

# Differential Improvements in Student Fruit and Vegetable Selection and Consumption in Response to the New National School Lunch Program Regulations: A Pilot Study



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## ARTICLE INFORMATION

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## ABSTRACT

**Objective** To investigate changes in student food selection and consumption in response to the new National School Lunch Program meal patterns during fall 2011.

**Design** Eight elementary and four intermediate schools in one Houston area school district were matched on free/reduced-price meal eligibility and randomized into control or intervention conditions.

**Intervention** Both intervention and control school cafeterias served the same menu. The intervention school cafeterias posted the new meal pattern daily; students could select one fruit and two vegetable servings per reimbursable meal. Control school students could only select the previous meal pattern: a total of two fruit and vegetable servings per meal.

**Main outcome measures** Students were observed during lunch: student sex and foods selected/consumed were recorded. Diet analysis software was used to calculate energy/food groups selected/consumed.

**Statistical analyses performed** Cochran-Mantel-Haenszel  $\chi^2$  tests examined differences in the percent of students selecting each meal component by condition, controlling for sex, grade, and school free/reduced-price meal eligibility. Analysis of covariance assessed differences in amount of energy/food groups selected and consumed, and differences in percent of food groups consumed.

**Results** Observations were conducted for 1,149 elementary and 427 intermediate students. Compared with students in the control schools, significantly more intervention elementary and intermediate school students selected total ( $P<0.001$ ,  $P<0.05$ ) and starchy vegetables ( $P<0.001$ ,  $P<0.01$ ); more intervention intermediate school students selected fruit ( $P<0.001$ ), legumes ( $P<0.05$ ), and protein foods ( $P<0.01$ ). There were significantly greater amounts of these foods selected and consumed, but no differences in the proportion of the foods consumed by condition. Fewer calories were consumed by elementary and intermediate school intervention students.

**Conclusions** More intervention students selected fruit and vegetables at lunch and consumed them compared with control condition students. Future studies with larger and more diverse student populations are warranted.

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THE NATIONAL SCHOOL LUNCH PROGRAM (NSLP) sponsored by the US Department of Agriculture (USDA) served more than 31 million lunches each day during fiscal year 2012.<sup>1</sup> About 68% of these meals were provided to students at a free or reduced price (FRP).<sup>2</sup> In 2008, the USDA commissioned the Institute of Medicine to provide new meal pattern recommendations to align the federal school meal programs with the Dietary Guidelines for Americans and Dietary Reference Intakes to ensure that the meals promoted health and reduced inadequate and excessive intakes.<sup>3</sup> The 2010 Healthy, Hunger-Free Kids Act directed USDA to update the school meal patterns and nutrition standards based on these recommendations.<sup>4,5</sup>

The new meal patterns were implemented at the beginning of the 2012-2013 school year. For the first time, both minimum and maximum calorie limits were set to ensure age-appropriate meals for children in three grade groupings: 550 to 650 kcal for kindergarten through grade five, 600 to 700 kcal for grades 6 through 8, and 750 to 850 kcal for grades 9 through 12.<sup>4</sup> The amount of fruit and vegetables (F/V) in the school menu pattern increased to align to the amounts in the Dietary Guidelines for Americans.<sup>4</sup> For lunch, the new meal pattern provides a minimum of two servings (up to  $\frac{1}{2}$  cup each) of vegetables and one serving ( $\frac{1}{2}$  cup) fruit per lunch meal, one serving more than the previous standard of two servings total of F/V per lunch meal. A

specific number of servings of dark green and red/orange vegetables and legumes must be offered each week.<sup>4</sup> For the offer vs serve option (OVS) in the new rules, students have to select at least one serving of a fruit or vegetable for the meal to count as reimbursable.<sup>4</sup> OVS is optional for elementary schools.<sup>4</sup> The expectation was that the opportunity to select more F/V at lunch would increase student F/V consumption. Other meal improvements included the specification that all grains be whole-grain rich (ie, must contain at least 50% whole grains and the remaining grain, if any, must be enriched) by July 2014, and a gradual reduction in the sodium content of the meals over 10 years.<sup>4</sup>

We present the results of a pilot study that investigated changes in student food selection and consumption in response to partial implementation of the new NSLP meal patterns for F/V during the fall 2011 semester. The main hypotheses were that intervention school students would select more servings of F/V, resulting in greater amounts selected and consumed compared with students in schools without access to the new F/V meal patterns.

## METHODS

This pilot study was conducted during the fall semester of 2011, before the final NSLP meal patterns were published. Participants included intermediate and elementary school students in one school district in the Houston, TX, area. The school district had 37,000 students (21% Hispanic, 10% African American, 10% Asian, 59% white, and 26% FRP), 26 elementary (kindergarten through grade 5), and 10 intermediate schools (grades 6 through 8). The district received a monetary reimbursement to cover potential increases in food cost due to the menu changes. The child nutrition director selected the schools based on eligibility for FRP meals: four low (49% to 79% FRP) and four middle-income elementary schools (7% to 18% FRP), and two low (~34% FRP) and two middle-income (~20% FRP) intermediate schools. The schools were matched on grade level and FRP, and randomized to intervention or control conditions by the study statistician using a random numbers generator (Excel, Microsoft Corp). The planned study sample size (540 elementary and 540 intermediate observations) provided 80% power to detect significant differences with  $\alpha=.05$ .

The study was approved by the Institutional Review Board at Baylor College of Medicine. Because the study data were collected using anonymous observations of student food selection and consumption in the school cafeterias, consent forms were not required.

## Menu Changes

The school district used a 2-week menu cycle; new menu patterns were developed that met the new guidelines.<sup>6</sup> The menu included almost all whole grains, and only low-fat white milk or nonfat flavored milk. A fresh fruit was available every day, plus a raw vegetable, canned fruit, and cooked vegetable. Intervention and control schools served the same menu. The intervention school students were allowed to select one fruit serving and two vegetable servings (three total), plus a protein food, two grain servings, and a milk for the reimbursable meal. Control school students could only select the current USDA meal pattern of a total of two servings of fruit and/or vegetables, but similar servings of grain,

protein, and milk as in the intervention schools. The district allowed the OVS option at all grade levels; students could select fewer meal components as long as the meal met a specified minimum.<sup>6</sup> Because this study took place before the nationwide implementation of the new guidelines, the district was unable to implement the new OVS rule that students had to select at least one fruit or vegetable serving for the meal to qualify as a reimbursable meal.

In the six intervention schools, letters in English and Spanish that explained the new menu pattern were sent home to all parents/guardians, and the teachers received information to display in their classrooms. Each intervention cafeteria set up an easel at the entrance to the serving line and displayed color photographs of the foods being served that day showing the correct number of servings to select under each food group category. There was also a small sign placed on the serving line that identified that one fruit and two vegetable servings could be selected for each reimbursable lunch meal. No easel or signage was present in the control schools.

## Cafeteria Observation Procedures

Student consumption data were collected by direct observation in the cafeterias during lunch periods. All foods provided on the menus and sold as à la carte were preprinted on an observation checklist. There were columns to check the foods the student selected in the cafeteria line, and identify source (eg, using codes for NSLP, home, à la carte, or a friend), and whether food was given away, spilled, or obtained (eg, purchase or trade). Extra lines were available to record other foods and the source. For each item, the amount eaten was recorded using the quarter waste method (ie, 0,  $\frac{1}{4}$ ,  $\frac{1}{2}$ ,  $\frac{3}{4}$ , or all), which has high interrater and intermethod reliability.<sup>7</sup> Student sex and grade level were also recorded.

Seven research staff members (four registered dietitian nutritionists, two staff with nutrition degrees, and one college undergraduate) attended a 3-hour training. Each observer conducted two to four practice observations, with the research coordinator also recording consumption. Interrater reliability was assessed and practice continued until acceptable (>90%) agreement was obtained. One trained observer conducted quality control checks once a month.

Observers were assigned to specific schools and visited each school 1 day each week during the semester. The schools did not know the day of the visit in advance. Each observer obtained the cafeteria seating arrangements and established the weekly data collection rotation for each school. Elementary school classrooms were assigned a table and this information was used so that equal numbers of students in each grade were observed during the semester. The intermediate schools did not have grade-specific lunch periods. Therefore, only intermediate grade level was recorded on the intermediate school observation sheets. The observer developed a rotation plan so that all tables in the schools would be observed in a systematic method during the semester. Because names were not obtained, a student could have been observed more than once.

There was a continuous influx of elementary school students into the cafeteria lunch line; the intermediate schools had three lunch periods each day. Each data collector first checked the cafeteria line lunch items against the observation

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