Outcome Evaluation of a Pilot Study Using "Nudges"

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Abstract: *Background*: Every school day, over 31 million U.S. children eat school lunches. Unfortunately, students often do not choose the healthy options in the school cafeteria. This paper describes outcome results of a pilot study using "nudges" to improve elementary school students' fruits and vegetables selections.

Methods: A pilot study was conducted from January to May 2012, in six intervention schools and 2 control schools. A behavioral economics-based intervention was conducted using "nudges" or cues from the cafeteria (staff encouragement to select fruit and vegetables, food labels, "Harvest of the Month" posters), school (morning announcement messages, prompts regarding cafeteria food selections), and parents (school newsletter articles, parent listserve messages) to promote students' selection of fruits and vegetables in the school cafeteria. The serving data from the point-of-service machine provided fruits and vegetables served per student per day.

Results: There were no significant differences in the number of servings of fruits and vegetables served per student per day, averaged over the study period. Process data revealed low implementation of the intervention components, which may partially explain results.

Conclusions: Low implementation of nudges led to non-significant results in this pilot study. However, providing environmental cues are important and warrant further research with full implementation. Starting 2012, the new meal pattern includes two vegetables and a fruit serving for lunch; and two fruit servings for breakfast. Minimal cost interventions should be explored to facilitate successful implementation of new school meal guidelines.

Keywords: National School Lunch Program, fruit, vegetables, behavioral economics, environment, school, cafeteria.

BACKGROUND

The National School Lunch Program (NSLP) offers nutritious lunches in 99% of U.S. public schools [1, 2]. In fiscal year 2011, approximately 31 million school children participated in the NSLP each school day [2]. Although the USDA has nutrition standards for meals, students often do not choose the healthy cafeteria options. Students' fruit and vegetable (FV) intake is low in schools [3, 4] and over the entire day [5]. FV consumption has been associated with lower adiposity and reduced risk of chronic diseases and some cancers [6]. Therefore, intervening with youth to improve dietary choices of FV at school is an important strategy to improve energy balance and maintain appropriate growth.

Choice architecture, a Behavioral Economics strategy, proposes that the ways that choices are presented to individuals in their environments may influence food selection decisions [7]. One's environment, personal characteristics, and behavior interact with and influence each other as operationalized in Social Cognitive Theory [8]. Therefore, subtle environmental cues or "nudges" could encourage students to select certain foods. In a cafeteria lunch line there are several points of influence. Marketing research shows that food presentation is important: items displayed more prominently, at eye level, or first in the line, tend to be chosen more often than other items [9].

Few studies have tested behavioral economics approaches in schools. One elementary school cafeteria intervention included four components (an extra fruit or vegetable in the lunch line daily, attractive food presentation, verbal encouragement to try FV from cafeteria staff as students went through the line, and FV tastings in the cafeteria) [10]. Fruit intake significantly increased and was significantly associated with cafeteria staff verbal encouragement. Two other studies included verbal encouragement for selecting fruit, juice or vegetables from school staff. In two elementary schools, more intervention school students

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selected a fruit or juice, compared with comparison school students [11]. When teachers asked preschool children if they wanted FV, the children had higher acceptance of and took more bites of FV [12]. In an observational study, however, although cafeteria staff endorsed suggesting healthful food selections to students in the line, no cafeteria staff made food recommendations, when observed [13]. However, a majority of the cafeteria staff reported an interest in learning how to offer encouragement to students as they went through the lunch line.

This paper describes outcome results of a pilot study to improve elementary school student FV selection. The innovative school-based program focused on integrated "nudges" or cues from the cafeteria staff, school, and parents to promote healthy student food choices in the cafeteria. We hypothesized that intervention school students would select more FV in the school cafeteria than comparison school students.

METHODS

This study was conducted with elementary schools, cafeteria staff, parents and students in nine elementary schools in a large urban school district in Houston, Texas. The ethnicity of the district's enrolled students was 61% Hispanic, 28% African American, 8% white, and 3% other at the time of the study. Formative research was conducted during the first year which included focus groups, interviews, and anonymous surveys with cafeteria staff and parents from three schools [14]. Informed consent was obtained from all who took part in the focus group discussions and interviews. Cafeteria staff and parents were recruited for the focus groups and to complete the anonymous surveys from three schools. These schools had a majority of Hispanic students and 50 to 96% of the students were eligible for free or reduced price meals.The pilot study was conducted during the second year. Six additional schools with diverse student populations were recruited for the pilot feasibility study; 57 to 97% of the students were eligible for free or reduced price meals. This study was approved by the Institutional Review Board of Baylor College of Medicine.

Intervention Development

The research team met with the school district food service staff to develop the pilot intervention components based on the district's four-week menu cycle. Usually two vegetables and a fruits were served each day. Three environmental nudges were planned based on the cycle menu.

Nudge 1 (Cafeteria)

Based on the cafeteria staff suggestions, English and Spanish names of FV were printed on labels that had the cafeteria mascot on them to be posted on the cafeteria line. Cafeteria staff received training to encourage children's food selections as they went through the serving line. To facilitate these conversations, a script with statements was developed for FV served each week. For example: "This broccoli was grown in Texas and tastes great. Would you like to try some?" Finally, a Texas-grown fruit or vegetable was highlighted each month in the menus and in the cafeteria [Harvest of the Month]. Posters with Harvest of the Month were provided to the cafeteria staff to post in the cafeteria.

Nudge 2 (School Environment)

The principals received a list of short messages about cafeteria foods for the schools' public address system. To improve student writing skills, teachers often have students write a short paragraph on specific topics each week. A set of writing prompts about cafeteria foods was created for teachers to use for this assignment. Teachers were also provided with the posters with the Harvest of the Month.

Nudge 3 (Home Environment)

Two short articles about the cafeteria foods were given to the Principals for the existing school newsletter each month. Including articles in the existing newsletters was based on suggestions made by the parents and staff during formative research [14]. A food service electronic mailing list (listserv) was established by the Food Service Department. Parents and teachers could sign up to receive two brief messages about cafeteria foods and nutrition information each month, plus the Harvest of the Month poster.

Intervention Implementation

The pilot study was implemented during the spring semester of 2012. Six [two African-American; two Hispanic; two diverse] low income elementary schools were recruited by the Food Service Department dietitian to be the intervention schools. Parents and staff were invited to join the Food Service Department list serve *via* English/Spanish letters sent home to all students in the six intervention schools during

November and December, 2011. Cafeteria staff was trained and received the food labels, encouragement scripts, and Harvest of the Month posters. The intervention school materials (newsletter items, PA announcements, and writing prompts for the teachers) were delivered to the Principals for distribution. Two of the schools that participated in the formative research served as the control schools.

Measurement

For each day during the 2012 spring semester, the number of FV servings selected and the number of reimbursable meals served at each school were obtained as electronic text files from Food Service Department. Canned, fresh and frozen FV, including baked fries, were counted. In Texas, fried foods are prohibited in the school cafeteria, and baked flash frozen potato products are only allowed to be served one time per week in elementary schools [15].

Process outcome data were also collected. Eight unannounced observations over the semester were conducted in each intervention school by trained observers. Three observations occurred in each control school during the semester. Using a checklist, the observers noted cafeteria staff encouragement, and the presence of the food labels and the Harvest of the Month posters. School newsletters were checked for the nutrition messages. The Food Service Department dietitian provided the number of participants who signed up for the list serve. An anonymous survey was created to query Principal and teacher use of the intervention materials. The teacher survey was web-based; the Principals were sent the link and asked to send it to their faculty. A print-based Principal survey was delivered to each Principal with a stamped and addressed envelope.

Data Analyses

The average number of FV servings selected per student per day was calculated and averaged for each week for each school. To examine the intervention effect, analyses of repeated measures analyses of variance (RM ANOVA) were conducted with weekly FV servings as the dependent variable and group membership (intervention, control) as the main effect. The covariance structures specified a first-order autoregressive moving-average (ARMA (1,1)) structure. Separate models were run for each dependent variable. Alpha was set at 0.05. All the analyses were performed using SAS (version 9.3, 2010, SAS Institute Inc., Cary, NC). The results from the process evaluation observation sheets were summed across all days for each category.

With a final analysis sample of eight schools with 22 weekly measures and α=0.05, there was 80% power to detect large differences between group with correlations across weeks of 0.398 for fruit and 0.535 for vegetables.

RESULTS

Outcome Evaluation Results

FV Served

Twenty-two weekly data points of FVservings data for eight elementary schools were analyzed (January-May, 2012). There was no significant group effect for fruitservings (*P*=0.23; Table **1**). The plot of the weekly average daily fruit servings per student for six intervention and two control schools for the intervention period is shown in Figure **1**. There was no significant intervention effect for vegetable servings (*P*=0.10; Table **1**). The plot of the weekly average daily vegetables servings per student for six intervention and two control schools for the intervention period is shown in Figure **2**.

Process Evaluation Results

Nudge 1 (Cafeteria)

Table **2** shows the overall percentages for the cafeteria observations of each intervention component out of 48 possible observations. There was poor

Table 1: Weekly Average of Daily Fruit and Vegetable Servings per Student for 6 Intervention and 2 Control Schools for January to May, 2012 (Spring Semester)

	Control Schools		Intervention Schools	
	Mean	**SE**	**Mean**	**SE**
Fruit	0.56	0.10	0.71	0.03
Vegetable	0.66	0.17	1.02	0.10

*SE: Standard Error. Not significant at the level of 0.05.

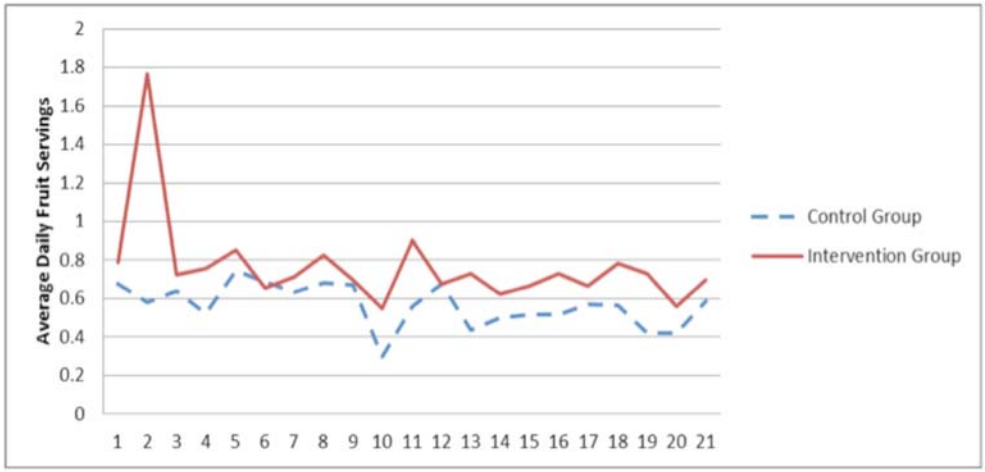

Figure 1: Weekly plot of the average daily fruit servings per student for 6 interventions and 2 control schools for January to May, 2012 (Spring semester).

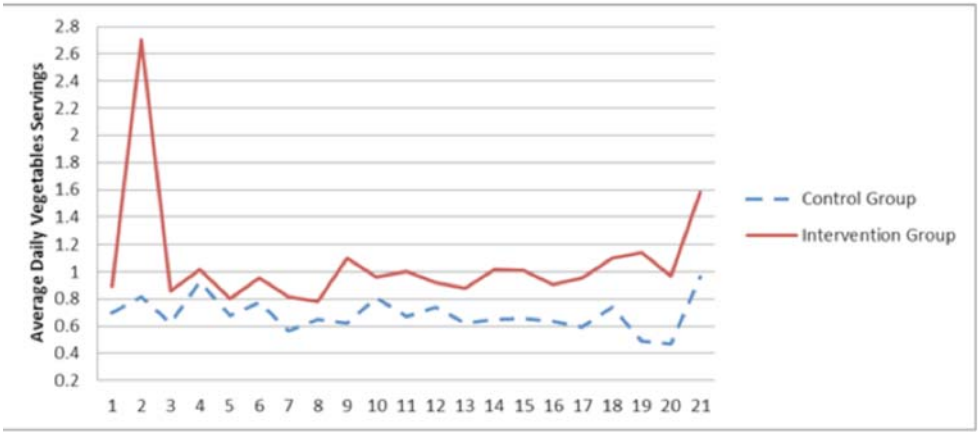

Figure 2: Weekly plot of the average daily vegetable servings per student for 6 interventions and 2 control schools for January to May, 2012 (Spring semester).

Table 2: The Percentage of Observations (Out of 48 Intervention and 6 Control Visits) for the Intervention Components from 6 Intervention and 2 Control Schools during the Spring 2012 Semester

Measure	Intervention Schools (n=48 Observations)	Control Schools (n=6 Observations)
Food labels posted		
% fruit	27	0
% vegetable	55	0
Harvest of the Month poster in cafeteria	33	17
Encouragement by cafeteria staff		
% fruit	16	0
% vegetable	44	0

compliance with posting the fruit food labels and the Harvest of the Month posters. Little encouragement was provided for fruit items, and encouragement for vegetables items occurred on only 44% of the observed visits.

Nudge 2 (School Environment)

Twenty-six teachers from three schools completed the anonymous teacher surveys (13% of total eligible in the six intervention schools). Only 31% reported seeing

the monthly Harvest of the Month posters; 50% reported they did not look at the posters. The results for seeing the cafeteria food articles in school newsletters were mixed. Thirty-one percent reported seeing one in every newsletter, 34% reported them in some, and 35% reported never seeing any food articles in their school newsletters. Forty-six percent never heard any food-related item in morning announcements, while 35% reported hearing one daily. Finally, 31% of the teachers reported never receiving the writing prompts about food with students, 42% never used them, and 15% reported using them a few times.

Only three of the six Principals returned surveys; two were incomplete. One saw the five Harvest of the Month Posters. Two reported not using cafeteria food articles in school newsletters. Two reported using some of the cafeteria food messages in morning announcements, and two heard that some teachers used the writing prompts about food with students.

Nudge 3 (Home Environment)

Five of the six schools had a school newsletter. Only four food/nutrition articles from two schools were noted during the semester. Only six parents out of about 3500 signed up for the Food Services Department list serve.

DISCUSSION

This study used Behavioral Economics strategies suggested during formative research with parents and cafeteria staff to improve children's selections of FV in school cafeterias. Despite providing an intervention that was responsive to their suggestions, there was no difference in the number of FV served in the intervention schools compared to the control schools. Process evaluation indicated poor fidelity with the intervention components.

One intervention components was verbal encouragement by the cafeteria staff to try FV. This method was effective in three small studies [10]. Despite recommendations from the cafeteria staff (results from formative research are reported elsewhere [14]) few encouraging remarks were observed in the school cafeterias in this study. These results are similar to a previous study, where cafeteria staff endorsed suggesting healthful food selections to students going through the line, but none of the cafeteria staff made food choice recommendations during subsequent observations [13]. The training for the cafeteria staff in this study might not have been sufficient to increase the staff's self-efficacy to talk with students. The cafeterias were also very busy and staff might not have perceived they had enough time for this component. Future qualitative research should try to identify the most appropriate training techniques that would enable staff to encourage student food selections, and other barriers to this strategy to promote FV.

The current intervention added labels for the foods on the line and Harvest of the Month posters, as well as promotion during morning announcements and *via* writing prompts for classroom. Perhaps, in this study, students did not notice the labels or posters. Peer influence and support around eating may be important in the school setting [16] and predict participants' food consumption [17]. Pre-adolescent girls peers' intake was a significant predictor of participants' snack consumption [17]. In addition, 4th to 6th grade students reported negative peer responses when they ate vegetables [18]. Further research should investigate what strategies in the serving line could prompt student choices. Studies have found that offering pre-sliced fruit in schools improved selection and intake [19] and that the selective use of attractive names, effectively and persistently increased healthy food consumption in school [20].

Providing teachers with information about healthy cafeteria food selections that they discuss in the classroom could foster positive peer support for healthy food choices at school. In the current study, few teachers reported using the writing prompts in their classrooms and being aware of the materials in the cafeteria or the newsletter articles. Whether teachers can promote healthy cafeteria choices is an important area for further study.

To reach parents in this study, school newsletter articles were given to Principals, and parents could sign up to receive email messages about cafeteria foods and nutrition. Intervention newsletters sent home for parents have been the most commonly used channel for disseminating messages, but evidence suggests this method may not be effective [21]. In this study, few of the materials were used, suggesting that more research into the use of existing school resources for reaching parents is needed. Also, other potentially effective communication channels need to be tested.

Email messages from the Food Service Department (using listserv) were used for sending food and nutrition information to the parents in the six intervention

schools. Only six parents signed up to receive the two messages per month. Bilingual information letters about receiving the emails were given to the six schools in packages for each homeroom teacher for distribution to students *via* their weekly news and information packet. There was no way to verify that these were distributed. Identifying the best method to provide parents with this information is an important area for further research. This is especially relevant because internet use was reported by 85% of Americans in 2013; 85% for African-Americans and 76% for Hispanics [22]. With school districts and FSDs adopting social media as communication channels [23], there are guides available to help school nutrition programs successfully utilize this media [24].

The response from the Principal surveys was low as were the responses for the teacher surveys. It is not clear if the materials were sent to the teachers. Future studies should interview Principals to identifystrategies to deliver intervention materials to teachers. Direct delivery of intervention materials to the teachers might be more successful.

There are several limitations to consider. Participants in this pilot study attended eight schools in one school district in Houston, TX. The findings may not be generalizable to all elementary school students. Cafeteria production records provided an objective measure of student food selections at school but there was no individual measure of food intake at lunch or for the total day. Future studies should assess the impact of the intervention on diet. Finally, some materials did not reach the user, reducing the dose of the intervention.

IMPLICATIONS FOR CHILD HEALTH AND NUTRITION

This simple, very low cost intervention complements the USDA Team Nutrition program [25], which promotes child nutrition within the total school environment, including the cafeteria. In the only published evaluation of Team Nutrition, there was a significant increase in the variety of foods and the amount of grains consumed by elementary school students [26]. Although no significant changes were observed in this pilot study, encouragement and communications may be important components to be considered with the new meal patterns implemented in fall, 2012; more research is needed in this area. Each lunch meal now includes two vegetable and one fruit serving; and two fruit servings for breakfast [27]. Students must select at least one fruit or vegetable for reimbursable meals. Minimal cost interventions should be explored to help with successful implementation of new school meal guidelines.

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