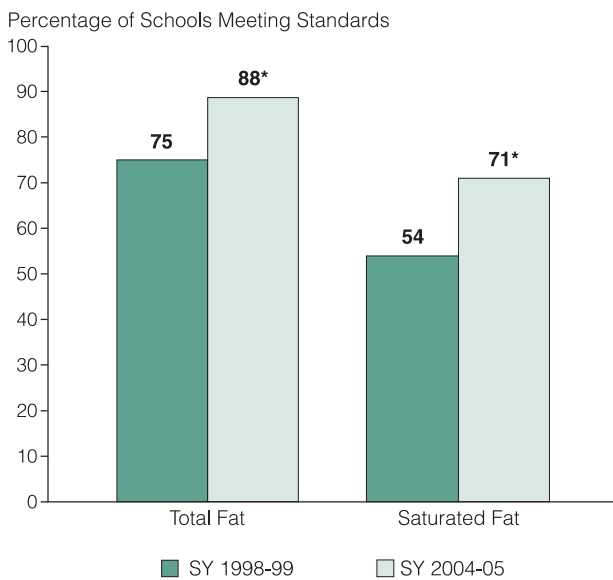
\*SNDA-III result is significantly different from the SNDA-II result at the .05 level.

## Breakfast

**Large proportions of schools served SBP breakfasts that met the RDA standards for most SMI nutrients in both SNDA-II and SNDA-III, and most changes were not statistically significant.** Exceptions were vitamin C (for which the proportion of elementary schools meeting the SMI standard fell from 98 to 87 percent) and iron (for which the proportion of secondary schools meeting the standard increased from 57 to 78 percent).

### Breakfasts made progress in meeting the standards for total fat in elementary schools and for saturated fat in

Figure 11A  
**Significantly More Elementary Schools Served Breakfasts Meeting SMI Standards for Both Total and Saturated Fat in SNDA-III (SY 2004-05) than in SNDA-II (SY 1998-99)**

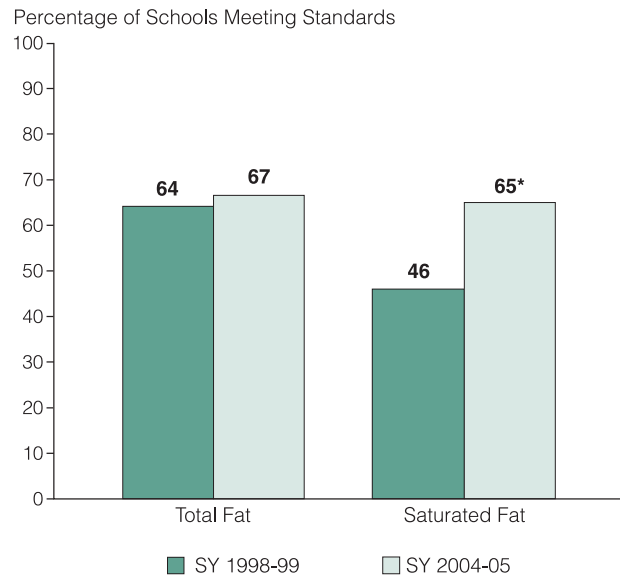


Source: School Nutrition Dietary Assessment-III, Menu Survey (Volume I, Table VIII.11) and School Nutrition Dietary Assessment-II, Menu Survey (Fox et al. 2001).

\*SNDA-III result is significantly different from the SNDA-II result at the .05 level.

**both elementary and secondary schools.** There were statistically significant increases in the proportion of elementary schools meeting the standards for total fat (from 75 to 88 percent) and in the proportion of schools meeting the standard for saturated fat—about 71 percent of schools met the standard for saturated fat (versus 54 percent in SY 1998-1999) (Figure 11A). Among secondary schools, about two-thirds of schools served breakfasts meeting the total fat standard in both periods, but the proportion of schools meeting the standard for saturated fat increased from 46 percent in SY 1998-1999 to 65 percent in SY 2004-2005 (Figure 11B).

Figure 11B  
**Significantly More Secondary Schools Served Breakfasts Meeting SMI Standards for Saturated Fat in SNDA-III (SY 2004-05) than in SNDA-II (SY 1998-99)**



Source: School Nutrition Dietary Assessment-III, Menu Survey (Volume I, Table VIII.11) and School Nutrition Dietary Assessment-II, Menu Survey (Fox et al. 2001).

\*SNDA-III result is significantly different from the SNDA-II result at the .05 level.



## 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. Such venues may be operated by departments or groups other than the school foodservice program.

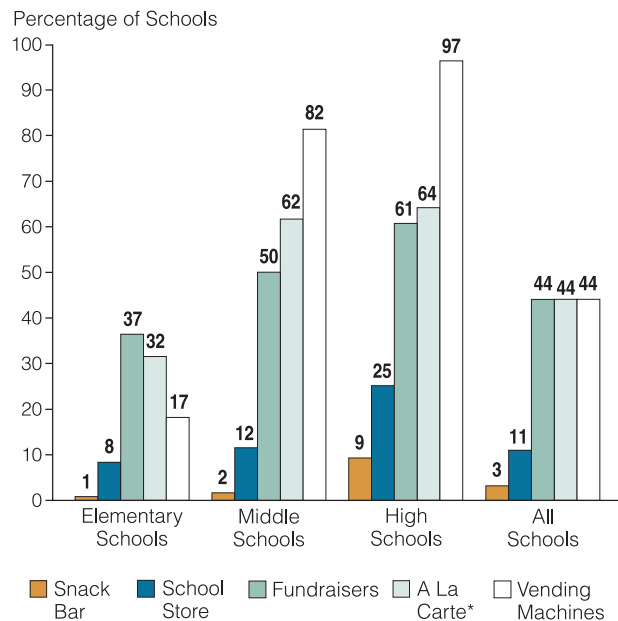
USDA regulations currently define competitive foods more narrowly, as foods sold in the foodservice area during breakfast or lunch periods, and regulate them only by prohibiting the sale of foods of minimal nutritional value—for example, carbonated beverages and hard candy—in the foodservice area during meal periods. State agencies and SFAs may impose additional restrictions.

### Availability

**In SY 2004-2005, competitive foods were widely available, especially in middle and high schools (Figure 12).** The most common sources of competitive foods were vending machines, a la carte sales, and fundraisers. Roughly one-third of elementary schools and close to two-thirds of middle and high schools had foods or beverages other than milk for sale on an a la carte basis during lunch periods. Fundraisers

Figure 12

### Competitive Foods Were Widely Available, Especially in Middle and High Schools



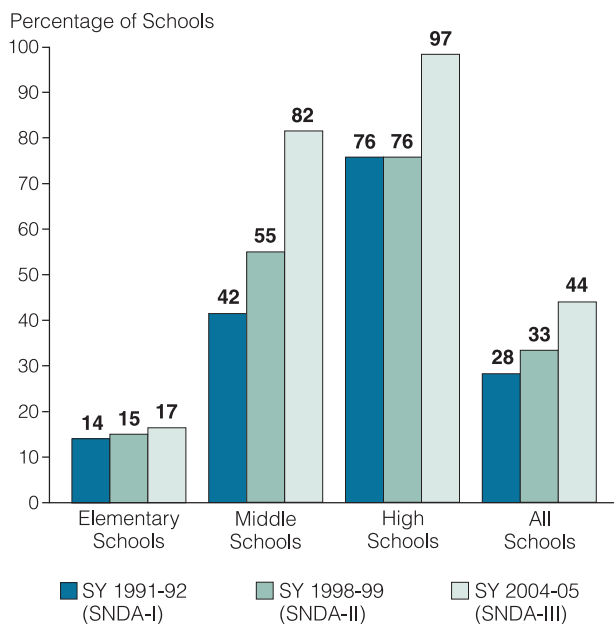
Source: School Nutrition Dietary Assessment-III, Surveys of Foodservice Managers and Principals (see Volume I, Tables III.6 and III.7) and A La Carte Checklist (see Volume I, Table IV.8).

\*Food or beverages other than milk available during lunch.

that focused on food or beverage sales occurred in 37 percent of elementary schools and 50 to 60 percent of middle and high schools. Vending machines were available in 17 percent of elementary schools but were present in 82 percent of middle schools and 97 percent of high schools.

**The availability of vending machines in middle and high schools has increased dramatically since the early 1990s (Figure 13).** Compared to SY 1991-1992 (when SNDA-I data were collected), the percentage of middle schools with vending machines has almost doubled (increasing from 42 to 82 percent), and the percentage of high schools with vending machines has increased about a quarter (from 76 to 97 percent).

Figure 13  
**The Availability of Vending Machines in Middle and High Schools Has Increased Since the Early 1990s**



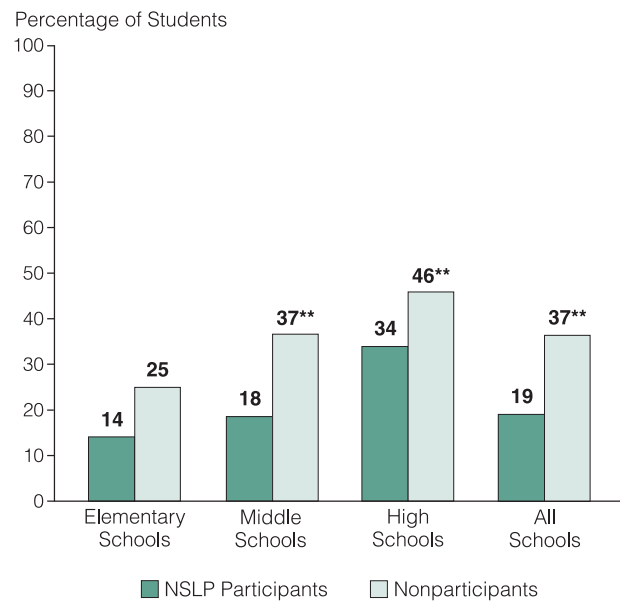
Source: School Nutrition Dietary Assessment-I, II, and III, Surveys of Foodservice Managers and Principals (see SNDA-I, Burghardt et al. 1993, Table III.6; SNDA-II, Fox et al. 2001, Exhibit 2.23; and SNDA-III, Volume I, Table III.6).

## Consumption

**NSLP participants were less likely than nonparticipants to consume competitive foods (Figure 14).** 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 a third (34 percent) of NSLP participants and close to half (46 percent) of nonparticipants consumed one or more competitive foods. At all school levels, competitive foods were most often consumed at lunch.

Figure 14  
**NSLP Participants Were Significantly Less Likely than Nonparticipants to Consume Competitive Foods**



Source: School Nutrition Dietary Assessment Study-III, 24-Hour Dietary Recalls (see Volume II, Table VI.9). Sample includes all students, including those who did not consume a lunch.

Note: Data were not statistically adjusted.

\*\*Difference between participants and nonparticipants is significantly different from zero at the .01 level.

**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 (Figure 15).** 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 significantly 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.

Table 2

**Top Five Competitive Foods Consumed by NSLP Participants and Nonparticipants**

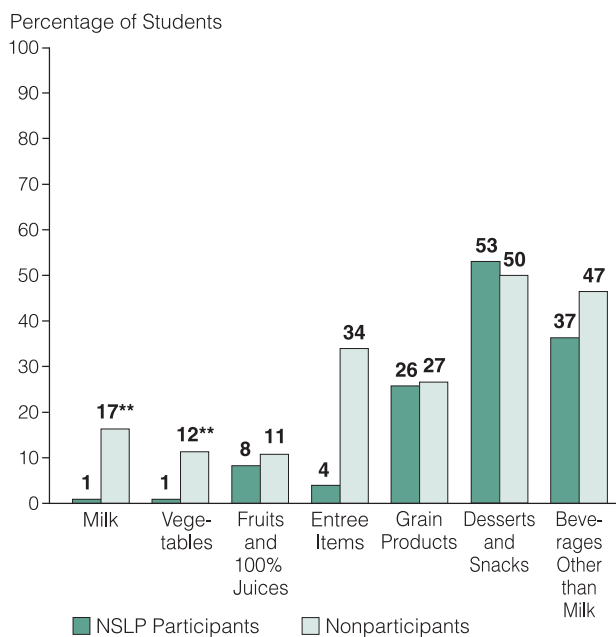
NSLP Participants	Nonparticipants
1. Candy (28%)	1. Candy (24%)
2. Cookies, cakes, brownies (18%)	2. Cookies, cakes, brownies (19%)
3. Carbonated soda (16%)	3. Carbonated soda (17%)
4. Crackers/pretzels (14%)	Juice drinks (17%)
5. Juice drinks (13%)	Milk (17%)
	4. Bottled water (12%)
	5. Corn/tortilla chips (11%)

Source: School Nutrition Dietary Assessment Study-III, 24-Hour Dietary Recalls (see Volume II, Table VI.10). Sample includes students who consumed one or more competitive foods.

Notes: Numbers in parentheses show the percentage of students who consumed a specific food, among students who consumed one or more competitive foods. None of the differences between participants and nonparticipants is statistically significant.

Figure 15

**Desserts and Snacks and Beverages Other than Milk Were the Most Commonly Consumed Competitive Food Groups**



Source: School Nutrition Dietary Assessment Study-III, 24-Hour Dietary Recalls (see Volume II, Table VI.10). Sample includes only students who consumed one or more competitive foods.

Note: Entree items include meats and meat alternates, such as chicken nuggets, as well as combination items, such as sandwiches and pizza.

\*\*Difference between participants and nonparticipants is significantly different from zero at the .01 level.

**Candy was the most commonly consumed competitive food for both NSLP participants and nonparticipants (Table 2).**

Candy 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/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 due primarily to elementary school nonparticipants, many of whom purchased milk to go with lunches brought from home.

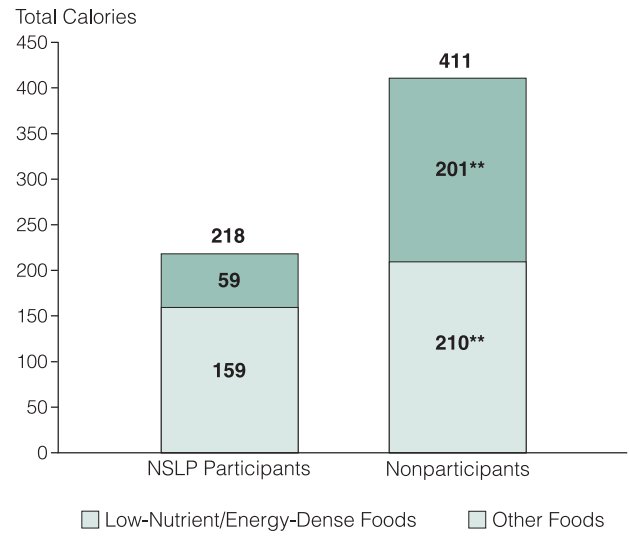
**The competitive foods consumed by nonparticipants provided more calories and were significantly higher in fat and saturated fat than the competitive foods consumed by NSLP participants.**

On average, NSLP participants who consumed competitive foods obtained 218 calories from these foods, compared with 411 calories for nonparticipants (Figure 16). 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/brownies, carbonated sodas, and juice drinks—all likely to be high in sugar (Table 2). 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 (Figure 15).

**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-nutrient, energy-dense foods 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, 159 of 218 calories (73 percent of competitive food calories) came from these foods (Figure 16). 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, or 51 percent).

Figure 16  
**Among Students Who Consumed Competitive Foods, Both NSLP Participants and Nonparticipants Consumed More than 150 Calories from Foods That Were Low in Nutrients and Energy Dense**



Source: School Nutrition Dietary Assessment Study-III, 24-Hour Dietary Recalls (see Volume II, Table VI.II). Sample includes only students who consumed one or more competitive foods.  
 \*\*Difference between participants and nonparticipants is significantly different from zero at the .01 level.



## Students' Dietary Intakes

An important part of the SNDA-III study was comparing school-day dietary intakes of NSLP and SBP participants and nonparticipants. Such comparisons provide useful information about the diets of students who do and do not participate in the school meal programs. Statistical techniques were used in most analyses to account for differences in observed characteristics of school meal participants and nonparticipants. However, even with 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 *effects* of the school meal programs.<sup>5</sup>

### Dietary Intakes of NSLP Participants and Nonparticipants

#### Mean Intakes at Lunch

**The average lunch consumed by NSLP participants included 88 percent of the calories available in the average lunch served.** High school NSLP participants consumed the greatest share of the calories available in NSLP lunches (737 of 787 calories, or 94 percent), and middle school NSLP participants consumed the smallest share (619 of 743 calories, or 83 percent).

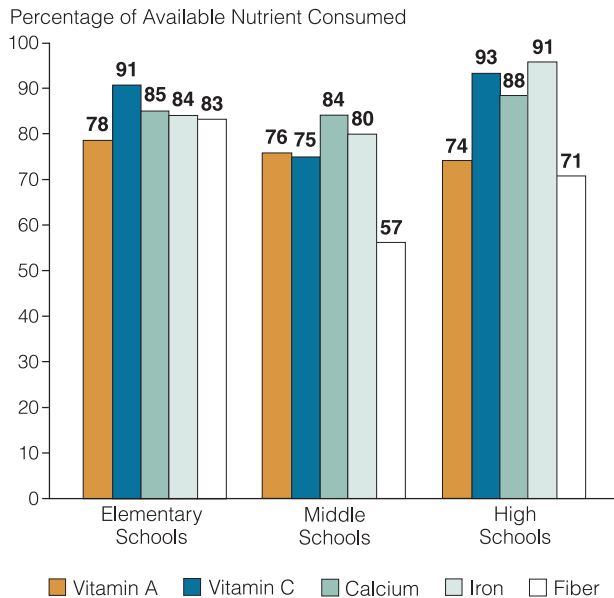
**NSLP participants at all school levels consumed a smaller proportion of the vitamin A and fiber available in the average lunch served than of other nutrients (Figure 17).** On average, NSLP participants consumed roughly three-quarters of the vitamin A available in NSLP lunches. Middle school NSLP participants consumed 57 percent of the fiber available in NSLP lunches, and high school NSLP participants consumed 71 percent of the available fiber. Except for vitamin C among middle school participants, participants consumed 80 percent or more of the vitamin C, calcium, and iron available in NSLP lunches.

**In general, lunches consumed by NSLP participants and nonparticipants provided similar amounts of energy.** 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

Figure 17

**Vitamin A and Fiber Were Proportionately the Least Consumed Nutrients in NSLP Lunches**



Source: School Nutrition Dietary Assessment-III, Menu Survey and 24-Hour Recalls; derived from Volume II, Appendix Table F1.a (nutrients in average lunch consumed) and Volume I, Table VI.5 (nutrients in average lunch selected). Data were not statistically adjusted. Student sample includes only NSLP participants.

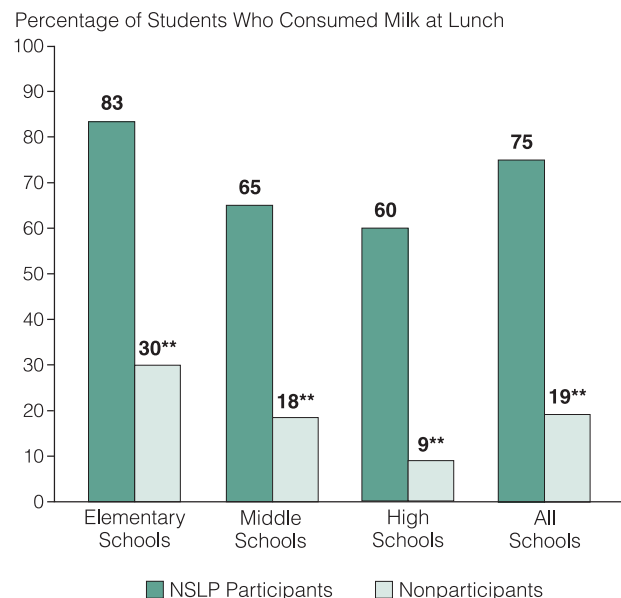
provided significantly more fat and saturated fat, as a percentage of total energy, than the lunches consumed by nonparticipants. The participant-nonparticipant difference in the percentage of energy provided by saturated fat was also significant overall (11.5 percent of energy from saturated fat versus 10.6 percent).

**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 (Figure 18). Milk was the first or second most important source of all these nutrients in the lunches consumed by students.

**Many of the significant differences in average intakes of NSLP participants and nonparticipants at lunch per-**

Figure 18

**NSLP Participants Were Significantly More Likely than Nonparticipants to Consume Milk at Lunch**



Source: School Nutrition Dietary Assessment-III, 24-Hour Recalls (see Volume II, Table VI.7). Sample excludes students who did not consume a lunch.

Note: Data were not statistically adjusted.

\*\*Difference between participants and nonparticipants is significantly different from zero at the .01 level.

**sisted 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. 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.

**Usual Daily Intakes of Energy and Macronutrients**

To assess the quality and adequacy of students' overall diets—considering foods consumed at school, as well as those consumed elsewhere during a school day—students' usual daily intakes were compared to the DRIs. The DRIs are the most up-to-date scientific standards for assessing diets of individuals and population groups. The DRIs define different standards for different types of nutrients. The DRI



Table 3  
**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.**

standards used in this analysis, and the nutrients to which they are applied, are described in Table 3. 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*.

**Among elementary and high school students, NSLP participants had significantly higher usual daily intakes of energy than 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 8 percent of high school nonparticipants did not consume a lunch.

**Overall, there were no statistically significant differences between NSLP participants and nonparticipants in the extent to which usual daily macronutrient intakes conformed to DRI standards.** Seventy-seven percent of NSLP participants and 94 percent of nonparticipants had usual daily fat intakes that fell within the AMDR defined in the DRIs (25 to 35 percent of total energy). 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 (consume more

fat [as a percentage of energy] than recommended) than to fall below it. For both NSLP participants and nonparticipants, usual daily intakes of carbohydrate and protein were generally consistent with the respective AMDRs. Usual daily intakes that fell below the AMDRs were rare.

**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 should provide less than 10 percent of total calories.

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

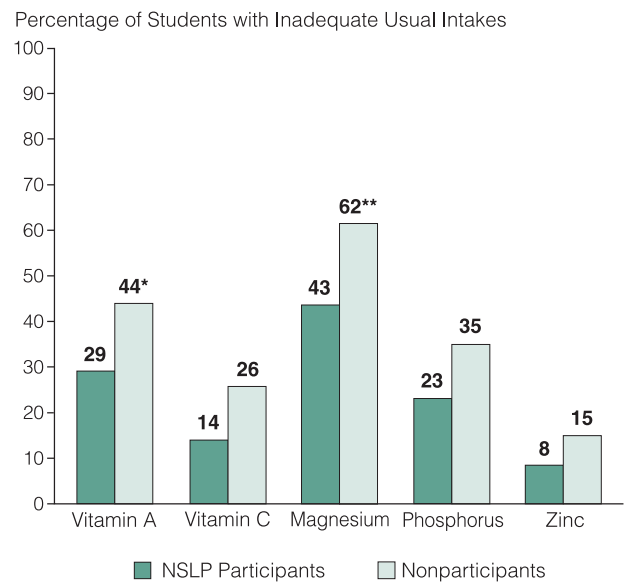
**There were no significant differences between elementary school NSLP participants and nonparticipants in the prevalence of inadequate usual daily intakes of vitamins or minerals.** Except for vitamin E, for which the prevalence of inadequacy was high for all groups of students, inadequate usual daily intakes of vitamins and minerals were rare among elementary school students.<sup>6</sup>

**Middle school NSLP participants were significantly less likely than nonparticipants to have inadequate usual daily intakes of vitamin A and magnesium (Figure 19).** Just under 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

Figure 19

### Middle School NSLP Participants Were Significantly Less Likely than Nonparticipants to Have Inadequate Usual Daily Intakes of Vitamin A and Magnesium



Source: School Nutrition Dietary Assessment Study-III, 24-Hour Recalls (see Volume II, Table VI.6). Sample includes all students, including those who did not consume a lunch.

\*Difference between participants and nonparticipants is significantly different from zero at the .05 level.

\*\*Difference between participants and nonparticipants is significantly different from zero at the .01 level.

school level and gender indicate that the prevalence of inadequate intakes was particularly high for high school girls.

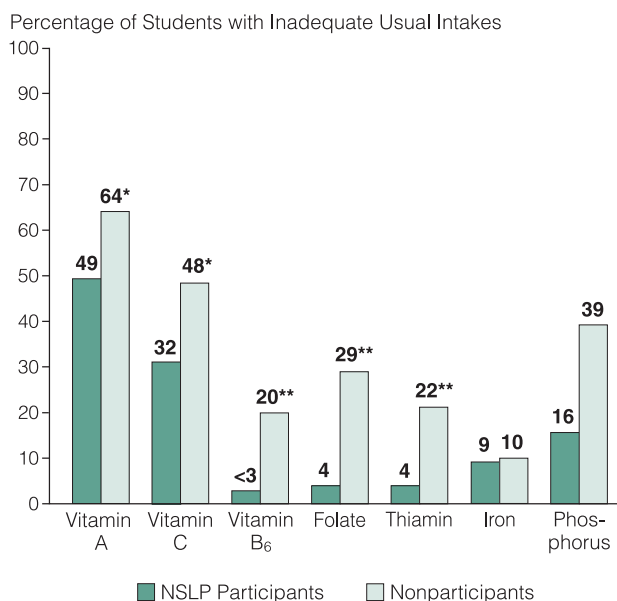
**High school NSLP participants were significantly less likely than nonparticipants to have inadequate usual daily intakes of vitamin A, vitamin C, vitamin B<sub>6</sub>, folate, thiamin, and phosphorus (Figure 20).** Except for vitamin A, the differences between participants and nonparticipants are largely attributable to 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 (Figure 21).** Usual daily calcium intakes of middle school and high school NSLP participants, expressed as a percentage of the AI, averaged 88 and 87 percent, respectively, compared to 64 and 71 percent for middle and high school nonparticipants. This difference in

Figure 20

**High School NSLP Participants Were Significantly Less Likely than Nonparticipants to Have Inadequate Usual Daily Intakes of Several Vitamins and Minerals**



Source: School Nutrition Dietary Assessment Study-III, 24-Hour Recalls (see Volume II, Table VI.6). Sample includes all students, including those who did not consume a lunch.

\*Difference between participants and nonparticipants is significantly different from zero at the .05 level.

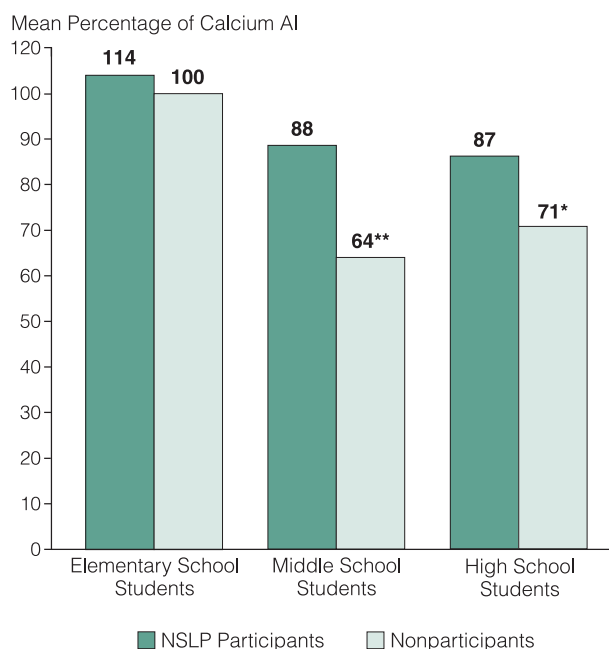
\*\*Difference between participants and nonparticipants is significantly different from zero at the .01 level.

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 (Table 3). 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 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

Figure 21

**Middle and High School NSLP Participants Had Significantly Higher Mean Usual Daily Calcium Intakes than Nonparticipants**



Source: School Nutrition Dietary Assessment Study-III, 24-Hour Recalls (see Volume II, Table VI.6). Sample includes all students, including those who did not consume a lunch.

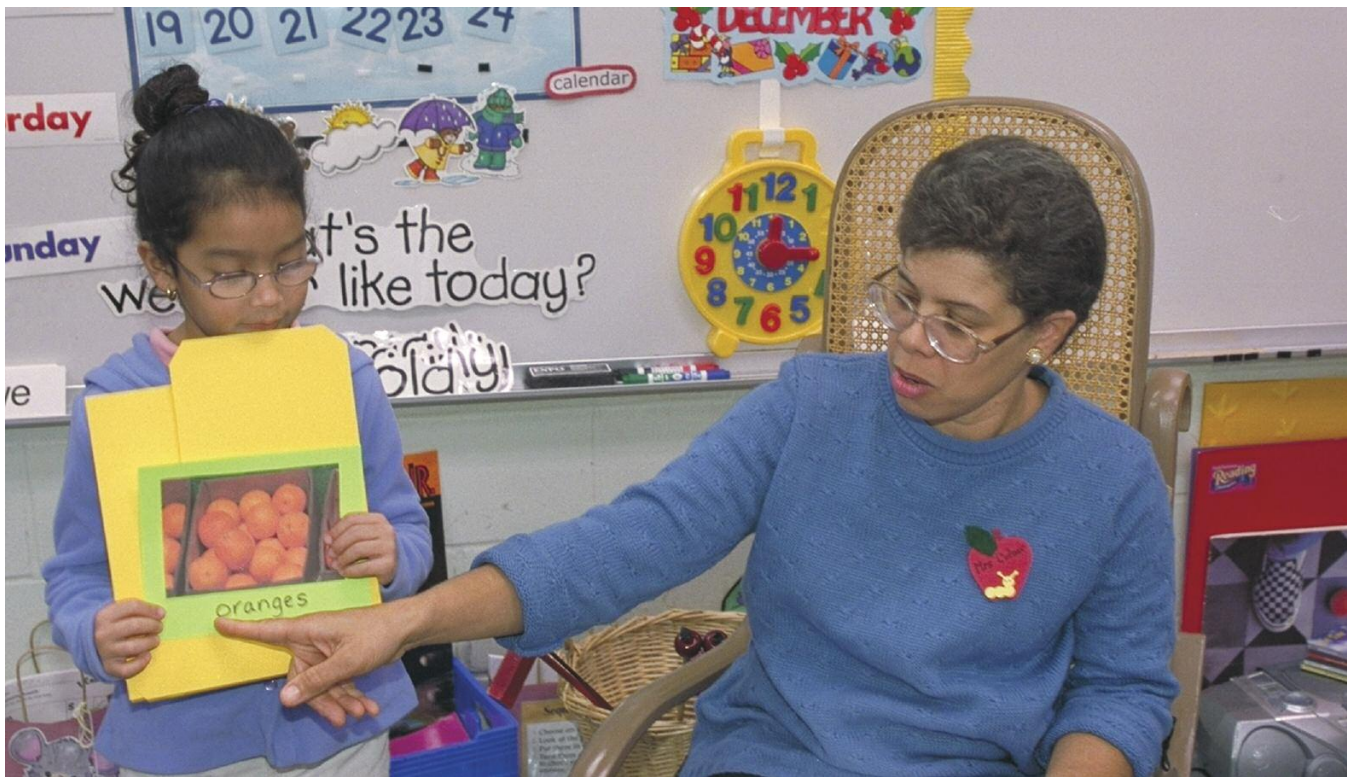
\*Difference between participants and nonparticipants is significantly different from zero at the .05 level.

\*\*Difference between participants and nonparticipants is significantly different from zero at the .01 level.

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.** 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, less 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 than among elementary and middle school students (16 to 21 percent versus 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 fiber AI, compared to 45 percent of the AI for nonparticipants.

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

### **Mean Intakes at Breakfast**

**The average breakfast consumed by SBP participants included 94 percent of the calories available in the average breakfast served.** Elementary school SBP participants consumed essentially all of the foods served to them in SBP breakfasts, and high school SBP participants consumed more than 90 percent of the calories available in SBP breakfasts (522 of 565 calories, or 92 percent). Middle school SBP participants, on the other hand, consumed only 75 percent of the calories available in SBP breakfasts (396 of 526 calories). Consequently, middle school participants consumed only about two-thirds of the iron and fiber available in SBP breakfasts and less than three-quarters of the available vitamin A.

**Overall, breakfasts consumed by both SBP participants and nonparticipants provided similar amounts of energy and macronutrients.** On average, breakfasts consumed by both SBP participants and nonparticipants provided roughly 420 to 450 calories. Differences in intakes of key macronu-

trients were concentrated among high school students. In this group of students, breakfasts consumed by SBP participants provided significantly greater percentages of energy from fat and protein and a significantly smaller percentage of energy from carbohydrate than breakfasts consumed by nonparticipants. Differences in percentage of energy from protein and carbohydrate were also observed in the full sample.

**There were relatively few differences in mean breakfast intakes of SBP participants and nonparticipants in elementary schools and high schools.** Among elementary school students, differences in mean breakfast intakes were limited to potassium (SBP participants had a higher mean intake) and cholesterol (SBP participants had a lower mean intake). Among high school students, mean breakfast intakes of SBP participants and nonparticipants differed significantly only for vitamin C, sodium, and fiber (on a gram-per-1,000-calorie basis). SBP participants had significantly higher mean breakfast intakes of vitamin C and sodium than nonparticipants, and a significantly lower mean breakfast intake of fiber.

**Among middle school students, there were many significant differences in mean breakfast intakes of SBP participants and nonparticipants.** In this group of 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, zinc, and cholesterol than breakfasts consumed by nonparticipants. Except for cholesterol, observed differences in mean breakfast intakes are attributable largely to the fact that SBP participants were significantly less likely than nonparticipants to consume fortified ready-to-eat breakfast cereals (29 versus 40 percent). Such cereals were the leading contributors of vitamins and minerals in the breakfasts consumed by both SBP participants and nonparticipants.

**Relatively few of the differences observed in the breakfast intakes of SBP participants and nonparticipants remained significant over 24 hours.** The difference observed among high school students in the relative contribution of fat to overall energy intake dissipated during the day. In fact, over 24 hours, high school SBP participants obtained a significantly smaller percentage of their total energy intake from saturated fat than nonparticipants (10.4

versus 11.1). All the differences observed in the vitamin, mineral, and fiber intakes of middle school SBP participants and nonparticipants dissipated during the day. Among elementary school students, the greater mean intake of potassium among SBP participants persisted over 24 hours. In addition, mean intakes of vitamin B<sub>12</sub>, calcium, and phosphorus were higher over 24 hours for SBP participants than for nonparticipants.<sup>7</sup>

### Usual Daily Intakes of Energy and Macronutrients<sup>8</sup>

**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 than among 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—by 75 percent—than for nonparticipants (4 versus 16 percent). Among middle school students, the prevalence of inadequate usual daily magnesium intakes was 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, which suggests that the prevalence of inadequate usual daily calcium intakes among elementary school students is 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. Mean usual daily potassium intakes of students at all school levels were less than 100 percent of their respective AIs.

### 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).

**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, less than 20 percent of SBP participants and nonparticipants had usual daily cholesterol intakes that exceeded the recommended maximum of 300 mg. The prevalence of excessive usual daily cholesterol intakes varied widely by school level and participation status, from 6 to 46 percent. Although the prevalence of excessive usual daily cholesterol intakes was consistently lower among SBP participants than nonparticipants, none of the differences was statistically significant.

**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).



## For More Information

The SNDA-III study results offer information on how the school meal programs were operating when SMI had been in place for nearly 10 years, while also providing a benchmark for FNS to use in determining how best to improve the programs. For in depth results, please consult the following technical reports:

U.S. Department of Agriculture, Food and Nutrition Service, Office of Research, Nutrition, and Analysis, *School Nutrition Dietary Assessment Study-III: Volume I: School Foodservice, School Food Environment, and Meals Offered and Served*, by Anne Gordon, Mary Kay Crepinsek, Renée Nogales, and Elizabeth Condon. Project Officer: Patricia McKinney. Alexandria, VA: 2007.

U.S. Department of Agriculture, Food and Nutrition Service, Office of Research, Nutrition, and Analysis, *School Nutrition Dietary Assessment Study-III: Volume II:*

*Student Participation and Dietary Intakes*, by Anne Gordon, Mary Kay Fox, Melissa Clark, Renée Nogales, Elizabeth Condon, Philip Gleason, and Ankur Sarin. Project Officer: Patricia McKinney. Alexandria, VA: 2007.

U.S. Department of Agriculture, Food and Nutrition Service, Office of Research, Nutrition, and Analysis, *School Nutrition Dietary Assessment Study-III: Volume III: Sampling and Data Collection*, by Anne Gordon, John Hall, Eric Zeidman, Mary Kay Crepinsek, Melissa Clark, and Elizabeth Condon. Project Officer: Patricia McKinney. Alexandria, VA: 2007.

In addition, the study will provide material for many years of future research. The data collected for the SNDA-III study are available to researchers in public-use files. The files and documentation are available from FNS.

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## Endnotes

<sup>1</sup> U.S. Department of Agriculture, Food and Nutrition Service, Office of Analysis, Nutrition, and Evaluation, *School Nutrition Dietary Assessment Study-II*, by Mary Kay Fox, Mary Kay Crepinsek, Patty Connor, and Michael Battaglia. Project Officer: Patricia McKinney. Alexandria, VA: 2001.

U.S. Department of Agriculture, Food and Nutrition Service, Office of Analysis and Evaluation, *The School Nutrition Dietary Assessment Study: School Food Service, Meals Offered, and Dietary Intakes*, by John Burghardt, Anne Gordon, Nancy Chapman, Philip Gleason, and Thomas Fraker. Project Officers: Leslie Christovich and Patricia McKinney. Alexandria, VA: 1993.

<sup>2</sup> Food Research and Action Center. "School Breakfast Scorecard: 2005." December 2005. [[www.frac.org/pdf/2005\\_SBP.pdf](http://www.frac.org/pdf/2005_SBP.pdf)]. Accessed November 16, 2006.

<sup>3</sup> These policies, known as Provision 2 and Provision 3, are described in detail in Volume I, Chapter II.

<sup>4</sup> For more information on the analysis of meals offered and served, see Volume I, Appendix C.

<sup>5</sup> Multivariate regressions were used to control for student characteristics in assessing differences in mean intakes at

lunch and breakfast. Propensity-score matching techniques were used in assessing differences in usual daily intakes, relative to the DRIs. See Chapter V in Volume II of the full report for a detailed description of statistical methods.

<sup>6</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 noted limitations of both the data used to establish the EAR for vitamin E and the data used to assess vitamin E intakes. Reference: U.S. Department of Agriculture, Economic Research Service, *Review of Dietary Reference Intakes for Selected Nutrients: Challenges and Implications for Federal Food and Nutrition Policy*, by Barbara Devaney, Mary Kay Crepinsek, Kenneth Fortson, and Lisa Quay. Washington, DC: 2007.

<sup>7</sup> Mean breakfast intakes of calcium and phosphorus were greater for SBP participants than for nonparticipants, but the difference was not statistically significant.

<sup>8</sup> See Table 3 and the associated text for a discussion of the reference standards used to assess students' usual daily intakes.

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