



Identifying Associations Between Format and Placement of School Salad Bars and Fruit and Vegetable Selection

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ABSTRACT

Purpose/Objectives

Children do not consume the recommended amount of fruits and vegetables (FV). Salad bars in schools increase FV consumption in children, but their effect may be strengthened by modifying their placement and reinforcing their impact by using appropriate health promoting practices. The objective of the study was to determine associations between format and placement of salad bars and the amount of FV selected from salad bars.

Methods

The study was descriptive with a cross-sectional design. Eligible schools were 1,953 public elementary schools (K-6 grades) that contracted with a national vendor from 34 states in all regions (West, Midwest, South, and Northeast) of the United States including both urban and rural areas. Elementary school nutrition staff completed a survey on salad bar format and placement, and reported type and amount of FV selected from salad bars for one week based on school food service records. Data collection occurred during Spring 2012.

Results

The final usable sample was 606 elementary schools representing 137 school districts in 26 states. The mean FV selected from salad bars per school lunch was 0.70 cup ($SD = 0.30$). The amount of FV selected from salad bars per school lunch differed significantly by salad bar format [$t(604) = -3.610, p < 0.001$], visibility of salad bars [$F(2, 378) = 6.89, p = 0.001$], and the number of salad bar items offered at least once during the week [$F(3, 601) = 5.54, p = 0.001$].

Application to Child Nutrition Professionals

The study demonstrates salad bars may be a way to encourage students to select the required 0.50 cup of FV as required by the Healthy, Hunger-Free Kids Act of 2010. In addition, stand-alone salad bars may be more visible and serve as a cue or trigger to choose salads as compared to salad bars incorporated into the lunch line. Schools could take steps to increase the visibility of salad bars as children enter the cafeteria and consider offering approximately 12-14 different salad bar items during the week.

Keywords: salad bar, behavioral economics, school nutrition, fruits and vegetables

INTRODUCTION

Approximately 34.7% of all 6 to 19 year old school aged children in the United States are overweight or obese by conventional standards (Ogden, Carroll, Curtin, Lamb, & Flegal, 2010),

and most children do not consume the recommended amount of fruits and vegetables (FV) (Kim et al., 2014). Physical health problems observed primarily in adults are now being seen in children (Daniels, 2006), including cardiovascular, metabolic, pulmonary, skeletal, other disorders, and complications. Additionally, poor diet and lack of physical activity contribute to poor health outcomes including cardiovascular disease, cancer, and diabetes (Centers for Disease Control and Prevention, 2011).

Children spend approximately six hours per day in school (National Center for Education Statistics, 2012) and usually consume one or more meals on-site during the school day (Story, Kaphingst, & French, 2006). One way to improve nutrition is to increase the dietary intake of FV, and school environments provide an opportunity for students to access FV which could encourage student consumption. FV provide important nutrients, reduce risks of chronic diseases, and are low in calories (U.S. Department of Agriculture [USDA] & U.S. Department of Health and Human Services, 2010). Salad bars have been shown to increase the availability and accessibility of FV among students during school lunches (Slusser, Cumberland, Browdy, Lange, & Neumann, 2007). A salad bar evaluation study from Los Angeles demonstrated an increase in FV frequency (consuming FV or 100% FV juice at any meal or snack) from 2.97 to 4.09 frequency from pre- to post- salad bar intervention (Slusser et al., 2007). Simply offering FV through salad bars with minimal promotion led to increased consumption of FV (Slusser et al., 2007). However, Adams, Pelletier, Zive, and Sallis (2005) examined students' FV consumption in two schools with salad bars and two schools using preportioned servings and did not find significant differences between the two groups. Limitations were that a small number of schools were sampled, and the data collection period occurred for only one day. Furthermore, the authors cited factors not measured in the study which could explain the insignificant findings such as location of the salad bar, signage, popularity of items, and social norms (Adams et al., 2005). Another study examined four schools with salad bars and two schools without salad bars and found no significant differences in FV intake (University of North Carolina Center for Health Promotion and Disease Prevention, 2010). However, in the same study, students who chose the salad bar consumed half a serving more of FV than students who chose the hot lunch line. There have been inconsistent findings for the effectiveness of salad bars; however, factors such as the format and placement of salad bars may influence FV selection.

Behavioral economics principles can be used to encourage health promoting behaviors and focus on how cognitive processes such as perceptions, memory, and processing influence purchasing behavior (Just & Wansink, 2009). Behavioral economics combines the fields of psychology and economics to understand behaviors (Thorgeirsson & Kawachi, 2013). Applied to eating behaviors, the underlying theme is that healthy foods should be available and accessible, and unhealthy foods should be hidden from view or made more difficult to obtain (Thaler & Sunstein, 2008). A concept in behavioral economics is 'subtle nudges' which are cues that make it easier for people to select the desired choice (Thaler & Sunstein, 2008). For instance, placing FV in a visible and prominent location will make them more likely to be selected than if they were placed in a non-prominent location. In the context of salad bars, choice architects are individuals who have the ability to manipulate the environment and offer choices that are convenient and accessible; thereby, more likely to be selected (Thaler, Sunstein, & Balz, 2010). Choice architects manipulate the food environment to enhance healthy eating by choosing the format of the salad bar (e.g., offering the salad bar as a stand-alone unit or incorporating the salad bar into the hot lunch line), deciding the location of the salad bar (e.g., in relation to point

of sale/register, within the lunch line, in relation to the walls), or establishing the number of items to be offered.

In cafeterias, placing food items in a visible or central location, making them easily accessible and convenient to obtain, increased sales and consumption (Just, Mancino, & Wansink, 2007; Just & Wansink, 2009; Just, Wansink, Mancino, & Guthrie, 2008). Specific ways foods were made readily accessible were by moving salad bars away from walls and placing them in the middle of the lunch room (Just & Wansink, 2009); replacing snacks with fruits next to the register (Just & Wansink, 2009); and placing FV at the beginning of the cafeteria lines (Just et al., 2007). More FV may be selected when salad bars are placed away from the walls or placed at the beginning or end of the lunch line.

More food choices offering variety may encourage consumption. Adams et al. (2005) demonstrated students' FV intake was positively associated with the number of FV items offered on a salad bar. Specifically, schools offering four to seven items on the salad bar had the highest consumption, and schools that offered the fewest items had the lowest mean consumption (Adams et al., 2005). Similarly, increasing fruit choices from three to six, though not part of a salad bar, significantly increased fruit sales by approximately 300% (Jeffery, French, Raether, & Baxter, 1994). More FV may be selected when more items are offered on salad bars.

This paper presents findings from a study that explored relationships between health promoting salad bar characteristics (i.e., format and placement) and the amount of FV selected from a sample of salad bars in elementary school cafeterias.

METHODOLOGY

The study was descriptive with a cross-sectional design to examine associations between format and placement of salad bars and the amount of FV selected in cups per school lunch. School lunches adhere to federal requirements for meal patterns or nutrition standards and include full-price, subsidized reduced-price, and subsidized free-price reimbursable meals (Richard B. Russell National School Lunch Act, 2009).

Sample

Eligible schools were 1,953 public elementary schools (K-6 grades) that contracted with a national vendor. Schools were dispersed across 34 states in all four regions (West, Midwest, South, and Northeast) of the United States in both urban and rural locations.

Instruments

The Salad Bar Survey, developed based on a paper by Just and Wansink (2009), asked school nutrition personnel about format (incorporated into the lunch line or stand-alone bar that is separate from the lunch line), location (before or after the point of sale/register; at the beginning, middle, or end of lunch line; flush/near the walls of the dining area and not centrally located or away from the walls and centrally located), and visibility (salad bar is first visible, hot lunch is first visible, or both are visible at the same time as you enter the cafeteria). School and respondent information included school name, school district name, participant's name, and his or her role.

Food service records were data on salad bar items and quantity selected for each day. FV selected was obtained by calculating the amount of produce offered at the start of the lunch period and subtracting this amount from the amount left over at the end of the lunch period. The resulting quantity was divided by the number of school lunches sold, to yield mean FV in cups selected per school lunch.

Procedures

Since no prior information was available to indicate which elementary schools had salad bars, all ($n = 1,953$) elementary schools were asked to complete the Salad Bar Survey. General managers who oversee a number of schools received an email indicating the nature of the study, an attachment with the food service record form, and an embedded survey link. General managers were instructed to forward the email to the appropriate elementary school personnel responsible for nutrition services and food service record tracking (i.e., chefs, nutrition directors, or front-line staff cafeteria managers). One designated person completed the survey for each school through SurveyGizmo, an online survey program. Respondents who indicated their school had a salad bar were asked to complete a food service record form for a five day lunch period. A reminder email was sent three weeks after initiation of the survey. Nutrition staff had the option of completing the Salad Bar Survey and food service record form online or through paper and pencil, which could be either scanned, emailed, or mailed to the researchers. The survey was implemented from April to June 2012.

Schools were further categorized into four regions (West, Midwest, South, and Northeast) based on the United States Census Bureau (1994) designations and into urban-centricity (urban/rural) based on the National Center for Education Statistics (2006) urban-centric locale categories. City, suburbs, and town locales were combined into the urban category. The study was submitted to IRB for review. However, the research study was deemed as not meeting the federal definitions for research involving human subjects and therefore did not require further review.

Data Analysis

Every item offered was converted from the reported value (e.g., items, cans, bags) from food service records into pounds and then into cups using standardized values from the USDA (2008) *Food Buying Guide for Child Nutrition Program* standards. Food as purchased (AP) in pounds was converted into edible portions (EP) in pounds. Edible portions were remaining parts of produce when items were cored, peeled, ready-to-cook or raw. Next, the EP pounds were converted into cups. This conversion process was conducted for 93 items reported within the five day study period. The resulting number was divided by the number of school lunches sold for a mean FV in cups selected per school lunch. In addition, the number of salad bar items offered was divided into quartiles.

To account for the potential degree of commonality or relatedness among schools within school districts or among school districts within states, intra-class correlation coefficients (ICC) were calculated for both school districts and states. The intra-class correlation coefficient for FV per school lunch for school districts was $ICC < 0.001$ and for states was also $ICC < 0.001$. Because these intra-class correlations coefficients were small (< 0.05) (Hox, 2002), the clustering variables were ignored and not entered into further statistical procedures. Data were entered into and analyzed by using the statistical software, SPSS version 20. T-tests and one-way analysis of variance tests were performed at an alpha level of 0.05.

RESULTS AND DISCUSSION

The sampling frame was 1,953 elementary schools, and 852 schools responded (43.63%) to the Salad Bar Survey. Of the 852 schools that responded, 670 schools had salad bars and 182 schools did not have salad bars. Of the 670 schools that had salad bars, 14 were ineligible because they were middle, high, or private schools. Finally, 50 schools had missing data, errors, or were outliers. The final usable sample size was 606 schools, representing 31.03% of the total sample. Tests were not conducted to compare regional or other differences between respondents and non-respondents.

The 606 schools were from 137 school districts across 26 states as shown in Table 1. Over half of elementary schools (62.6%) and school districts (59.9%) were from the Western region; the Northeastern region had the fewest elementary schools (3.8%) and school districts (3.6%). The majority (83.3%) of schools with salad bars were from urban locations.

Table 1. Regional Location of School Districts and Elementary Schools with Salad Bars

Regions	School Districts	Elementary Schools
	n (%)	n (%)
West	82 (59.9)	379 (62.6)
Midwest	26 (19.0)	119 (19.6)
South	24 (17.5)	85 (14.0)
Northeast	5 (3.6)	23 (3.8)
Total (26 states)	137 (100.0)	606 (100.0)

Across all schools, there were 66 items offered at least once during the week of data collection (28 fruits, 27 vegetables, and 11 beans and legumes). Taking into consideration the different forms of each item (fresh, frozen, canned, dried, and juice), there were 93 total items offered across all schools. The mean FV selected from salad bars per school lunch across 606 elementary schools was 0.70 cup ($SD = 0.30$).

This study examined the associations between format, placement, and the number of items offered and the amount of FV selected. As shown in Table 2, there was a significant difference between salad bar format [$t(604) = -3.610, p < 0.001$]. The mean cup of FV selected from the stand-alone salad bars was 0.73 cup ($SD = 0.32$) compared with 0.64 cup ($SD = 0.24$) for salad bars which were incorporated into the lunch line. There was also a significant difference among set-ups affecting visibility of salad bars [$F(2, 378) = 6.89, p = 0.001$]. Using a Bonferoni post-hoc comparison and correction and the adjusted alpha levels of 0.017 per test (0.05/3), there was a significant difference between set-ups where the salad bar was first visible, as compared to set-ups in which the hot lunch line was first visible. The mean cup of FV selected per school lunch when the salad bar was first visible was 0.79 cup ($SD = 0.33$) compared to 0.66 cup ($SD = 0.31$) when the hot lunch line was first visible ($p = 0.001$). In addition, there was a significant difference in the amount of FV selected when the hot lunch line was first visible (0.66 cup, $SD = 0.31$) as compared to situations where both were visible at the same time (0.77 cup, $SD = 0.30; p = 0.003$). There was no significant difference between situations where the salad bar was first visible and both were visible at the same time ($p = 0.639$).

Table 2. Associations Between Format and Placement of Salad Bars and Amount of Fruits and Vegetables Selected from Salad Bars per School Lunch

Salad Bar Characteristic	Number of Schools	Cups of FV Selected per School Lunch		
	n (%)	<i>M</i>	<i>SD</i>	<i>p</i>
Format	606			< 0.001
Incorporated into the lunch line	223 (36.8)	0.64	0.24	
Stand-alone	383 (63.2)	0.73	0.32	
Incorporated into the lunch line				
<i>Location in the lunch line</i>	222*			0.464
Beginning of the lunch line	34 (15.2)	0.63	0.21	
Middle of the lunch line	21 (9.4)	0.58	0.23	
End of the lunch line	167 (74.9)	0.65	0.25	
Stand-alone				
<i>Location in relation to point of sale (register)</i>	377*			0.746
Before the point of sale	91 (23.8)	0.74	0.31	
After the point of sale	286 (74.7)	0.73	0.32	
<i>Visibility</i>	381*			0.001
Salad bar is first visible	105 (27.4)	0.79	0.33	
Hot lunch is first visible	154 (40.2)	0.66	0.31	
Both are viewed at the same time	122 (31.9)	0.77	0.30	
<i>Location in relation to the walls</i>	382*			0.088
Away from walls and centrally located	329 (85.9)	0.74	0.32	
Near or flush with the walls	53 (13.8)	0.66	0.29	
Number of items offered by quartiles				
	606			0.001
First (1-11 items)	101 (16.7)	0.59	0.25	
Second (12-14 items)	201 (33.1)	0.71	0.29	
Third (15-16 items)	129 (21.3)	0.73	0.32	
Fourth (17-31 items)	175 (28.9)	0.71	0.29	

*Percentages do not add to 100 because of missing data

Furthermore, there was a significant difference in the amount of FV selected from salad bars per school lunch according to the number of items offered at least once during the week [$F(3, 601) = 5.54, p = 0.001$]. Using a Bonferoni post-hoc comparison and correction, the adjusted alpha levels of 0.008 per test (0.05/6), there were significant differences in FV selected from salad bars per school lunch for the first quartile (1-11 items) and all other quartiles [second (12-14 items), third (15-16 items), and fourth (17-31 items)], ($p = 0.004, p = 0.001, \text{ and } p = 0.007$, respectively) indicating a greater amount of FV was selected when there were more types of items available. The mean cup of FV per school lunch selected for the first quartile was 0.59 cup ($SD = 0.25$) compared to the second [0.71 cup ($SD = 0.29$)], third [0.73 cup ($SD = 0.32$)], and fourth [0.71 cup ($SD = 0.29$)].

This study demonstrates that in the schools studied, on average, students willingly selected 0.70 cup of FV even when there were no requirements to take FV. The regulations in effect at the time of the study (Richard B. Russell National School Lunch Act, 2009) required schools to offer 0.75 cup of FV, but students could still refuse to take the FV. Participating schools were compliant with the current regulations in effect during the time of the study. Under the current regulations (Healthy, Hunger-Free Kids Act of 2010), students are required to select at least 0.50 cup of FV. Health promoting salad bars could be an avenue for students to select the required amount of FV under these current regulations.

This is the first known study examining associations between salad bar format and placement and FV selected from salad bars per school lunch. The main significant finding is that more FV were selected when the salad bar was in a separate stand-alone salad bar format than when it was incorporated into the lunch line. Study results were consistent with principles of behavioral economics, which emphasize the impact of environmental cues and triggers on behaviors (Just & Wansink, 2009).

A secondary finding was that there were more FV selected from salad bars for set-ups where the stand-alone salad bar was first visible when entering the lunch area, as compared to set-ups in which the hot lunch line was first visible. There were more FV selected when both the hot lunch line and stand-alone salad bars were visible at the same time as compared to situations where the hot lunch line was first visible. These findings again were congruent with behavioral economics principles; healthy foods like FV from salad bars should be positioned to be easily viewed and readily accessible, while unhealthy foods should be hidden from view (Thaler & Sunstein, 2008). Researchers have encouraged people to select foods by placing products at eye level and/or prominently displaying them (Just et al., 2007).

The variety of items offered on salad bars was positively associated with the amount of FV selected per school lunch and is congruent with previous studies. For the present study, the first quartile (1-11 items offered), which had the least variety, was associated with having the least selection as compared to all other quartiles (up to 31 items offered). In addition, there appears to be limited impact on FV selected after the second quartile (i.e., 15-31 items); therefore, the second quartile (12-14 items offered) is the ideal number of items to maximize FV selection. The present finding on the association between variety and selection is similar to Adams et al. (2005) and Jeffery et al. (1994) findings who demonstrated FV intake was positively associated with the number of FV items offered.

There were several non-significant findings worth noting. For salad bars which were incorporated into the lunch line, there were no significant differences among the three locations (beginning, middle, or end) in the lunch line. In a previous study, researchers found increased selection when placing FV at the beginning of the cafeteria lines or replacing snacks with fruits at the register which is at the end of the lunch line (Just & Wansink, 2009).

For stand-alone salad bars, there was no significant difference between location in relation to the point of sale (before versus after the point of sale). There were no known previous studies examining the location of stand-alone salad bars in relation to the point of sale. However, based on behavioral economic principles, stand-alone salad bars located before the point of sale would have greater FV selection than those located after the point of sale. Salad bars offered before the

point of sale provide more opportunities to select FV rather than after the point of sale when students have already made their food selection and have limited room on their trays. The finding of salad bar location in relation to the point of sale did not support the predictions from behavioral economic principles. The location of the stand-alone salad bars (in the middle of the room versus near the walls) in the cafeteria did not reach statistical significance. In previous research, increased sales and consumption were demonstrated by moving salad bars away from walls and placing them in the middle of the lunch room (Just & Wansick, 2009).

CONCLUSIONS AND APPLICATION

The current study demonstrates students select more FV when salad bars are set up in health promoting formats, are placed in visible locations, and offer a variety of items. Given the regulations in effect today (Healthy, Hunger-Free Kids Act of 2010, 2010) which require students to select 0.50 cup of FV, salad bars could be an approach to encourage students to willingly select the required amount. Stand-alone salad bars may be more visible and are a stronger cue or trigger for students to choose salads than when they are incorporated into the lunch line. In addition, stand-alone salad bars allow students to access both sides, incentivizing students who may be short on time. Cafeterias that displayed the stand-alone salad bar first or equally with the hot lunch line resulted in the selection of more FV. If schools change the location of stand-alone salad bars to make them more prominent or assure that the stand-alone salad bar is more visible than the hot lunch line, higher FV selection may occur. This study suggests that schools should consider offering approximately 12-14 different items during the week to maximize the benefits of FV selected from salad bars.

The current study had several limitations. The generalizability of this study was limited to elementary schools contracting with food service management companies for their nutrition services. These schools may have more FV offerings due to the enhanced logistics, procedures, and transportation for procuring FV which may be difficult to replicate in other non-food service contracted school settings. Thus, schools in this study may not have been representative of other schools in the United States. In addition, the analysis was conducted on a convenience sample which could have contributed to selection bias. Schools which were amenable to participating, may have been more health promoting (e.g., offer more FV), and may have responded to the study more readily than schools which were less health promoting.

Another limitation was that data were collected from food service records which were not originally intended for research and thus were not collected by trained data collectors. When errors in food service records were found, estimates were calculated using standardized measures using the smallest or typical weight of the fruit or vegetable (USDA, 2009). Future research should use trained data collectors to weigh FV selected from salad bars for more precise estimates of FV offered and selected by students.

In addition, this study did not examine intake or consumption of FV. Students could have selected FV from salad bars, but may not have consumed the produce. Future studies should use plate waste or recall methods to determine not only FV selected, but also consumption and waste. A final limitation is that the present study used the number of school lunches sold as a denominator for the FV metric. There may be some instances where students or staff could have bought a la carte salad bar entrees and the amount of FV may not have been accounted for by the number of school lunches sold.

Future research should examine further the effectiveness of salad bar format and placement as compared to the hot lunch line. Additional studies should examine if findings of this study are similar for middle and high school students and if selection of less popular items can be encouraged. In summary, children do not consume the recommended amount of FV. Schools offering salad bars when properly formatted and positioned with a variety of FV allow students to willingly select FV which is essential for life-long healthy eating behaviors.

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