

# **Middle School Student Lunch Consumption**

## **Impact of National School Lunch Program Meal and Competitive Foods**

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### **Abstract**

Children's consumption of National School Lunch Program (NSLP) meals is associated with several positive dietary quality outcomes but concerns remain. Students who consumed mainly NSLP food reported higher intake of most nutrients, milk, fruits, and vegetables and lower intakes of sweetened beverages and candy than students who consumed mainly non-NSLP food, including a la carte items, food from vending machines, and food from home. Students in the "mainly NSLP" group also consumed more sodium, fat, and saturated fat, however, and calorie intake was also higher for this group, although it was only 80 percent of the NSLP requirement for calories served at lunch. The findings were based on lunchtime food records collected from students in three Houston area middle schools during school year 2001-02.

**Keywords:** National School Lunch Program, Child Nutrition Programs, food assistance programs, competitive foods, snack bar, vending, middle school, diet, Food Assistance and Nutrition Research Program, FANRP, ERS, USDA

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## **Executive Summary**

On an average school day, over 28 million children consume a lunch provided through the USDA National School Lunch Program (NSLP). In many schools, children also have the opportunity to purchase foods not subsidized by the NSLP and not subject to its nutritional standards. These “competitive foods” can be sold through snack bars, a la carte purchase in the cafeteria lunch line, vending machines, and other locations, according to the local school policy. In 2000, 74 percent of middle schools had at least one location at which “competitive foods or beverages” could be purchased. Because of the impact of school meals on children’s dietary intakes, attention has recently focused on the potential effects of these “competitive foods” on the quantity and quality of lunchtime food consumption. Previous research suggests that access to snack bars, a la carte meals and vending machines, which begins for many students in middle school, has a negative impact on NSLP participation and student diets.

To assess the impacts of the National School Lunch Program (NSLP) meal and competitive foods on children’s diets, we collected lunchtime food records from students in three Houston area middle schools during school year 2001-2, with information on the source of each item consumed: NSLP, vending, snack bar, home, and other. We measured lunchtime consumption of nutrients and servings of fruit/juice, vegetables, high fat vegetables, milk, total sweetened beverages, soft drinks, candy, cakes/cookies, and snack chips. We tested for group differences in consumption for two student groups: those consuming more than the median of total calories from the NSLP lunch (Group 1, “mainly NSLP”), and those with less than the median of total calories from NSLP (Group 2, “mainly non-NSLP”).

The results provide evidence of some beneficial impacts of NSLP participation as well as areas of concern associated with participation. Students in Group 1, “mainly NSLP,” reported higher consumption of Vitamins A and C, iron, and calcium, milk, fruit and vegetables, all nutrients and foods which are under-consumed by school children, than Group 2 “mainly non-NSLP” . Group 1 also had lower intakes of sweetened beverages and candy than students in Group 2.

Fat, saturated fat, and sodium consumption were higher for Group 1, however, and exceeded USDA NSLP meal guidelines. Substituting lower saturated fat selections like skim and 1% milk would be an important food service strategy to reduce saturated fat intake, since whole and 2% milk accounted for 49% of the milk consumption among the students in these three middle schools. In addition, more attention to lower fat and sodium entrees and food preparation techniques could also lower meal fat and sodium content.

Energy intake was also higher for Group 1, although it was only 80 percent of the NSLP requirement for calories served at lunch.

While fruit and vegetable consumption was higher for Group 1 than Group 2, the results show the potential for improvement. Fruit and vegetable consumption by Group 1 was about one serving per lunch, not counting high fat vegetables, while the school menus listed two servings of fruit and vegetables on the menu daily. More research is needed to fully understand how to encourage FV consumption at school.

While not national in scope, this study provided detailed data on sources of foods eaten at school and their contributions to nutrient and food group intake. The results provide updated evidence that while the NSLP lunch provides nutrients and food groups that are under-consumed by children, fat and saturated fat content remains a concern, even with the 1995 School Meal Initiative efforts to reduce fat and saturated fat intake.

## Introduction

On an average school day, over 28 million children consume a lunch provided through the USDA National School Lunch Program (NSLP) (Food and Nutrition Service/USDA, 2006). USDA sets nutrition standards for NSLP meals. Since 1994, the lunches have been required to average 30% or less of their kilocalories (kcal) from total fat and less than 10% from saturated fat over a one-week period. They are also required to serve milk with each meal and most serve two or more fruit and vegetable (FV) items daily (Food and Nutrition Service/USDA, 1997). In many schools, children also have the opportunity to purchase foods not subsidized by the NSLP and not subject to its nutritional standards. These “competitive foods” can be sold through snack bars, a la carte purchase in the cafeteria lunch line, vending machines, and other locations, according to the local school policy. In 2000, 74 percent of middle schools had at least one location at which “competitive foods or beverages” could be purchased (Wechsler, H., et al., 2001). Because of the impact of school meals on children’s dietary intakes, attention has recently focused on the potential effects of these “competitive foods” on the quantity and quality of lunchtime food consumption (United States General Accounting Office (GAO), 2004, Gordon, A.R., et al., 1995).

Students gain access to snack bar/a la carte meals and vending machines in middle school (Cullen, K.W., et al., 2000, Fox, M.K., et al., April 2001). Previous research suggests that these school food environments have a negative impact on NSLP participation and student consumption of healthful foods identified by Federal dietary guidance as being currently underconsumed (these include lowfat milk, fruits, and vegetables). For example, weekly a la carte sales were inversely related to NSLP participation (Fox, M.K., et al., April 2001). Middle school students with access to snack bar foods consumed significantly fewer FV servings

compared with elementary school students who only received NSLP meals (Cullen, K.W., et al., 2000). Among students followed from elementary into middle school, consumption of fruit, regular vegetables, and milk decreased, while consumption of high fat vegetables and sweetened beverages increased (Cullen, K.W., et al., 2004). The number of school snack vending machines was negatively related to lunch fruit consumption (Kubik, M.Y., et al., 2003).

Students who reported eating NSLP meals consumed greater amounts of all nutrients except vitamin C, compared with students eating lunch meals from other sources (Ho, C., et al., 1991), and greater daily intakes of vegetables, and milk, and lower intakes of added sugars, soda and fruit drinks compared with non-participants (Gleason, P., et al., January 2001). Intakes of energy (calories) were also higher. However, the combined impact of other food sources (e.g. the competitive food sources identified above) in the school food environment on consumption of nutrients and other food groups is unknown.

This report describes the impact of NSLP meals and competitive foods on middle school student lunchtime nutrient and food consumption. The primary hypothesis was that students eating most of their kcal from the NSLP meals would report greater nutrient and healthy food group intakes compared with students eating from snack, vending, and other sources.

### **Description of Study**

Participating students attended three middle schools with approximately 2790 6<sup>th</sup>-8<sup>th</sup> grade students (48% free/reduced price lunch; 61% Hispanic, 34% white, 3% African-American, 2% Asian/other) in one school district in Harris County, Texas. This study was approved by the Institutional Review Board at Baylor College of Medicine. Parents received

notification about the study and were informed that they could tell their children not to participate. During data collection, students provided verbal assent prior to completion of anonymous lunch food records.

During the 2001-2002 school year, students who assented completed anonymous lunch food records in the cafeteria immediately after eating lunch to maximize reporting accuracy (Baxter, S.D., et al., 1997). Each day, trained data collectors selected two to three tables in sequential order in the cafeteria and asked students to volunteer to complete an anonymous lunch food record. The data collectors repeated this process daily throughout the school year, sampling tables in order. On the food record, students listed each food and amount eaten on a separate line, and identified the source of each food (NSLP, snack bar, home, vending, other source). This method of food record data collection has been shown to be valid (Domel, S.B., et al., 1994). No records documenting number of refusals were collected. No demographic data from the students were collected so students could have completed multiple records throughout the school year.

The food records were entered into Nutrition Data Systems for Research (NDS-R) (version 4.2; Nutrient Coordinating Center, University of Minnesota) by a trained registered dietitian. Energy (kcal), nutrients, and servings of fruit/juice, vegetables, high fat vegetables, milk, total sweetened beverages, soft drinks (included in total sweetened beverages), candy, cakes/cookies, and snack chips were obtained from the NDS-R output (Cullen, K.W., et al., 2004). Two groups were formed based on the median split of energy (kcal) consumed from the NSLP meal (57%). Group 1 “mainly NSLP” students consumed above and Group 2 “mainly non-NSLP” students consumed below the median kcal from NSLP. The data were aggregated weekly and independent t-tests were applied to investigate group differences in consumption.

## Findings

There were 2,244 self-reported lunch food records. The impact of the NSLP meal on student consumption is reported in Table 1. Group 1 “mainly NSLP” students reported significantly higher lunch consumption of all nutrients and servings of fruit/juice, vegetables, and milk, and lower intakes of sweetened beverages, soft drinks, candy, cakes and pies, and snack chips compared to Group 2 “mainly non-NSLP” students. Energy intake was also higher for Group 1, although it was only 80 percent of the NSLP requirement for calories served at lunch.

Table 1. Daily lunch consumption per student stratified by consumption above (Group 1) or below (Group 2) the median split of total kilocalories (kcal) consumed from the National School Lunch Program (57%)

|                           | Group1<br>N=24 <sup>1</sup><br>Mean (SD <sup>2</sup> ) | Group 2<br>N=24<br>Mean (SD) | NSLP guidelines   |
|---------------------------|--|------------------------------|-------------------|
| <b>Nutrients</b>          |  |                              |                   |
| Kcals **                  | 666 (76)   | 509 (99)                     | ~825              |
| Protein (g) **            | 28.2 (3.6)   | 13.9 (5.6)                   | 16                |
| Fat (g) **                | 29.6 (3.3)   | 19.7 (4.2)                   | -                 |
| % kcal from fat           | 40 (5)   | 35 (7)                       | ≤30               |
| SFA (g) **                | 10.6 (2)   | 6.3 (1)                      | -                 |
| % kcal from saturated fat | 14 (2)   | 11 (2)                       | <10               |
| Fiber (g) **              | 4.7 (1.1)  | 2.4 (0.6)                    | -                 |
| Vitamin A (RE) **         | 224.8 (54.9)   | 66 (37.5)                    | 300               |
| Vitamin C (mg) **         | 19.8 (5.8)   | 7.1 (3.9)                    | 18                |
| Iron (mg) **              | 4 (0.6)  | 2.5 (0.9)                    | 4.5               |
| Calcium (mg) **           | 400 (98)   | 154 (53)                     | 400               |
| Sodium (mg) **            | 1195 (201)   | 718 (180)                    | ≤800 <sup>3</sup> |
| <b>Servings</b>           |  |                              |                   |
| Fruit/Juice **            | 0.60 (0.42)  | 0.07 (0.07)                  |                   |
| Vegetables **             | 0.47 (0.26)  | 0.12 (0.19)                  |                   |
| High fat vegetables       | 0.06 (0.13)  | 0.05 (0.15)                  |                   |
| Milk (oz) **              | 4.37 (2.08)  | 0.79 (1.13)                  | 8 ounces          |

|                        |             |             |
|------------------------|-------------|-------------|
| Sw Beverages (oz) **   | 0.62 (0.69) | 7.32 (3.84) |
| Sw Soft Drink (oz) **  | 0.30 (0.46) | 6.15 (3.53) |
| Candy **               | 0.01 (0.02) | 0.16 (0.13) |
| Cakes, cookies, etc. * | 0.03 (0.04) | 0.13 (0.15) |
| Snack Chips **         | 0.04 (0.05) | 0.36 (0.23) |

\*p<.01, and \*\*p<.001;

<sup>1</sup> Number of aggregated weeks

<sup>2</sup> Standard Deviations

<sup>3</sup> While there is currently no specific NSLP nutrient standard for sodium, the National Research Council's recommendation is  $\leq 2400$  per day; one-third of this limit for the lunch meal would be 800 mg.

### Discussion

The importance of the NSLP meal to middle school student dietary consumption was documented and supports findings reported in the first School Nutrition Dietary Assessment Study (2). Group 1 “mainly NSLP” students consumed significantly more of the nutrients and food groups related to healthy choices (protein, Vitamins A and C, iron, and calcium, FV, and milk) and less of those food groups related to less desirable choices (sweetened beverages, and high fat salty and sweet snacks/desserts), compared with Group 2 “mainly non-NSLP” students. Of concern, intake of fat and saturated fat exceeded the USDA NSLP meal guidelines for both groups. Intakes for Group 1 “mainly NSLP” were particularly high. Nationally, there was a 10% reduction in the fat content of NSLP meals as served from 37.5% to 33.5% between the 1991-1992 and 1998-1999 school years (Fox, M.K., et al., April 2001) and a 20% reduction in saturated fat content from 15% to 12%. In this current study, whole and 2% milk accounted for 49% of the milk consumption among the students in these three middle schools. Substituting lower fat selections like skim and 1% milk would be an important food service strategy to reduce

total fat and saturated fat intake. In addition, more attention to lower fat entrees and food preparation techniques could also lower meal fat content.

Sodium consumption was well above the 800 mg guideline for the “mainly NSLP” group. Nationally, reducing the sodium content of school meals has not been very successful. The mean sodium content of school meals as offered to students only declined from 1399 mg to 1285 mg between the 1991-1992 and 1998-1999 school years (Fox, M.K., et al., April 2001). Further understanding of the problems associated with reducing sodium content of school meals is warranted. For example, is it a problem of overuse of sodium in school food preparation or of the use of high-sodium prepared food items?

Although the energy consumption of the “mainly NSLP” group (666 kcal) is higher than the “mainly non-NSLP” group (509 kcal), it is 23% lower than the NSLP requirement for calories served at lunch (820 kcal). This finding may reflect a combination of plate waste and use of “offer vs. serve” - the NSLP provision that allows schools to permit students to refuse up to two items in a reimbursable lunch. There is some concern that the USDA lunch energy requirements are too high, given the 2005 Dietary Guidelines recommendation tying calorie intake to expenditures (HHS/USDA, 2005). Further research is needed to explore this area and may require updated NSLP meal guidelines.

Fruit and vegetable consumption by the “mainly NSLP” students was about one serving per lunch, not counting high fat vegetables. This was slightly higher than the 0.82 serving reported for middle school students consuming the NSLP meal in another study (Cullen, K.W., et al., 2003). The school menus listed two servings of fruit and vegetables on the menu daily, suggesting that more research is needed to fully understand how to encourage FV consumption at school.

More milk was consumed by the Group 1 “mainly NSLP” students (4.37 ounces) and probably contributed to their significantly higher calcium intake. An eight ounce serving of milk is part of every NSLP meal. The low milk consumption among Group 2 students (less than 1 ounce) suggests alternative school lunch beverages, which is supported by the sweetened beverage intake of Group 2 students (7 ounces).

Sweetened beverage consumption was 7+ ounces per day for Group 2 students, 85% were soft drinks. The majority of these beverages were obtained from vending (80%) (data not presented). USDA regulations prohibit access to soft drinks in the cafeteria area during meal times (Food and Nutrition Service/USDA, 1997). However, these data suggest that students do consume soft drinks at lunch, which has been associated with lower milk and fruit juice consumption (Harnack, L., et al., 1999), lower fruit consumption (Cullen, K.W., et al., 2002) and higher energy (kcal) intake (Cullen, K.W., et al., 2002). The American Academy of Pediatrics suggests that school districts adopt school-wide policies that restrict the sale of soft drinks to reduce health problems associated with excess energy intake (Murray, R.D., et al., 2004).

The dietary measure used in the current study resulted in estimates that were somewhat similar to a study using direct observation of food purchases in two high schools and one middle school (Cohen, R., et al., 2004). In that study, energy available per meal purchase transaction was calculated from observed sales data and was 739 - 787 kcal for reimbursable NSLP meals (vs. 666 kcal in this study), 294 - 411 kcal for snack bar sales, and 140 - 216 kcal for vending transactions, compared to 506 kcal for snack/vending foods in this study . Individual student consumption was not measured in that study.

Several limitations of the study should be noted. Differences between the two groups may be related to the method of determining groups - grouping students as “all NSLP,” “some

NSLP,” “no NSLP,” for example, might have yielded different results. By aggregating the data at the weekly level, the standard deviations were smaller. However, in calculating the independent t test statistic, the effect of the smaller standard deviation associated with a smaller sample is minimized by the incorporation of the sample size into the statistic. All student data were from self-report, which is limited by memory and ability to estimate portion size. However, the lunchtime food records were completed during the lunch period, which increased confidence in the validity of the self-report (Baxter, S.D., et al., 1997). Lunch periods were from 10:30 to 12:45. Students in the early lunch periods may not have been hungry, consumed smaller lunches, and bigger snacks later on in the day. The present study only collected consumption data during the lunch period and would have missed the increased snacks later during the day, or, indeed, any counterbalancing effects of foods consumed outside of the lunchtime period.

### **Implications for Research and Practice**

There are several key findings from this study. The importance of the NSLP meal to middle school student intake of several healthful foods and nutrients was documented with actual student consumption records. However, findings indicate that NSLP participation continues to be associated with over-consumption of fat, saturated fat, and sodium. Further investigation of strategies to modify NSLP meals to meet these requirements, while serving meals that appeal to students, is warranted. Students choosing primarily foods and beverages from non-NSLP sources, such as snack bars and vending, consumed less healthy foods and beverage options, and daily consumption of these meal choices over a length of time is a concern. Further delineation of the reasons for the purchases of snack bar and vending foods by students eligible for the free/reduced price meal is needed. Previous research has identified that poor attitudes towards the

NSLP meals represent serious barriers to NSLP participation (Meyer, M., et al., 2001). Because of the critical need for nutrients during growth in middle school students, and the increasing rates of obesity, strategies for improving NSLP meals and changing student attitudes toward them should be a priority area for further research. If NSLP meals do not meet preferences of these students, investigation of how they can be modified to be more appealing, while still meeting nutrition recommendations, is warranted. There may be a need for more positive advertising and/or marketing of the NSLP meal to students and staff.

In addition, schools may wish to consider strategies to improve or limit alternatives to NSLP meals (Cullen, K.W., et al., 2006). Each local educational agency participating in the NSLP is now required, under Federal law, to establish a local school wellness policy by School Year 2006. Policies on competitive foods and allowable sweetened beverages may be an important part of wellness policies. Educational messages about foods and meals brought from home for both students and parents may be appropriate. Together with NSLP meals that meet USDA nutrition standards while appealing to student preferences, changes in non-NSLP food and beverage offerings can improve the overall school food environment, promoting improved diets and health of students.

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