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Plate Waste and Attitudes among High School Lunch Program Participants

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Please note that this study was published before the SY2014-15 implementation of the Smart Snacks Nutrition Standards for Competitive Food in Schools, as required by the Healthy, Hunger-Free Kids Acts of 2010. As such, certain research relating to food in schools may not be relevant today.

ABSTRACT

Purpose/Objectives

The purpose of this study was to determine: 1) What foods high school students participating in the National School Lunch Program (NSLP) are discarding the most? 2) How much of these foods they are discarding? and 3) What are their perceptions towards school lunch?

Methods

Researchers measured plate waste at two high schools using a previously validated digital photography method. Additionally, students completed a 19-item, multiple-choice lunch program experience survey. Data were analyzed using analysis of variance, Pearson's correlation, and t-tests.

Results

Plate waste data were collected from 317 students and surveys from 127. The majority of students had = 10% waste in each food category (Entrée, Fruit, Vegetable, Other, Milk). Vegetables had the highest average percentage of waste (29%), although fewer students selected vegetables (20%) compared to other categories. Entrées had the lowest average percentage of waste (12%). Females discarded significantly more entrée, total fruit, and canned fruit than males (p = 0.05). On a scale from 1 (strongly disagree) to 5 (strongly agree), student means indicate that they feel neutral or slightly disagree that school lunches are healthful (2.6), taste good (2.5), make them full (2.4), and include enough variety (2.3).

Applications to Child Nutrition Professionals

Understanding high school students' school lunch choices and consumption patterns guide priorities for menu and policy changes and provide a baseline for comparison. Since vegetable waste was highest in this study, interventions should focus on increasing selection and consumption of vegetables among high school students. Additionally, a more accurate understanding of student attitudes toward school lunch will give school nutrition professionals a foundation from which to design more attractive, healthful meals as perceived by students. Therefore, food service professionals should involve students in the implementation of changes in the school lunch menu and a la carte options, e.g. through surveying students, establishing student advisory groups, and conducting taste tests.

Keywords: plate waste, survey, school lunch program, formative assessment, high school

INTRODUCTION

Childhood and adolescent overweight and obesity are major health concerns in the United States. Nearly a third of 2-19 year olds in the U.S. are overweight and approximately 17% are obese (Centers for Disease Control and Prevention [CDC], 2011; Ogden, Carroll, Curtin, Lamb, & Flegal, 2010). Among adolescents 12-19 years old, 18.1% are obese (Ogden et al., 2010). Overweight and obesity in children and adolescents are associated with increased risk for many chronic conditions such as metabolic syndrome, fatty liver disease, type 2 diabetes, cardiovascular disease, and joint problems (CDC, 2011; Weiss et al., 2004).

Adolescent overweight and obesity are related to adolescents' poor dietary habits (Moreno et al., 2010; Neumark-Sztainer, French, Hannan, Story, & Fulkerson, 2005). Today adolescents are consuming larger portion sizes (Moreno et al., 2010; Nielsen & Popkin, 2003), more energy dense and high fat snacks (Jahns, Siega-Riz, & Popkin, 2001; Moreno et al., 2010), and more soft drinks than in the past (Moreno et al., 2010). Thus, many are not meeting dietary recommendations (Cole & Fox, 2008; Krebs-Smith, Guenther, Subar, Kirkpatrick, & Dodd, 2010; Pearson, Atkin, Stuart, Trish, & Edwardson, 2009). Among 14-18 year old adolescents, approximately 85%, 98%, and 100% consume fewer than the recommended number of servings of fruits, vegetables, and whole grains, respectively (Krebs-Smith et al., 2010).

School lunch program practices, such as what foods are offered, how foods are presented, and student participation, can positively influence dietary behaviors in adolescents (Briefel, Wilson, & Gleason, 2009; Gordon et al., 2007; Gordon & Fox, 2007). Among high school (HS) students, fewer NSLP participants consume competitive foods (any food item that is sold in competition to the reimbursable school meal) than non-participants (Gordon et al., 2007), and NSLP participants consume significantly less energy from sugar-sweetened beverages at school than do nonparticipants (Briefel, Wilson, & Gleason, 2009; Cole & Fox, 2008). Additionally, NSLP participants are more likely to consume milk, at least one vegetable and at least one fruit per day than non-participants (Gordon et al., 2007; Briefel et al., 2009). Very few recent studies exist which specifically examine HS students perceptions of school lunch. Gordon and colleagues (2007) conducted the School Nutrition Dietary Assessment study (SNDA-III), including a survey of 2,314 total students, 358 of whom were HS students participating in the NSLP. The study aimed to provide updated information on school meal programs and student participation. One goal of the study was to determine students' perceptions and views regarding school meal programs and what factors affect satisfaction with the programs. HS students reported that their perceptions toward school lunches are only okay or they don't like them and that they only sometimes or never like the taste of the food (Gordon et al., 2007).

If students are not consuming school lunch, they may be choosing competitive foods (food made available to students outside of school meals) from a la carte sales, vending machines, school stores, snack bars, or fund raisers. In the most recent School Nutrition Dietary Assessment study (SNDA-IV), researchers found that vending machines were available in 85% of high schools. For beverage vending machines, high schools allocated more space to beverages other than 100% juice or water, and for snack machines most space was allocated to snack foods, including chips, of which the majority were not low-fat (Fox & Condon, 2012).

Multiple interventions have been successful in improving students' lunch choices, nutrition, and BMI status (French & Stables, 2003; Gortmaker et al., 1999; Lytle et al., 2006; Reynolds et al., 2000; Sharma, 2006). Because school lunch offerings and practices can impact students' dietary behavior, initiatives to directly improve the food choices students make at school need to be considered.

The purpose of this study was to respond to a community request to determine factors to improve school lunch choices and dietary behavior of high school students. This study sought to answer three research questions: 1) What types of foods are high school students discarding the most? 2) How much of these foods are they discarding? 3) What are high school students' perceptions towards school lunch?

METHODOLOGY

Study Design and Subjects

The study population consisted of HS students, grades 9-12, participating in the school lunch programs at two schools in Colorado. Plate waste data were collected in each school using digital photography. Surveys of HS lunch program participants were administered in both schools during lunch periods to gauge student perceptions and experience regarding school lunch. This study was approved by the Colorado State University Institutional Review Board and school district and included verbal assent of the students. Parents of the HS students were notified of the survey and

had the opportunity to decline their child's participation. Prior to data collection, students were notified by a school announcement that research staff from Colorado State University would be collecting plate waste data and administering surveys. Students were read an approved verbal script before data was collected for each individual.

Plate Waste

Researchers were trained in the proper setup and data collection prior to the day of data collection. Each researcher was required to participate in two 2-hour trainings addressing each component of set up, data collection, and analysis. Researchers were required to demonstrate they understood the process and could perform the process properly during pilot plate waste data collection. Researchers prepared index cards pre-labeled with school name, date, gender, grade, and lunch menu items of the day. Five samples of each item served were photographed and then weighed to determine average reference weights. Three to 10 samples are a sufficient number to determine accurate average weight (Bergman, Buergel, Englund, & Femrite, 2004; Cashman, Tripurana, Englund, & Bergman, 2010; Lazor, Chapman, & Levine, 2010; Sánchez & Contreras, 2003; Templeton, Marlette, & Panemangalore, 2005).

As students exited the lunch line, researchers selected every third student, alternating genders and lunch lines. If students agreed, their grade, gender, and food items were marked on an index card and taped to their lunch boat. (High school students do not have trays on which to carry their lunches; rather they are given approximate 7" x 4" x 2" heavy-weight paper containers, commonly known as lunch boats to hold all of their food items.) To avoid duplication, students were not allowed to participate again if they had participated in the study on a prior day.

After lunch, each assenting student's waste was individually arranged on a tray with the index card and photographed. The tripod head was fixed with the camera 26.5" above the tray at a 45° angle for maximum depth perception and consistency (Martin et al., 2007). Any remaining milk was poured into a measuring glass and recorded. Waste samples of each photographed item were collected and later weighed to confirm accuracy of visual waste estimations.

Waste Analysis and Data Entry

The same two trained researchers simultaneously reviewed the post-consumption photographs alongside the reference food photographs and determined the proportion of each food item discarded to the nearest 5% increment. Differences in observations greater than 10% for any food item were resolved by reviewing photographs of similar weighed trays alongside the reference tray photographs and student tray in question. Consensus was reached when estimates from each observer were within 5% of each other, and the average was recorded. Though the researchers reviewed the photographs simultaneously, each researcher determined percent remaining independently, and when there was a difference greater than 10%, researchers discussed further to reach consensus. If there was no remnant of a food item which was marked as taken on the index card, it was considered to have been entirely eaten and marked as zero waste.

Waste samples were weighed, and the weight of each was divided by the standard reference weight as portioned by the cafeteria staff. This determined the "true" percentage waste of the sample, which was then compared to the visually-determined percentage waste to assess accuracy and consistency of the researchers' visual estimates.

Lunch Program Experience Survey

Graduate students developed the lunch program experience survey as part of a graduate community nutrition course requirement. The original survey included a total of 26 items, including age, gender, school, grade, eight self-reported behaviors, eight attitudes and six knowledge items. Three school nutrition experts established survey content validity. Expert reviewer feedback on items from the questionnaire fell into the following categories: flow of survey questions, clarity of questions, topic relevance, and format and feasibility of analysis. All recommended revisions were incorporated into the survey.

A pilot test-retest procedure was used to confirm reliability of the validated survey questions. The pilot test subjects included high school students ranging from freshmen to seniors. To recruit respondents, two of the researchers went to a participating high school cafeteria at lunch time and

randomly and informally asked students if they would like to participate in an anonymous and voluntary survey. Thirty-five test surveys and fifteen re-test surveys were collected. Pearson's correlation, paired t-tests, and percent agreement were determined for each item. For all survey items, correlation coefficients (r) ranged from .21-1.0, p-values from the t-test ranged from .027-1.0, and percent agreement values ranged from .33-1.0. For items to be considered reliable and included in the final version of this survey, they had to have scored well ($r > .7$; $p > .05$; % agreement > 60%) on two or all of these three tests.

The post-pilot, final lunch program experience survey used in this study contained 19 items, including gender, grade, six self-reported behaviors, eight attitudes, and three knowledge items. For the final survey, principal component analyses indicated a single scale for attitude questions measuring school lunch, (Cronbach's alpha = 0.78) and a single scale for the knowledge questions (Cronbach's alpha = 0.67).

Procedure

No parents indicated their desire to opt out of having their child participate in the survey. Surveys were administered on a later date following plate waste data collection so as to reduce student burden and likely increase response rates. As students exited the lunch line, one of every two to three was selected, alternating genders and lunch lines. Because both plate waste and surveys were collected randomly and anonymously on different days, the students who participated in plate waste may or may not have been the same as those who completed a survey. Assenting students were handed a survey and pen and instructed to return the completed survey before lunch ended. One researcher entered all survey data. If an item was not answered or contained more than one response, a missing value was entered.

Statistical Analyses

Statistical procedures were completed using Statistical Package for the Social Sciences (SPSS) version 19. For plate waste, descriptive statistical methods determined estimated average percent plate waste within each food group and frequency of waste percentages within each food group. Univariate analysis of variance determined statistical significance of differences in percentage of waste between genders and grades. An independent sample *t* test was used to determine differences in percent waste between students who took a la carte items and those who did not.

For the survey, descriptive statistical methods were used to calculate means for student attitude and behavior questions. A one-way analysis of variance was used for questions with scale variables in order to determine the statistical significance of differences in responses between genders and grades. Pearson's correlation was conducted to determine if relationships existed between the dependent variable, frequency of wasting at least ¼ of total food on tray, and various independent variables regarding attitudes about school lunch. A one-way analysis of variance determined the relationship between frequency of waste and the reason for discarding food. For all data, differences were determined to be statistically significant at $p = 0.05$.

RESULTS AND DISCUSSION

Student Demographics

Plate waste data collected from 317 students, 154 (48.6%) from school A and 163 (51.4%) from school B, were approximately evenly distributed between males and females (53.3% males). This represents 56% of students who participated in school lunch at these schools. Grade distribution included 105 (33.1%) 9th graders, 129 (40.7%) 10th graders, 60 (18.9%) 11th graders, 21 (6.6%) 12th graders, and 2 (0.6%) missing values.

Surveys were collected from 127 students: 67 (52.8%) from school A and 60 (47.2%) from school B. This represented nearly one-fourth of students who participated in school lunch. Data collection was approximately evenly distributed between genders: 59 (46.5%) males, 64 (50.4%) females, with 4 (3.1%) missing gender. Grade distribution included 45 (35.4%) 9th graders, 52 (40.9%) 10th graders, 23 (18.1%) 11th graders, 6 (4.7%) 12th graders, with 1 (.8%) missing grade.

Plate Waste

School cafeteria staff provided meal service each day at both school A and school B, and items were served through a trayline. The menu for school A and B included two main entrees, which varied daily, a cold turkey or ham sandwich option, a salad option, a fresh fruit, a canned fruit, a canned vegetable, a fresh vegetable, and another item, which included one of various items such as a bread roll, pudding, or gelatin dessert. At school A the first day of data collection was a Monday, and main entrees included chicken nuggets with mashed potatoes and a sloppy joe sandwich. The second day of data collection was a Tuesday, and main entrée options included barbeque sandwich and a hamburger. The third day of data collection was a Thursday, and main entrée options were nachos with beef and cheese and lasagna. Friday was the last day of data collection at school A, and main entrée options included Asian orange chicken with brown rice and Italian cheese bread. At school B the first day of data collection was a Monday, and main entrée options included macaroni and cheese and corn dog. The second day of data collection was a Thursday, and main entrée options were chicken quesadilla and chicken sandwich. The last day of data collection at school B was a Friday, and main entrée options were beef fingers with mashed potatoes and sloppy joe sandwich.

Visual estimation of the percentage of plate waste was accurate and reliable within plus or minus 10% of weighed samples for 30 of 38 samples. Some deviation existed among the portion sizes (as portioned by lunch staff) of various items, but deviation was small enough that it likely did not affect the percentage of waste by students. Standard deviation (SD) for weights included 6.5 g for entrees, 5.1 g for canned fruits and 10 g for canned vegetables.

Average percent of students who selected each food item, average plate waste percentages for each food category and frequency of waste percentages of each food category are reported in Table 1. There were too few "other" items to be analyzed individually, as they were not consistently provided as a daily selection. Entrées had the highest selection rate, while vegetables had the lowest. Vegetables had the highest average percentage of waste among students, and entrées had the lowest. However, results indicate that the majority of students had = 10% waste in each food category.

Table 1. *School Lunch Food Categories: Selection and Plate Waste (N=317)*

Food Category	**Students Who Selected Food**		**% Plate Waste**	**% Students with ≤ 10% Waste**
	n	**%**	***M* (*SD*)**	
Entrée	316	100	12 (20)	65
Total Fruit1	275	87	26 (37)	58
Canned Fruit	167	53	27 (37)	59
Fresh Fruit	134	42	22 (37)	67
Vegetable	64	20	29 (36)	52
Other2	174	55	14 (29)	75
Milk	233	74	16 (28)	69

[1]Total fruit is not equal to canned plus fresh fruit. Some students selected both items, so when recording percent waste for total fruit, both items were combined to give one total percentage.
[2]Includes any other lunch menu items such as side grains, biscuits, pudding, and gelatin dessert.

Table 2 shows waste differences between genders, schools, and grades. Females discarded significantly more entrees, total fruit and canned fruit than males. No significant differences in plate waste were found between students who took a la carte items and those who did not.

Table 2. *Percent Average Waste within Each Food Category by Gender, School, and Grade*

	Entrée	Total Fruit	Canned Fruit	Fresh Fruit	Vegetable	Other[1]	Milk
%							
Overall *M*	12	26	27	22	29	14	16
Gender							
Male (n=168)	8*	19*	23*	13	29	8*	10
Female (n=149)	13	31	34	25	26	19	17
School							
A (n=154)	14*	30*	33	25	39*	17	16
B (n=163)	7	20	24	13	16	10	11
Grade							
9th (n=105)	12	27	30	20	20	24	11a
10th (n=129)	14	31	30	33	26	11	24[abc]
11th (n=60)	11	22	26	14	37	12	11[b]
12th (n=21)	6	21	28	10	27	6	8[c]

*Significant difference with *P*-value = .05; using Univariate Analysis of Variance
[abcd]If values in a column have the same letter superscript, then they are significantly different.
[1] Other includes any other lunch menu items such as grains, biscuits, pudding, and gelatin dessert

Lunch Program Experience Survey

Table 3 shows the mean or percent scores for behavior, attitude, and knowledge questions. Students reported eating something for lunch on most days of the week, and students most often purchased lunch from the school cafeteria as opposed to bringing a lunch. Regarding waste, students reported throwing away at least ¼ of their school lunch on average 2.1 days per week, and this was most frequently because they didn't like the taste of the food.

Most students were neutral or disagreed that school lunches are healthful, taste good, make them full, and include enough variety. When deciding what to purchase for lunch from the school cafeteria, students indicated that good taste is important, whereas, nutritional content of food was not identified as very important. Few students were knowledgeable of the school lunch fruit and grain requirements with more knowledgeable of the vegetable requirements. Few significant survey differences were seen between male and females. Females indicated that they throw away at least

¼ of their total food on average 2.5 days a week, which is more often than males, who throw away at least ¼ of their total food on average 1.6 days a week (p = 0.05). Also, males had a stronger disagreement (2.1) than females (2.7) that school lunches make them full (p = 0.05).

Table 3. *Mean or Percent Scores for High School Lunch Program Experience Survey Questions*[1]

Question and Scale	**n**	**Measure**
Frequency of Behavior Questions (1=1 day per wk to 5=5 days per wk)		***M* (*SD*)**
Eat something for lunch	127	4.5 (1.2)
Get lunch from school cafeteria	126	3.7 (1.6)
Bring lunch from home	126	0.7 (1.4)
Get lunch from somewhere other than the cafeteria or home	125	0.8 (1.3)
Throw at least ¼ of school lunch away	124	2.1 (1.2)
Attitude Questions		**%**
Reason for throwing food away is most often because… Too much food Didn't like taste of food Didn't have time to finish Other Rarely throw food away	117	 3 68 3 9 16
Attitude Questions (1=Strongly disagree to 5=Strongly agree)		***M* (*SD*)**
Prefer to leave campus for lunch	125	3.7 (1.2)
Food served in school cafeteria is healthy	126	2.6 (1.1)
Food served in school cafeteria tastes good	125	2.5 (1.0)
The food I get from the school cafeteria is enough to make me full	126	2.4 (1.3)
There is enough variety of foods in the school cafeteria	126	2.3 (1.1)
I have enough time to eat lunch when I get it from the school cafeteria	125	3.0 (1.5)

Table 3. *Mean or Percent Scores for High School Lunch Program Experience Survey Questions*[1]		
Attitude Questions (1=Not at all important to 5=Very important)		***M* (*SD*)**
When deciding what to get for lunch from the school cafeteria, the nutritional content of the food is…	126	2.8 (1.3)
When deciding what to get for lunch from school cafeteria, good taste is .	124	4.3 (1.1)
Knowledge Questions (1=Yes; 2=No; 3=I don't know)		**% Correct**
Is the school cafeteria required to provide a fresh fruit option at lunch every day? (2)	123	9
Is the school cafeteria required to provide a vegetable option at lunch every day? (1)	123	41
Is the school cafeteria required to provide a whole grain option at lunch every day? (2)	123	6

[1]Includes all schools, grades, and genders.

Students who indicated that they throw away food because they didn't like the taste were significantly (p = 0.05) more likely to throw away food more frequently (2.8 d/wk) than those who throw away food for a different reason (1.2 d/wk). Significant negative correlations were seen between frequency of throwing away and attitudes toward school lunch as healthful (r = -.215, p =.017), as tasting good (r = -.330, p=.000), and as providing enough variety (r = -.224, p=.013).

Discussion

This study provides important details about the school lunch experience, behaviors, and perceptions of HS students in two selected high schools who regularly participate in the NSLP. Waste appears low. Although average waste percentages for each food category appear higher (12-29%), averaging 19% across all food categories, the majority of students' waste was between 0-10%. Sanchez and Contreras (2003) reported slightly higher results in junior high schools (7th – 9th grades), where total percentage of plate waste was 22%. However, these percentages are lower than those seen among younger students. Marlette, Templeton, & Panemangalore (2005) found average plate waste for sixth graders among food categories to be 15-38%, averaging 26%. It appears that waste decreases with an increase in grade level, perhaps because older adolescents naturally eat more or because those who dislike school lunch and discard the most food have opted out of the program.

While vegetables had the highest waste average, perhaps even more concerning, is that students chose vegetables least often. In another study, researchers reported that vegetables were chosen second to least often by sixth graders, with fruit being chosen even less frequently (Marlette et al., 2005). In a study done among HS students, researchers reported that NSLP "promoted green foods"; (including most fruits and vegetables) were chosen about half as often as "cautioned yellow foods" (including most proteins and grains) (Snelling, Korba, & Burkey, 2007). This may not be surprising

considering that among 14-18 year old adolescents nearly 98% fall short on vegetable intake (Krebs-Smith et al., 2010).

In this study, gender differences were seen in the types and amounts of foods discarded. Waste for females was higher than for males in every food category except for vegetables, which was (non-significantly) lower. Similarly, among sixth graders, females wasted more grains, meat, milk, and mixed dishes than males (Martin et al., 2007). Females usually require fewer calories, and they tend to have a higher concern for their health and weight than males (Shannon, Story, Fulkerson, & French, 2002), which may partially explain these differences.

The survey results illuminate several student perceptions toward school lunch. As expected, because of the selection criteria, surveyed students most often purchased lunch from the school cafeteria rather than bringing their lunch from home. However, despite their participation, this study's findings suggest that students' perceptions towards school lunch are generally negative. The majority of students disagreed that school lunch tastes good, is nutritious, makes them full, and offers enough variety. On average, students reported that they discard at least ¼ of their food two days each week, most frequently because they do not like the taste of the food. Similar results were found at a national level from the School Nutrition Dietary Assessment III (Gordon et al., 2007). The majority of HS students reported that their opinions of school lunches are only okay or they don't like them and that they only sometimes or never like the taste of the food (Gordon et al., 2007).

Lastly, most students reported that they prefer to leave campus for lunch (Table 3), but most students surveyed were 9th and 10th graders, who likely do not have their drivers' license and/or a car and may not have friends who have a car, thereby limiting their lunch location options. However, based on students' negative and neutral perceptions towards school lunch, their preference to leave campus for lunch, and their growing independence and social influence, it is plausible that if the students had the option to leave campus for lunch, they would, and once they have the option, they will. Nationally, participation rates are (non-significantly) lower in schools with open campus lunch compared with those schools with closed campus (Gordon et al., 2007).

Strengths and Limitations

A major strength of this study is that it adds to the relatively limited research on school lunch program plate waste and perceptions of HS students. Additionally, the use of digital photography allowed for minimum burden on cafeteria operations and more precision with measures. This study responded to a community need and provided practical and useful information to the schools regarding students' dietary behavior and perceptions.

However, the results of this study cannot be generalized, since the sample was a convenience sample drawn from only two schools in one school district. Limited resources did not allow us to examine any differences in waste by specific offerings, only by food categories/meal components. Surveys were administered on separate days than plate waste in order to reduce the burden on students. The menu was not the same for days of survey administration and days of measuring plate waste. However, survey questions emphasized "on average" and "most often" as opposed to referring to the specific day the survey was administered. Additionally, reliability of plate waste observation was based on a consensus between observers rather than independent estimates. Also, students completing a survey at lunch in the cafeteria may have been influenced by their peers, increasing the likelihood for inaccurate or biased responses. Lastly, the survey design was not comprehensive in assessing all factors influencing adolescents' lunch program experience, such as environment.

CONCLUSIONS AND APPLICATIONS

Results of this study suggest that, in general, HS students waste little food at lunch except for vegetables. At the same time, vegetables are the least likely to be chosen. This indicates that students are unlikely to consume vegetables at school, and if they do not have access to them outside of school, they may not be consuming any at all. Students' perceptions toward school lunch

were generally negative to neutral and most students indicated that they would rather leave school for lunch than stay on campus. Additionally, taste is an important factor when deciding what to select and eat from the lunch line. The plate waste assessment and surveys were effective tools in capturing a general understanding about the foods HS students discard and their perceptions towards school lunch and can be used to design an intervention to improve school lunch choices.

Recommendations
Efforts to improve student lunch choices can be implemented via school-based interventions and might focus on increasing selection and consumption of vegetables by HS students. Providing a greater variety of vegetables is associated with higher selection and intake of vegetables among students (Adams et al., 2005; Snelling et al., 2007; Just, Lund, & Price, 2012). As indicated in this study and previous research, taste of food is most important to students when choosing what to select from the cafeteria (Shannon et al., 2002) and in determining overall satisfaction with the school food service (Meyer & Conklin, 1998), so student taste preferences for vegetables should also be examined.

Students should be involved in the implementation of changes in the school lunch menu and a la carte options, e.g. through surveying students, establishing student advisory groups, and conducting taste tests. Wojcicki & Heyman (2006) successfully implemented menu changes in a San Francisco school district after surveying students on their detailed food preferences. (Student advisory groups have also been used to create improved menus that are acceptable to students, which may reduce plate waste (Buzby & Guthrie, 2002). Once students' specific likes and dislikes are understood, changes to meal preparation and the menu can be made. These changes might include improving the flavor of vegetables with spices or herbs and/or altering the cooking method.

Furthermore, removing low-nutrient, energy dense food items from the a la carte line has been shown to increase vegetable consumption among HS students (Briefel et al., 2009). Behavioral economics strategies may also help in guiding students' lunch choices. Allowing students a choice, but making the less healthful choice less convenient, can help guide students to more often make the healthier choice when selecting a lunch item. For example, staff could place the chocolate milk behind the white milk or place the vegetables and fruit at the very front of the tray line (Just & Wansink, 2009). Additionally, providing a convenience food line that offers only healthier food options may also encourage students to select the healthier option (Hanks, et al., 2012).

If HS students are not participating in the school lunch program, they may be leaving campus for lunch and frequenting fast food restaurants or convenience stores. Unfortunately, those students who do participate in the school lunch program rarely choose vegetables, and those who do choose vegetables waste more vegetables than other foods. These findings have relevance for health professionals working with adolescents to improve school lunch choices and dietary behavior.

Digital photography offers researchers and school food service administrators a resource- and time-effective tool. Student surveys provide school food service administrators with a useful, convenient, and inexpensive way to better understand students' attitudes toward school lunch. Understanding the food choices students are currently making, what they are consuming versus discarding from school lunch, and their attitudes towards school lunch inform goals for intervention development.

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