Availability of More-Healthy and Less-Healthy Food Choices in American Schools

A National Study of Grade, Racial/Ethnic, and Socioeconomic Differences

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Background: The purposes of this study are to examine the extent to which (1) more-healthy and less-healthy food choices are available to American secondary students in their schools, and (2) there are differences in the availability of such foods as a function of grade, racial/ethnic background, and socioeconomic status (SES).

Methods: United States nationally representative samples of over 37,000 students in 345 secondary schools were surveyed in 2004 and 2005 as part of the Youth, Education, and Society (YES) study and the Monitoring the Future (MTF) study. In the YES study, school administrators and food service managers completed self-administered questionnaires on food policies and food offerings in their schools. In the MTF study, students in the same schools completed self-administered questionnaires. Data were analyzed in 2006.

Results: A greater percent of high school students have access to both more-healthy and less-healthy food choices than middle school students. Compared to white students, fewer black students have access to certain healthy foods (lowfat salty snacks, lowfat cookies and pastries). Hispanic high school students have greater access to regular ice cream and to fruits and vegetables. Otherwise the racial/ethnic group differences are modest. However, there is a positive linear association between SES (as indicated by parental education) and (1) access to most types of healthier snacks from vending machines, school/student stores, or snack bars/carts and (2) the number of healthier foods offered à la carte in the cafeteria. The association between SES and access to less-healthy snacks varies more by item.

Conclusions: Indisputably, less-healthy foods are more available than more-healthy foods in the nation's schools. At a time when food and beverage offerings are under intense policy scrutiny, this study provides a comprehensive assessment of the types of foods made available to students. While it is encouraging to see schools offering healthy food alternatives, such as lowfat snacks and fruits and vegetables, the findings strongly suggest that the availability of more-healthy snacks needs to be increased, particularly for racial/ethnic minorities and youth of lower SES. Simultaneously, schools could considerably decrease the availability of less-healthy snack choices available to students. Future monitoring is needed to evaluate the effectiveness of the food industry's recent agreement to play a role in helping to solve these problems.

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Introduction

To ensure that American students receive meals with adequate nutritional value, the United States Department of Agriculture's (USDA) Food and Nutrition Service (FNS) administers the School Lunch and School Breakfast Programs that provide meals (breakfast, lunch, and in some schools, after-school snacks) that follow nutritional guidelines set forth by the FNS.[1] These government guidelines are intended to limit total and saturated fat and to ensure that meals have a minimum amount of vitamins and nutrients. However, concerns have emerged regarding the nutritional value of foods and beverages that students consume in schools. These concerns stem largely from the increased commercialization of the foods and beverages provided to students in schools that do not fall under the administration of the FNS.[2,3] "Competitive foods" is the label given by the USDA to all foods

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and beverages sold in schools that are not part of the meals provided through the School Lunch and School Breakfast Programs. These competitive foods, which are largely composed of items having high fat, high sodium, and/or added sugars (such as cookies, candies, salty chips, and carbonated beverages), are usually sold in vending machines, à la carte in the cafeteria when meals are offered, and through school stores, canteens, and snack bars/carts.

Although many of these foods and beverages do not meet the government's recommended nutritional value, schools make them available to students because the contracts with the food and beverage industry provide needed revenue that at least partially offset budget woes that schools have experienced in recent years.[4] Despite some restrictions on their sales by federal and state governments,[2] studies have shown that students' access to these competitive foods in one or more of those venues (vending machines, à la carte) has been nearly universal.[5–8]

In response to the increased obesity epidemic[9–13] and the concern about foods available to American students,[5–8] a number of states and schools have begun initiatives to decrease the availability of less-healthy foods and to increase the availability of nutritious food to students.

The present study extends the work done by the Centers for Disease Control and Prevention (CDC) School Health Policies and Programs Study (SHPPS).[6,14] Briefly, the purpose of SHPPS was to obtain information on school health policies and programs at the state, district, school, and classroom levels. SHPPS was conducted in 1994 and 2000, and a third survey was scheduled for 2006. Findings from the present study, the Youth, Education, and Society (YES) School Policies and Programs study, will serve to complement the findings from the SHPPS in four important ways. First, the present study is in the beginning stages of what will be annual monitoring of U.S. school and school district policies that are likely to have an impact on the foods offered to middle and high school students. Second, it will be possible to examine the extent to which types of foods available to all American students, by racial/ethnic backgrounds and socioeconomic levels, vary over time as a function of federal, state, district, and school policy changes. Third, data are presented that reflect the percentage of American students who are exposed to various foods rather than data that simply reflect the percentage of schools that offer certain foods, as was the case with the SHPPS. That takes into account the fact that large schools influence a disproportionately large number of students. Fourth, original national survey data are presented that allow a comparison of the school food environments faced by students of different levels of schooling and different racial/ethnic and socioeconomic status (SES) backgrounds. This information will serve to inform scholars and policymakers about the role that the schools may play in disparities in overweight among these groups in the entire country. This latter activity is made possible by the connection of data from school administrator surveys with data from students in the same schools.

The overrepresentation of overweight and obesity among youth from certain racial/ethnic backgrounds and low socioeconomic groups[9,15–17] highlights the importance of identifying the mechanisms that can serve as targets of interventions in order to prevent and reduce obesity among all children, and in particular among those most at risk. To this end, this article focuses specifically on describing the availability and types of foods offered by schools to students by race/ethnicity and SES, with distinctions made between different grade levels (grade 8 in middle school versus grades 10 and 12 in high school).

Methods

Samples and Survey Methods

The analyses utilized data from two ongoing studies: Monitoring the Future (MTF), funded by the NIDA, and Youth, Education, and Society (YES), funded by the Robert Wood Johnson Foundation (RWJF). Both studies were conducted at the University of Michigan's Institute for Social Research (ISR). MTF involves annual surveys of nationally representative samples of 8th-, 10th-, and 12th-grade students, located in approximately 410 public and private schools; each school participates for 2 consecutive years. In YES, administrators in schools that are in the half-samples cycling out of the MTF survey that year are asked to complete a lengthy questionnaire describing school policies and programs related to various health issues, including food services, physical education, and substance use. These are nationally representative half-sample replicates. Data were analyzed in 2006.

MTF design and methods. The design and methods for the MTF project are summarized briefly here; a detailed description is available elsewhere.[18] At each of three grade levels (8th, 10th, 12th), a multistage sampling design was used to obtain nationally representative samples of students from the 48 contiguous states. The stratified random sampling procedure involved three stages:[19] (1) geographic regions were selected, (2) schools were selected within regions with probability proportional to the estimated number of students in the target grade, and (3) approximately 45,000 students were selected per year within schools, usually by means of randomly selecting whole classrooms. Sample weights were assigned to each student to take into account variations in selection probabilities that occurred at all stages of the sampling procedures. Participating students completed a self-administered questionnaire during a normal class period.

The current study used the student self-reported race/ethnicity and parent education. Students' racial/ethnic background was measured by the item "How do you describe yourself?" For the present study, students were coded as being of white, black, Hispanic, or other background. There were insufficient cases for other racial/ethnic groups to make reliable estimates. Parent education was defined as an average

of father's and mother's educational attainment (with one missing data case permitted). The measure was coded as follows: 1=completed grade school or less, 2=some high school, 3=completed high school, 4=some college, 5=completed college, 6=graduate or professional school after college. Parent education was utilized as a proxy for SES. (Parent education was chosen as a measure of SES because students are generally unable to provide accurate information on family income.) Grade refers to the grade in which the student was enrolled: 8th, 10th, or 12th. For purposes of this study, 10th and 12th graders have been combined, and are referred to as high school students, and 8th graders as middle school students.

Design and methods of YES. The half-samples of nationally representative schools that were cycling out of the MTF study in 2004 and 2005 composed the target sample (N=345, 85% response rate) for the current study. School administrators were asked to complete a self-administered questionnaire that contained, among other things, questions related to school and district policies concerning contracts with soft drink bottlers as well as detailed questions about the types of foods and beverages available to students. Over 85% of the primary respondents were school administrators (e.g., school principals, vice-principals), followed by teachers and other school personnel. For some sections of the questionnaire, it was recommended that a person other than the school administrator (e.g., food service manager) answer if they were more likely to know the information. One section of the questionnaire asked about the types of foods and beverages made available to students in the school's vending machines (including when they are made available), à la carte offerings at lunch, and the standard school lunch menu. This section was answered by the food service manager or other food worker in 71% of schools where 8th graders were surveyed, 78% of schools in which 10th graders were surveyed, and 70% of those in which 12th graders were surveyed. In the remaining schools the principal usually answered these questions.

School and student data were available on the variables of relevance to the present analyses for over 340 schools and the 37,000 student respondents from these schools who provided data on the MTF questionnaires. The school administrator and student data were combined into one data set. Combined across grades, the student sample was 69% white, 11% black, 9% Hispanic, and 11% from other racial/ethnic backgrounds. About 7% were in the lowest socioeconomic group, and 16% in the highest.

The primary data for this study included the answers to the questions on the types of foods available to students. First, school principals were asked to estimate the percentage of students who on a typical day eat the lunch offered at their school, bring their own lunch, or go off campus to buy lunch. Then, questions were asked to determine if students in schools that offer lunch have à la carte and other lunch options. Questions were also asked to determine the type of menu planning system schools utilize (nutrient standard menu planning or NuMenus, assisted nutrient standard menu planning or Assisted NuMenus, enhanced food-based menu planning, traditional food-based menu planning, and any other menu planning) and to identify whether decisions about menus and food service were made at the school level, the district level, by an external contractor, or some other entity.

The availability of brand-name fast-food items (such as Pizza Hut, Taco Bell) was determined using a set of questions that asked about the availability of such foods during a typical week as à la carte lunch items and for school lunch meals. To identify the types of foods available to students, a set of questions was asked concerning the availability of a number of healthier and less-healthy food items (see list below) in vending machines, in school/student stores, and in snack bars/carts. The food items were:

Candy
Salty snacks that are not low in fat, such as regular potato chips
Cookies, crackers, cakes, or other baked goods that are not low in fat
Ice cream or frozen yogurt that is not low in fat
Lowfat salty snacks, such as pretzels, baked chips, or other lowfat chips
Lowfat cookies, crackers, cakes, pastries, other lowfat baked goods
Lowfat or fat-free ice cream, frozen yogurt, sherbert, or lowfat or nonfat yogurt
Fruits or vegetables (not including fruit or vegetable juice)

The first four were considered to be less-healthy snack choices because of their high sugar, fat, and/or salt content, and the last four to be more healthy because they have lower such content. The terms less-healthy and more-healthy were used because they distinguish foods more on their relative position on a scale of healthfulness rather than making assumptions about their absolute status. Lowfat salty snacks, for example, are more healthful than salty snacks.

For each of the foods listed above, school personnel were asked to indicate the times of the day when these were available to students: (1) before classes begin in the morning, (2) during school hours when meals are not being served, (3) during school lunch periods, and (4) after school.

In schools where lunch was offered, respondents were also asked if during a typical week, the same food items as those listed above were offered to students as à la carte selections in the cafeteria at lunch.

Finally, school personnel were also asked about the frequency (never, some days, most or every day) that students were offered any one of the choices listed below as part of the school lunch meals (not à la carte):

Two or more different entrees or main courses
Two or more different vegetables
Two or more different fruits
Two or more types of 100% fruit juice
Milk that is 1% fat or skim (e.g., fat-free)
Whole or 2% milk, or flavored milk
Pizza
Deep-fried French-fried potatoes (including fries that you just reheat)

For the purpose of this report, the first five items were considered more-healthy food choices and the last three items, less-healthy food choices for the reasons cited earlier. Items were coded 0, 1, or 2 for never, some days, or most or every day, respectively. After reverse coding, the responses to all eight variables were added to create an index that mea-

sured the extent that more-healthy food choices are offered as part of school lunch meals (not à la carte).

Data Analysis

A major analytic objective was to determine how different the food environment was for students (1) in middle schools versus high schools, (2) of different racial/ethnic groups, and (3) of different socioeconomic levels as indicated by level of parent education. The distribution (percents and medians) of the food environment variables were compared across grades, racial/ethnic groups, and SES groups. Chi-square and t-test statistics were used to determine whether the percents and means, respectively, varied according to the students' grade level. These variables were also used to determine differences among white, black, and Hispanic youth. While percents and means are presented for students identified in the "other" racial/ethnic category for completeness, this category was not included in assessing statistical significance because the "other" racial/ethnic background is a residual category that includes very different population groups. Disaggregation of this category would result in very small sample sizes that would not permit meaningful analysis. Ordinary least squares regression analysis was used to determine the extent to which there was a linear association between each of the dependent variables and the five-category measure of parents' education.

All analyses included weighted data to adjust for the slightly different probabilities of selection of students that occur during the various stages of the sampling process and took into account design effects resulting from clustered sampling in calculating variance estimates using Stata version 8.0.

In addition to the above analyses, the ratio was calculated of the mean number of less-healthy to the mean number of more-healthy food types available to students in vending machines, school/student stores, or snack bars/carts. Differences in the ratio between student grades, racial/ethnic groups, and SES were assessed using the same statistics described above.

Results

Because of the considerable amount of information reported in the following tables, each table includes three sections. These are: (A) School lunch and breakfast participation, (B) Menu planning, and (C) More- and less-healthy food types. When results are noted, both the table number and the section letter are cited to facilitate look-up.

Results by Grade Level

As shown in Table 1A, across the nation, there is nearly universal access to lunch in school by students (99%) and almost all (87% of middle school students, and 92% of high school students) are in schools where they have access to à la carte lunch items. Somewhat smaller percentages of students attend schools that provide breakfast (77% for middle school, 85% for high school). Only the à la carte lunch items differ significantly between grade levels.

Compared to middle school students, high school students are less likely to eat the lunch offered by the school (70% in middle school vs 60% in high school) or bring their own lunch (25% vs 18%), and they are much more likely to go off-campus to buy lunch (less than 0.5% vs 11%) (Table 1A).

The great majority (87%) of students attend schools that participate in the USDA-reimbursable National School Lunch Program (NSLP), with no real difference between middle and high schools (Table 1A). About 44% of students attend schools that participate in the USDA-sponsored Team Nutrition program, with no significant difference between grade levels (Table 1A). The USDA Team Nutrition program provides schools with resources to support innovative activities aimed at improving the students' nutrition in schools. These findings indicate that most schools in the nation do not, or are not able to, take advantage of this program.

About half (49% of middle and 55% of high school students) of students attend schools that use traditional food-based menu planning. The most common nontraditional system is the nutrient standard menu planning (NuMenus) system, with about 31% of students nationwide being in these schools (Table 1B). There are no significant between-grade differences in the types of menu-planning systems that schools utilize (NuMenus, Assisted NuMenus). The importance of these planning systems will be discussed below.

With respect to the locus of decision making about menus and food service, most students attend schools where these decisions are made at the district level (78% for middle, 69% for high), followed by the school level (36% and 42%) and an external contractor (8% and 17%) (Table 1B). These percents add to more than 100% because in some schools decisions are made at more than one level. The only significant between-grade difference is that for an external contractor.

On average, American students are offered a brand-name fast-food item (e.g., Pizza Hut, Taco Bell, others) once a week through à la carte lunch items, and about every 2 weeks in school lunch meals (Table 1C), with no significant difference by grade level.

The more-healthy food choices are less available to middle school than to high school students in all three venues combined: vending machines, school/student stores, or snack bars/carts. Fifty-six percent of middle school students attend schools where lowfat salty snacks (e.g., pretzels) are available, versus 80% of high school students ($p<0.001$). The corresponding figures for lowfat cookies, crackers, and pastries are 41% versus 54% ($p<0.05$); 32%, versus 39% (not significant) for lowfat or fat-free ice cream, including frozen yogurt, sherbet, and lowfat or nonfat yogurt; and 60% versus 65 % (not significant)for fruit or vegetables. The mean number of these more-healthy food items available to students from vending machines, school/student stores, or snack/bar carts is significantly lower for

Table 1. Food availability in all schools and by grade level: 2004–2005

	8th	10th and 12th	8th versus 10th and 12th comparison
Approx N schools	126	219	
Approx N students	13,367	24,176	
A. SCHOOL LUNCH AND BREAKFAST PARTICIPATION			
Percentage of students in schools that offer:			
Breakfast to students	77.4	85.2	
Lunch to students	99.3	99.2	
À la carte lunch items	87.0	92.1	**
Mean percentage of students who:			
Eat lunch offered by the school	69.7	59.6	***
Bring their own lunch	25.2	18.0	*
Go off-campus to buy lunch	–	11.2	***
Percentage of students in schools that participate in the USDA reimbursable National School Lunch Program	88.0	86.4	
Percentage of students in schools that participate in the USDA-sponsored Team Nutrition program	44.6	44.2	
B. MENU PLANNING			
Percentage of students by the menu planning system that schools utilize:			
Nutrient Standard Menu Planning (NuMenus)	30.7	31.5	
Assisted Nutrient Standard Menu Planning (Assisted NuMenus)	6.3	6.0	
Enhanced Food-Based Menu Planning	15.4	15.7	
Traditional Food-Based Menu Planning	49.3	54.9	
Other menu planning	11.5	10.8	
Percentage of students by organization that makes the decision about menus and food service:			
School	35.9	41.5	
District	77.9	69.3	
External contractor	7.7	17.1	**
C. MORE AND LESS HEALTHY FOOD TYPES			
Mean number of days per week that brand-name fast food (e.g., Pizza Hut, Taco Bell, others . . .) is offered to students through:			
À la carte lunch items	0.8	1.1	
School lunch meals	0.6	0.5	
Percentage of students in schools that offer **more healthy foods** (in vending machines, school/student stores, or snack bars/carts) such as:			
Lowfat salty snacks[a]	55.7	79.9	***
Lowfat cookies, crackers & others[b]	40.9	54.1	*
Lowfat or fat-free ice cream[c]	32.4	39.3	
Fruits or vegetables[d]	60.1	64.8	
Mean number of **more healthy food types**[e] available to students from vending machines, school/student stores, or snack/bar carts	1.9	2.4	***
Percentage of students in schools that offer **less healthy foods** (in vending machines, school/student stores, or snack bars/carts) such as:			
Candy[f]	43.7	74.0	***
Salty snacks not low in fat[g]	60.8	84.8	***
Cookies not low in fat[h]	65.5	84.1	***
Ice cream not low in fat[i]	46.4	54.0	
Mean number of **less healthy food types**[j] available to students from vending machines, school/student stores, or snack bars/carts	2.1	3.0	***
Mean number of **more healthy à la carte food types**[k] available to students in the cafeteria at lunch	2.2	2.6	***
Mean number of **less healthy à la carte food types**[l] available to students in the cafeteria at lunch	1.9	2.4	**
Mean number **of more healthy food types offered during lunch**[m]	9.4	9.5	

Note: Between-grade differences are indicated with asterisks in the column "Sig. 8th v. 10th & 12th Comparison." "—" indicates less than 0.5 percent but greater than zero percent.

[a]Includes lowfat snacks such as pretzels, baked chips, or other lowfat chips, among others.

[b]Includes lowfat cookies, crackers, cakes, pastries, and other lowfat baked goods.

[c]Includes lowfat or fat-free ice cream, frozen yogurt, sherbert, or lowfat or nonfat yogurt.

[d]Does not include fruit or vegetable juice.

[e]The number of items range from 0–4 and are based on the four sets of more healthy items listed in a–d.

[f]Includes any type of candy.

[g]Includes salty snacks that are not low in fat, such as regular potato chips.

[h]Includes cookies, crackers, cakes, or other baked goods that are not low in fat.

[i]Includes ice cream or frozen yogurt that is not low in fat.

[j]The number of items range from 0–4 and are based on the four sets of less healthy items listed in f–i.

[k]Range is 0–4. Items include lowfat salty snacks, cookies, crackers, cakes, pastries, other baked goods, lowfat or fat-free ice cream, frozen yogurt, sherbet, fruits, or vegetables.

[l]Range is 0–4. Items include candy, salty snacks (e.g., regular potato chips), cookies, crackers, cakes, other baked goods, ice cream, or frozen yogurt, that are not low in fat.

[m]Index that measures the extent to which students are offered a choice of more and less healthy items as part of lunch meals (not à la carte). Possible range of responses is 0–16 with higher scores representing greater availability of healthy food choices.

*$p<0.05$; **$p<0.01$; ***$p<0.001$.

Table 2. Food availability by student race/ethnicity: 2004–2005

	Student race/ethnicity				Sig. racial/ ethnic
	White	Black	Hispanic	Other	comparison
Approx N total	25,895	4,113	3,280	4,254	
Approx N 8th	9,002	1,202	1,276	1,887	
Approx N 10th & 12th	16,894	2,911	2,004	2,368	
A. SCHOOL LUNCH AND BREAKFAST PARTICIPATION					
Percentage of students in schools that offer:					
Breakfast to students					
8th	72.4	92.6	92.3	81.5	WB,WH
10th & 12th	82.5	94.1	93.3	86.6	WH
Lunch to students					
8th	99.2	99.8	99.6	99.6	WB,WH
10th & 12th	99.0	99.7	99.9	99.8	WH
À la carte lunch items					
8th	85.5	95.8	91.5	85.2	WB,BH
10th & 12th	92.0	89.7	92.1	95.6	
Mean percentage of students who:					
Eat lunch offered by the school					
8th	70.3	69.0	68.1	68.6	
10th & 12th	60.2	60.3	56.6	57.7	
Bring their own lunch					
8th	25.8	23.8	22.4	25.0	
10th & 12th	18.9	13.4	14.1	19.4	WB,WH
Go off-campus to buy lunch					
8th	—	—	—	—	
10th & 12th	11.6	4.0	15.9	11.9	WB,BH
Percentage of students in schools that participate in the USDA reimbursable National School Lunch Program					
8th	86.8	91.6	94.8	87.1	WH
10th & 12th	84.6	92.9	92.8	86.1	WB,WH
Percentage of students in schools that participate in the USDA-sponsored Team Nutrition program					
8th	40.0	68.4	49.3	48.0	WB,BH
10th & 12th	42.9	53.8	48.1	38.6	
B. MENU PLANNING					
Percentage of students by the menu planning system that schools utilize:					
Nutrient Standard Menu Planning (NuMenus)					
8th	29.1	37.3	42.5	26.5	
10th & 12th	28.2	42.7	42.3	32.4	WH
Assisted Nutrient Standard Menu Planning (Assisted NuMenus)					
8th	5.9	10.4	5.5	5.9	
10th & 12th	5.6	10.6	4.2	5.4	BH
Enhanced Food-Based Menu Planning					
8th	14.9	10.2	13.9	22.2	
10th & 12th	16.0	13.6	16.3	15.8	
Traditional Food-Based Menu Planning					
8th	51.4	49.3	33.6	49.2	
10th & 12th	54.5	67.7	49.7	47.7	
Other menu planning					
8th	11.3	12.4	14.3	10.3	
10th & 12th	10.1	12.4	8.7	16.0	
Percentage of students by organization that makes the decision about menus and food service:					
School					
8th	39.5	29.1	23.8	30.9	WH
10th & 12th	42.2	33.1	49.0	40.1	
District					
8th	75.4	89.3	81.5	79.8	WB
10th & 12th	65.0	84.3	79.1	73.4	WB,WH
External contractor					
8th	6.3	6.3	16.4	9.0	WH,BH
10th & 12th	17.2	13.2	17.9	20.9	
C. MORE AND LESS HEALTHY FOOD TYPES					
Mean number of days per week that brand-name fast food is offered to students through:					
À la carte lunch items					
8th	0.8	0.5	0.7	0.8	
10th & 12th	1.0	0.9	1.9	1.6	WH,BH
School lunch meals					
8th	0.6	0.4	0.8	0.7	
10th & 12th	0.4	0.5	0.8	0.7	WH
Percentage of students in schools that offer more healthy foods (in vending machines, school/student stores, or snack bars/carts) such as:					
Lowfat salty snacks[a]					
8th	54.4	48.8	62.6	61.4	
10th & 12th	82.2	67.6	73.2	83.4	WB

(continued on next page)

Table 2. Food availability by student race/ethnicity: 2004–2005 *(continued)*

	Student race/ethnicity				Sig. racial/ethnic comparison
	White	Black	Hispanic	Other	
Lowfat cookies, crackers, & others[b]					
8th	42.2	30.1	30.9	48.4	
10th & 12th	56.0	49.1	42.4	56.1	
Lowfat or fat-free ice cream[c]					
8th	33.8	25.5	31.4	30.8	
10th & 12th	38.3	44.3	34.9	44.5	
Fruits or vegetables[d]					
8th	62.7	46.5	60.6	55.9	WB
10th & 12th	62.9	63.1	76.3	71.0	WH
Mean number of more healthy food types[e] available to students from vending machines, school/student stores, or snack/bar carts					
8th	1.9	1.5	1.9	2.0	
10th & 12th	2.4	2.2	2.3	2.5	
Percentage of students in schools that offer less healthy foods (in vending machines, school/student stores, or snack bars/carts) such as:					
Candy[f]					
8th	44.6	37.7	52.3	37.1	
10th & 12th	75.0	71.6	70.3	72.8	
Salty snacks not low in fat[g]					
8th	62.7	54.3	60.8	56.0	
10th & 12th	85.6	79.7	83.7	86.0	
Cookies not low in fat[h]					
8th	67.6	60.8	57.1	63.8	
10th & 12th	84.7	81.9	78.9	86.8	
Ice cream not low in fat[i]					
8th	46.6	40.4	53.9	43.7	
10th & 12th	52.4	57.0	66.5	51.6	WH
Mean number of less healthy food types[j] available to students from vending machines, school/student stores, or snack bars/carts					
8th	2.2	1.9	2.2	2.0	
10th & 12th	3.0	2.9	3.0	3.0	
Mean number of more healthy à la carte food types[k] available to students in the cafeteria at lunch					
8th	2.3	1.9	2.2	2.3	
10th & 12th	2.7	2.4	2.4	2.8	
Mean number of less healthy à la carte food types[l] available to students in the cafeteria at lunch					
8th	2.0	1.7	2.0	1.7	
10th & 12th	2.4	2.1	2.4	2.5	
Mean number of more healthy food types offered during lunch meals[m]					
8th	9.3	10.2	9.3	9.6	WB
10th & 12th	9.4	9.3	9.9	10.0	WH,BH

Notes: Between-race/ethnicity differences are indicated in the column "Sig. Racial/Ethnic Comparison" with a minimum significance level of $p<0.05$. WB=White-Black, WH=White-Hispanic, and BH=Black-Hispanic. "—" indicates less than 0.5 percent but greater than zero percent. Percentages represent school-level estimates of the corresponding variable by race/ethnicity. For example, white students attend schools where 11.6% of 10th and 12th graders go off campus to buy lunch. It is not the percentage of white students who go off campus to buy lunch.

[a]Includes lowfat snacks such as pretzels, baked chips, or other lowfat chips, among others.

[b]Includes lowfat cookies, crackers, cakes, pastries, and other lowfat baked goods.

[c]Includes lowfat or fat-free ice cream, frozen yogurt, sherbet, or lowfat or nonfat yogurt.

[d]Does not include fruit or vegetable juice.

[e]The number of items range from 0–4 and are based on the four sets of more healthy items listed in a–d.

[f]Includes any type of candy.

[g]Includes salty snacks that are not low in fat, such as regular potato chips.

[h]Includes cookies, crackers, cakes, or other baked goods that are not low in fat.

[i]Includes ice cream or frozen yogurt that is not low in fat.

[j]The number of items range from 0–4 and are based on the four sets of less healthy items listed in f–i.

[k]Range is 0–4. Items include lowfat salty snacks, cookies, crackers, cakes, pastries, other baked goods, lowfat or fat-free ice cream, frozen yogurt, sherbet, fruits, or vegetables.

[l]Range is 0–4. Items include candy, salty snacks (e.g., regular potato chips), cookies, crackers, cakes, other baked goods, ice cream, or frozen yogurt, that are not low in fat.

[m]Index that measures extent to which students are offered a choice of more and less healthy items as part of lunch meals (not à la carte). Possible range of responses is 0–16 with higher scores representing greater availability of healthy food choices.

*$p<0.05$; **$p<0.01$; ***$p<0.001$.

middle school students (1.9 items) than for high school students (2.4 items) ($p<0.001$) (Table 1C).

The reported rates of availability for all of the less-healthy food classes also are lower for middle school students, with three of the four differences reaching statistical significance: candy (44% in middle school vs 74% in high school, $p<0.001$), salty snacks not low in fat (61% vs 85%, $p<0.001$), cookies and other baked goods not low in fat (66% vs 84%, $p<0.001$), and ice cream (46% vs 54%, not significant). As is the case with

the availability of more-healthy snacks, high school students have a significantly higher mean number of the less-healthy food items (3.0 items) available to them than middle school students (2.1 items) ($p<0.001$) (Table 1C). Put another way, high school students on average have a greater variety of food types from which to choose, both those more and less healthy.

The availability of four healthier (lowfat salty snacks, cookies, and ice cream, and fruits or vegetables) and four less-healthy (salty snacks, cookies, and ice cream that are not low in fat, and candy) food choices was also examined for the à la carte items in the cafeteria at lunch. (Percentages for the individual types are not shown; only the mean number is provided in Table 1.) Middle school students have a lower mean number of both more-healthy and less-healthy food types than high school students ($p<0.01$) (see Table 1C).

An index was created to measure the extent to which students have access to more-healthy food choices in the school lunch meals (not à la carte). As indicated in the Methods section, there are five food choices categorized as more healthy (having two or more choices of entrée, fruits, vegetables, 100% fruit juices, and milk that is ≤1% fat) and three as less healthy (pizza, French fries, and 2% or whole milk). The index takes into account the frequency with which these food alternatives are offered, and possible values range from 0 to 16. A score of 16 would indicate that the school offers all of the five healthy food item alternatives most or every day and never offers the three less-healthy ones. Actual values range from a low of 2 to a high of 15, with a mean of 9.4 (SD=2.6). The mean of 9.4 indicates that on average schools are doing a good job of offering more-healthy food choices to students; however, there is still plenty of room for improvement by decreasing the number, or the frequency with which, less-healthy food choices are made available.

Finally, as an indicator of the balance of less-healthy versus more-healthy foods being available to students in vending machines, school/student stores, or snack bars/carts, a ratio was calculated of the mean number of less-healthy food types (out of four) divided by the mean number of more-healthy food types (out of four). As shown in Table 4, the ratio was significantly higher than 1.0 for both middle school (1.14) and high school (1.25), indicating that less-healthy food types tend to be more available than the healthier food types; the grade-level difference is not significant.

Racial/Ethnic Differences

The data in Table 2 show the distribution of the dependent variables by race/ethnicity. Significant differences between white–black (denoted as WB in the table), white–Hispanic (WH), and black–Hispanic (BH) students are indicated in the last column.

As shown in Table 2A, virtually all schools offer lunch to students, and although the difference among racial/ethnic groups is statistically significant, it is not substantively significant. Attending schools that offer breakfast varies by race/ethnicity, with white students (72% in middle school, 83% in high school) generally less likely to be attending such schools when compared to black (93% and 94%) and Hispanic (92% and 93%) students. Also, black students in middle schools (96%) are more likely than white (86%) and Hispanic (92%) middle school students to have access to à la carte lunch items ($p<0.05$ in both cases).

Among high school students, white students attend schools in which a slightly higher percentage of students (19%) bring their own lunch versus black students (13%) and Hispanic students (14%) ($p<0.05$ for both differences) (Table 2A). Also, among high school students, black students attend schools in which fewer students go off-campus to buy their lunch than white (4% vs 12%, $p<0.05$) or Hispanic students (4% vs 16%, $p<0.05$). All but three middle schools reported that no students go off-campus to buy lunch.

Higher percentages of black and Hispanic students attend schools that participate in the NSLP (see Table 2A). With respect to the percentage of students in schools that participate in the USDA-sponsored Team Nutrition program, among middle schools, a significant difference exists between black students (68%) and white students (40%, $p<0.05$) as well as Hispanic students (49%, $p<0.05$) (see Table 2A).

Section C of Table 2 provides information on the availability of various other more- or less-healthy food choices by race/ethnicity. For the most part, the differences by race/ethnicity are not statistically significant, although there are some exceptions. In terms of the mean number of days per week that brand-name fast-food items are offered to students as à la carte lunch items, Hispanics in high school, but not middle school, attend schools with a significantly higher mean number of days when these items are offered on the à la carte menu (about 2 days per week) in comparison to white and black students (about 1 day per week) ($p<0.05$) (Table 2C). These fast-food items are also offered most often for lunch meals in high schools attended by Hispanics, with a significantly higher mean number of days than for whites (0.8 vs 0.4, $p<0.05$).

In middle schools, black students are less likely than white students to attend schools that provide fruits and vegetables in vending machines, school/student stores, and snack bars/carts. At the high school level, schools attended by Hispanic students are more likely than those attended by white students to offer fruits and vegetables in these venues, although they are also more likely offer ice cream not low in fat.

In middle schools, black students on average attend schools with a significantly higher mean number of more-healthy food types offered during lunch meals

than do whites (10.2 vs 9.3), but in high schools, it is Hispanic students whose schools offer a higher number of more-healthy food types, compared to either white or black students. In general, these data indicate that racial/ethnic differences tend to differ by grade level and by type of food.

As is shown in Table 4, the ratio of the mean number of less-healthy to more-healthy food types available to students from vending machines, school/student stores, or snack bars/carts is statistically significantly different from 1.0 for all racial/ethnic groups in both grade levels, but the ratios do not differ by race/ethnicity.

Socioeconomic Status Differences

To assess SES differences, linear regressions were run for middle school and high school, using the five-category SES measure (based on the average education level of the student's parents) as a single predictor variable; the results are shown in Table 3. In both middle and high schools there is a negative linear association between SES and the percentage of students who are in schools that offer breakfast to students (Table 3A). The great majority of schools attended by students in all SES strata provide lunch and à la carte selections, and the variation by SES is not significant.

In middle school, SES has a significant negative linear association ($p<0.01$) with the percentage of students who eat lunch offered by the school (Table 3A). Among the lowest SES stratum, school personnel estimate that 71% of students eat the school lunch, compared to 63% among the highest SES stratum. On the other hand, there is a significant positive linear association ($p<0.001$) with the percentage of students who bring their own lunch in both middle and high schools (Table 3A).

There is a significant negative association of SES with the percentage of middle and high school students in schools that participate in the NSLP and with the percentage of high school students who participate in the USDA-sponsored Team Nutrition program (Table 3A). There also is an inverse association of student SES with the percentage of high schools who utilize NuMenus and Assisted NuMenus to plan lunch meals (Table 3B). There is also a negative association of SES with the percentage of high school students in schools where the district makes the decisions about menus and food service ($p<0.01$) (Table 3B). These findings may be indicative of greater efforts being made in lower-SES schools to provide students with meals that meet dietary guidelines and to engage in innovative activities aimed at preventing and reducing obesity in their student populations. It is also possible that larger school systems, which may tend to have a larger proportion of lower-SES youth, are more likely to follow these types of procedures.

Section C of Table 3 provides information on the availability of various more- or less-healthy food choices by the students' SES. In general, the differences by SES in middle schools are not statistically significant, with only two exceptions (number of days fast-food items are featured at school lunch and mean number of more-healthy items available à la carte).

Most of the differences by SES in high schools are also not significant, but there is a clear tendency for schools attended by higher-SES students to have a wider array of more-healthy food items available. There are significant positive associations for availability in vending machines, school/student stores, or snack bars/carts of lowfat salty snacks and fruits and vegetables, as well as a higher mean number of more-healthy snacks in these venues. There is also a significant positive association with the mean number of more-healthy foods available à la carte. However, there is also a significant positive association with the mean number of less-healthy foods available à la carte. Figure 1 provides a graphic display of the data for the four types of more-healthy foods.

Table 4 shows that there is significant variation by SES at the high school level in the ratio of number of less-healthy to more-healthy food choices available to students. Students in the highest SES stratum have a ratio of only 1.15 compared to a ratio of 1.29 in the lowest stratum. This suggests that low-SES students have a less-healthy mix of options available to them from vending machines, school/student stores, and snack bars/carts.

Discussion

Practically all schools in this study offered lunch to their students, and most offered breakfast. The great majority of students (87%) attend schools that participate in the NSLP. The goals and objectives of the USDA-reimbursable NSLP are to provide all students, but particularly low-income students, with proper nutrition. Consistent with those goals, a higher percentage of black and Hispanic students and students of low SES were found to attend schools that participate in this program. However, despite the nearly universal availability of lunch in schools, the percentage of students who actually eat lunch offered by the school is only about 70% for middle school students and 60% for high school students. Thus, significant percentages of students are bringing their own lunch, or, in the case of high school students, going off-campus to eat lunch. These students may not be getting the benefit of nutritious meals, but a much more detailed individual-level study would be required to determine that.

In order to facilitate schools' meeting the nutritional standards set forth by NSLP, the USDA's School Meals Initiative for Healthy Children provides for several

Table 3. Food availability by student SES: 2004–2005

	Student SES						
	1 (Low)	2	3	4	5 (High)	b	Sig. Linear Assoc.
Approx N total	2,760	8,449	9,840	10,544	5,950		
Approx N 8th	1,005	3,046	3,262	3,813	2,241		
Approx N 10th & 12th	1,755	5,403	6,577	6,732	3,709		
A. SCHOOL LUNCH AND BREAKFAST PARTICIPATION							
Percentage of students in schools that offer:							
Breakfast to students							
8th	91.5	83.9	79.6	75.3	62.6	−6.43	***
10th & 12th	93.2	87.7	84.7	82.3	83.8	−2.15	*
Lunch to students							
8th	99.6	99.5	99.6	99.3	98.7	−0.20	
10th & 12th	99.8	99.4	99.2	99.2	98.8	−0.19	
A la carte lunch items							
8th	85.9	86.0	85.3	86.9	91.5	1.30	
10th & 12th	92.3	91.6	92.0	92.3	92.4	0.18	
Mean percentage of students who:							
Eat lunch offered by the school							
8th	71.4	73.1	71.6	68.7	63.2	−2.45	**
10th & 12th	60.4	61.9	59.8	59.0	56.8	−1.22	
Bring their own lunch							
8th	21.1	21.6	23.2	26.5	32.2	2.93	***
10th & 12th	12.5	14.9	17.7	19.5	22.5	2.44	***
Go off-campus to buy lunch							
8th	0.0	0.1	0.0	0.0	0.0	−0.01	
10th & 12th	11.4	9.9	10.6	12.0	12.4	0.63	
Percentage of students in schools that participate in the USDA reimbursable National School Lunch Program							
8th	95.0	93.2	91.0	85.9	77.1	−4.54	**
10th & 12th	95.4	93.3	89.5	82.3	74.5	−5.65	***
Percentage of students in schools that participate in the USDA-sponsored Team Nutrition program							
8th	48.5	44.7	47.2	42.6	42.2	−1.39	
10th & 12th	50.2	48.9	46.4	41.3	35.6	−3.95	**
B. MENU PLANNING							
Percentage of students by the menu planning system that schools utilize:							
Nutrient Standard Menu Planning (NuMenus)							
8th	36.2	31.7	32.1	31.3	23.8	−2.24	
10th & 12th	43.8	32.9	32.4	28.6	27.2	−3.11	*
Assisted Nutrient Standard Menu Planning (Assisted NuMenus)							
8th	10.4	7.2	7.0	5.2	4.1	−1.32	
10th & 12th	8.1	7.0	7.2	4.9	3.8	−1.12	*
Enhanced Food-Based Menu Planning							
8th	13.3	15.7	15.9	16.2	14.1	0.03	
10th & 12th	15.8	13.7	16.1	17.0	15.5	0.54	
Traditional Food-Based Menu Planning							
8th	44.8	48.2	46.6	49.5	56.5	2.37	
10th & 12th	53.6	57.2	56.1	53.9	52.2	−1.08	
Other menu planning							
8th	9.3	8.1	10.5	12.1	17.8	2.38	
10th & 12th	9.8	10.0	9.7	11.2	13.7	0.10	
Percentage of students by organization that makes the decision about menus and food service:							
School							
8th	34.7	36.1	36.5	34.5	37.5	0.19	
10th & 12th	40.1	36.0	41.5	45.4	43.0	2.20	
District							
8th	81.2	78.0	77.6	76.6	78.7	−0.44	
10th & 12th	79.5	74.6	70.8	65.1	62.1	−4.46	**
External contractor							
8th	10.4	8.7	8.1	7.3	5.2	−1.13	
10th & 12th	13.3	14.6	16.3	18.3	21.9	2.14	
C. MORE- AND LESS-HEALTHY FOOD TYPES							
Mean number of days per week that brand-name fast food is offered to students through:							
À la carte lunch items							
8th	0.8	0.6	0.8	0.9	0.8	0.07	
10th & 12th	1.4	0.9	1.0	1.1	1.1	0.07	
School lunch meals							
8th	0.5	0.4	0.6	0.8	0.7	0.11	*
10th & 12th	0.6	0.4	0.5	0.5	0.5	−0.01	

(continued on next page)

Table 3. Food availability by student SES: 2004–2005 *(continued)*

	Student SES						
	1 (Low)	2	3	4	5 (High)	b	Sig. Linear Assoc.
Percentage of students in schools that offer more healthy food types (in vending machines, school/student stores, or snack bars/carts) such as:							
Lowfat salty snacks[a]							
8th	55.8	53.0	53.6	56.3	61.3	1.86	
10th & 12th	69.6	76.4	78.8	82.1	87.6	3.89	***
Lowfat cookies, crackers, and others[b]							
8th	36.7	36.6	37.7	43.0	49.9	3.64	
10th & 12th	47.1	52.7	52.9	55.1	59.6	2.43	
Lowfat or fat-free ice cream[c]							
8th	28.2	28.1	31.3	33.9	39.3	3.05	
10th & 12th	33.3	38.8	38.9	39.2	44.0	1.78	
Fruits or vegetables[d]							
8th	53.9	59.0	59.8	60.8	63.6	1.77	
10th & 12th	64.4	58.7	61.5	66.9	75.6	3.93	**
Mean number of more healthy food types[e] available to students from vending machines, school/student stores, or snack/bar carts							
8th	1.7	1.8	1.8	1.9	2.1	0.10	
10th & 12th	2.1	2.3	2.3	2.4	2.7	0.12	***
Percentage of students in schools that offer less healthy foods (in vending machines, school/student stores, or snack bars/carts) such as:							
Candy[f]							
8th	48.6	47.6	46.0	42.7	34.5	−3.51	
10th & 12th	69.5	74.8	73.3	74.1	76.1	0.86	
Salty snacks not low in fat[g]							
8th	57.3	63.4	61.1	58.6	62.4	−0.11	
10th & 12th	78.6	83.4	83.9	85.9	89.2	2.12	*
Cookies not low in fat[h]							
8th	60.5	67.8	64.5	64.6	67.5	0.44	
10th & 12th	74.2	83.1	85.2	84.9	87.0	2.04	
Ice cream not low in fat[i]							
8th	48.8	44.2	43.6	46.3	52.4	1.48	
10th & 12th	54.4	52.8	53.4	54.4	55.9	0.65	
Mean number of less healthy food types[j] available to students from vending machines, school/student stores, or snack bars/ carts							
8th	2.1	2.2	2.1	2.1	2.1	−0.02	
10th & 12th	2.8	2.9	3.0	3.0	3.1	0.05	
Mean number of more healthy à la carte food types[k] available to students in the cafeteria at lunch							
8th	2.1	2.1	2.1	2.3	2.6	0.13	**
10th & 12th	2.4	2.5	2.6	2.7	2.8	0.09	**
Mean number of less healthy à la carte food types[l] available to students in the cafeteria at lunch							
8th	1.8	1.9	1.9	1.9	1.9	0.01	
10th & 12th	2.2	2.3	2.4	2.5	2.5	0.08	*
Mean number of more healthy food types offered during lunch meals[m]							
8th	9.1	9.2	9.2	9.5	9.9	0.19	
10th & 12th	9.5	9.4	9.4	9.5	9.6	0.04	

Notes: The column labeled "b" refers to the unstandardized regression coefficient obtained from the OLS regression analyses that were utilized to determine if a linear association exists between SES and each of the dependent variables (items in rows). Significance of regression coefficients is indicated with asterisks in the column "Sig. Linear Assoc." Percentages represent school-level estimates of the corresponding variable by student SES. For example, students of low SES backgrounds attend schools where 11.4% of 10th and 12th graders go off campus to buy lunch. It is not the percentage of low-SES students who go off campus to buy lunch.

[a]Includes lowfat snacks such as pretzels, baked chips, or other low-fat chips, among others.

[b]Includes lowfat cookies, crackers, cakes, pastries, and other lowfat baked goods.

[c]Includes lowfat or fat-free ice cream, frozen yogurt, sherbet, or lowfat or nonfat yogurt.

[d]Does not include fruit or vegetable juice.

[e]The number of items range from 0–4 and are based on the four sets of more healthy items listed in a–d.

[f]Includes any type of candy.

[g]Includes salty snacks that are not low in fat, such as regular potato chips.

[h]Includes cookies, crackers, cakes, or other baked goods that are not low in fat.

[i]Includes ice cream or frozen yogurt that is not low in fat.

[j]The number of items range from 0–4 and are based on the four sets of less healthy items listed in f–i.

[k]Range is 0–4. Items include lowfat salty snacks, cookies, crackers, cakes, pastries, other lowfat baked goods, lowfat or fat-free ice cream, frozen yogurt, sherbet, fruits, or vegetables.

[l]Range is 0–4. Items include candy, salty snacks (e.g., regular potato chips), cookies, crackers, cakes, other baked goods, ice cream, or frozen yogurt, that are not low in fat.

[m]Index that measures the extent to which students are offered a choice of more and less healthy items as part of lunch meals (not à la carte). Range of responses is 0–16 with higher scores representing greater availability of healthy food choices.

$^{*}p<0.05$;$^{**}p<0.01$;$^{***}p<0.001$.

OLS, ordinary least squares; SES, socioeconomic status.

Table 4. Ratio (and standard error) of the average number of less healthy to more healthy food types available to students from vending machines, school/student stores, or snack bars/carts by grade level, race/ethnicity, and SES: 2004–2005

		Student race/ethnicity				Student SES					Sig. linear assoc.
Grade	All students	White	Black	Hispanic	Sig.	1 (Low)	2	3	4	5 (High)	
8th	1.14(0.08)	1.14(0.08)	1.24(0.13)	1.21(0.16)	—	1.22(0.10)	1.26(0.09)	1.18(0.08)	1.09(0.09)	1.00(0.07)	—
10th & 12th	1.25(0.05)	1.24(0.05)	1.29(0.12)	1.31(0.11)	—	1.29(0.09)	1.30(0.06)	1.27(0.06)	1.23(0.06)	1.15(0.06)	*

Note: All ratios are significantly different from the Null of 1.00 at $p<0.001$ with the exception of ratios for SES=4 and SES=5 among 8th graders, which were not significantly different from 1.00. Standard errors are given in parentheses next to the ratios. Columns labeled "Sig." and "Sig. linear assoc." indicate significant ratio differences between racial/ethnic groups and significant linear association with SES, respectively.
*$p<0.05$.

menu planning options.[20] These are the traditional food-based menu planning and enhanced food-based menu planning systems, and two computer-based systems using USDA-approved software, the NuMenus and Assisted NuMenus systems. Over 50% of students attend schools that use the traditional system, about 31% are in schools that use NuMenus, nearly 16% are in schools that use the enhanced system, and about 6% are in schools that use the Assisted NuMenus. There were no between-grade differences in the use of these menu planning systems, and few differences among racial/ethnic and socioeconomic groups.

With regard to where menu planning takes place, black and Hispanic students, as well as low-SES students, are more likely than white students to attend schools where decisions are made at the district level, particularly among high schools. This may reflect their attending public schools located in larger school districts, such as in urban settings, where centralized decision-making may be more the norm.

The Team Nutrition program is another USDA Food and Nutrition Service–sponsored initiative ". . . to support the Child Nutrition Programs through training and technical assistance for food service, nutrition education for children and their caregivers, and school and community support for healthy eating and physical activity."[21] Less than half of all students (44%) attend schools that participate in Team Nutrition. Generally, a

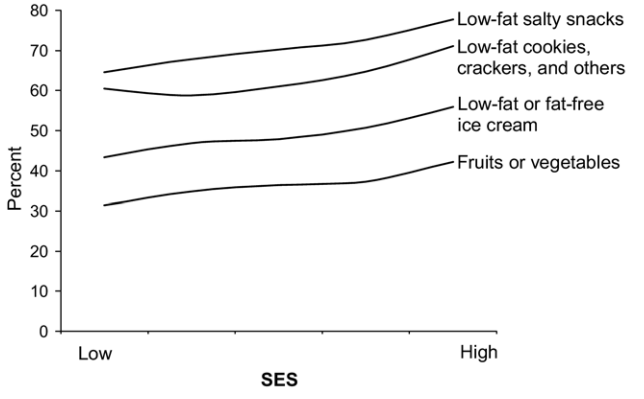

Figure 1. More healthy snacks: percentage of students that attend schools that have them available in vending machines, school or student stores, or snack bars or carts, by SES.

greater percentage of black students and those of low SES attend schools that utilize this service. Greater effort is needed by the USDA to encourage and facilitate more schools participating in this program.

Further examination of school food activities revealed that schools, on average, offer brand-name fast-food items to students through school lunch meals about once a week and through à la carte lunch items about once every 2 weeks, with Hispanic high school students being exposed to these foods more frequently. Reducing the availability of fast-food items served in schools, particularly in schools with high Hispanic enrollment, may serve as a target of interventions that over time might contribute to lowering the percentage of overweight and obese youth.

Some interesting patterns emerged when the availability of the more- and less-healthy food items sold in vending machines, school/student stores, and snack bars/carts was examined. First, a greater percentage of high school students than middle school students have access to both more-healthy and less-healthy food choices. The increased access to a larger variety of snacks may be because high schools, which are larger on average than middle schools, have more vending machines, stores, and snack bars/carts. By way of contrast, there were no differences in the percentage of high school students and middle school students who have access to fruits and vegetables; the majority (63%) of students attend schools that provide this option. However, that leaves more than one in three students without the option of fruits or vegetables from vending machines, school/student stores, or snack bars/carts. Second, there were no consistent differences among racial/ethnic groups in the availability of these products.

Third, there were some differences observed in high schools as a function of SES. High-SES students tend to attend schools with greater access to a variety of the healthier snacks. The fact that lower-SES students have less access to healthier snacks suggests that more needs to be done to increase the availability of healthy snacks to low-SES students. The association of SES with availability of less-healthy snacks was not consistent or as strong, which may suggest that all groups stand to benefit, and if anything higher-SES groups a bit more,

from a diminished availability of such items as cookies and pastries, salty snacks, and ice cream.

Finally, as shown in Table 4, the ratio of less-healthy (four food items) to more-healthy types of snacks (four food items) is significantly higher than 1.0 across all student subgroups, reflecting a relatively high ease of access to less-healthy food types. One would like to see this ratio decline in the coming years, as a result of the healthier types of snacks becoming more available and the less-healthy ones becoming less available. Ideally, the largest increase should occur with fruits and vegetables, by far the healthiest food choices, yet presently, the least available.

Limitations

This study, like most, has limitations that should be kept in mind in interpreting the findings. The school-level data are based on the responses from school administrators (mostly principals) and food service managers through self-administered questionnaires, and there is always the possibility of errors in reporting due to lack of knowledge, misunderstanding, or social desirability bias. However, the types of respondents chosen are responsible people who are quite knowledgeable about the subjects about which they are asked. Moreover, to minimize errors, participants who provided incomplete answers, or whose answers to related questions appeared inconsistent, were recontacted by phone or letter by a research staff member to clarify or complete the answers. Despite the large student sample sizes, it was not possible to analyze data for the various Hispanic subgroups separately nor to disaggregate the residual racial/ethnic category of "Other." Parent education was chosen for the measurement of SES for the reasons discussed in another paper in this supplement[22]; other measures might have been developed, but this measure showed a number of systematic and important differences. Finally, although the number of schools (over 300) is large by most standards, it is still somewhat limited, resulting in limited power. Thus, it is suspected that some observed differences that do not reach statistical significance in fact reflect real differences. As of this writing, a national mailing targeting 600 schools is underway precisely to increase analytic power. These data will permit ongoing monitoring of food and beverage choices in American schools with larger sample sizes.

Conclusion

These findings provide a comprehensive assessment of the types of foods, and their general availability to students, in schools across the nation. While it is encouraging to see that healthy food alternatives such as lowfat snacks and fruits and vegetables are being made available to many students, the study findings are consistent with the recommendations made by the Institute of Medicine (IOM) that calls for schools to limit the availability of competitive foods, but when available, to increase the availability of healthier food choices such as fruits, vegetables, and nonfat or lowfat foods.[23] It is recommended that greater attention be paid particularly to schools with higher concentrations of racial/ethnic minorities and youth of lower SES. In October 2006, the Alliance for a Healthier Generation (a partnership of the American Heart Association and the William J. Clinton Foundation) reached a snack foods agreement with Campbell Soup Company, Dannon, Kraft Foods, Mars, and PepsiCo relating to the nutritional contents of competitive foods sold in the schools, creating the "Nutritional Guidelines for Competitive Foods." It is believed that through ongoing monitoring, as this study offers, it will be possible to measure and understand the extent to which the nascent nutrition-related policies enacted at the federal, state, district, and school levels, including those stemming from partnerships between the food industry and nonfood industry organizations,[24] are being diffused into the nation's schools and contributing to halting and perhaps even reversing the obesity epidemic among children.

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