

An Assessment of the Campus Food Environment at a Large Commuter University

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Abstract

We assessed the campus food environment through food retail outlets (FROs) and vending machines at a large, commuter university. We assessed 16 food retail outlets, 14 dining locations, 2 convenience stores, and 35 vending machines. We used Full Restaurant Evaluation Supporting a Healthy Dining Environment (FRESH) for dining locations, Convenience Store Supporting Healthy Environment for Life-promoting Food (SHELF) for convenience stores, and Nutrition Environment Measures Survey-Vending (NEMS-V) for vending machines. 28.6% of the FROs promoted unhealthy food options, while 35.7% of the outlets did display some healthy food signage. Campus convenience store assessment shows that these outlets do not support healthy eating. Vending machine data evaluated 35 vending machines (1,024 slots). According to the NEMS-V standards, more than half of the vending slots were coded “Red”. Both the availability and the cost of healthy food should be addressed to improve student options.

KEYWORDS: community health, nutrition, health education

Introduction

Obesity and chronic diseases are increasing at alarmingly high rates. Nearly 117 million people in the United States are living with one or more chronic diseases (Ward, Schiller, & Goodman, 2014). Even young adults are beginning to see the negative effects of an inherently unhealthy lifestyle through chronic diseases such as diabetes, hypertension, heart disease,

stroke, and obesity (Arsiwalla, Arnold, Teel, Ulrich, & Gropper, 2018). There are many factors that play a role in the weight status and chronic disease risk of Americans, including the food environments to which they are exposed (Morland & Evenson, 2009). Young adults attending college may be negatively impacted by these lifestyle factors which may be due, in part, to the food options they have available (Small, Bailey-Davis, Morgan, & Maggs, 2013).

Although the term ‘Freshman 15’ may be commonly used to reference an anticipated weight gain in a student’s first year of college, research actually indicates that weight and body fat gains occur throughout the years of college (Arsiwalla et al., 2018). Students on college campuses experience many shifts in lifestyle and environment, such as new academic schedules, social relationships, irregular sleep patterns, which may place college students at risk for weight gain, especially when combined with an unhealthy diet (Arsiwalla et al., 2018). Self-reported height and weight from a large national sample indicates that 22.7% of college students are overweight (BMI 25-29.9) and 14.3% are obese (BMI 30+) (American College Health Association, 2018). High prevalence of overweight and obesity in college students may be attributable, at least in part, due to consumption of high-fat, high-sugar products, and low intakes of fruits, vegetables, and whole grains (McArthur, Riggs, Uribe, & Spaulding, 2018).

Among both college students and the general population, the food environment can affect weight outcomes in multiple ways. Access to food stores, fast food, and restaurants, can affect both food consumption patterns and weight status (Morland & Evenson, 2009). The efficiency of accessing different types of food outlets may also influence food choices. In poor food environments, healthy foods are limited such that consumers’ choices are bounded and they cannot allocate limited resources efficiently (Li & Lopez, 2016). Overall, the presence of convenience stores, fast-food restaurants, and supercenters, a discount store selling a line of grocery merchandise, are associated with a higher prevalence of obesity whereas supermarkets, chain grocers and fruit and vegetable markets (including local food) is generally associated with lower rates of obesity in the general population (Li & Lopez, 2016).

Currently, research centered around the food environment within colleges is limited. Qualitative work revealed that independence, social networks, and physical environment influence food choices among European college students (Deliens, Clarys, De Bourdeaudhuij, & Deforche, 2014). A study of

vending machine offerings on campuses included 11 different institutions but did not report on other types of campus food outlets (Byrd-Bredbenner et al., 2012). Nelson and Story inventoried the food stored by students in dormitories (2009), but these results do not clarify the food environment at campuses with large commuter populations. An assessment of food environment on a variety of campuses noted some variation of healthy choices with school size, but used a sample of the food outlets on each campus and did not include vending, so these results may not represent a comprehensive picture of the food environment at a large urban commuter university (Horacek et al., n.d.). With rising concerns about food insecurity among college populations (Maroto, Snelling, & Linck, 2015), it is becoming increasingly important to accurately portray the food environment of various university settings. Accordingly, our study presents a comprehensive data collection effort at a large urban university with a majority commuter population.

Method

This assessment of a campus food environment was conducted at a large urban university in Las Vegas, NV. The university is a public institution with approximately 25,000 undergraduate students and 5,000 graduate students, most of whom commute to campus. The assessment consisted of two components that influence student diet, food retail outlets and vending machines, and was limited to the university's main campus. Since the study involved the assessment of physical environment, not human subjects, and originated as a class project, the study was not submitted for IRB approval after discussion with our Office of Research Integrity.

Food retail outlets

At the time of the audit, the campus had a total of 16 food retail outlets (FROs) available to students. The names and locations of the FROs were found on the university's website through a basic search of restaurants on campus. Once the specific FROs had been determined, they were assessed using the Full Restaurant Evaluation Supporting a Healthy Dining Environment (FRESH) audit tool (Horacek, Yildirim, Simon, et al., 2019) and the Convenience Store Supporting Healthy Environment for Life-promoting Food (SHELF) audit tool (Horacek, Yildirim, Kelly, et al., 2018), both of which are components of the Healthy Campus Environmental Audit developed by the USDA (Sorden, 2017).

FRESH (Horacek, Yildirim, Simon, et al., 2019) is aimed at evaluating the food and preparation descriptions to determine healthfulness of menu

items and the availability/extensiveness of other supports for making healthy decisions in dining establishments. SHELF (Horacek, Yildirim, Kelly, et al., 2018) is designed to evaluate the presence of healthier food and the availability/extensiveness of other environmental supports for making healthy food purchasing decisions in the food store environment.

Data collection

Data collection was limited to on campus food outlets and included all persistent FROs (excluding food trucks and other mobile or pop up outlets). The FROs were divided among seven student researchers, who were tasked with completing either the FRESH (Horacek, Yildirim, Simon, et al., 2019) or SHELF audit tool (Horacek, Yildirim, Kelly, et al., 2018) for their assigned establishment as appropriate. Members of the research team were trained on the audit tool before data collection began.

Data from each tool was collected during the month of November 2018. The same member of the research team assessed the two convenience stores located on campus utilizing the SHELF audit tool (Horacek, Yildirim, Kelly, et al., 2018), and the remaining six team members were tasked to utilize the FRESH audit tool (Horacek, Yildirim, Simon, et al., 2019) on the remaining fourteen FROs. Students electronically completed the audits through a google form containing all questions from the original FRESH (Horacek, Yildirim, Simon, et al., 2019) and SHELF (Horacek, Yildirim, Kelly, et al., 2018) audit tools. Results were analyzed using MS Excel.

Vending machines

The university's main campus includes 87 main buildings, most of which contain at least one vending machine. The research team selected nine of these buildings for assessment, based on their size and campus location. We focused our surveillance on buildings with higher occupant capacity to ensure we were collecting data from machines that would receive the most traffic. The nine buildings we selected included the primary classroom buildings, the largest residential building, and the Student Union, which represented all geographical areas of the campus. Once building locations were chosen, the research team obtained data from all vending machines within the respective buildings in the month of November 2018.

Data collection

Data collection teams recorded information from the vending machines using the Nutrition Environment

Measures Survey-Vending (NEMS-V) audit tool (Voss, Klein, Glanz, & Clawson, 2012), which has been assessed for reliability and validity (Voss et al., 2012). Research team members were trained on the use of the tool before data collection began. After data on the contents of the vending machines was collected, the items were categorized by their nutrition value according to the NEMS-V standards. Nutritional values were assigned using the NEMS-V

Red, Yellow, and Green category standards (Voss et al., 2012). “Red” items are typically highly processed, nutritionally compromised foods (such as chips, cookies, and candy). “Yellow” items include lower sodium options or diet sodas, and “Green” options are fresh or low-calorie choices (such as cereal bars or bottled water). Results were analyzed using MS Excel.

Table 1. Accessibility data for food retail outlets on a Southern Nevada college campus, 2018.

Accessibility feature	Count (%)
Dining establishment type	
Dining hall/Cafeteria/Buffer	4 (28.6)
Fast food	10 (71.4)
Venue organization	
Food court standing	4 (28.6)
Free standing	10 (71.4)
Weekday hours	
5-8	1 (7.1)
9-12	11 (78.6)
13-16	1 (7.1)
17 or more	1 (7.1)
Parking	
No parking facility/in the middle of campus	3 (21.4)
Very limited parking (parking permit required)	8 (57.2)
Meter parking/pay lot/garage available	3 (21.4)

Results

Food retail outlets

There were 14 dining locations studied using the FRESH food audit tool (Horacek, Yildirim, Simon, et al., 2019). They were all located on campus: ten of the dining locations were fast food dining establishments and the remaining four were a dining hall, cafeteria, or buffet dining establishment (Table 1). During the week most of the dining locations (78.6%) were open for 9-12 hours (Table 1).

However, on the weekend 53.6% of the dining locations were closed. Parking near these dining locations is scarce; eight of the locations had very limited parking where a parking permit was required. The other six locations were split evenly between ‘no parking in the middle of campus’ and ‘meter, pay lot, or garage’ availability (Table 1).

Overall, most of the menus at the dining locations sold unhealthy food options with four of the dining

locations offering slightly/primarily healthy items (Table 2). Five of the dining locations did not offer any fruit options; however, six of the locations

offered ‘more than or equal to 7’ vegetable options (Table 2). Most (64.3%) of the establishments did not have any fried food options available (Table 2).

Table 2. Menu characteristics for food retail outlets on a Southern Nevada college campus, 2018.

Characteristic	Count (%)
Menu descriptions	
Specific description of food items that primarily promotes unhealthy items	4 (28.6)
Specific descriptions of food items that slightly promote unhealthy foods	2 (14.3)
Neutral or equal food description healthy and unhealthy foods	4 (28.6)
Specific description of food items that slightly promote healthy items	1 (7.1)
Specific description of food items that primarily promote healthy items	3 (21.4)
Types of fruit available	
None available	5 (35.7)
Only processed (added sugar/syrup) and dried fruits	2 (14.3)
1 fresh fruit with no added sugar/syrup	4 (28.6)
2 fresh fruit with no added sugar/syrup	1 (7.1)
More than or equal to 3 fresh fruits with no added sugar/syrup	2 (14.3)
Types of vegetables available	
None available	3 (21.4)
1-2	3 (21.4)
3-4	0 (0)
5-6	1 (7.1)
More than or equal to 7	6 (43.0)
Not applicable	1 (7.1)
Number of fried food options	
None	9 (64.3)
1-2	2 (14.3)
3-4	2 (14.3)

5-6	1 (7.1)
Number of healthy beverage categories offered	
1-2	5 (35.7)
3-4	9 (64.3)

Nutrition information was visible on site for most (64.3%) of the dining establishments (Table 3). Six locations had signage that encourages healthy eating behaviors and/or healthy food options. However, when it came to the board menu labeling, only four of the locations had all or mostly health-promoting labels on their menu (Table 3). When price differences were compared, at four dining locations healthy options cost more than unhealthy options. At an additional four dining locations, the healthy options and unhealthy options are equally priced (Table 3).

There were two convenience stores on campus studied using the SHELF food audit (Horacek, Yildirim, Kelly, et al., 2018). One of the stores

offered ‘1-3 fresh fruit options’, and the other did not have any fresh fruit available. Neither of the stores sold any frozen fruit, frozen vegetables, or fresh vegetables. There were no low-fat dairy products or dairy substitutes available at either of the stores nor were there any fountain or self-service drinks. One store provided ‘1-5 healthy staple foods’, such as high fiber bread products and the other store had no options available. At one store there were ‘7-9 unhealthy products adjacent to the checkout counter’; at the other there were no products adjacent to the checkout counter. The daily hours of operation were examined on Tuesday, one store was open for ‘more than or equal to 16 hours’ and the other was open for ‘10-12 hours’. On Sundays, one store was closed while the other was open for ‘13-15 hours’.

Table 3. Signage characteristics for food retail outlets on a Southern Nevada college campus, 2018.

Characteristic	Count (%)
Nutrition information provided	
None available	1 (7.1)
Information provided only online	2 (14.3)
Information visible at site: provided in take away sources, by request, and/or via scannable link/kiosk	1 (7.1)
Information visible at site: provided at point of purchase, menu, and/or board	9 (64.3)
Information provided on site and at least one additional source	1 (7.1)
Kinds of signage posted	
All unhealthy signage that encourages overeating and/or unhealthy food choices	3 (21.4)
Majority unhealthy signage with limited healthy signage	4 (28.6)
Neutral, equal, or no healthy signage nor unhealthy signage	1 (7.1)
Majority healthy signage with limited unhealthy signage	5 (35.7)
All healthy signage that encourages healthy eating behaviors and/or healthy food choices	1 (7.1)

Sustainability signage	
No sustainability signage/labels on site or information online	9 (64.3)
Sustainability information online only	1 (7.1)
1 type of sustainability signage/label on site	1 (7.1)
2 type of sustainability signage/label on site	2 (14.3)
3 type of sustainability signage/label on site	1 (7.1)
Menu board labeling	
All unhealthy labels that encourages overeating and/or unhealthy food choices	4 (28.6)
Majority unhealthy labels with limited healthy labels	2 (14.3)
Neutral, equal and/or no labels to encourage unhealthy or healthy choices	4 (28.6)
Majority healthy labels with limited unhealthy labels	3 (21.4)
All healthy labels that encourage healthy eating behaviors and/or healthy food choices	1 (7.1)
Facility pricing systems (more than one may apply)	
All you can eat buffet or one meal card swipe for all you can eat	1 (7.1)
Combo meals (add a side or drink at a reduced cost than items would total individually)	9 (64.3)
One meal card swipe for one portioned meal	2 (14.3)
Items are priced individually	10 (71.4)
Items are priced by weight	1 (7.1)
Not applicable	1 (7.1)
Price differences for comparable individually priced meals or items	
Healthy options cost more than unhealthy options and additional costs to make healthy substitutions	4 (28.6)
Healthy options cost more than unhealthy options and no additional costs to make healthy substitutions	1 (7.1)
Healthy options and unhealthy options are equally priced	4 (28.6)
Healthy options cost less than unhealthy options with additional costs to make healthy options	1 (7.1)
Not applicable (no items are individually priced/dining hall/buffet)	4 (28.6)

Vending machines

There were a total of 35 vending machines containing 1,024 slots assessed in 10 buildings on the campus. When the research team categorized the items by color code, 580 of them were coded in the “Red” category for unhealthy or highly processed foods (Table 4). There were 200 “Yellow” items and 244 “Green” items (Table 4). Of the 244 “Green” items

coded, almost half ($n=116$) were bottled water. There were 104 empty slots of the 1,024 slots within the machines. The mean cost for items of all color codes was \$1.65 (Table 4). The highest individual category mean was “Yellow” with a mean price per item of \$1.93, and the lowest was “Red” with the mean price per item of \$1.56 (Table 4).

Table 4. Counts and mean costs for food items in 35 vending machines on a Southern Nevada college campus ($n=1128$), 2018.

	Count	Mean cost
Food category		
Red	580	\$1.56
Yellow	200	\$1.93
Green	244	\$1.63
Empty	104	
Total	1128	

Discussion

Food retail outlets

One of the most important things that our research uncovered was that none of the food retail establishments offered healthy food options at a lower price point than unhealthy food options (Table 3). Four of the dining establishments did not have individual priced items, four of the dining establishments had healthy and unhealthy options priced the same, and four of the dining establishments had healthy options priced higher than unhealthy food options (Table 3). Under this pricing structure, there is no financial incentive for students to make better choices, and in fact students trying to maintain a healthy diet may be constrained by budgetary concerns.

Another important finding from this project is that a large number of the dining outlets were closed during weekend hours (Table 1). Although many students at this university are commuters, some students do reside on campus, and our results show an overall lack of accessibility to food options for students. In addition, we found that a large number of dining outlets on campus were fast food establishments (71.4%); however, the health implications of this may be countered by the fact that 64.3% ($n=9$) of the establishments did not have fried food options. Since a majority of the dining establishments (64.3%)

included visible nutrition information at the point-of-purchase, menu, and/or menu board, students may be able to evaluate their food purchases more accurately and improve the quality of their diets (Hwang & Lorenzen, 2008).

In addition, the way that a food outlet markets healthy or unhealthy foods can impact point-of-sale choices (Liberato, Bailie, & Brimblecombe, 2014). We found that 28.6% of the food retail outlets promoted unhealthy items (Table 2). This was due in part to overall low price or promotion of a “combo meal.” Compared to these establishments, 35.7% of the outlets did promote ‘majority healthy signage with limited unhealthy signage’ (Table 3). We were pleased to see that a greater number of dining establishments were promoting healthier food options on signage; however, four locations advertised only unhealthy food combinations and/or options.

The results of our assessment of the convenience stores, while not surprising, contribute to the characterization of the campus food environment as a one that does not support healthy choices. The options in stock at both stores were typical of convenience store offerings, namely few fresh and/or healthier options and many highly processed options which are calorie dense and nutrient poor. Again, students who are trying to make healthy dietary

choices in this environment may have a difficult time finding affordable options.

Vending machines

Overall, our findings for the vending machine component of the project were consistent with other findings (Byrd-Bredbenner et al., 2012) that unhealthy vending machine options are typically much more abundant and cheaper than healthier options (Table 4). We initially hypothesized that vending machines available on this campus would not have an ample selection of fresh fruits and/or vegetables available due to barriers related to food preservation. Our results indicate that over half (580 of 1,024) of all items on sale within the 35 vending machines were categorized as “Red”, or of poor nutritional value. The 1,024 vending slots contained only 200 “Yellow” items and 244 “Green” items. The difference between the availability of “Green” and “Red” items becomes even more striking when we consider that of the 244 “Green” items offered for sale, 116 of those were bottled water, leaving only 128 items (12.5%) of the food items on sale being “Green”. “Red” items had the lowest mean cost at \$1.56. “Green”, or healthier, options had a mean cost of \$1.63. Finally, “Yellow” items were priced the highest with a mean price of \$1.90. Some of these prices may have been affected by “health washing”, or inflated prices associated with health claims for products in this category like energy drinks and protein-based workout drinks (Teratanavat & Hooker, 2006).

Limitations

The findings of this study strengthen the current knowledge of the food environment on college campuses by characterizing a large, urban university. However, we do recognize some important limitations to our work. We did not assess interrater reliability with our research team because this project originated as a class project which was not originally intended for publication. Also, this study was only conducted on one university campus and the results may not be generalizable to all college campuses.

Conclusion

As college students, along with adults in the general population, struggle to address weight concerns, the quality of the food environment on campuses is of increasing concern. Paired with rising awareness of food insecurity among college students, administrators should consider concerted efforts to improve the quality of food presented in both FROs and vending machines, and to address the price inequities for healthy food on campus.

Declaration of interest

The authors report no conflicts of interest with this study.

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