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The impact of worksite supports for healthy eating on dietary behaviors

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Abstract

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Objective—The purpose of this study was to assess the availability of worksite supports (WSS) for healthy eating and examine associations between existing supports and dietary behaviors.

Methods—A cross-sectional, telephone-based study was conducted with 2013 participants in four metropolitan areas in 2012. Logistic regression was used to examine associations between dietary behaviors and the availability or use of WSS.

Results—Those reporting the availability of a cafeteria/snack bar/food services at the worksite were more likely to consume fruits and vegetables more than twice/day, and less likely to consume fast food more than twice/week.

Conclusions—Study results highlight the utility of specific WSS to improve employee dietary behaviors while raising questions about why the presence of healthy foods at the worksite may not translate into employee consumption of such foods.

Keywords

Healthy eating; health promotion; nutrition; worksite wellness

INTRODUCTION

Chronic diseases account for seven of the top ten leading causes of death in the U.S. and cost billions of dollars annually in healthcare, lost productivity, and premature death.¹ Poor diet is recognized as a crucial, modifiable behavior that increases the risk of chronic diseases, such as obesity, diabetes, cardiovascular disease, and cancer.²⁻⁴ Those with an unhealthful diet typically overconsume unhealthy foods, such as saturated and trans fats, sodium, and excess sugars, and under consume fruits and vegetables.⁵ In 2013, 39% of U.S. adults reported consuming fruit less than one time per day, and 23% reported consuming vegetables less than one time per day.⁶

Strategies to improve dietary behaviors leading to chronic diseases may be more effective when implemented at multiple levels of a socio-ecological framework. Story and colleagues propose such a framework, which illustrates the multiple influences on foods people consume and highlights the complex web of factors complicating decisions about which foods people may choose.³ Given this complexity, as well as mounting evidence, experts suggest the power and potential of environmental and policy interventions to increase healthy eating.^{3,7} People are unable to select healthy foods if such foods are unavailable or unaffordable; thus, creating access to affordable, healthy foods is a crucial step in interventions designed to improve dietary behaviors.⁸ Environmental and policy interventions may be particularly suited to aid this process.

Multiple sectors exist in which to implement environmental and policy interventions to increase access to affordable, healthy foods, in particular, schools, worksites, and places where people spend long periods of time.⁹ Because employed adults, which includes about 63% of the U.S. population,¹⁰ may spend half of waking hours at work, worksites are natural places to assist employees in choosing healthy foods.^{11,12} Research on dietary supports for healthy eating at the worksite highlights the promise of these strategies to improve dietary behavior. Specifically, studies show that nutrition behaviors can be impacted through

worksite interventions that include environmental modifications.¹³⁻¹⁵ According to a recent systematic review, healthy food procurement policies, which ensure that food purchased or provided (e.g., for those in worksites or schools) is healthy, can effectively increase the availability and purchase of healthy foods.² Other studies have shown that reducing prices of low-fat snacks in vending machines increases sales without impacting profits.¹⁶ Increasing selection of fruits, vegetables, and salad, and reducing prices for these items also increases purchases.^{17,18}

Specific recommended strategies for creating a healthy worksite food environment include: providing healthy food in cafeterias and vending machines, ensuring access to clean water, and reducing the prices of fruits and vegetables.¹⁹ Many of these recommendations were generated by government agencies, expert panels, and professional societies (e.g., The National Academy of Medicine, Centers for Disease Control and Prevention, Obesity Society) based on emerging empirical evidence. However, questions remain about whether worksites are implementing these strategies, and if so, whether employees are utilizing them.

The purpose of this study was to assess the availability of worksite supports for healthy eating and examine associations between existing supports and eating behaviors. Specific research questions included: (1) Are recommended environmental and policy supports for healthy eating available at worksites? and (2) Does the presence of worksite supports for healthy eating affect dietary behaviors, such as fruit, vegetable, sugar, and fast food consumption?

METHODS

Design

A cross-sectional, telephone-based survey was conducted as part of The Supports at Home and Work for Maintaining Energy Balance (SHOW-ME) study.²⁰ The SHOW-ME study was designed to examine the associations among residential and worksite environmental and policy influences and energy balance behaviors and outcomes. The full design and methods of the SHOW-ME study are described in detail elsewhere.²¹

Sample

In an effort to have representation in racial minority and income status, as well as variation in built environment, the study team recruited adult participants from four metropolitan areas in Missouri (St. Louis, Kansas City, Columbia, and Springfield). Home census tracts were selected after meeting the following criteria: population density greater than the 10th percentile of the population density of study areas and less than 50% of population inhabitants 15-24 years old. The final sample was derived through a multistage, stratified sampling method that sampled participants within seven strata: metro size (large, small) and within large metro areas, walkability (low, moderate, high) and racial/ethnic minority (low, high).²²

Participants were selected through random-digit-dialing and completed the survey between April 2012 and April 2013. The first eligible adult per household was selected to participate. Inclusion criteria were: age of 21-65 years, employment of at least 20 hours per week

outside the home, work conducted at one primary location comprised of five or more employees, not pregnant, no physical limitations preventing walking or bicycling in the past week, and having a household telephone land-line. Verbal informed consent was received from all participants. The Institutional Review Board of Washington University in St. Louis approved the study.

Measures

The survey instrument drew on existing self-reported measures and environmental assessments and was informed by the experience of the research team and a Questionnaire Advisory Panel, which included experts in the fields of diet and worksite wellness. The survey underwent significant cognitive response testing via telephone interview with 12 participants and two trained research personnel. Interview findings were used to revise the survey to improve clarity. Further, test-retest reliability was assessed via a random-digit-dial telephone survey. Test-retest coefficients ranged from 0.41 to 0.97; 80% of items had reliability coefficients >0.6 . Survey development, testing procedures, telephone interview protocols, and reliability assessments are described in detail elsewhere.²⁰

Main outcome variables involved dietary intake, and questions came from established and tested survey tools. Measurement of fruit and vegetable consumption came from the 2011 Behavioral Risk Factor Surveillance Survey.²³ Sugar consumption was measured with items from the California Health Interview Survey and was estimated through questions about consumption of cookies/cakes/pies/brownies, and ice cream/frozen desserts.²⁴ Data were also collected on the consumption of sugar-sweetened beverages; associations between their consumption and key dietary behaviors are explored in a separate paper. Participants were asked these questions regarding consumption in the past month, and response options were open-ended, encouraging participants to report the number of times each food had been consumed per day, week, or month, resulting in continuous variables. One question about fast food was posed to participants as follows, "In the past 7 days, how many times did you eat fast food? Include fast food meals eaten at work, at home, or at fast-food restaurants, carry out or drive through."

Worksite supports for healthy eating were independent variables, and included 19 items, which were new or adapted from three existing instruments: California Check for Health²⁵, the Community Healthy Living Index^{26,27}, and the Environmental Assessment Tool.²⁸ Participants were asked about the availability of each support individually. For two items (availability of cafeteria/snack bar/food services and availability of vending machines) participants indicating these items were available were then asked whether they had ever used the cafeteria/snack bar/food service, and if they used the vending machines at least once per week. Table 1 contains a full list of worksite supports. Response options included yes, no, and don't know. Participants indicating that they did not know if their workplace had a particular WSS were considered not to have it.

Participants reported data on personal characteristics, including gender, age, race/ethnicity, annual household income (dichotomized as high or low = $< \$30,000$), full or part time work status (full time = 40 hours/week) and worksite size (<50 , 50-199, 200-499, >500 employees). Self-reported height and weight were used to determine obesity status. Obesity

status was dichotomized as not obese: under/normal/overweight (body mass index <30 kg/m²) or obese (body mass index ≥ 30 kg/m²).

Analysis

Outcome variables were dichotomized as follows: eating fruits more than two times per day, eating vegetables more than two times per day, consuming fast food more than two times per week, and having cookies/cakes/pies/brownies and ice cream/frozen desserts more than two times per week. Dichotomization was based on low fruit/vegetable consumption in the US,²⁹ the prevalence of fast food consumption in US diets,³⁰ and the distribution of the data.

Descriptive statistics were run to determine the number and percent of participants reporting the availability and use of worksite healthy eating supports. Bivariate analyses were run using Chi-square statistics to explore associations between main dietary outcome variables, obesity, and demographic variables, using a statistical significance cutoff value of $p = 0.05$. Logistic regression models were used to examine associations between dietary behaviors and the availability or use of each worksite support for healthy eating.

Odds ratios and 95 percent confidence intervals were calculated. Potential control variables were selected from demographic and obesity variables and were included in analyses based on their statistical significance in each regression model. All analyses were conducted in IBM SPSS Statistics version 23.³¹

RESULTS

Overall, 2,013 people completed the survey (46% response rate). Table 1 shows the numbers and percentages of participants reporting use of worksite supports for healthy eating. Most participants (86.3%) reported that a clean water fountain was available at the worksite, and almost half noted the presence of free cooler or bottled water. Nearly half of participants (49.2%) reported the availability of a cafeteria, snack bar, or other food services at the worksite. Of those, 86.4% reported using them. Notably, a majority of participants reported that the cafeteria, snack bar, or food services at their worksites sell fresh fruits and vegetables on a daily basis (85.2%), non-fried meat entrees (78.9%), low fat snack items (80.3%), low fat dairy products (84.7%), and other healthy choices (Table 1). Those indicating that the fresh produce was affordable, however, were fewer (66.1%). The lowest percentage of participants indicating the presence of supports for healthy eating was related to food labeling, with calorie labeling in cafeterias, snack bars, or food services available to only 44.8% of participants. Almost three-fourths of participants indicated that vending machines were available at the worksite, but of those, only 30.6% reported using them and only 26.9% noted that the vending machines provided food labeling, through symbols to identify healthy food alternatives (Table 1).

Table 2 shows participant demographics and bivariate associations between demographic variables and main dietary outcome variables. Overall, 67.5% of participants were female, 62% were white, 31.9% were obese, and almost 20% reported low annual household income. Sixty percent of participants reported working at sites with fewer than 200 employees, and 71.5% worked full time outside the home (Table 2).

Those more likely to consume fruits more than two times per day were more likely to be white, 55 years old or older, not obese, and to have a high annual household income. Those consuming vegetables more than two times per day were more likely to be white, female, 55 years old or older, not obese, and to have a low annual household income (Table 2). By comparison, participants reporting consumption of fast food more than two times per week were more likely to be Black, less than 45 years old, obese, and to have low income. The only statistically significant difference seen in weekly consumption of desserts was among those working part time, who were more likely to consume such foods more than two times per week (Table 2).

Logistic regression results (Table 3) show unadjusted and adjusted associations between diet behaviors and worksite supports for healthy eating. Those reporting the availability of a cafeteria, snack bar, or food services at the worksite were more likely to consume fruits and vegetables more than two times per day, and less likely to consume fast food more than two times per week. Participants reporting that their cafeteria, snack bar, or food services offered daily fresh fruits and vegetables were also less likely to consume fast food more than two times per week.

In the unadjusted model, those whose cafeteria, snack bar, or food services offered non-fried meat options were more likely to consume vegetables more than two times per day; however, this association was not statistically significant after adjustment. Those reporting the availability of food sold in smaller or half-sized portions were also more likely to consume vegetables more than two times per day (Table 3).

Table 3 also shows that participants reporting that their cafeteria, snack bar, or food services used signs or posters to encourage healthy eating were more likely to consume ice cream or frozen desserts more than twice per week, while those with access to affordable prices for fresh fruits and vegetable were less likely to consume fast food more than twice per week (Table 3).

Those reporting the availability of vending machines were more likely to consume fruit more than two times per day, and less likely to consume ice cream and frozen desserts. Participants who indicated that they use the vending machines were less likely to consume fruits twice per day and more likely to consume fast foods more than twice per week. Finally, participants reporting the availability of low-fat snacks or healthy food alternatives in their vending machines were less likely to consume fast food more than twice a week and more likely to consume cookies, cakes, pies, and brownies more than twice a week (Table 3).

DISCUSSION

This study reveals some interesting and vexing findings about employees' dietary behaviors in relation to the worksite supports for healthy eating available to them. Positively, those reporting access to a cafeteria, snack bar, or food services offering fresh fruits and vegetables and those who found these items to be affordable were less likely to consume fast food more than twice a week. Further, the presence of a cafeteria, snack bar, or food services

increased the likelihood of daily fruit and vegetable consumption, and decreased the likelihood of weekly fast food consumption. These results suggest that access to food at work may have a positive effect on employees' dietary behaviors. Moreover, access to healthy and affordable foods at work may improve employee food choices.

Traditionally, public health efforts have focused on educating individuals about the importance of making healthy choices without ensuring that they had the ability to make those choices. For example encouraging people to participate in regular physical activity when they may not have access to safe places to be physically active makes behavior change difficult or impossible.⁸ Similarly, if healthy food is not available, it cannot be selected; if it is available but not affordable, it often will not be selected. In this sample, between 58-85% of participants indicated that healthy foods were available in the worksite cafeteria, snack bar, or through food services; 66% indicated that fruits and vegetables were affordable. However, almost three-fourths of the sample had high annual household income. For maximum benefit, healthy food should be available and affordable to all employees, regardless of income. Further, healthy foods available at the worksite should be labeled or identified in ways that help employees distinguish them. In this study, calorie labeling in cafeterias, snack bars, and food services and healthy food identification in vending machines were the least prevalent supports for healthy eating. As efforts to provide calorie labeling become more pronounced across the country, worksites should join other food providers by making this information available to employees.

Research indicates that improving selection of healthy foods and reducing prices for such foods can increase healthy food purchasing at the worksite.¹⁶⁻¹⁸ For example, Kottke and colleagues discovered that reducing salad bar prices in a worksite cafeteria by 50% resulted in three times more salad bar sales during the intervention period, with sales returning to normal after the intervention. Further, participants from this study indicated that the high price of salad is a barrier to selection.¹⁸ Other studies suggest that price reduction of healthy foods does not negatively impact profits.¹⁶

Given potential benefits, it is important to consider why more worksites do not offer such healthy food supports. Recent research indicates that employers value employee health and are interested in options to improve it at the worksite; however, many do not believe they have the financial or human resources to implement suggested interventions.³² Other employers, especially small- and medium-sized business owners, cite the lack of tools and guides to aid with worksite intervention implementation as a barrier to such program uptake.³³ The burden to disseminate findings from these studies lies with researchers and public health professionals. If increasing access to affordable, healthy foods at the worksite can improve employee health without reducing profits, concerted efforts should be made to ensure employers know this and have the tools necessary to implement these changes. Beyond scientific articles, targeted issue briefs and presentations to employee wellness program decision-makers should be considered, as well as efforts to inform employees, who may have opportunities to present such information to appropriate staff in their workplaces.

It is interesting to note that a majority of employees indicated that healthy food options were available at the worksite (Table 1); however, logistic models do not indicate that employees

are taking full advantage of these options (Table 3). If employees have access to healthy, affordable foods at the worksite but are not selecting them, attention should be paid to understanding why and aiming to encourage the utilization of these supports for healthy eating. Also notable are current study findings related to the presence and use of vending machines at the worksite. Curiously, those who reported using vending machines were less likely to consume daily fruits and vegetables and more likely to consume fast food. Further, those reporting vending with low-fat or healthy alternatives were more likely to consume cookies/cakes/pie/brownies more than twice a week. In a similar study, those reporting use of vending machines at the worksite were more likely to consume sugar-sweetened beverages compared to those who did not use vending.³⁴ In this case, it appears that having healthy foods available in vending machines does not necessarily mean that employees will choose them. This may underscore the importance of efforts to encourage employee selection of *healthy* foods available at the worksite, not simply *any* foods available at the worksite.

A few study limitations should be noted. Because this study was cross-sectional, we are only able to report associations, not determine causality. The sampling strategy used and restricted geographic area included in the sample may limit generalizability of the findings. Some bias may be present because only those with land lines were able to participate in the survey.³⁵ Further, data on the presence of worksite supports and dietary behaviors were all self-reported by participants; thus, they are subject to inaccuracy. While many of the associations examined produced statistically insignificant results, this may be related to the worksite being only one of many life spaces where people make dietary choices (i.e., work, home, or other spaces – such as a park, with friends, at restaurants); alternatively, the study may be underpowered for weak associations. This analysis also did not distinguish those who regularly bring food from home to the worksite; thus, their reported dietary behaviors may be unrelated to foods available at the worksite.

Despite these limitations, these study results enhance other findings highlighting the utility of worksite supports for healthy eating in improving employee dietary behaviors. As Story and colleagues note, it is important for future work to identify and reduce barriers to organizational and environmental change.³ Specifically, studies should examine these barriers from the employer perspective to identify what prevents or discourages them from providing a worksite food environment that includes healthy, affordable foods. Additional work should seek to understand employee barriers to selecting available, healthy foods and test interventions to address those barriers.

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Table 1

Number and percentage of participants using worksite supports for healthy eating, N=2015

	Participants reporting availability/usage of the support, n (%)
Water	
Clean water fountain available at worksite	1738 (86.3)
Water cooler/bottled water available free of charge at worksite	1000 (49.6)
Cafeteria/snack bar/food services	
Cafeteria/snack bar/food services available	992 (49.2)
Among those participants with cafeteria etc. at their workplace	
Use cafeteria/snack bar/food services	857 (86.4)
Cafeteria etc. sell fresh fruit and vegetables on a daily basis	845 (85.2)
Cafeteria etc. sell non-fried meat entrees, such as fish or chicken	783 (78.9)
Cafeteria etc. sell low fat snack items, such as pretzels or dried fruit	797 (80.3)
Cafeteria etc. sell low fat dairy products, such as yogurt or low-fat milk	840 (84.7)
Cafeteria etc. sell sandwiches made with whole grain bread	759 (76.5)
Cafeteria etc. sell food in smaller or half-sized portions	577 (58.2)
Cafeteria etc. sell food with symbols or signs to identify healthy food alternatives, such as low-fat or heart healthy	576 (58.1)
Cafeteria etc. sell food with calorie information for food served on-site	444 (44.8)
Cafeteria etc. have posters or signs that encourage healthy eating	571 (57.6)
Cafeteria has affordable prices for fresh fruits and vegetables	656 (66.1)
Vending Machines	
Vending machine available	1505 (74.7)
Among those with vending machines at their workplace	
Use vending machine	461 (30.6)
Vending machines provide low-fat snacks or other healthy food alternatives, such as pretzels or dried fruit	962 (63.9)
Vending machines provides low-fat or fat free milk, or water	976 (64.9)
Vending machines have symbols to identify healthy food alternatives on	405 (26.9)

Participants reporting availability/usage of the support, n (%)	
or near the vending machines	

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Table 2

Bivariate analyses of participant characteristics and diet behaviors

	Race			Gender		Age (years)			Worksite Size (# employees)				Employment type		Obese		Income	
	White	Black	Other	Male	Female	21-44	45-54	55-65	< 50	50-199	200-499	> 500	Full time	Part time	Yes	No	High	Low
Total %	1250 62.0	601 29.8	142 7.0	652 32.4	1361 67.5	697 34.6	656 32.6	636 31.6	619 30.7	610 30.3	264 13.1	426 21.1	1440 71.5	571 28.3	643 31.9	1266 62.8	1495 74.2	391 19.4
Have fruits more than 2 times per day (N=681, 34%)																		
Yes %	447 35.8	185 30.8	40 28.2	209 32.1	471 34.6	203 29.1	232 35.4	235 36.9	192 31.0	215 35.2	97 36.7	144 33.8	493 34.2	188 32.9	188 29.2	454 35.9	535 35.8	106 27.1
Chi-sq	0.037			0.257		0.006			0.292				0.575		0.004		0.001	
Have vegetables more than 2 times per day (N=766, 38%)																		
Yes %	528 42.2	169 28.1	59 41.5	219 33.6	545 40.0	232 33.3	251 38.3	270 42.5	224 36.2	230 37.7	103 39.0	173 40.6	552 38.3	212 37.1	218 33.9	502 39.7	106 27.1	608 40.7
Chi-sq	<0.001			0.005		0.003			0.526				0.616		0.014		<0.001	
Have fast food more than 2 times per week (N=934, 46%)																		
Yes %	519 41.6	352 58.9	56 39.7	309 47.5	625 46.1	361 52.1	309 47.1	254 39.9	306 49.8	278 45.6	139 52.7	185 43.4	672 46.8	259 45.5	372 57.9	517 40.9	672 45.0	204 52.4
Chi-sq	<0.001			0.554		<0.001			0.52				0.614		<0.001		0.009	
Have cookies/cake/pie/brownies more than 2 times per week (N=930, 46%)																		
Yes %	595 47.6	271 45.2	54 38.0	316 48.5	614 45.2	327 46.9	301 46.1	291 45.8	295 47.7	289 47.4	121 45.8	188 44.1	644 44.8	284 49.9	292 45.6	592 46.8	679 45.4	194 50.3
Chi-sq	0.079			0.171		0.908			0.666				0.037		0.607		0.130	
Have ice cream/frozen desserts more than 2 times per week (N=421, 21%)																		
Yes %	270 21.6	112 18.6	34 23.9	135 20.7	285 21.0	143 20.5	138 21.1	133 20.9	142 23.0	125 20.5	52 19.7	84 19.7	282 19.6	138 24.2	145 22.6	255 20.2	304 20.4	88 22.5
Chi-sq	0.216			0.891		0.971			0.524				0.022		0.219		0.352	

Crude and adjusted logistic regression of worksite supports for healthy eating and diet behavior variables, adjusted for race, gender, age, employment type, obesity, and income

Table 3

Water						
Clean water fountain available						
Model N	2001	2001	1996	1998	1999	
Crude	0.90 (0.69, 1.18)	1.00 (0.77, 1.31)	0.90 (0.69, 1.16)	0.93 (0.72, 1.20)	1.18 (0.85, 1.65)	
Adjusted	0.92 (0.68, 1.23)	1.10 (0.82, 1.48)	0.92 (0.69, 1.23)	1.02 (0.77, 1.35)	1.15 (0.81, 1.64)	
Water cooler/bottled water available						
Model N	2014	2014	2009	2001	2012	
Crude	0.99 (0.82, 1.19)	1.01 (0.84, 1.20)	0.96 (0.81, 1.15)	1.01 (0.85, 1.21)	0.97 (0.78, 1.20)	
Adjusted	1.05 (0.86, 1.28)	1.05 (0.87, 1.28)	1.00 (0.83, 1.22)	1.03 (0.86, 1.25)	0.98 (0.78, 1.23)	
Cafeteria/snack bar/food services						
Cafeteria/snack bar/food services available						
Model N	2014	2014	2009	2001	2012	
Crude	1.30 (1.08, 1.57)	1.36 (1.14, 1.63)	0.82 (0.69, 0.98)	0.89 (0.74, 1.05)	0.96 (0.77, 1.19)	
Adjusted	1.28 (1.05, 1.56)	1.28 (1.05, 1.55)	0.80 (0.66, 0.97)	0.95 (0.79, 1.15)	0.97 (0.77, 1.23)	
Using cafeteria/snack bar/food services						
Model N	992	992	991	991	992	
Crude	0.72 (0.50, 1.03)	0.82 (0.57, 1.18)	1.03 (0.72, 1.49)	1.05 (0.73, 1.51)	1.39 (0.85, 2.25)	
Adjusted	0.77 (0.52, 1.14)	0.91 (0.61, 1.35)	0.97 (0.66, 1.44)	1.09 (0.74, 1.61)	1.48 (0.88, 2.51)	
Cafeteria/snack bar/food services sell fresh fruit and vegetables						
Model N	992	992	991	991	992	
Crude	1.33 (0.92, 1.94)	1.32 (0.92, 1.90)	0.67 (0.47, 0.96)	1.29 (0.90, 1.84)	1.31 (0.83, 2.08)	
Adjusted	1.37 (0.92, 2.05)	1.21 (0.82, 1.78)	0.67 (0.46, 0.98)	1.27 (0.87, 1.85)	1.20 (0.74, 1.94)	
Cafeteria/snack bar/food services sell non-fried meat entrees						
Model N	992	992	991	991	992	
Crude	0.97 (0.71, 1.33)	1.40 (1.02, 1.92)	0.93 (0.68, 1.26)	0.85 (0.63, 1.16)	1.08 (0.74, 1.58)	

	Fruits 2/day OR (95% CI)	Vegetables 2/day OR (95% CI)	Fast food 2/week OR (95% CI)	Cookies etc. 2/week OR (95% CI)	Ice cream etc. 2/week OR (95% CI)
Adjusted	0.96 (0.68, 1.34)	1.30 (0.93, 1.83)	0.93 (0.67, 1.30)	0.81 (0.58, 1.12)	1.12 (0.74, 1.70)
Cafeteria/snack bar/food services sell low fat snack items					
Model N	992	992	991	991	992
Crude	1.08 (0.78, 1.50)	1.04 (0.75, 1.43)	1.13 (0.83, 1.56)	1.21 (0.88, 1.66)	1.04 (0.71, 1.54)
Adjusted	1.24 (0.87, 1.76)	1.13 (0.80, 1.60)	1.00 (0.71, 1.41)	1.17 (0.83, 1.64)	1.00 (0.66, 1.52)
Cafeteria/snack bar/food services sell low fat dairy products					
Model N	992	992	991	991	992
Crude	1.00 (0.70, 1.43)	1.36 (0.95, 1.95)	0.85 (0.60, 1.20)	1.33 (0.93, 1.89)	1.46 (0.91, 2.32)
Adjusted	0.95 (0.64, 1.41)	1.18 (0.80, 1.74)	0.78 (0.53, 1.14)	1.30 (0.89, 1.90)	1.42 (0.86, 2.36)
Cafeteria/snack bar/food services sell sandwiches made with whole grain bread					
Model N	991	991	990	990	991
Crude	1.01 (0.74, 1.36)	1.36 (1.00, 1.84)	0.96 (0.71, 1.29)	1.00 (0.74, 1.34)	0.99 (0.69, 1.43)
Adjusted	0.97 (0.70, 1.34)	1.28 (0.92, 1.77)	0.92 (0.67, 1.27)	0.96 (0.70, 1.31)	1.00 (0.68, 1.48)
Cafeteria/snack bar/food services sell food in smaller or half-sized portions					
Model N	991	991	990	990	991
Crude	1.14 (0.87, 1.48)	1.25 (0.97, 1.62)	0.97 (0.75, 1.25)	0.99 (0.77, 1.27)	1.01 (0.74, 1.37)
Adjusted	1.21 (0.91, 1.61)	1.39 (1.05, 1.84)	0.97 (0.74, 1.28)	1.04 (0.79, 1.37)	1.08 (0.77, 1.51)
Cafeteria/snack bar/food services sell food with symbols or signs to identify healthy food alternatives					
Model N	991	991	990	990	991
Crude	0.94 (0.72, 1.22)	1.12 (0.86, 1.44)	0.96 (0.75, 1.24)	1.07 (0.83, 1.39)	1.21 (0.88, 1.66)
Adjusted	0.81 (0.64, 1.03)	1.07 (0.81, 1.40)	1.00 (0.76, 1.32)	1.13 (0.86, 1.49)	0.84 (0.63, 1.12)
Cafeteria/snack bar/food services sell food with calorie information for food served on-site					
Model N	991	991	990	990	991
Crude	0.98 (0.76, 1.27)	1.03 (0.80, 1.32)	1.07 (0.83, 1.37)	1.09 (0.85, 1.41)	1.07 (0.78, 1.45)
Adjusted	0.98 (0.74, 1.30)	1.04 (0.79, 1.38)	1.04 (0.79, 1.37)	1.17 (0.89, 1.55)	1.04 (0.74, 1.46)
Cafeteria/snack bar/food services has posters or signs that encourage healthy eating					
Model N	991	991	990	990	991
Crude	1.20 (0.92, 1.56)	0.87 (0.67, 1.12)	0.95 (0.74, 1.23)	0.95 (0.74, 1.23)	1.34 (0.98, 1.84)

	Fruits 2/day OR (95% CI)	Vegetables 2/day OR (95% CI)	Fast food 2/week OR (95% CI)	Cookies etc. 2/week OR (95% CI)	Ice cream etc. 2/week OR (95% CI)
Adjusted	1.18 (0.89, 1.57)	0.85 (0.65, 1.12)	0.98 (0.75, 1.30)	1.00 (0.76, 1.31)	1.53 (1.08, 2.16)
Cafeteria/snack bar/food services has affordable prices for fresh fruits and vegetables					
Model N	991	991	990	990	991
Crude	1.24 (0.94, 1.64)	1.25 (0.96, 1.64)	0.71 (0.55, 0.93)	1.11 (0.85, 1.45)	0.90 (0.65, 1.24)
Adjusted	1.11 (0.83, 1.50)	1.17 (0.87, 1.57)	0.79 (0.59, 1.05)	1.07 (0.80, 1.42)	0.84 (0.59, 1.18)
Vending Machines					
Vending machine available					
Model N					
Crude	1.37 (1.10, 1.71)	1.07 (0.87, 1.31)	0.87 (0.71, 1.06)	0.96 (0.78, 1.17)	0.77 (0.61, 0.98)
Adjusted	1.30 (1.02, 1.65)	0.92 (0.73, 1.15)	0.88 (0.70, 1.10)	1.04 (0.83, 1.30)	0.78 (0.61, 1.03)
Use vending machine					
Model N	2014	2014	2009	2011	2012
Crude	0.63 (0.50, 0.80)	0.73 (0.58, 0.92)	2.39 (1.91, 2.99)	1.05 (0.84, 1.30)	1.03 (0.79, 1.36)
Adjusted	0.67 (0.51, 0.87)	0.84 (0.65, 1.09)	2.12 (1.65, 2.72)	1.02 (0.80, 1.30)	1.12 (0.83, 1.52)
Vending machine provides low-fat snacks or other healthy food alternatives					
Model N	1505	1505	1504	1503	1504
Crude	0.78 (0.63, 0.97)	1.10 (0.88, 1.36)	0.63 (0.51, 0.79)	1.31 (1.06, 1.62)	1.07 (0.82, 1.39)
Adjusted	1.23 (0.97, 1.56)	1.01 (0.80, 1.27)	0.64 (0.51, 0.81)	1.30 (1.04, 1.63)	0.95 (0.71, 1.26)
Vending machines provide low-fat or fat free milk, or water					
Model N	1505	1505	1504	1503	1504
Crude	0.95 (0.76, 1.19)	0.91 (0.73, 1.13)	1.09 (0.88, 1.34)	0.88 (0.71, 1.09)	0.91 (0.70, 1.18)
Adjusted	0.99 (0.78, 1.25)	0.98 (0.77, 1.24)	1.01 (0.80, 1.28)	0.90 (0.71, 1.13)	0.92 (0.69, 1.22)
Vending machines have symbols to identify healthy food alternatives on or near the vending machines					
Model N	1505	1505	1504	1503	1504
Crude	1.02 (0.80, 1.29)	0.95 (0.75, 1.20)	1.15 (0.92, 1.45)	0.94 (0.75, 1.18)	1.15 (0.87, 1.52)
Adjusted	1.12 (0.86, 1.45)	1.06 (0.82, 1.38)	1.10 (0.85, 1.41)	0.96 (0.75, 1.23)	1.24 (0.92, 1.68)