Nutrition Information at Point of Selection in High Schools: Does it Affect Entrée Choices?

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National Food Service Management Institute
The University of Mississippi

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EXECUTIVE SUMMARY

The National School Lunch Program (NSLP) is a federally assisted meal program that operates in over 101,000 public and non-profit private schools and residential child care institutions (United States Department of Agriculture [USDA], 2009). In 2008, the NSLP provided nutritionally balanced, low-cost, or free lunches to more than 30.5 million children each school day (USDA, 2009). However, high school students do not participate in the NSLP at the same level as elementary and middle school students. Teenagers have more freedom to make choices, and 24.9% of the high schools allowed students to leave campus during the lunch period (USDA, 2007a).

As students move from elementary school to high school, the satisfaction level with the school nutrition (SN) program decreases. In a 2007 study conducted by the USDA, 56.1% of elementary students reported liking school lunches, but only 31.9% of high school students reported liking school lunches. However, high school students reported feelings of hunger more than elementary school students. Fifty-five percent of high school students listed hunger as the top reason for eating school lunch, as opposed to only 25.1% of elementary students and 42.1% of middle school students (USDA, 2007b).

There are very few studies regarding nutrition information at the point of selection (POS) in high schools. Conklin, Cranage, and Lambert (2005) conducted a study with six high schools in Pennsylvania. They found that providing nutrition information at the POS influenced students'

choice for more healthful entrées. Cranage, Conklin, and Lambert (2006) found that student satisfaction with the SN program increased when nutrition information was provided.

Posting nutrition information at the POS was important for several reasons. Nutrition information can be an important component of local wellness policies. High school students are becoming more independent in their dietary choices, and nutrition labels can create awareness of nutrients and assist students in making entrée choices.

This research study was conducted in three phases. In Phase I, focus groups were conducted with high school students from three high schools in the Midwest, Southeast, and Southwest USDA regions. In Phase II, the intervention school directors posted nutrition labels for entrées in the high school**.** In Phase III, the intervention school directors were interviewed via telephone to determine satisfaction with and barriers to posting nutrition information at the POS.

Four focus group sessions (9^{th} and 10^{th} grade females, 9^{th} and 10^{th} grade males, 11^{th} and 12^{th} grade females, and 11^{th} and 12^{th} grade males) were conducted in three high schools, for a total of 38 female and 35 male student participants. Male and female students thought nutrition information might affect their food choices. Twenty high schools in six USDA regions participated in the study. The SN directors supplied entrée sales data and nutrition information for September, October, January, and February. The nine intervention schools posted nutrition labels for entrées at lunch in January and February, 2009. There were eleven control schools. In total, there were 1,508 menu days assessed across the 20 schools.

The two groups were significantly different at pre-test, with the control group schools offering entrées with fewer calories and less fat but more choices. The control group schools also had a higher level of influence because more students participated in the lunch program. These

schools then decreased the amount of calories and fat in their menu during the post-test period. Concurrently, the intervention schools increased the level of calories and fat in their menu.

SN directors are continuously changing menus to accommodate new foods, new preparation methods, and student preferences. The sampling effects, notwithstanding the findings, clearly indicate that attention to the levels of calories and fat in the menu influences student POS purchases. If schools provide healthy options, students will eat better. While this conclusion appears simple, it is consistent with the principle of having professionally trained SN directors and registered dietitians associated with SN programs. Menus must be planned and implemented appropriately to ensure that students have healthy options.

All SN directors from intervention schools (n=9) were interviewed by telephone after the two months of intervention. All were able to post the nutrition labels, and none reported concurrent nutrition education activities. Eight of nine directors reported that students noticed the labels, and one of the directors reported a student who stated that they didn't want to know the nutrition information. One director reported that the school had quite a few vegan students interested in nutrition. Another director reported that female students were more interested in the nutrition information than male students. Seven directors reported their greatest success was student awareness of the labels.

The lack of impact of entrée nutrition labels in the intervention schools suggests that simply providing passive nutrition information is insufficient for changing lunch purchases in high schools. These results are in agreement with those of Harnack and French (2008), who advocate for promotional messages combined with nutrition labeling.

INTRODUCTION

The National School Lunch Program (NSLP) is a federally assisted meal program operating in over 101,000 public and non-profit private schools and residential child care institutions (United States Department of Agriculture [USDA], 2009). In 2008, the NSLP provided nutritionally balanced, low-cost, or free lunches to more than 30.5 million children each school day (USDA, 2009). High school students do not participate in the NSLP at the same level as elementary and middle school students. Teenagers have more freedom to make choices, and 24.9% of the high schools allowed students to leave campus during the lunch period (USDA, 2007a).

As students move from elementary school to high school, the satisfaction level with the school nutrition (SN) program decreases. In a 2007 USDA study, 56.1% of elementary students reported liking school lunches, but only 31.9% of high school students reported liking school lunches (USDA, 2007b). However, high school students reported feelings of hunger more than elementary school students (USDA, 2007b). Fifty-five percent of high school students listed hunger as the top reason for eating lunches, as opposed to only 25.1% of elementary students and 42.1% of middle school students.

In a study of 3,155 suburban Atlanta high school students, Young and Fors (2001) reported that male high school students were significantly ($p<.05$) more likely than the female students to self-report eating a healthy lunch. Shannon, Story, Fulkerson, and French (2002) conducted a study with 10th, 11th, and 12th grade students at a Minneapolis high school to determine influences on food choices (health concerns, labeling and nutrition information, taste, cost, availability, and peers) and to determine whether these influences vary by gender, grade level, or health and weight concerns. Female students were significantly more likely than male

students ($p \leq .01$) to report that they would use information on the fat content of foods if displayed near the cafeteria line. The authors recommended point-of-purchase nutrition information to enable students to make more informed and healthier food choices.

There are very few studies regarding nutrition information at the point of selection (POS) in high schools. Conklin, Cranage, and Lambert (2005) conducted a study with six high schools in Pennsylvania. They found that providing nutrition information at the POS influenced students' choice for more healthful entrées. Sales of pepperoni pizza dropped significantly ($P < .05$), and sales of cheese pizza increased ($p < .05$). Fewer cheeseburgers and bacon cheeseburgers were sold, while the sales of hamburgers and vegetarian burgers increased ($p < .05$). Cranage, Conklin, and Lambert (2006) found that student satisfaction with the SN program increased when nutrition information was provided. The authors concluded that supplying nutrition information at the POS can be used to market the SN program, and allow students to make informed choices about their food selections.

Fifty-five percent of high schools, 62.2% of middle schools, and 61.7% of elementary schools routinely make nutrient content information available to students or parents (USDA, 2007a). High schools (n=125) reported multiple channels for sharing nutrition information which included the following: menus and flyers sent home (59.5%); posting the information in school (57.6%); posting online (42.5%); posting in newspapers (27.7%); and on television (15.6%). Among schools that use software for conducting nutrient analyses, NutriKids is the most popular software (USDA, 2007a).

Harnack & French (2008) reviewed six studies on the effects of calorie information on food choices in restaurants and cafeteria settings. Results from five of the six studies provided some evidence that calorie information may influence food choices in a cafeteria or restaurant

setting. However, the results were inconsistent or weak. One of the six studies found no evidence of an effect of calorie labeling on food choices. Factors such as taste, price, convenience, and social relationships tended to be rated higher than nutrition when making restaurant meal choices. Harnack & French (2008) recommended that promotional messages be combined with calorie labels to strengthen the value of point-of-purchase calorie labeling on food choices.

Fulkerson, French, Story, Snyder, and Paddock (2002) surveyed 235 high school foodservice staff and found that 76.6% of staff strongly agreed that students usually know exactly what they want to order when they approach foodservice staff. The foodservice staff reported that students did not purchase healthful foods because their friends did not eat healthful foods.

Posting nutrition information at the POS is important for several reasons. Nutrition information can be an important component of local wellness policies. High school students are becoming more independent in their dietary choices, and nutrition labels can create awareness of nutrients and assist students in making entrée choices.

Research Objectives

The goals and objectives of this study were to:

- Conduct focus groups with high school students to find out how they select their foods, and to determine their preferences for nutrition information at the POS;
- Determine whether high school students change their food selections based on the availability of nutrition information posted at the POS; and
- Conduct telephone interviews with SN personnel from intervention schools after the intervention to determine satisfaction with and barriers to having nutrition information posted at the POS.

METHOD

Research Plan

This research study was conducted in three phases. In Phase I, focus groups were conducted with high school students from three high schools in the Midwest, Southeast, and Southwest United States Department of Agriculture (USDA) regions. In Phase II, the intervention schools posted nutrition labels for entrées in the high school. In Phase III, the intervention school directors were interviewed via telephone to determine satisfaction with and barriers to posting nutrition information at the point of selection (POS).

Informed Consent

The protocol for this study was approved by the Eastern Michigan University Human Subjects Review Committee and The University of Southern Mississippi Institutional Review Board.

Phase I

After a review of literature on nutrition information at the POS, focus group questions were drafted using recommendations from Krueger & Casey (2000) as a guide. These questions are represented in Table 1.

Table 1

Focus Group Questions

Type of Question	**Question(s)**
Introduction	Please tell us your first name and grade level. Do you read nutrition labels?
Transition	Do you look at nutrition information when eating in restaurants?
Transition	How do you choose your lunch foods at school?
Key	Would having nutrition information change your choices? Probes: Is nutrition information a consideration in food choice? How important is it in comparison to taste, presentation, etc.?
Key	For which menu items would you like to see the nutrient information available? (entrées only vs. all items, etc.)
Key	Which nutrients should be included in the available information? Probe: What should the format be?
Key	Where should the information be available? (POS, in printed menu, link to nutrient analysis on Web site, table tents, etc.)
Key	Would it help to show caloric totals of reimbursable meals as a whole vs. individual meal components?
Key	Would providing the nutrition information increase your confidence/satisfaction/trust in the school nutrition (SN) program? Would it improve the image of the SN program as providing nutritious meals?
Ending	Is there anything we should have talked about, but didn't?
Ending	Of all the topics we discussed, which one is the most important to you?
For pilot only	This is the first in a series of groups like this that we are doing. Do you have any advice for how we can improve?

Three SN directors in three different USDA regions were contacted to host focus groups. The directors were chosen based on geographic location and diversity of students in the district. The Midwestern high school was located in a city with 32,000 residents and one high school. The Southeastern high school was located in a city of 92,000 residents and a district with 18 high schools. The Southwestern high school was in a suburban district with six high schools. The SN directors chose the high schools for the focus groups, and they worked with teachers to identify 9th and 10th grade females, 9th and 10th grade males, 11th and 12th grade females, and 11th and 12th grade males for the focus groups. Four focus groups (one for each of the listed groups) were held in each high school. Assent forms were sent home so that parents and students who did not want to participate were allowed to decline.

Phase II

State agency directors were asked via e-mail to identify SN directors from school districts of varied sizes to serve as intervention high schools and control high schools. Each state agency was asked to provide 6 contacts (two large-size districts with ≥ 30,000 students, two medium-size districts with 3,000 to 29,999 students, and two small size districts with < 3,000 students). The e-mail message to state agencies contained the following information:

- A brief description of the study purpose and design;
- A request for recommendations for SN directors from six districts (see above for sizes) willing to share accurate sales data and menus for a high school for the months of September and October, 2008 and January and February, 2009; and
- Districts with existing nutrient analysis of menu items were preferred, but not required. Menus, district names, and school names would not be reported.

The recommended SN directors were stratified by region and district size in an SPSS database. A stratified random sampling strategy was used to select SN directors within each region. The researchers then randomly selected 67% of the school districts in each region. The districts were listed in order of selection. The first four small, five medium, and three large districts were selected, with even numbers being designated as intervention districts and odd numbers serving as control districts. Oversampling was used so districts declining participation could be replaced by the next randomly selected district.

SN directors were contacted via telephone to explain the study and to request their participation. In addition, e-mail was used to follow-up with SN directors. SN directors with more than one high school were allowed to choose a high school for this study.

September and October were the pre-test months; January and February were post-test months. Intervention SN directors were asked to provide menus and nutrition information for entrées in September, October, January, and February. Directors who were using NutriKids software supplied their entrée nutrition labels as an e-mail attachment. Directors who were not using NutriKids software supplied their available nutrition information, food labels, and recipes so that nutrition labels could be created. The labels were printed on yellow card stock and laminated. Figure 1 shows the template created in Microsoft Excel to match the nutrition labels created in NutriKids. The labels were mailed to directors in December, 2008.

Figure 1

Template for Nutrition Label

Nutrition Facts	
Serving Size:	
Serving per Container:	
Amount Per Serving	
Calories:	Calories from Fat
	% Daily Value*
Total Fat	
Saturated Fat	
Trans Fat N/A	
Cholesterol	
Sodium	
Total Carbohydrate	
Dietary Fiber	
Protein	
Vitamin A	Vitamin C
Calcium	Iron
*Percent Daily values are based on a 2,000 calorie diet.	

In March of 2009, SN directors from intervention schools were asked to provide menus and production records for January and February. SN directors at control schools were asked to provide menus, production records, and nutrition information for September, October, January, and February. Follow-up telephone calls were made, and e-mail reminders were sent to SN directors. Data were entered into an SPSS database, and data were checked for accuracy by researchers.

Phase III

The SN directors from intervention schools (n=9) were contacted via telephone in March and April to determine satisfaction with and barriers to having nutrition information posted at the POS. Table 2 contains the telephone interview questions.

Table 2

Telephone Interview Questions for School Nutrition Directors of Intervention Schools

1. Were you able to implement the intervention?
2. Were there any concurrent nutrition education activities in the high school?
3. Did the students notice the nutrition labels?
4. Did the teachers and staff notice the nutrition labels?
5. Did you get any feedback from students, staff, or administrators?
6. What was your greatest challenge to posting nutrition labels?
7. What was your greatest success associated with posting nutrition labels?
8. Do you have any suggestions for schools who may want to implement nutrition labels for entrées?
9. Do you have any additional thoughts and comments about the intervention?

RESULTS AND DISCUSSION

Phase I Focus Groups with High School Students

Four focus group sessions (9th and 10th grade females, 9th and 10th grade males, 11th and 12th grade females, and 11th and 12th grade males) were conducted in three high schools, for a total of 38 female and 35 male participating students. The focus groups were moderated by the same individual, and notes were taken by the same individual. The notes were analyzed for themes by gender and grade level.

Female and male students thought nutrition information might affect their food choices, and female students were more interested in seeing nutrition information for all menu items and entrées. Male students were more likely to want nutrition information for entrées only, and they were more likely to state that taste was more important than nutrition in choosing menu items. Female and male students mentioned calories, fat, protein, and carbohydrates as nutrients of interest, and male students were more likely to want protein and vitamin information posted. Female students wanted the nutrition information available near the food and on a Web site, but most male students wanted it near the entrance to the line.

Because there are many choices, both groups thought nutrition information should be provided for individual menu items instead of just for a reimbursable meal. Female students were more likely than male students to say that providing nutrition information would increase their trust and satisfaction with the school nutrition (SN) program. Some students reported a distrust of school menu items and ingredients used in school menu items.

Like the results of the Shannon, Story, Fulkerson, and French (2002) study, gender differences were found, but differences between opinions of 9th and 10th grade and 11th and 12th grade students were not apparent. Students with health conditions, such as diabetes and athletic

involvement, were especially interested in nutrition labels. Table 3 contains quotations that are representative of the students' comments.

Table 3

Representative Comments by Gender

Comments from Female Students
Would having nutrition information change your choices?
"There is so much going on. You just want to get your food and go." *"It would help me figure out what to eat on certain days."* *"It would help with how much insulin."* *"Probably not."* *"I won't take the time to read it."* *"It depends."*
Would providing nutrition information increase your confidence in the school nutrition program?
"*Yes, definitely."* *"I think it would. You question whether it is real food."* *"It would increase my trust."* *"It would help with allergies."* *"Probably."*
Would providing nutrition information improve the image of the school nutrition program as providing nutritious meals?
"I like to eat healthy, but I like to have my junk." *"It would show they put thought in it."* *"Yes, if they provide it (nutrition information), then they don't have anything to hide."*
Most important topic discussed *"Having the ability to know the nutrition of what we're eating so we can eat more healthy."* *"The look of the food."* *"The fact that you're hearing our opinion."* *"Nutrition."* *"Having nutrition information available so you can see it."*

Table 3 continues

(Table 3 continued)

Representative Comments by Gender

Comments from Male Students:

Would having nutrition information change your choices?

"*I think it would.*"
"*If it was better for me, it might.*"
"*I'm trying to gain weight, so it would.*"
"*Probably not; I'm very active, so I can eat anything.*"
"*If it tastes good, I eat it.*"

Would providing nutrition information increase your confidence in the school nutrition program?

"*You would know something about what you're eating.*"
"*I think it would if the nutrition (information) was good.*"
"*No.*"
"*I think it would.*"
"*It would still taste the same.*"

Would providing nutrition information improve the image of the school nutrition program as providing nutritious meals?

"*Yes.*"
"*Yes, they say they do so we could agree with them that they (meals) are nutritious.*"
"*Yes, I think it would but they could still put stuff in.*"

Most important topic discussed

"*Nutrition labels.*"
"*Variety of foods.*"
"*Taste (of food).*"

Phase II Intervention Study

The project staff invited 46 SN directors to participate. Ten SN directors declined participation, and 36 SN directors committed to participate. Eight intervention SN directors failed to provide data at some point and were removed from the sample. Seven control SN directors failed to provide data at some point during the project and were removed from the sample. One of the intervention schools did not post the nutrition labels. In total, 20 schools were included in the study, yielding an attrition rate of 44%. The characteristics of the intervention schools (n=9) and control schools (n=11) are in Table 4.

Table 4

High School Characteristics

	Intervention Schools (n=9)	**Control Schools (n=11)**
Enrollment	1538.6 ± 766.3	1243.7 ± 859.0
Average Daily Attendance	1390.9 ± 711.8	1163.1 ± 816.9
Average Daily Participation in NSLP	621.0 ± 334.2	693.7 ± 500.3
Percentage of Free Lunch Eligible Students	33.6% ± 19.9%	36.5% ± 21.5%
Percentage of Reduced Price Eligible Students	7.5% ± 2.7%	8.0% ± 3.0 %
Lunch Price for Paid Lunch	$2.48 ± $0.82 *	$1.81 ± $0.55
Number of Serving Lines	3.9 ± 1.4	4.5 ± 2.5
Reimbursable Entrée Choices per Day	5.4 ± 3.7	9.8 ± 6.9
Average à la Carte Sales per Day	$819.07 ± $739.52	$790.05 ± $685.86

* One of the intervention schools was operating under Provision Two, so n=8.

The intervention schools had larger enrollment and less daily participation in the National School Lunch Program (NSLP) than control schools. Percentages of students qualified for free or reduced price meals were similar between intervention schools and control schools. Intervention schools had fewer reimbursable entrée choices than control schools. The average à la carte sales were similar between intervention and control schools.

In total, there were 1,508 menu days assessed across the 20 schools. The breakdown by region is contained in Table 5. Schools from the Northeast region were recruited but did not provide data, so they were not included in the final sample. In the sample, the Midwest region tended to be under represented, and the Southeast and Southwest regions had higher representation. The Southwest region was also absent from the intervention group, and the Western region was absent from the control group.

Table 5

Sample Description by Region

Region	**Menu Days Sampled**	**Percent of Sample**	**Number of High Schools**	**Number of Control Schools**	**Number of Interv. Schools**
Mid-Atlantic	228	15.1	3	1	2
Midwest	143	9.5	2	1	1
Mountain Plains	225	14.9	3	2	1
Southeast	462	30.6	6	3	3
Southwest	297	19.7	4	4	0
Western	153	10.2	2	0	2
TOTAL	1508	100.0	20	11	9

There were significant differences across the regions (see Table 6). The school population sizes had a large range. The Western region high schools had an average of 997.6

students, yet the Midwest region schools were almost 2.5 times that size. Similarly, the percentage of students in the NSLP also varied, with the Western region having the lowest participation and the Southern regions having the highest participation.

Table 6

Regional Differences in High School Size and Lunch Participation (n=20)

	Region	Mean	Std. Deviation	F	P value
Number of Students per High School	Southwest	1121.3	898.5	125.412	<.001
	Western	997.6	228.5		
	Mountain Plains	1675.6	241.8		
	Southeast	1160.1	794.6		
	Midwest	2542.7	379.6		
	Mid-Atlantic	1353.6	642.1		
Percentage of Student Participation in NSLP	Southwest	60.1	5.5	288.965	<.001
	Western	26.7	6.9		
	Mountain Plains	37.6	8.4		
	Southeast	64.9	20.2		
	Midwest	45.5	14.0		
	Mid-Atlantic	48.9	6.8		

Concurrent with significant regional differences, there were also differences associated with district size. Table 7 indicates that smaller schools had much higher percentages of students participating in the NSLP. Small districts had lower numbers of students enrolled in the schools, but medium-size districts had higher enrollments in the high schools.

Table 7

Student Participation Percentage and School Size Differences across District Sizes

	District Size	Number of Menu Days	Mean	Standard Deviation	F	P Value
Percentage of Participation in NSLP	Small	380	62.7	19.3	130.669	<.001
	Medium	821	45.9	12.5		
	Large	307	53.9	23.2		
Number of Students	Small	380	499.1	208.9	530.168	<.001
	Medium	821	1689.8	700.7		
	Large	307	1608.9	661.6		

To assess the impact of the district differences on research variables, the calories per serving and fat per serving at the point of selection (POS) were entered into an ANOVA analysis. The results of this analysis are contained in Table 8. High schools in larger districts tended to offer fewer calories and less fat at the POS. This was surprising, because the menu planning guidelines are the same for all districts. High schools in small districts had more variability in entrées, indicated by the higher standard deviations.

Table 8

Entrée, Calorie, and Fat Differences by District Size

	District Size	Number of Menu Days	Mean	Standard Deviation	F	P Value
Calories Per Entrée	Small	380	347.7	95.6	69.758	<.001
	Medium	821	359.7	58.9		
	Large	307	305.0	54.9		
Fat (g) Per Entrée	Small	380	15.4	4.4	65.305	<.001
	Medium	821	15.7	3.6		
	Large	307	12.8	3.6		

An analysis of regional differences on the research variables was conducted using the pre-test data. There were very significant differences across regions in the levels of fat and calories, as illustrated in Table 9. Schools in the Southeast region had much lower levels of fat and calories when compared to other regions. The Western, Midwest and Mid-Atlantic regions had the highest levels of fat. The Western region had much higher levels of calories, indicating some potential sampling effects. The Southeast region had significantly fewer entrées, while the Mid-Atlantic and Midwest regions had the highest number of entrées.

Table 9

Pre-test Calorie and Fat Levels in Entrées by Region

	Region	**Mean**	**Standard Deviation**	**F**	**P Value**
Number of Entrées	Southwest	9.3	8.6	97.803	<.001
	Western	6.8	3.7		
	Mountain Plains	7.5	3.3		
	Southeast	3.5	3.1		
	Midwest	9.8	1.4		
	Mid-Atlantic	10.6	3.9		
Mean Level of Calories per School at Pre Test	Southwest	330.1	17.2	509.583	<.001
	Western	427.5	75.2		
	Mountain Plains	335.6	20.1		
	Southeast	301.9	20.0		
	Midwest	382.6	13.4		
	Mid-Atlantic	389.2	36.6		
Mean Level of Fat Grams per School at Pre Test	Southwest	14.1	1.2	441.475	<.001
	Western	17.5	2.7		
	Mountain Plains	14.0	1.2		
	Southeast	13.8	0.9		
	Midwest	17.1	0.6		
	Mid-Atlantic	17.3	1.3		

Given the regional differences, the pre-test conditions were assessed. Within the intervention and control groups there were significant variances. The number of entrées ranged from 1 to 19 in the intervention group, while the control group ranged from 1 to 24. Similarly, the number of students in the intervention group ranged from 211 to 2,598 students, and the control group schools ranged from 384 to 2,908 students. The percent of students who participated in the NSLP ranged from 19.4% to 92.9% in the intervention group, while the control group ranged from 29.4% to 85.0%.

Table 10

Menu and Point of Sale Differences at Pre-Test

	Group	**Number of Menu Days Sampled**	**Mean**	**Standard Deviation**	**T Test p Value**
School Size	control	453	1,258.6	816.3	-4.780
	intervention	366	1,519.9	727.3	(<.001)
Percent Daily Participation in NSLP	control	453	57.5	13.5	10.818
	intervention	366	44.4	20.9	(<.001)
Number of Entrées	control	453	8.4	6.4	5.570
	intervention	366	6.2	4.5	(<.001)
Calories per Entrée	control	453	327.6	23.4	-11.302
	intervention	366	369.3	67.4	(<.001)
Fat Grams per Entrée	control	453	14.2	1.2	-14.771
	intervention	366	16.2	2.4	(<.001)
Calories per Purchased Entrée	control	453	345.2	32.6	-4.462
	intervention	366	362.5	68.3	(<.001)
Fat Grams per Purchased Entrée	control	453	14.3	1.7	-10.621
	intervention	366	16.0	2.6	(<.001)

A review of Table 10 indicates highly significant between-group differences at the time of the pre-test data collection. The control group had smaller schools with a higher percentage of students participating in the NSLP. The control schools also offered more entrées.

Concurrent with the basic sample differences, there were significant menu quality differences between the two conditions. The control group had significantly less fat and fewer calories per entrée. When the entrée purchases were compared, there were also significant between-group differences in the average amounts of calories and fat per purchase during the pre-test period.

Given the between-group differences for intervention and control groups and the concurrent regional differences, project staff were concerned that the pre-test differences may be related to regional differences. Consequently, the control and intervention groups in regions where both groups were present were assessed. The results of this assessment are provided in Table 11. A review of these results indicates a general pattern of decreased levels of fat and calories consumed in the control rather than the intervention groups. Concurrently, there is an increased discrepancy in the average levels of fat and calories in the menu items.

Table 11

Sample Changes by Regions with Intervention and Control Schools

Region	**Number of Menu Days**		**Change in Fat Per Purchased Entrée**		**Change in Cal. Per Purchased Entrée**		**Change in Average Fat Per Entrée**		**Change in Average Cal. Per Entrée**	
	Ctrl.	**Int.**	**Ctrl.**	**Int.**	**Ctrl**	**Int.**	**Ctrl**	**Int.**	**Ctrl**	**Int.**
Mid-Atlantic	3	55	.24	.11	12.62	.94	.91	.33	17.41	0.54
Midwest	74	69	.34	-.16	1.46	-3.34	-.55	.09	-16.54	-.72
Mountain Plains	151	74	-.61	.70	-10.98	-2.31	-.95	.70	-13.51	9.90
Southeast	239	223	-.44	.61	-4.50	8.85	-.25	.49	-5.76	6.04

The between-group differences in Table 11 may suggest some Hawthorne effects, a form of response whereby subjects change an aspect of their behavior being measured simply in response to the fact that they are being studied. The control group tended to decrease the calories and fat in the entrées, while the intervention group tended to increase calories and fat in the entrées. While the shifts were fairly small in magnitude, the bi-directionality gives rise to concerns about the sample.

An additional analysis that compared cheese pizza and cheeseburger sales was completed using Microsoft Excel 2007 to see if the results would be similar to those in the Conklin, Cranage, and Lambert (2005) study. The sales of cheese pizza and cheeseburgers in intervention schools were not affected by posting nutrition labels. These significant between-group differences at pre-test required a shift in the analysis strategy. It was decided that changes in the levels of fat and calories purchased might moderate the sampling effects because differences may have reflected the impact of providing nutrition information in the intervention schools. Such differences should reflect in a simple between-group analysis. This strategy shift was predicated on a continuity assumption that the two conditions maintained roughly the same level of fat and calories in the menu.

The continuity assumption was assessed by taking the average level of fat and calories per entrée during the post-test period and subtracting the average levels during the pre-test period. While some variance could be expected, menu continuity would suggest that the average levels would not fluctuate at a level of statistical significance. This assumption was tested using an independent samples t test comparing the pre-post test changes between the two conditions. The results of this analysis are presented in Table 12.

Table 12

Fat and Calorie Change in the Menu between Pre-Test and Post-Test Periods

		Number of Menu Days Assessed	Mean	Standard Deviation	T Test p Value
Change in Fat Levels	control	834	-.51	.61	-28.23
	intervention	674	.25	.42	(<.001)
Change in Calorie Levels	control	834	-11.75	12.92	-38.09
	intervention	674	6.65	4.67	(<.001)

A review of Table 12 indicates a worst-case situation where there were highly significant levels of fat and calorie menu item changes between the two groups. The control group decreased calorie levels on average by 11.75 calories per entrée between the pre-test and post-test periods. The intervention group, on the other hand, increased calories by 6.65 calories per menu item. There appeared to be a significant Hawthorne effect occurring in both conditions effectively compounding the sampling errors outlined above. SN directors are continuously changing menus to accommodate new foods, new preparation methods, and student preferences. It is unknown whether the differences between the control group and intervention group were due to the Hawthorne effect or menu changes.

The two groups were significantly different at pre-test, with the control group schools offering fewer calories and less fat but more choices. The control group schools also had a higher level of influence because more students participated in the lunch program. These schools then decreased the amount of calories and fat in their menu during the post-test period. Concurrently, the intervention schools increased the level of calories and fat in their menu.

The combined sampling and Hawthorne effects made it impossible to reliably discern the impact of nutrition labels on student purchasing decisions at the POS. Consequently, the researchers elected to shift the analysis so the variance associated with between group differences could be factored into the decision making. This required the use of separate stepwise multiple regression analyses for the amount of fat and calories purchased.

The stepwise analysis began by entering the between-school differences (school size, district size and percentage of students participating in the NSLP). By entering these variables first, the variance would be controlled in subsequent steps. The second step included the average number of fat grams per menu item during the pre-test period. Step three included the number of menu items to capture and control the level of student choice. The fourth step included the change in the average fat grams per menu item offered between pre-test and post-test. The final entry was the inclusion of nutrition information (control versus intervention conditions).

This five step model was used to control sampling artifacts prior to considering the research condition. The results of this analysis are provided in Table 13. The most important step to consider in this table is step five, because this row has the maximum level of statistical control. Also of note is the Standardized Beta Coefficients column; only one coefficient achieves significance. This variable is the average amount of fat grams per menu item at pre-test. All of the other variables, including the intervention, made insignificant contributions when sampling artifacts and the Hawthorne effects were controlled.

Table 13

Stepwise Regression Analysis onto the Average Grams of Fat per Entrée Purchased

Model		Standardized Beta Coefficients	t	P Value
1	(Constant)		38.761	<.001
	Percent of Students Participating in NSLP	-.088	-3.313	<.001
	School Size	.245	8.118	<.001
	District Size	-.341	-12.070	<.001
2	(Constant)		-.111	.912
	Percent of Students Participating in NSLP	.018	.733	.464
	School Size	.045	1.540	.124
	District Size	-.005	-.145	.885
	Average Fat Grams per Entrée at Pre-Test	.513	18.360	<.001
3	(Constant)		.006	.996
	Percent of Students Participating in NSLP	.018	.713	.476
	School Size	.042	1.416	.157
	District Size	-.006	-.181	.856
	Average Fat Grams per Entrée at Pre-Test	.508	17.167	<.001
	Number of Menu Items	.015	.592	.554
4	(Constant)		-.066	.947
	Percent of Students Participating in NSLP	.023	.931	.352
	School Size	.028	.916	.360
	District Size	.004	.127	.899
	Average Fat Grams per Entrée at Pre-Test	.508	17.177	<.001
	Number of Entrées	.022	.893	.372
	Change in Average Grams of Fat per Entrée	.039	1.658	.098

Table 13 continues

(Table 13 continued)

Stepwise Regression Analysis onto the Average Grams of Fat per Entrée Purchased

Model		Standardized Beta Coefficients	t	P Value
5	(Constant)		.089	.929
	Percent of Students Participating in NSLP	.031	1.190	.234
	School Size	.032	1.017	.309
	District Size	-.005	-.145	.885
	Average Fat Grams per Entrée at Pre Test	.480	12.648	<.001
	Number of Entrées	.039	1.360	.174
	Change in Average Grams of Fat per Entrée	.019	.629	.530
	Control versus Intervention Grouping	.044	1.173	.241

The analysis of the calories at the point-of-purchase used the same stepwise analysis design, yielding very similar results. In reviewing Table 14, the level of calories per entrée at pre-test was again the only significant influence on the purchase of calories at the POS (Beta = .720). The results of both models suggest that the introduction of nutrition information lacks sufficient impact when compared to offering healthy menu choices. Consistently, schools that ensured that the entrées were healthy choices had lower levels of calories and fat in the POS purchases.

Table 14

Stepwise Regression Analysis onto the Average Number of Calories per Entrée Purchased

Model		Standardized Beta Coefficients	t	P Value
1	(Constant)		53.365	<.001
	Percent of Students Participating in the NSLP	-.277	-10.720	<.001
	School Size	.151	5.127	<.001
	District Size	-.309	-11.204	<.001
2	(Constant)		-1.589	.112
	Percent of Students Participating in the NSLP	.025	1.199	.231
	School Size	.022	1.028	.304
	District Size	.016	.736	.462
	Average Calories per Entrée at Pre-Test	.751	36.372	<.001
3	(Constant)		-1.361	.174
	Percent of Students Participating in the NSLP	.023	1.109	.268
	School Size	.020	.884	.377
	District Size	.016	.713	.476
	Average Calories per Entrée at Pre-Test	.746	31.949	<.001
	Number of Entrées	.009	.453	.651
4	(Constant)		-1.420	.156
	Percent of Students Participating in the NSLP	.036	1.626	.104
	School Size	.016	.703	.482
	District Size	.027	1.185	.236
	Average Calories per Entrée at Pre-Test	.736	30.770	<.001
	Number of Entrées	.030	1.263	.207
	Change in Average Calories per Entrée	.041	1.865	.062

Table 14 continues

(Table 14 continued)

Stepwise Regression Analysis onto the Average Number of Calories per Entrée Purchased

Model		Standardized Beta Coefficients	t	P Value
5	(Constant)		-1.459	.145
	Percent of Students Participating in the NSLP	.035	1.605	.109
	School Size	.008	.332	.740
	District Size	.026	1.116	.264
	Average Calories per Entrée at Pre-Test	.720	27.376	<.001
	Number of Entrées	.040	1.629	.104
	Change in Average Calories per Entrée	.020	.787	.431
	Control versus Intervention Grouping	.039	1.426	.154

The sampling problems in this study presented many potential confounds in the data. First, randomization was an insufficient solution for minimizing differences between the intervention and control groups. There were significant differences on all research variables at the time of pre-test. Second, attrition rates resulted in some regions having schools represented not at all or only in the intervention or control group. Third, school and district sizes, along with the percentage of students participating in the NSLP, tend to reflect differences in school demographics and menus.

The greatest threat to the reliability of outcomes was the Hawthorne effect. There was a pattern of decreased levels of fat and calories in the control group menu items during post-test. Given that the control group had lower levels of fat and calories at pre-test, this was a difficult sampling error to manage. While the use of a stepwise regression analysis could manage the menu differences, the fact that there were pre-test differences may indicate that the SN directors

in the control schools were adjusting their menus toward healthy options more than the SN directors in the intervention schools.

The sampling effects, notwithstanding the findings, clearly indicate that attention to the levels of calories and fat in the menu influences student point of sale purchases. If schools provide healthy options, students will eat better. While this conclusion appears simple, it is consistent with the principle of having professionally trained SN directors and registered dietitians associated with SN programs. Menus must be planned and implemented appropriately to ensure that students have healthy options.

The lack of impact in the intervention schools suggests that simply providing passive nutrition information is insufficient for changing lunch purchases in high schools. These results are in agreement with those of Harnack and French (2008), who advocate for promotional messages combined with nutrition labeling.

Phase III Phone Interviews with Directors

All SN directors from intervention schools (n=9) were interviewed by telephone after the two months of intervention. All were able to post the nutrition labels, and none reported concurrent nutrition education activities. Eight directors reported that students noticed the labels, and one of the directors reported a student who stated that they didn't want to know the nutrition information. One director reported that the school had quite a few vegan students interested in nutrition. Another director reported that female students were more interested in the nutrition information than male students.

Five directors reported that teachers and staff noticed the labels, and two of the directors reported that teachers have a different line or don't come to the cafeteria. Six directors reported

that they received feedback from students, teachers, and staff. Feedback was positive, and in one district, the staff was surprised by the nutritive value of menu offerings.

Five directors reported that posting the labels was not a challenge. Four directors reported problems finding space to post the labels. One director reported that getting the nutrition information ready for the labels was a challenge. Only one director reported that rotating the labels was a challenge.

Seven directors reported their greatest success was student awareness of the labels. Only one director reported that students didn't notice the labels. One director mentioned the greatest success was getting the nutrition information ready for the labels.

Directors' comments on their greatest success with the intervention were as follows:

- Students looked at the labels;
- Providing a service to students;
- Seeing students' interest in nutrition;
- Students liked the labels;
- Students studied the labels; it helped them;
- Students read them; and
- Students noticed them and it increased awareness of nutrient content.

Directors (n=9) offered the following suggestions for directors who may want to implement nutrition facts labels for entrées:

- Once you have the software, it is easy to do;
- From a perception standpoint, it's a win;
- Advertise it and promote it;
- Promote it in the morning announcements (n=2);

- Promote prior to implementation and get staff (nurse, physical education teachers) involved;
- Work with health teachers;
- Create stickers for wrapped food items;
- Provide nutrition education in label reading;
- Make the labels available for a wide variety of menu items;
- Make sure you have a good location for the labels and ensure that students don't remove them;
- Make the labels larger to draw attention;
- Display the labels on a wall near the student entrance to the cafeteria;
- Get an attractive display case to display nutrition information; and
- Table tents are possibility.

The following were additional comments from the phone interviews with directors:

- "*It is difficult to implement when you're trying to run a department. A partnership with a college or university would help."*
- *"My school board was excited about it."*
- *"It is very time consuming."*
- *"I appreciated the opportunity to participate. We may want to continue posting the labels."*
- *"Students liked having the information available for health reasons."*
- *"I want to do it in all schools. It was beneficial. Find out if students understand the labels. I am happy to collaborate."*

- *"Keeping up with new menu items is a challenge. I'm not sure it was worth the time for only a few students."*
- *"Pair it with announcements. Teach students how to read labels. It was time consuming to get the nutrition information together. It is hard to convince teenagers. We need to start in first grade."*
- *"I think if I were more organized, I would definitely post nutrition information for all food items. I'm working toward that. It is good for children. Now that I have the software, I can access the information."*

CONCLUSIONS AND RECOMMENDATIONS

The results of this study suggest that high school students are interested in nutrition information, but nutrition labels at the point of selection did not affect high school students' entrée choices. The school nutrition (SN) directors' experiences with the intervention were positive, and they reported that providing nutrition labels was a service to students.

It is possible that a study with concurrent nutrition education activities would yield different results. There is a need for education and training resources for SN directors and local wellness policy committee members to use in conveying the nutrition messages and nutrition labeling in a more active manner. Nutrition education in addition to nutrition labeling at the point of selection (POS) might have an impact on high school students. Directors and local wellness policy committee members would be more likely to use developed resources on this topic instead of spending time to develop those for their high school(s).

Education and Training Implications

- Students need education in regard to reading and using nutrition labels.
- SN directors need education and training in using nutrition components of software. Some directors were not aware of the capability to print nutrition labels from NutriKids software.
- SN directors and local wellness committees would be likely to use nutrition education resources developed by the National Food Service Management Institute.

Recommendations for Additional Research

- The data collection was time consuming. Incentives for SN directors to participate may have a positive impact on the attrition rate.

- Conduct a similar study to determine the most effective format for nutrition labels and the most effective nutrition education communication methods.
- Conduct a similar study using schools with comparable levels of calories and fat in entrées, so that the intervention and control groups will be comparable.
- Conduct a similar study with schools that have the same entrées, so that the intervention and control groups will be comparable.
- Conduct a similar study with concurrent nutrition education activities in the schools.

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