Differential improvements in student fruit and vegetable selection and consumption in response to the new National School Lunch Program regulations: a pilot study

Karen W. Cullen[1], **Tzu-An Chen**[1], **Jayna M. Dave**[1], and **Helen Jensen**[2]

[1] USDA/ARS Children's Nutrition Research Center Baylor College of Medicine 1100 Bates Street, Houston, TX 77030-2600

[2] Department of Economics Iowa State University Ames, Iowa 50011

Abstract

Background—This study investigated 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 (FRP) 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: gender, foods selected/ consumed were recorded. Diet analysis software was used to calculate energy/food groups selected/consumed.

Statistical analyses performed—Cochran-Mantel-Haenszel Chi-square tests examined differences in the percent of students selecting each meal component by condition, controlling for gender, grade, and school FRP. ANCOVA assessed differences in amount of energy/food groups selected and consumed, and differences in percent of food groups consumed.

Results—Observations were conducted for 1149 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;

Corresponding Author and contact for reprints: Karen Weber Cullen (Professor of Pediatrics): 1100 Bates Street, Houston, TX 77030-2600, phone 713-798-6764, fax 713-798-7098, kcullen@bcm.edu.

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The authors have no conflict of interest.

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.

Keywords

school lunch regulations; children; lunch consumption; fruit; vegetables

INTRODUCTION

The National School Lunch Program (NSLP) sponsored by the United States Department of Agriculture (USDA) served more than 31 million lunches each day in fiscal year 2012.[1] About 68% of these meals were provided to students at a free or reduced price (FRP).[2] In 2008, the USDA commissioned the Institute of Medicine to provide new meal pattern recommendations to align the federal school meal programs with the U.S. Dietary Guidelines and Dietary Reference Intakes to ensure that the meals promoted health and reduced inadequate and excessive intakes.[3] The 2010 Healthy, Hunger-Free Kids Act directed USDA to update the school meal patterns and nutrition standards based on these recommendations.[4, 5]

The new meal patterns were implemented at the beginning of the 2012-13 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: 550-650 kilocalories (kcal) for kindergarten - grade 5, 600-700 kcal for grades 6-8, and 750-850 kcal for grades 9-12.[4] The amount of fruit and vegetables in the school menu pattern increased to align to the amounts in the US Dietary Guidelines.[4] For lunch, the new meal pattern provides a minimum of two servings (up to ½ cup each) of vegetables and one serving (1/2 cup) of fruit per lunch meal, one serving more than the previous standard of two servings total of fruit and vegetables per lunch meal. A specific number of servings of dark green and red/orange vegetables and legumes must be offered each week.[4] For the offer versus 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.[4] OVS is optional for elementary schools.[4] The expectation was that the opportunity to select more fruit and vegetables at lunch would increase student fruit and vegetable consumption. Other meal improvements included the specification that all grains be whole grain rich (must contain at least 50-percent 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.[4]

This paper presents 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 fruit and vegetables during the fall, 2011 semester. The main hypotheses were that intervention school students would select more servings of fruit and vegetables,

resulting in greater amounts selected and consumed compared with students in schools without access to the new fruit and vegetable meal patterns.

METHODS

This pilot study was conducted during the fall semester, 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, 26% eligible for free/reduced price meals (FRP)], 26 elementary (kindergarten - grade 5) and 10 intermediate schools (grades 6-8). 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 (49-79% FRP) and four middle income elementary schools (7-18% 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 an Excel random numbers generator. The planned study sample size (540 elementary and 540 intermediate observations) provided 80% power to detect significant differences with an alpha of 0.05.

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 utilized a 2-week menu cycle; new menu patterns were developed that met the new guidelines.[6] The menu included almost all whole grains, and only 1% white milk or skim 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 offer versus serve (OVS) option at all grade levels; students could select fewer meal components as long as the meal met a specified minimum.[6] 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, English and Spanish letters 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 photos 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 a 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 (using codes for NSLP, home, a la carte, friend, etc), 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 (0, ¼ ½, ¾, all), which has high inter-rater and inter-method reliability.[7] Student gender and grade level were also recorded.

Seven research staff (four registered dietitians, two staff with nutrition degrees, and one college undergraduate) attended a 3-hour training. Each observer conducted 2-4 practice observations, with the research coordinator also recording consumption. Inter-rater 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 one day per 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 over 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 over 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 checklist and menu for the day. Then the observer selected three to four students with a reimbursable NSLP meal, defined as a meal containing at least three of the five lunch components, who approached and then sat at the tables to be observed that day. The observations of these selected students were conducted unobtrusively from a distance.

Nutrient and Food Group Analyses

For each student lunch observation form, the foods selected and consumed were entered into separate Nutrition Data System for Research (NDSR) files (version 2011, Nutrition Coordinating Center, University of Minnesota) by trained dietitians. The project manager and research dietitians obtained the recipes and nutrient information for menu items from the food service department, and NDSR recipes were created for each item. Student intake of calories and food groups (fruit, 100% fruit juice, vegetables [total, dark green, red-orange, starchy (white potatoes, corn, peas), other (green beans, celery), legumes, high fat

vegetables], grains, protein foods, snack chips, sugar sweetened beverages, desserts, and milk) were obtained with the NDSR food group system.[8, 9] It is important to note that unlike the USDA MyPyramid coding system, the NDSR food group system does not count the fruit and vegetable contributions from high fat high sugar foods.[10]

Statistical Methods

Separate analyses were conducted for elementary and intermediate school student data. To test for the difference in the percentage of students selecting each food component by condition, Cochran-Mantel-Haenszel Chi-square tests were used, controlling for student gender and school FRP [low/middle income] for both elementary and middle schools, and also controlling for grade for elementary schools. Next, separate analyses of covariance (ANCOVA) were conducted to compare the mean amounts of calories and food groups selected and consumed, and the percentage of each food group consumed, with intervention or control school membership as the between group factor, adjusting for student gender and school FRP for elementary and intermediate school student data, and for grade for elementary school data. The adjusted outcome means for each food component for intervention and control groups were reported. An alpha level of $P<0.05$ was used to determine statistical significance. All the analyses were performed using SAS (version 9.3, 2011, SAS Institute Inc.).

RESULTS

Observations of student food selection and consumption were obtained for 1149 elementary school students (535 intervention and 614 control) and 427 intermediate school students (212 intervention and 215 control). Significantly more intervention elementary school students selected total vegetables ($P<0.001$) and starchy vegetables ($P<0.001$), but significantly fewer selected juice ($P<0.001$) and whole grains ($P<0.05$), compared with control school students (Table 1).

More than twice as many intervention intermediate school students selected fruit (45%) compared with control school students (21%) ($P<0.001$). More intervention intermediate school students also selected total vegetables ($P<0.05$), starchy vegetables ($P<0.01$), legumes ($P<0.05$) and protein foods ($P<0.01$) (Table 1).

As selected, elementary intervention school student lunch meals contained significantly greater quantities of total vegetables ($P<0.001$), dark green vegetables ($P<0.01$), and starchy vegetables ($P<0.001$), but less juice ($P<0.001$), whole grains ($P<0.01$), and protein foods ($P<0.001$) compared with control school lunches (Table 2). The amounts actually consumed had similar findings except for dark green vegetables for which there was no significant difference in consumption between groups (Table 2). Elementary intervention students also consumed significantly more other vegetables than control students ($P<0.05$). Overall, intervention elementary school students selected and consumed significantly less energy ($P<0.05$ for both) than control school students.

Compared with the lunches of the intermediate control school students, intermediate school intervention lunch meals as selected contained significantly greater amounts of fruit

(P<0.001), juice (P<0.05), total vegetables (P<0.01), starchy vegetables (P<0.001), and legumes (P<0.05); and significantly more of these food groups were actually consumed (Table 3). However, intermediate school intervention students selected lunch meals with significantly fewer whole grains (P<0.05) and they consumed less total grains (P<0.05) and whole grains (P<0.01) than control school students. Overall, intervention intermediate school students consumed significantly less energy (P<0.01) than control school students.

Intervention elementary school students consumed a greater proportion of other vegetables selected (P<0.05) and a lower proportion (P<0.01) of protein foods selected than control elementary school students, but there were no significant differences between intervention and control students in the proportion of any of the other types of vegetables or fruit they consumed (Table 4).

Intervention intermediate school students consumed a significantly lower proportion (P<0.001) of calories, total grains (P<0.001), whole grains (P<0.05), and protein foods (P<0.01) than control school students (Table 4). There were no significant differences in the proportion of fruit or vegetables consumed by intermediate intervention or control school students (Table 4).

DISCUSSION

This pilot study investigated changes in student food selection and consumption in response to the new NSLP guidelines for fruit and vegetables. Compared with elementary students in control schools, significantly more elementary intervention students selected total vegetables, dark green, and starchy vegetables, resulting in significantly greater amounts of these foods on their trays and significantly greater amounts of total and starchy vegetables consumed. However, significantly fewer intervention elementary school students selected juice, whole grains, and protein foods, which led to significantly smaller amounts of these foods on their trays and actually consumed. Elementary school intervention students also selected and consumed significantly fewer calories for lunch than control school elementary students.

The results for the intermediate school intervention students were also encouraging; significantly more intermediate school intervention students selected fruit, juice, legumes, and protein foods. The intermediate intervention school students therefore had significantly greater amounts of fruit, juice, legumes, and total and starchy vegetables on their trays, and consumed significantly more fruit, legumes, and total and starchy vegetables than intermediate control school students. The intermediate intervention school students also selected and consumed significantly lower amounts of whole grains and total grains and consumed significantly fewer calories than control school students.

There were no significant differences in the proportion of fruit and vegetables consumed, and, therefore wasted, between the intervention and control condition students except that elementary school intervention students consumed a greater proportion of other vegetables than control school students. However, as more students were selecting fruit and vegetables total waste was greater.

The new menu patterns were implemented nationwide in the fall of 2012. A recent study examined food selection and consumption before and after the new school guidelines were implemented and found a significant increase in the proportion of elementary and intermediate school students selecting fruit, but no difference in the proportion selecting vegetables.[11]

However, a greater proportion and amount of the vegetables were consumed, but there was no difference for fruit consumption.[11] These findings, plus the results from the current study, are encouraging. Regular monitoring of student food selection and consumption at school and over 24 hours is needed to assess the impact of the new meal patterns on diet.

Fruit and vegetable availability on the school cafeteria serving line has been related to improved student fruit and vegetable consumption. Using national data from 2005, Newman found that more students in schools that met the 2012 NSLP fruit and vegetable daily standards tried vegetables and ate significantly more total vegetables than students in schools where menus did not meet the daily standard (0.38 cup versus 0.30 cups).[12] An environmental cafeteria intervention in elementary schools that included an extra fruit or vegetable in the lunch line daily, attractive food presentations, and verbal prompts from cafeteria staff resulted in a significant increase in fruit consumption.[13] Other research has investigated cafeteria design and food presentation to influence student food selection behaviors.[14, 15] Longer term studies are needed to identify successful strategies to improve student fruit and vegetable selection and consumption.

Another reason for the improvement in fruit (intermediate) and vegetable (elementary and intermediate) selection and consumption may be the increased promotion and marketing of the new menu pattern. There was signage about the new pattern in the cafeteria, and classroom teachers and parents received supporting materials. Whether students were aware of and responded to these components was not assessed in this study. This is an important area of research. For example, the use of attractive names for carrots on the serving line led to significantly higher consumption of carrots, and to a significantly higher proportion of vegetables selected in a previous study.[16]

The new NSLP meal guidelines also set minimum and maximum calorie levels for lunch meals. In this study, elementary school students selected meals with caloric content within the guidelines, although intervention school students selected significantly fewer calories than control school students (598 vs 614 kcal). However, actual mean consumption for both groups was lower than the guidelines, with intervention school students consuming significantly fewer calories than control school students (449 vs 469 kcal). Intermediate school students selected meals that met the new minimum level for NSLP meals (612 kcal for intervention and 599 kcal for control), but mean consumption was also lower than the guidelines and intervention school students consumed significantly fewer calories than control school students (520 vs 571 kcal). These values are lower than what has been found in previous research. For example, mean lunch intakes for elementary and middle school students were 587 and 620 kcal, respectively, for students in a national study who completed 24-hour recalls during the 2004-05 school year.[17] In another study, middle school students who completed a lunch food record in the cafeteria during lunch reported a mean intake of

694 kcal.[18] The lower values in the current study may be the result of the more objective method of obtaining dietary intake (observation by trained staff) in contrast to the self-report method used in the previous studies that required portion size estimation by students. A Colorado study using an objective method of assessment, digital photography of the foods selected and left at the end of the meal, reported results that were similar to the current study [elementary (426 kcal) and middle school (529 kcal) students].[19] Whether student energy needs are met by school meals is an important area for future research. This is particularly significant for those children for whom the school lunch meals are an important safety net for meeting food needs.

The generally low consumption of fruit, vegetables, and whole grains by students is a concern and should prompt future research efforts associated with improving student preferences, selection, and consumption. Previous school studies have documented fruit waste of 45%,[11] 47%,[20] and 33-50%;[19] and vegetable waste of 40-90%.[11, 19, 20] These rates are similar to those in this study: fruit waste of 33% to 36% for elementary intervention and control school students, respectively, and 24% to 22% for intermediate intervention and control school students, respectively; and vegetable waste of 60% to 37% for elementary intervention and control school students, respectively, and 47% to 48% for intermediate intervention and control school students, respectively (Table 4). Previous research indicates that targeted nutrition education may be a promising strategy for increasing fruit and vegetable consumption. For example, one previous study found that nutrition classes were needed to enable elementary school students to select more fruit or vegetables when a salad bar was introduced.[21] In the Institute of Medicine Report, support for school food service staff was recommended. [3] This support could include marketing and presentation tips, as well as training for the food service staff to offer positive encouragement about the foods during meal service. Some previous studies have noted improvements in student food selection and consumption with positive encouragement to students during NSLP meal selection.[13, 22, 23] Other promising strategies from recent studies included taste testing for parents and students, marketing on the food line, and media campaigns.[3, 24-26]

There are several limitations to this study that should be noted. The participating school district only had 26% of students eligible for FRP meals; about 62% of Texas students were eligible for FRP meals during that school year.[27] Thus the findings from this district might not generalize to others in Texas and the US. Plus, the study was conducted in 12 schools in the Houston area, also limiting generalizability. The requirement to select at least one fruit or vegetable serving for a reimbursable meal was not implemented, which should prompt future studies to assess the impact of this piece of the new rule on student lunch consumption. In addition, the promotion and signage was only available in the intervention schools; perhaps the changes found for the intervention students were due to these strategies. Because this was a pilot study, with exploratory hypotheses on consumption, adjustments for multiple comparisons were not made.

CONCLUSIONS

The key finding from this study is that in response to piloting the new NSLP meal patterns for fruit and vegetables, whereby students could select three servings of fruit and vegetables

per reimbursable meal, more total and starchy vegetables and fruit were consumed by intervention school students, compared with students in the control schools. The proportion of the fruit and vegetables consumed did not differ between the intervention and control school students. This is an important step in the right direction. Future research should continue to evaluate the impact of the new menu patterns on student food selection and consumption at school.

Acknowledgments

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Table 1

Percent of students selecting each food component in schools testing the new NSLP meal patterns for fruit and vegetables during fall, 2011

	Elementary School		Intermediate School	
	Intervention	Control	Intervention	Control
	n=535	n=614	n=212	n=215
Fruit[b***]	56	51	45	21
Juice[a***]	50	61	52	43
Fruit & Juice[a*b***]	82	87	78	58
Total Vegetables[a***b*]	63	52	52	41
Dark Green Vegetables	10	8	11	14
Red Orange Vegetables	19	17	20	20
Starchy Vegetables[a***b**]	47	36	39	27
Other Vegetables	13	11	17	16
Legumes[b*]	4	2	9	4
Grains	100	100	100	99
Whole grains[a*]	40	48	49	52
Protein Foods[b**]	100	100	100	97
Milk	90	91	76	74

Cochran-Mantel-Haenszel test controlling for gender and school SES (and grade for Elementary school data)

[a] Significant difference between elementary intervention and control school students.

[b] Significant difference between intermediate intervention and control school students.

[*] p<.05

[**] p<.01

[***] p<.001

Table 2

Mean amounts of calories and foods selected and consumed at lunch by all elementary school students observed in the four intervention and four control schools testing the new NSLP meal patterns for fruit and vegetables during fall, 2011

	Foods Selected				Foods Consumed			
	intervention		control		intervention		control	
	n=535		n=614		n=535		n=613[b]	
	Mean	SE[a]	Mean	SE	Mean	SE	Mean	SE
Calories [c*d*]	598	5.00	614	4.66	449	6.65	469	6.21
Fruit (cup)	0.29	0.01	0.26	0.01	0.20	0.01	0.18	0.01
Juice (cup) [c***d***]	0.26	0.01	0.32	0.01	0.18	0.01	0.23	0.01
Fruit & Juice (cup) [c*]	0.54	0.01	0.59	0.01	0.38	0.01	0.41	0.01
Total Vegetables (cup) [c***d**]	0.32	0.01	0.22	0.01	0.14	0.01	0.10	0.01
Dark Green Vegetables [c**]	0.06	0.01	0.03	0.01	0.01	0.00	0.00	0.00
Red Orange Vegetables	0.07	0.01	0.06	0.01	0.03	0.00	0.03	0.00
Starchy Vegetables [c***d**]	0.15	0.01	0.10	0.01	0.10	0.01	0.06	0.01
Other Vegetables [d*]	0.02	0.00	0.02	0.00	0.01	0.00	0.00	0.00
Legumes	0.02	0.00	0.01	0.00	0.01	0.00	0.00	0.00
Grains (ounce equivalent)	2.21	0.04	2.21	0.04	1.62	0.04	1.65	0.04
Whole grains [c**d*]	0.48	0.03	0.59	0.03	0.30	0.02	0.39	0.02
Protein Foods (ounce equivalent) [c***d***]	2.00	0.04	2.27	0.04	1.43	0.05	1.77	0.04
Milk (ounce)	7.11	0.11	7.28	0.10	5.38	0.15	5.19	0.14

Analyses of covariance, adjusting for for gender and school SES (and grade for Elementary school data)

[a] SE = standard error

[b] 1 control school student did not eat the meal

[c] Significant food selected difference between intervention and control elementary school students

[d] Significant food consumed difference between intervention and control elementary school students

[*] P <.05

[**] P <.01

[***] P <0.001

Table 3

Mean amounts of calories and foods selected and consumed at lunch by all intermediate school students observed in the two intervention and two control) schools testing the new NSLP meal patterns for fruit and vegetables during fall, 2011

	Foods Selected				Foods Consumed			
	intervention		control		intervention		control	
	n=212		n=215		n=210[b]		n=214[b]	
	Mean	SE[a]	Mean	SE	Mean	SE	Mean	SE
Calories[d**]	612	10.8	599	10.7	520	12.4	571	12.5
Fruit (cup)[c***d***]	0.25	0.02	0.12	0.02	0.19	0.02	0.09	0.02
Juice(cup)[c*]	0.27	0.02	0.22	0.02	0.21	0.02	0.17	0.02
Fruit & Juice (cup)[c***d***]	0.52	0.02	0.33	0.02	0.39	0.02	0.26	0.02
Total Vegetables (cup)[c**d**]	0.23	0.02	0.14	0.02	0.17	0.02	0.10	0.02
Dark Green Vegetables	0.02	0.01	0.03	0.01	0.01	0.00	0.01	0.00
Red Orange Vegetables	0.05	0.01	0.04	0.01	0.03	0.01	0.03	0.01
Starchy Vegetables[c***d*]	0.12	0.01	0.06	0.01	0.10	0.01	0.06	0.01
Other Vegetables	0.05	0.01	0.05	0.01	0.03	0.01	0.02	0.01
Legumes[c*d**]	0.03	0.01	0.01	0.01	0.03	0.01	0.01	0.01
Grains (ounce equivalent)[d*]	2.56	0.09	2.65	0.09	2.13	0.09	2.43	0.09
Whole grains[c*d**]	0.55	0.05	0.70	0.05	0.37	0.04	0.56	0.04
Protein Foods (ounce equivalent)	2.15	0.06	2.18	0.06	1.84	0.08	2.05	0.08
Milk (ounce)	5.89	0.25	5.64	0.25	4.68	0.27	5.07	0.26

Analyses of covariance, adjusting for for gender and school SES (and grade for elementary school data)

[a] SE = standard error

[b] 2 intervention and 1 control school students did not eat their selected meals

[c] Significant food selected difference between intervention and control intermediate school students

[d] Significant food consumed difference between intervention and control intermediate school students

[*] P <.0.05

[**] P <.0.01

[***] P <0.001

Table 4

Percent of food consumed by all observed students in schools testing the new NSLP meal patterns for fruit and vegetables during fall, 2011

	Elementary School				Intermediate School			
	n=535		n=613		n=210		n=214	
	Intervention		Control		Intervention		Control	
	Mean	SE[a]	Mean	SE	Mean	SE	Mean	SE
Calories [c***]	75	1	77	1	85	2	97	2
Fruit	67	2	64	2	76	4	78	6
Juice	70	2	70	2	75	3	78	4
Fruit & Juice	69	2	67	2	76	3	79	3
Total Vegetables	40	17	63	18	53	5	52	6
Dark Green Vegetables	13	4	23	5	67	10	55	9
Red Orange Vegetables	38	4	43	4	40	8	40	9
Starchy Vegetables	39	3	37	3	52	6	43	7
Other Vegetables [b*]	28	4	15	5	29	8	30	9
Legumes	46	9	40	11	66	12	41	20
Grains [c***]	73	2	73	1	83	4	100	4
Whole grains [c*]	64	3	65	3	67	4	81	4
Protein Foods [b**c**]	72	2	79	1	84	3	96	3
Milk	81	5	75	5	79	10	103	10

Analyses of covariance, adjusting for for gender and school SES (and grade for Elementary school data)

[a]Standard error

[b]Significant % consumption difference between elementary intervention and control school students.

[c]Significant % consumption difference between intermediate intervention and control school students.

[*]p<.05

[**]p<.01

[***]p<.001