

Changes in School Food Preparation Methods Result in Healthier Cafeteria Lunches in Elementary Schools



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Introduction: The purpose of this study is to examine the impact of a districtwide food best practices and preparation changes in elementary schools lunches, implemented as part of the LiveWell@School childhood obesity program, funded by LiveWell Colorado/Kaiser Permanente Community Health Initiative.

Methods: Longitudinal study examining how school changes in best practices for food preparation impacted the types of side items offered from 2009 to 2015 in elementary school cafeterias in a high-need school district in southern Colorado. Specifically, this study examined changes in side items (fruits, vegetables, potatoes, breads, and desserts). In Phase 1 (2009–2010), baseline data were collected. During Phase 2 (2010–2011), breaded and processed foods (e.g., frozen nuggets, pre-packaged pizza) were removed and school chefs were trained on scratch cooking methods. Phase 3 (2011–2012) saw an increased use of fresh/frozen fruits and vegetables after a new commodity order. During Phase 4 (2013–2015), chef consulting and training took place. The frequency of side offerings was tracked across phases. Analyses were completed in Fall 2016. Because of limited sample sizes, data from Phases 2 to 4 (intervention phases) were combined for potatoes and desserts. Descriptive statistics were calculated. After adjusting for length of time for each phase, Pearson chi-square tests were conducted to examine changes in offerings of side items by phase.

Results: Fresh fruit offerings increased and canned fruit decreased in Phases 1–4 ($p=0.001$). A significant difference was observed for vegetables ($p=0.001$), with raw and steamed vegetables increasing and canned vegetables decreasing from Phase 1 to 4. Fresh potatoes (low in sodium) increased and fried potatoes (high in sodium) decreased from Phase 1 to Phases 2–4 ($p=0.001$). Breads were eliminated entirely in Phase 2, and dessert changes were not significant ($p=0.927$).

Conclusions: This approach to promoting healthier lunch sides is a promising paradigm for improving elementary cafeteria food offerings.

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INTRODUCTION

Proper nutrition plays a significant role in the growth of children's physical and mental development.¹ Wholesome foods support a healthier quality of life, including a stronger immune system.² Diets rich in fruits and vegetables, whole grains, and healthy fats are recommended for a balanced adolescent diet.² Conversely, a diet consisting of processed and

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high-fat foods may lead to increased weight gain and comorbid effects later in life.³ Studies indicate that a poor diet during childhood is directly associated with poor health as an adult.³ Comorbid effects associated with an unbalanced diet are high blood pressure, heart disease, and diabetes.⁴

In addition to the negative impacts of diet on physical health, lower cognitive functions have been associated with childhood obesity.⁵ Making healthful decisions at a young age establishes a crucial platform for brain activity now and in the future. Research shows that wholesome childhood nutrition is linked to greater educational achievement, attendance rates, standardized test scores, and improved grades.⁶ Students who omit eating breakfast have been shown to make more mistakes within the classroom and perform slower than students who do eat breakfast.⁷ In a study by Kleinman and colleagues,⁸ the researchers studied students' total daily energy intake in a 6-month study. Results indicated that students whose nutritional intake improved over the study also improved math scores and reduced absences. Moreover, researchers found that students with a sufficient nutritional intake had between a half and one letter grade improvement in areas such as math, reading, science, and social science.

Many school-aged children consume 35%–47% of their daily calories at school.⁹ School meal programs such as the School Breakfast Program and the National School Lunch Program (NSLP) account for the majority of school-aged children's nutritional daily needs.¹⁰ The NSLP's goal is to provide one third of nutritional value of children's daily diet at lunch.¹¹ Research indicates that students who attend schools that do not partake in NSLP do not receive as many nutrients and energy (calories) as students whose school does participate.⁵ In these programs, schools provide free or reduced-price meals to students who qualify based on family income. In 2015, there were 30 million children who bought lunch from school, and of those, an estimated 76% of children received free or reduced-price lunches.¹²

Limiting food and beverages high in fat and sugars at school is directly related to reduced consumption of these items throughout the school days.⁹ If healthier options are unavailable, students may consume foods high in fats and added sugars. Thus, changing the availability of foods high in fats and added sugars may potentially result in students eating healthier items such as fruits, vegetables, and whole grains while at school. It is probable that policies promoting the addition of such foods may provide students with healthier options, which ostensibly will contribute to better nutritional intake. In one example of this approach, Mobley et al.¹³ studied 21 schools and focused on improving meal choices that students were offered. This included improving portion

sizes, lowering fat content, serving more fruits and vegetables, eliminating sugary beverages, and serving more high-fiber foods by keeping records of students' food consumption during school. Results indicated that the program was successful in eliminating these foods within the intervention schools but not within the control schools.¹³

In addition to policies focused on the types of foods provided, policies that focus on food preparation methods may also have the ability to increase the quality of school nutrition.¹⁴ Examples of these policies may include scratch cooking, increased use of fresh foods, reduced use of frying in oils, and reduction in processed or pre-packaged foods that are served. Scratch cooking eliminates prepared foods that are high in sodium, added sugars, and saturated fats. These foods include frozen and fried entrees, such as breaded chicken, french fries, and chips. Fresh foods are prepared daily and cooked in healthier ways, such as baking or grilling. Processes used to make fresher foods and entrees from scratch are used to minimize processed products and to increase nutritional intake. In one such initiative, the LiveWell@School¹⁴ childhood obesity program evaluated their program to include more scratch cooking within schools.¹⁴ This program embraced teaching school cafeteria chefs how to cook with raw and fresh fruits and vegetables, and eliminating processed foods. Results showed that on average, school districts increased their fresh produce plate proportions and made more options from scratch. This was composed of kitchens using fewer canned fruits and vegetables at the salad bar and cooking with raw chicken and beef.¹⁴

Following the methods used to implement and evaluate the LiveWell@School program,¹⁴ the purpose of this study is to examine the impact of a districtwide food preparation practice on side items served in lunches in a high-need school district in southern Colorado. Such policies, if effective, may represent an avenue to increase healthful dietary patterns and, in turn, increase the health outcomes and academic achievements of U.S. youth.

METHODS

Study Sample

This study used a longitudinal design (2009–2015) to investigate how school food policies for food preparation methods affected the type of side items being served during elementary school lunches in a school district. This study was funded in part by Kaiser Permanente Colorado through their Community Health Initiative, LiveWell Colorado, a comprehensive place-based approach to obesity prevention. The sample included public schools (N=15), kindergarten to fifth grade, in a high-need school district in southern Colorado, U.S., where district-level free and reduced-price lunch rates were 72% in 2009–2010 and 70% in 2014–2015.

Measures

A records review was conducted for existing and enacted school food better practice during the years under examination. This review comprised a content analysis of districtwide menus published monthly with coding of menu items (e.g., fresh preparation, canned products). Procurement processes were also investigated as a part of this review step, and counts of the types of foods being served, along with the preparation methods used for side items (i.e., fruit, vegetables, potatoes, breads, and desserts). These records were produced and maintained by the school-based food managers and provided to the research team at regular intervals.

This study was divided into four phases: Phase 1 (January 2009–May 2010); Phase 2 (August 2010–May 2011); Phase 3 (August 2011–December 2012); and Phase 4 (January 2013–May 2015). Regardless of phase, all schools had their own kitchen and prepared their own foods. Equipment in each kitchen was the same or similar as the phases progressed, and all foods were procured at a district level and provided to the schools in order to provide uniformity of side item offerings.

During Phase 1, baseline data were collected. No changes were made in food production methods or nutritional content, as food and commodities were already ordered by the school food manager for the academic year. As part of this baseline data collection, side items were placed into categories based on type. Fruits were separated by fresh, canned in heavy syrup, and canned in light syrup. Vegetables were categorized into raw, steamed, and canned. Potatoes were placed into groups based on being fresh, dehydrated/par baked with high sodium, dehydrated/par baked with low sodium, and fried and not counted as a vegetable. Breads were divided into two groups: all enriched breads and all whole-grain breads. Desserts were also separated into two groups by the amount of processed sugar content (cookies, cakes, puddings) and whether they were fresh whole fruits or whole grains.

During Phase 2, a school food best practices were enacted by the district in which healthier food options were made available and the reduction or removal of unhealthy and processed items began. Included in this phase, the school food supervisor at the district level began removing processed, breaded items, and other unhealthy choices high in sodium and sugar. Concurrently during the removal of unhealthy items was the introduction of improved options through better ingredients (e.g., reduced-fat milk and reduced-sodium butter).

During Phase 3, Boot Camps for cafeteria employees were held to teach them how to prepare, cook, and serve fresh, healthy food. Professional chefs were brought in to teach school chefs to teach their cafeteria employees how to prepare and cook school meals. These intensive sessions were short in duration (1–3 days) and were intended to teach food staff the skills needed to cook large batches of food through scratch cooking. Additionally, commodity orders included fresh/frozen proteins, fruits in 100% fruit juice, and vegetables (no breaded/processed items); onsite chef consultations were provided to improve food preparation and other handling procedures. Cafeteria staff members were also trained to use new kitchen equipment, such as robot coupes (i.e., food processor); scales; kitchen utensils; and chillers for every school funded through a grant from a philanthropic foundation.

During Phase 4, the entire school district enacted the food preparation best practices changes into full effect where there was an increased use of fresh/frozen proteins and fresh/flash-frozen fruits and vegetables. Moreover, monthly chef consultations,

trainings, and refreshers were provided to cafeteria staff and full utilization of new equipment (e.g., robot coupes, immersion blenders, knives, scales) was implemented.

Statistical Analysis

Data analyses were completed during the fall of 2016. Frequency counts for all side items served during the time period (2009–2015), aggregated for all schools, were tallied and entered into a spreadsheet for analysis. Initially, five categories of side items were created for analyses: (1) Vegetables; (2) Fruits; (3) Potatoes; (4) Desserts; and (5) Breads. Because of sample size changes from elimination of certain types of foods (i.e., enriched breads), the aforementioned categories were further reduced into (1) Vegetables (raw/steamed versus canned); (2) Fruits (fresh versus canned); (3) Potatoes (fresh/low-sodium versus fried/high-sodium); and (4) Desserts (containing fruit and whole grain versus all other types).

Because phase lengths were inconsistent across schools, frequency counts were weighted by length of phase so that frequency counts could be accurately compared. Because both vegetables and fruits were consistently served over all four phases of the study, there was an adequate sample size and no further reduction was necessary for statistical purposes. However, because of declines in certain potato and dessert sides' frequency counts over time, these categories had to be merged into two different phases to preserve sample sizes in the latter phases. Thus, analyses for these sides are dichotomized by baseline (i.e., Phase 1) and intervention (Phases 2–4). The resulting analyses included two (type of food) \times four (phase) chi-square analyses for vegetables and fruits, and two (type of food) \times two (phase) chi-square tests for potatoes and desserts. Further, to investigate which cells contributed to significant differences (where applicable), standardized residuals were examined. All analyses were completed using SPSS statistical software, version 22.0, with $\alpha=0.05$. These data and analyses were reviewed and deemed non-human research by the IRB at Northern Arizona University.

RESULTS

The results showed a significant ($p<0.01$) change in vegetable offerings, with an increase in raw/steamed vegetables offered over time (Figure 1). Examining

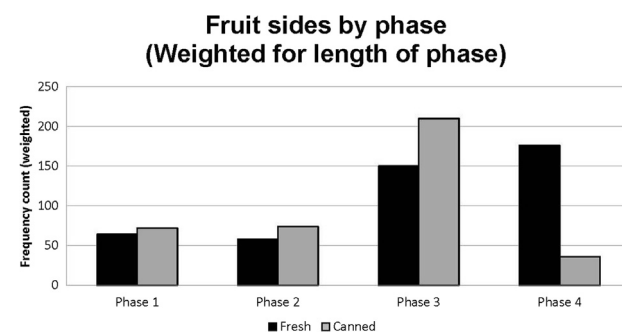


Figure 1. Fruit sides by phase, comparison of canned versus fresh fruit offerings (weighted; $N=15$).

Note: $\chi^2 p=0.0001$; *Standardized residuals, Phase 3–4 significantly different from Phase 1–2, $p<0.017$.

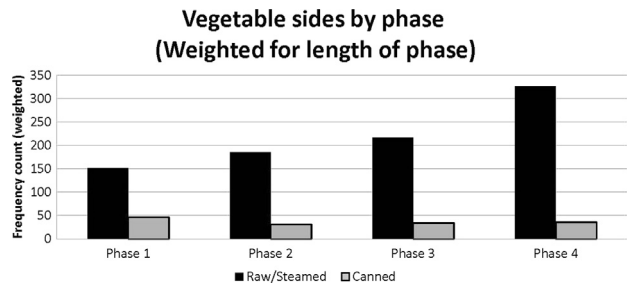


Figure 2. Vegetable sides by phase, comparison of canned versus raw/steamed offerings (weighted; N=15). Note: χ^2 $p=0.0001$; *Standardized residuals, Phase 1 and 4 for canned items significantly different from other phases, $p<0.017$.

standardized residuals indicated that changes in canned vegetables from Phase 1 to Phase 4 accounted for most of the change in the model over time. Similarly, over the observed time frame, fruit offerings changed significantly ($p<0.01$) with a sustained increase in fresh fruits offered over time, and a sharp reduction in canned fruits during Phase 4 (Figure 2). Standardized residuals indicated that most change was observed during Phases 3 and 4.

For potato offerings, significant changes ($p<0.01$) occurred with an observed sharp decline in fried/high-sodium offerings, and an increase in fresh/low-sodium potato offerings (Figure 3). Dessert offerings did not change significantly over time (data not shown).

DISCUSSION

The findings of this study indicate that school food preparation policies can have a positive impact in the types of foods that are served in school cafeterias. The changes made to best practices for food preparation in this high-need, low-socioeconomic-level, urban school district led to a significant increase in fresh fruits and vegetables being served, as well as more nutritious potatoes and the elimination of enriched breads. Although the nutritional value of dessert offerings did not change over time, there were significant reductions in

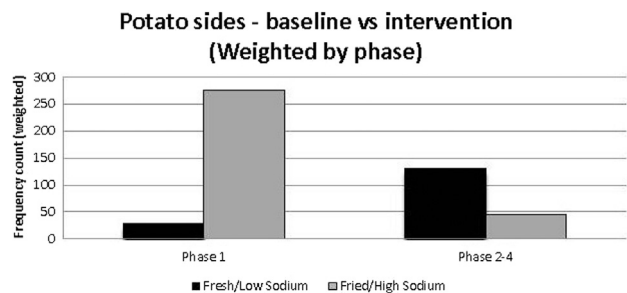


Figure 3. Potato sides: baseline versus intervention, comparison of fresh/low-sodium versus fried/high-sodium offerings (weighted; N=15). Note: $p<0.01$.

otherwise healthy foods that were prepared in a healthier way (i.e., not fried, lower sodium). These changes may be a model for schools and districts considering changing the way that foods are prepared in school cafeterias.

In one specific study done by Mobley and colleagues,¹³ the main objective was to increase the availability of nutritious school foods and beverages. Their study had five goals, one of which was to serve at least two servings of fresh fruit or vegetables for lunch with the NSLP. Similar to this study, the goal of the aforementioned report was to increase the convenience of fresh fruits and vegetables available for students within a high-need urban school district in southern Colorado. In Phase 4 of this study, fresh fruit was offered nearly five times more than canned fruits whereas raw or steamed vegetables were offered nine times more than canned vegetables. Thus, it is possible that these food preparation policies resulted in more nutritious options.

In addition to the study by Mobley and colleagues, new standards were set by the U.S. Department of Agriculture Food and Nutrition Service in 2012. These standards require that every school meal must include a fruit or vegetable.¹⁵ In addition, lunch staff must also make a verbal suggestion for the students to take a fruit or vegetable before sitting down to eat. If the school fails to provide students with nutritious options, schools will not be compensated by the Food and Nutrition Service.¹⁶ Within the southern Colorado School District, canned fruits and vegetables were served less throughout the four phases, and fresh, raw, and steamed fruits and vegetable servings increased over time. Importantly, the changes described in the current findings occurred independently of any federal initiatives and changes. That is, the school district decided to make these food preparation changes to improve upon any changes required by federal law or guideline.

Current data indicate that the majority of children in the U.S. consume too much sodium in their diets.¹⁷ According to the 2010 Dietary Guidelines of America, children should consume less than 2,300 mg of sodium per day.¹⁸ Typically, children aged 2-19 years will consume more than 3,100 mg of sodium daily. Many (43%) of school-aged children’s daily sodium intake comes from school foods, such as pizza, bread, pasta, potatoes, and breaded chicken.¹⁷ However, in the present study, low-sodium potatoes were served nearly three times more than high-sodium potatoes. Moreover, fried potatoes were reduced and prepared differently, and fresher foods (i.e., foods prepped day of) were served more often. Thus, the authors believe that these food preparation policies did have a beneficial impact in the types of foods that were served, and posit that uptake of similar policies by other school districts could lead to similar outcomes. Accordingly, if children are consuming

the foods that are provided, their sodium intake would likewise decrease.

Limitations

This study has several limitations that should be noted. The findings are from one school district in a relatively healthy state in the U.S., and no comparison groups were available, and therefore may not be generalizable to other school districts in other geographic locations. Additionally, these data represent only elementary schools in which food choice and options are relatively limited by the school. In older grades (i.e., middle school and high school) where additional food choices may occur, it may be more difficult to create food environments that are directly impacted by such policies. Moreover, these changes occurred where all foods were purchased at the district level and provided to schools. In districts where this is not the case, these results may be more difficult to replicate. Practically, it may be additionally advisable for schools to ensure the quality of fresh food options, as food safety risks may be present. Finally, although these policies led to healthier options being served, it is unknown whether healthy eating behaviors were influenced; did the students actually consume the healthier foods?

CONCLUSIONS

This study presents findings that illustrate the potentially strong influence that school food preparation policies can have on foods offered to students. The approach presented here may serve as a model to other school districts attempting to influence the types of foods prepared for their students. Future research should address the link between foods presented, and foods consumed, to examine whether the school food policies that are focused on food preparation can have a direct impact on eating behaviors.

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