ABSTRACT

BACKGROUND: Schools can play a major role in prevention and intervention for childhood obesity. We describe changes in elementary school cafeteria lunch sales patterns resulting from nutritional improvements in menu offerings that were part of a community-wide focus on health.

METHODS: Elementary school lunch sales data were collected for 1 week in each of 7 years in a district serving a predominantly poor, rural, and Caucasian student population, with high rates of obesity. Post hoc data analyses described lunch sales patterns and related food service costs over the project years.

RESULTS: The percentage of high calorie/low nutrition foods sold decreased from 22% of all sales in 2005 to 0% in 2011. High-calorie snack purchases decreased from 535 items to 0 items. The sale of fresh fruits increased by 12%. There was only a slight decline in the percentage of children who purchased cafeteria lunches over the years and a 15.2% cost increase for purchasing healthier food supplies.

CONCLUSIONS: Elementary school children purchased healthier lunches when healthier menu items were offered and when less healthy foods were eliminated from the menu. There was no significant decline in the number of students who purchased lunches as nutritional improvements were made.

Keywords: community health; nutrition and diet; school food services; public health.


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The prevalence of childhood obesity has increased rapidly in recent decades and is a critical public health problem that likely will result in serious consequences for the nation if not addressed with a multisector approach. Obesity prevalence more than tripled from 1980 to 2008, from 5% to 19.4% in 2-to-5-year-olds, from 6.5% to 19.6% in 6-to-11-year-olds, and from 5% to 18.1% in 12-to-19-year-olds. Currently, 17% of all American children are obese, with a body mass index of equal to or greater than the 95th percentile for their age and sex.

Unhealthy diet and low physical activity are two factors affecting the high prevalence of obesity in the United States. For example, in Pennsylvania, only 20% of children consume 5 servings of fruits and vegetables daily. Additionally, the majority (79%) do not attend daily physical education classes in school and almost one-third (31%) watch television for more than 3 hours on school days. Obese children have an increased current and future risk of serious health problems, including cardiovascular disease, type 2 diabetes, and mental health conditions such as anxiety and depression.

Nutritional and physical activity factors affecting childhood obesity are active in the school setting. For example, children consume 35% to 47% of their daily caloric intake at school. Schools can play a central role in addressing the childhood obesity epidemic by reinforcing healthy habits throughout childhood. Educators can teach students about the importance of regular physical activity and making good food choices and can provide opportunities for students to engage in...
healthy behaviors during the school day. But schools face significant challenges in playing this role, including limited resources and the need to focus on academic programs to improve standardized test scores. Through vending machines and fundraisers, schools have long promoted and sold high-calorie, low-nutrient foods as a way to generate revenue for needed programs. Although improvements in the nutritional quality of school meals have been documented, results from a 2006 survey indicate that nutrition services program practices in many schools continue to need improvement. That survey provided a disconcerting picture of the continued widespread availability of foods and beverages high in fat, sodium, and added sugars as à la carte cafeteria choices, in vending machines, and in school stores.

Katz argues that although children spend more time outside of school than in it, improvement in school nutrition standards and food offerings is of the highest priority. His editorial notes, however, that the evidence so far for the effectiveness of school nutrition changes on behavioral and health parameters is "more suggestive than decisive." The large HEALTHY Study trial, for example, demonstrated that a targeted intervention focusing on improving nutritional offerings in middle schools could significantly reduce portion sizes, high-fat foods, added-sugar beverages, and higher-fat milk in intervention schools compared to control schools, but there was no effect of the intervention on child weight parameters compared to control schools. Another study found that offering more nutritious foods in elementary and middle school cafeterias resulted in healthier eating practices generally for some students. Another reported that students want healthy foods to be available for purchase at school and will eat those when they are available, although the purchase of healthy foods did not decrease the purchase of unhealthy foods when those were also available.

A meta-analysis reviewed 43 studies published between 1991 and 2010 evaluating school-based interventions aimed at reducing childhood obesity rates. Results showed that interventions with a physical activity component may be effective toward that goal but not those that targeted nutrition or sedentary behavior alone. Communities concerned about childhood obesity have begun to partner with local schools in an attempt to impact the rates of obesity in their children, with some success.

In response to local obesity data, 1 Pennsylvania county adopted a community-wide approach to childhood obesity prevention and intervention. More than one-third (37%) of elementary school students in Armstrong County were found to be overweight or obese in 2005, the first year that the state mandated school nurses to measure body mass index for all students (unpublished data). The HEALTHY (Healthy Eating Active Lifestyles Together Helping Youth) Armstrong initiative adopted elements of the National Heart, Lung, and Blood Institute’s We Can! program (Ways to Enhance Children’s Activity & Nutrition; http://www.nhlbi.nih.gov/health/public/heart/obesity/wecan/) to help children in their predominantly rural county improve nutrition and increase physical activity levels. The initiative is housed at a hospital serving the entire county and includes partners from all aspects of county life, including the largest school district, largest pediatric practice, county government, local sports and recreation facilities, and a regional health insurer, among others. The local coalition partnered with the national We Can! program; Armstrong County was designated the first We Can! county in the United States in 2007. The coalition’s initiatives include sponsoring local marketing to promote healthy behaviors, assisting schools in giving students and parents opportunities to learn about and engage in healthy behaviors, working with grocery stores to provide Healthy Recipes of the Week, and hosting health-focused community events. The coalition assisted the district’s 7 elementary schools during the first 5 years of the initiative and, now, the 5 middle and high schools in promoting healthy behaviors among students. Schools receive a wellness guide that offers general information about health and wellness, describes programs and activities that can be adopted easily, and reviews practical strategies and implementation tips to assist. The coalition’s wellness coordinator works with a paid facilitator, usually a teacher, within each of the schools to implement specific programs and policies designed to give students opportunities to learn about and practice healthy activity and eating behaviors.
An early goal of the initiative was to improve the healthiness of lunch foods purchased by children in the elementary school cafeterias. From the 2005-2006 through 2011-2012 school years, the district’s food service department made improvements to the school lunch program with the support of school administration to reduce the amount of total fat, saturated fat, and trans fat delivered via lunch menu offerings. In 2006, for example, deep fryers were removed from all kitchens so that now tater tots, French fries, potato wedges, chicken nuggets, chicken strips, and cheese sticks are baked instead of fried. Since 2008, only whole-wheat bread and pasta products have been offered. Recipes were modified to reduce fat in typical entrée offerings; the tuna salad croissant sandwich, for example, was modified by using whole-wheat croissants and low-fat mayonnaise. Whole milk was removed from the menu in 2006 and, as of 2011, only skim or 1% milk is offered. A minimum of three kinds of fresh fruit choices and two entrée salads are offered daily. Students can “super size” the vegetable of the day or choose a small salad as a side dish.

This report describes the changes in lunch food sales patterns and costs of elementary school that resulted from the HEALTHY Armstrong initiative. The research questions posed in this post hoc analysis of data were (1) Will children purchase healthier foods when those are offered in elementary school cafeterias? (2) Are there any unanticipated negative consequences of altering cafeteria menus in the direction of healthier food offerings? and (3) Do food supply costs increase when schools introduce a healthier lunch menu?

METHODS

Setting and Participants

The study was set in the elementary school cafeterias and the Food and Nutrition Services department of the Armstrong School District in northwestern Pennsylvania. Demographics of the population served by this school district are presented in the Results section.

Procedures

In 2010 and 2011, elementary school lunch sales data were collected and analyzed for 1 week of each school year from 2005 through 2011. The first week in October of each year was designated as the standardized study week. Menu offerings during the designated study week varied from year to year, but the food service director verified that menu offerings during study weeks were nutritionally consistent over the years. Daily production sheet records completed by cafeteria managers provided the raw data for determining the number of menu items sold during the study weeks. No specific promotions or nutrition education activities occurred during study weeks compared to other weeks of the school year.

Foods on the cafeteria menu during study weeks were coded post hoc to correspond to the We Can! Go, Slow, and Whoa category framework described below and were analyzed to detect the impact of HEALTHY Armstrong’s nutritional interventions on children’s purchasing behavior at lunch. Foods were categorized into one of three general nutritional categories using the We Can! assignment of foods into Go, Slow, and Whoa categories. These categories separate nutrient-dense or lower calorie/higher nutrition foods from energy-dense or higher calorie/lower nutrition foods. Designed to help children and families make smarter food choices, the Go, Slow, and Whoa system is a nutrient profiling method that closely corresponds to tertiles of Nutrient Rich Foods Index scores. We Can! food categories have been used to classify food for studies on food advertising to children and nutrition education interventions.

“Go” foods are low in calories, saturated fat, and dietary cholesterol and are high in nutrition. Children are encouraged to eat as many of these healthy foods as possible in their daily diet. The Go category includes fresh fruits and vegetables, whole-grain breads and pastas, fat-free milk, and water. “Slow” foods are those that are higher in calories and fat but still have good nutritional value. Examples of Slow foods are vegetables served with added sauce/fat, dried fruit, canned fruit in light syrup, and juice. Children are encouraged to eat Slow foods in moderate portions so they have room for other more nutrient-dense foods. “Whoa” foods are those that should only be eaten once in a while or for special treats. They typically are high in saturated fat and dietary cholesterol and, in some cases, are also high in sugar. They provide much lower or no nutritional value. Whoa foods include items such as French fries, canned fruit in heavy syrup, doughnuts, full-fat cheese, pizza, regular soda, and potato chips.

An expert group review process was utilized to code weekly menu items into Go, Slow, or Whoa categories. Judgments were reached collaboratively by referring to the table provided on the We Can! website (http://www.nhlbi.nih.gov/health/public/heart/obesity/wecan/downloads/go-slow-whoa.pdf). Expert reviewers included a dietitian, the district food service director, and dietitian interns. Most menu items were listed as specific examples in the We Can! table; thus, classification of these items required no discussion. When an exact match for a food item was not available, the experts conferred and reached a mutual decision based on the menu item’s correspondence to other products within a category. Consensus was reached for 100% of foods using this method. The food service director or his/her designee used the daily production sheets to enter the numbers of each food item purchased at each school into a spreadsheet and then tallied the data to provide sales numbers for each year for the district.
Measures

To describe student food purchase patterns, the number of Go, Slow, and Whoa items purchased as entrées, beverages, fruit/vegetables, and à la carte/snack items was gathered for the study week each year, as was the total number of cafeteria meals purchased. To describe the relative costs of providing healthier foods in school lunches, the district’s yearly expenditure in dollars to supply the school cafeterias was gathered. Student lunch enrollment data, or the number of elementary students enrolled in school minus kindergarteners who either did not stay at school after the morning session or did not arrive before lunch, were retrieved to act as the denominator in describing lunch program participation over time. School lunch price data for all years and percentage of children receiving free and reduced lunch support were also gathered.

Data Analysis

Lunch sales and other relevant study data were analyzed using descriptive statistics, including frequency distributions of item types, percentages, and ratios, to derive (1) the numbers of Go, Slow, and Whoa entrées and other food items purchased and (2) percentage of all food purchases, à la carte items, and fruit that were categorized as Whoa compared to Slow and Go. To determine if the overall quantity of cafeteria sales exhibited any change over the study period, the total number of food items of any type purchased each year was calculated. Dollar amounts for lunch prices over the years were adjusted for inflation with 2005 as the base year.

RESULTS

Sample and Data Set

Cafeteria sales data were available from all 7 elementary schools in the participating school district from the 2005-2006 through the 2011-2012 school years. The schools together served an average of 3046 kindergarten through sixth grade students per year over that time period (range, 2891 to 3210). Students were predominantly Caucasian and poor. In the 2011 school year, 97.65% were Caucasian; 1.26% were African American, and <1% each were from other racial or ethnic categories, including Mixed and Hispanic. An average of 48% qualified for free/reduced-price lunches (2005-2011 range, 45.4% to 50.3%). The school population was, on an average, 52.8% male (range: 51.8% to 53.3%) during the study period. See Table 1 for the Whoa-Slow-Go categorization of lunch menu items offered during the 7 study weeks.

Lunch Purchases

Results show that the percentage of Whoa food purchases by children decreased from 22% in 2005 to 0% in 2010 and 2011. Sales of Whoa entrées, specifically, decreased from 52% of all entrées purchased in 2005 to 0% in 2010 and 2011 (Figure 1). The purchase of snack items classified as Whoa foods—primarily packaged snacks and cookies—initially increased over 3 years from the 2005 baseline year when 535 such items were purchased during the study week (772, 1014, and 2566 in 2006, 2007, and 2008, respectively) and then decreased dramatically over the next 3 years (151, 0, and 0 in 2009, 2010, and 2011, respectively). Fresh fruit (Go) sales increased by 12% between 2005 and 2011, while Slow fruit sales—primarily canned fruit in syrup—decreased 59% over the same time frame. There was a shift in proportions of Go, Slow, and Whoa foods purchased overall from 2005 through 2011, as shown in Figure 2. The total number of food and beverage items purchased during study weeks showed a 31% decrease from 2005 (40,035 items sold; 14.5 items per child) through 2011 (27,920 items sold; 10.6 per child).

Lunch Menu Offerings

There was a corresponding major shift over time in the percentage of entrées and other items offered on the menu that were in the Whoa category compared to those that were Slow or Go. In 2005, 30% of entrées offered on the menu were Whoa foods, compared to 0% in 2011. In the same time frame, total Whoa foods, including entrées, fruits, and vegetables, offered on the menu showed a decrease from 22% of all foods offered in 2005 to 0% in 2011. See Figure 3 for details of these changes over time, compared to the Whoa food purchasing data.

Other Variables

There was a slight decline over the years from 76% to 70% in the percentage of children who were present in school during the lunch period who purchased lunch in the cafeterias. See Figure 4 for a year-by-year description of these data. Figure 4 also shows changes in district food service expenditures over the course of the project. It was not possible to separate out expenditures for elementary school food service supplies alone. However, because similar nutritional changes were made in secondary school cafeteria offerings during the same time frame, system-wide food service expenditures provide an adequate picture of costs for implementing the changes described. These data show a small increase in costs over the years of the initiative.

Percentage of children eligible for free/reduced lunch varied slightly across study years (x̄ = 48.0%; min = 45.4% in 2008; max = 50.3% in 2009). Lunch prices rose from $1.70 in 2005-2006 to $2.15 in 2011-2012, a 26% increase; adjustment for inflation reduces the relative increase to 10%.
Table 1. Go, Slow, and Whoa Categorizations for School Cafeteria Lunch Offerings

<table>
<thead>
<tr>
<th>Nutrient Dense → Calorie Dense</th>
<th>Go</th>
<th>Slow</th>
<th>Whoa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entrées</td>
<td>Chef salad with cheese-filled breadstick</td>
<td>Cheese burger*</td>
<td>Corn dog</td>
</tr>
<tr>
<td>Grilled chicken</td>
<td>Baked chicken</td>
<td>Fried chicken nuggets</td>
<td>Fried chicken patty-sandwich</td>
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<tr>
<td>Hot turkey sandwich</td>
<td>Baked chicken nuggets</td>
<td>Fried chicken patty-sandwich</td>
<td>Ham and cheese croissant</td>
</tr>
<tr>
<td>Turkey hoagie</td>
<td>Baked chicken patty-sandwich</td>
<td>Beef and bean chili with corn bread</td>
<td>Hot dog</td>
</tr>
<tr>
<td>Yogurt fruit plate</td>
<td>Breakfast for Lunch†</td>
<td>Hot dog in a blanket</td>
<td>Krazy dippers*</td>
</tr>
<tr>
<td></td>
<td>Cheeseburger bowl with wheat roll</td>
<td>Pizza Hut pizza</td>
<td>Toasted cheese with tomato soup§</td>
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<td></td>
<td>Chicken noodle soup</td>
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<td></td>
<td>Chicken salad</td>
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<td></td>
<td>Chicken wrap</td>
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<tr>
<td></td>
<td>General Tso chicken and rice bowl</td>
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<td></td>
<td>Hoagie</td>
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<td></td>
<td>Lasagna‡</td>
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<td></td>
<td>Manicotti</td>
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<tr>
<td></td>
<td>Peanut butter and jelly</td>
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<td></td>
<td>Pizza</td>
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<td></td>
<td>Rigatoni</td>
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<td></td>
<td>Sloppy joe with chips and cheese</td>
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<td></td>
<td>Soft taco</td>
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<tr>
<td></td>
<td>Toasted cheese with tomato soup§</td>
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<tr>
<td></td>
<td>Tuna croissant†</td>
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<tr>
<td></td>
<td>Turkey croissant with low-fat cheese</td>
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<td></td>
<td>Turkey wrap</td>
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<td></td>
<td>Canned fruit</td>
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<tr>
<td>Side dishes</td>
<td>Garden salad</td>
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<td></td>
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<tr>
<td></td>
<td>Fresh fruit</td>
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<tr>
<td></td>
<td>Fresh vegetables</td>
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<tr>
<td></td>
<td>Frozen vegetables</td>
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<tr>
<td>Beverages</td>
<td>Bottled water</td>
<td>2% milk</td>
<td>Whole milk</td>
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<td></td>
<td>1% milk (includes flavored milk)</td>
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<tr>
<td></td>
<td>Skim milk</td>
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</tbody>
</table>

* Cheeseburgers were made with low-fat beef.
† Breakfast for Lunch consisted of French toast sticks, turkey sausage, and orange juice.
‡ Lasagna was made with low-fat cheese and whole-wheat pasta.
§ 2005-2009: Toasted cheese was made with whole-milk cheese; as of 2010, it was made with reduced-fat cheese and whole-wheat bread, changing its classification to Slow.
|| Tuna croissant was made with low-fat mayonnaise.
¶ Krazy Dippers consisted of chicken rings, mozzarella sticks, and a bread stick with dipping sauce.

DISCUSSION

Data from this community initiative show that school food services programs can change the pattern of cafeteria lunch purchases for elementary school children by reducing the availability of less healthy foods, by changing food preparation techniques, and by offering healthier entrées, side dishes, beverages, and à la carte items. As those changes were implemented in our study setting, there was a dramatic shift in the direction of improved nutritional content of the food purchased by the children for lunch, from 52% of entrée purchases that were Whoa in 2005 to 0% in 2010 and 2011.

Although institutional changes in menu development and food preparation were the major factors driving the shift from Whoa to Slow and Go food purchases, children’s food choices at the point of purchase also played a role in the overall results. The elimination of Whoa foods from the menu might have been expected to shift the bulk of children’s Whoa purchases to the Slow category as the “next best thing” to Whoa foods in children’s minds. Our data suggest, however, that when Whoa foods were eliminated, children shifted their purchases fairly equally into foods in the Slow and Go categories. The data shown in Figure 2 suggest this pattern: in 2005, Slow and Go foods, not including beverages, represented 47% and 53%, respectively, of non-Whoa foods purchased. In 2011, the percentage of Slow foods purchased was 48% compared to 52% for Go foods, indicating that children were redistributing their Whoa purchases fairly equally into the Slow and Go categories. The data in Figure 3 also suggest another way of describing a healthy shift in children’s purchasing patterns. In the early years of the program, although Whoa entrées comprised 30% of entrées on the menu in 2005, 36% in 2006, and 38% in 2007, children purchased Whoa entrées in differentially high amounts during those years (52%, 55%, and 52%, respectively,
of all entrées purchased. In 2008 and 2009, when Whoa entrées were still available on the menu, children’s Whoa purchases declined to numbers more closely resembling the relative presence of Whoa foods on the menu. Study data also show that children purchased healthier fresh fruit when it became available and decreased their purchases of canned fruit when fresh fruit was offered.

One concern in making school cafeteria food more nutritious is that, as food offerings change in a healthier direction, children might simply opt out of purchasing lunch from the cafeteria to maintain preferred and less healthy eating patterns by bringing food from home or other non-cafeteria sources. This concern does not appear to be founded from the present data. Comparison of lunch enrollment numbers to meals purchased shows only a slight decline over the years in percentage of students who purchased meals from the cafeteria. These data reinforce the hopeful notion that children will eat healthier food if unhealthy food is eliminated from school cafeteria menus. It does appear, however, that there was a decline in the number of items purchased per child. This finding may reflect the effect of lunch price increases over the years. It also may represent a healthy shift toward consumption of a more reasonable amount of food for lunch or a less desirable effort by children who may have brought less healthy food from outside to supplement their reduced number of purchases in the cafeteria.

There was a small increase in the overall cost to the district for providing a healthier lunch menu, a fact that may be a deterrent for some schools who want to institute healthy food service changes. As this exemplar school district did, however, it is often possible—in the current environment in which child obesity is high on the nation’s radar screen—to find grant sources for extra funds to purchase fresh fruits
and vegetables, thus offsetting some of the extra costs. In our study, there was no clear evidence that slight changes in the percent of school children eligible for free/reduced lunches across study years affected purchasing patterns. The percentage of students who purchased lunch declined gradually and linearly over the years, while free/reduced lunch percentages first decreased 4% in 2005 through 2008, then jumped 4.9% in 2009, and remained at a similar level through 2011.

A key factor in the success of this school-based nutrition change endeavor was that the Food and Nutrition Services department worked hand in hand with the school administration to institutionalize the policies that proved successful in altering food purchase patterns over the years at the school-district level. By instituting district-wide policies, positive nutrition changes were less likely to be altered by subsequent district administrators or food service personnel. Many of the local changes made during the course of the HEALTHY Armstrong initiative preceded similar changes in state and federal food service nutrition mandates. The fact that new federal policies are being considered that require improvements in the nutritional content of food served to children in schools, and that local policies have some evidence for effectiveness, will be a key factor in institutionalizing improved nutritional access in schools across the nation.

Limitations

There are several limitations to these data. First, some changes to cafeteria food offerings were already in effect by 2005 when the initiative began, so we are not able to parse out results that were exclusively due to the initiative. Second, data were gathered for only 1 week per school year. Because menus varied somewhat in their total fat and calorie content, especially in the earlier years, it is possible that the 1-week snapshot did not fully represent student lunch purchases throughout the year. Third, our methods did not allow us to measure the amount of purchased food that was actually consumed by the children. It is possible that more food was discarded as food offerings became healthier.

Conclusions

The results of this 7-year initiative showed that elementary school cafeteria lunch sales patterns were affected in a positive direction when school administrators, supported by community stakeholders, took informed steps to modify food offerings. Children purchased healthier foods when those were offered, with no major decline in the number of students who purchased lunch at school. Future research should focus on assessing whether healthier cafeteria offerings result in increased food waste from uneaten food and/or increased incidence of students bringing food from home to supplement their lunches.

IMPLICATIONS FOR SCHOOL HEALTH

School administrators and food service personnel may use these results to support efforts to revamp school lunch menus. School nurses, health educators, and teachers can be part of the process of improving students’ overall nutrition by using these data and the Go, Slow, and Whoa categorization of foods to inform children about healthier food choices and to support the idea that children will eat healthy foods when they are available. Schools also can promote, through school activities highlighting healthy food options and activity-based rewards and reinforcements, the purchase and consumption of healthier food by children in general and in the school cafeterias specifically. District costs for providing healthier food options increased somewhat in this study, but interested schools may take advantage of external funding to supplement their budgets for this purpose.

Human Subjects Approval Statement

The University of Pittsburgh Institutional Review Board designated the protocol for analysis of anonymous data from this community project as exempt under Section 45 CFR 46.101(b)(4) (IRB# PRO11120352).


