

COLLEGE STUDENTS' PURCHASING PRACTICES FROM FOOD AND BEVERAGE VENDING MACHINES AND NUTRITIONAL VALUE OF ITEMS SELECTED

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ABSTRACT

Access to vending machines, with traditionally low nutritional value snack items, has shown to contribute to weight gain in college students. This study investigated university students' vending purchasing practices and the nutrient values of items purchased using the federal Smart Snacks guidelines. A total of 429 college students were surveyed at point of vending item purchase. Descriptive statistics summarized respondents' demographics and responses. Top reasons for purchases were hunger, convenience, and taste with nutrition as the least reason. A total of 40% beverages and 2% foods purchased were healthy. Future research should investigate increasing healthy food availability and selection.

Keywords: college students, vending items, healthy snacks, Smart Snacks

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INTRODUCTION

Eating nutritiously may be challenging for students entering college as they transition to a more independent stage of their life (Brown, Flint, & Fuqua, 2014; LaFontaine, Neisen, & Parsons, 2006). For the first time, many students are completely responsible for all food purchases and meal preparation (Schwarz, Levandoski, & Edelstein, 2014). The freshmen year, especially, of college has been shown to be a critical period for managing weight due to changing eating behaviors (Anderson, Shapiro, & Lundgren, 2003; Hoffman, Policastro, Quick, & Lee, 2006; Mihalopoulos, Auinger, & Klein, 2008) and is a time when life-long healthy or unhealthy eating behaviors may be established (Brown et al., 2014; Kicklighter, Koonce, Rosenbloom, & Commander, 2010).

Because the university environment provides a wide range of eating venues to a large number of students, it is important to understand the impact of those venues on student health. Influences such as variety of cafeteria foods choices, cost of food choices, and increased snacking, can negatively impact healthy eating and contribute to weight gain (Crombie, Ilich, Dutton, Panton, & Abood, 2009; LaFontaine et al., 2006). Furthermore, snacking and access to vending machines, that traditionally house low nutritional quality food and beverage products, have been identified as contributing to weight gain in college students and to an overall obesogenic food environment (Brown et al., 2014; Byrd-Bredbenner et al., 2012). While few studies have been published on college students' purchasing behavior with vending machines on college campuses, (Ali,

Jarrar, Abo-El-Enen, Al Shamsi, & Al Ashqar, 2015; Brown et al., 2014; Caruso, Klein, & Kaye, 2014; Pelletier & Laska, 2013) one study found that almost 50% of students on the college campus purchased items from vending machines at least one or more times per week (Pelletier & Laska, 2013). Reasons cited for purchasing items from vending machines are hunger, convenience, taste, and cost (Caruso et al., 2014). When interviewed, students agreed that access to vending machines contributes to poor eating habits and those who often purchase foods from vending machines gain weight (Smith-Jackson & Reel, 2012).

In an effort to improve healthy food selections offered in vending machines, one state university adopted a vending policy requiring that a certain percentage of healthier vending items be offered. However, it was found that less than 8% of students selected the healthier vending items (Caruso et al., 2014). In another study, vending machine inventory was manipulated to increase the number of healthy items being offered in five targeted vending machines. Nutrition information and encouraging messages to select healthy items were posted near the machines. A pre and post assessment showed that no significant differences were found in decreasing the purchases of the higher calorie and less nutrient dense items across the five vending machines. However, there was a 50% increase in healthy vending items selected although no significance was reported (Brown et al., 2014).

While advocacy for increasing healthy snack items in vending machines at the university level has been seen, support in addressing the nutritional value of vending machine items has largely occurred in primary and secondary school settings with the passing of the Healthy Hunger-Free Kids Act, 2010. As of school year 2014-2015 all foods sold within the school day must meet nutrition standards as stated in Smart Snacks regulations (Food and Nutrition Services, 2014). Food and beverage items must meet the nutrient criteria for total calories and levels of fat, sodium, and sugar in order to be sold in competitive food venues such as a la carte sales in cafeterias, school stores, and vending machines. Earlier studies showed that schools having strong compliance with nutrition standards for competitive foods saw an improvement in the school nutrition environment (Hennessy et al., 2014; Lyn, O'Meara, Hepburn, & Potter, 2012; Metos & Nanney, 2007; Park, Sappenfield, Huang, Sherry, & Bensyl, 2010; Snelling & Kennard, 2009).

While positive outcomes have occurred in primary and secondary schools with competitive food policy compliance, few evaluations of university campus' food venues and potential impact on student health have been published (Brown et al., 2014; Caruso et al., 2014; Pelletier & Laska, 2013). Several organizations have made efforts to bring campus wellness to the forefront. The National Prevention

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Council under the Office of the Surgeon General has developed strategies encouraging colleges and universities to increase the availability of healthy foods in vending machines that require a commitment from the various university stakeholders (Surgeon General, 2014). The American College Health Association established Healthy Campus Coalition 2020 with national health objectives for college and university students. Objectives targeting students include increasing healthy weight, reducing obesity, increasing fruit and vegetable intake, and increasing the number of students receiving nutrition information from their institute (American College Health Association, 2012). With a reported 20.4 million students expected to attend American colleges and universities in the fall of 2017, (National Center for Educational Statistics, 2016), academic campuses would be an impactful venue in addressing weight and health issues.

The purpose of this study was to investigate vending machines food venues by 1) identifying university students' purchasing practices and 2) evaluating the nutrient value of vending items purchased.

METHODS

Procedure

Location of all food and beverage vending machines on two southern public university campuses was provided through each university's contractual services department. At University 1, graduate students who were enrolled in a graduate nutrition education course, during fall 2016, were recruited to collect data from students who purchased items from targeted vending machines. Prior to data collection, the graduate students were trained in research methods for questionnaire data collection. At University 2, a faculty member and graduate student researcher were recruited to oversee and distribute the same questionnaires and collect data during the same time frame using similar methods. All data collectors at both universities completed the CITI Human Subject Research Education Program required by the Universities' Internal Review Boards.

At University 1, paper questionnaires were distributed to students at the point of vending item purchase in all 23 academic buildings, the student union, library, and recreation center. At University 2, a mixed method of distributing paper and online questionnaires was used. Paper questionnaires were distributed to students at 8 of the 22 academic buildings and two library sites which were identified as having the highest usage. To increase participation, the data collector posted signs on the vending machines in all academic buildings and two libraries to access the survey through Qualtrics, an online survey program. Neither University distributed questionnaires to students in buildings with restricted access, such as student dormitories.

At the point of purchase, students were asked by the data collectors to complete a questionnaire about their purchasing practices. The data collectors followed a script which asked each student to provide voluntary verbal consent to participate in completing a two-minute questionnaire. The data collectors confirmed that participants were students and that they had not already completed the questionnaire at another vending machine.

Questionnaire Content

The first section of the questionnaire was completed by the data collectors who documented the product manufacturer, product name, product flavor, size, and price for the vending item selected by the student. The next two questions were based on criteria found in previously published research (Caruso et al., 2014), modified for this study, and completed by the student: 1) frequency of vending purchases and 2) reasons for their selection (taste, price, nutritional value [added], convenience, thirst and/or hunger, other). The next three questions were added: 3) was item purchased considered a

meal or snack, 4) if nutrition information would be of interest, and 5) if nutrition information would influence their selection. The questionnaire also requested self-reported demographic information on gender, age, classification (freshmen, etc), full time/part time student status, ethnicity, and on campus or off campus residence.

Prior to the primary study, the questionnaire was pilot tested using a convenience sample of 12 graduate students who were asked to evaluate the questionnaire for clarity and inclusiveness of contents. Based on their input, the questionnaire was minimally revised. This research was approved by both Universities' Internal Review Board prior to the beginning of data collection.

Vending items selected by students were evaluated based on nutrient allowances for high school students established by Smart Snacks nutrition standards (United States Department of Agriculture, n.d.) and were identified as compliant (healthy) or non-compliant. Nutrient information needed for assessment was obtained using the *Alliance for a Healthier Generation's Smart Snacks Product Calculator and Alliance Product Navigator tools product generator* (Alliance for a healthier generation., n.d.), Nutrition Facts labels, and/or food manufacturers' websites. Nutrient standards are for one serving size and are as follows:

Foods

- Whole grain-rich grain product or have as the first ingredient a fruit, a vegetable, a dairy product, or a protein food
- Calorie limits: ≤ 200 calories
- Sodium limits: ≤ 200 mg
- Fat limits: Total fat: $\leq 35\%$ of calories, Saturated fat: $< 10\%$ of calories, Trans fat: zero grams
- Sugar limit: $\leq 35\%$ of weight from total sugars in foods

Beverages

- Plain water (with or without carbonation)
- Unflavored low fat milk, unflavored or flavored fat free milk
- 100% fruit or vegetable juice and 100% fruit or vegetable juice diluted with water (with or without carbonation), and no added sweeteners.
- No more than 20-ounce portions of calorie-free, flavored water (with or without carbonation); Other flavored and/or carbonated beverages that are labeled to contain < 5 calories per 8 fluid ounces or ≤ 10 calories per 20 fluid ounces.
- No more than 12-ounce portions of beverages with ≤ 40 calories per 8 fluid ounces, or ≤ 60 calories per 12 fluid ounces

Data Analysis

Descriptive statistics of means, standard deviations, frequencies, and percentages were used to summarize respondents' demographics and responses (e.g., healthy versus non healthy vending items). Chi-square analysis was used to compare study variables and to evaluate how students responded differently to questions by demographics.

RESULTS AND DISCUSSION

Demographics

A total of 429 questionnaires were completed with 295 questionnaires completed at University 1 and 134 completed at University 2. Table 1 reports student demographics. Numbers of male and female students at University 1 were 52.88% and 47.12% respectively. University 2 had a lower percentage of male than female students with 33.58% to 66.42%, respectively. Ethnicity and living status for students were similar among the two universities. University 2 had a larger percentage of students who were 26 or older. Student data on mean age of graduate and undergraduate students under age 26 at University 1 was 90.80% and at University 2

Table 1: Demographic Characteristics of University Students.

Characteristics	University 1 (n = 295 ^a)		University 2 (n = 134 ^a)	
	n	%	n	%
Gender				
Male	156	52.88	45	33.58
Female	139	47.12	89	66.42
Classification				
Freshman	39	13.22	18	13.43
Sophomore	48	16.27	8	5.97
Junior	76	25.76	23	17.16
Senior	93	31.53	64	47.76
Graduate	37	12.54	18	13.43
Age				
18	22	7.46	11	8.21
19	49	16.61	7	5.22
20	46	15.59	14	10.45
21	67	22.71	28	20.90
22	39	13.33	26	19.40
23	33	11.19	10	7.46
24	16	5.42	8	5.97
25	6	2.03	6	4.48
26 or older	16	5.42	24	17.91
Ethnicity--				
White	223	75.59	96	71.64
Hispanic or Latino	9	3.05	7	5.22
African American	54	18.31	24	17.91
Native American	1	0.34	1	<.01
Asian/Pacific Islander	3	1.02	5	3.73
Other	4	1.36	0	0
Living Status				
On Campus	64	21.69	31	23.13
Off Campus	230	77.97	103	76.97

^aTotals may not equal 295 or 134 and percentages may not equal 100 due to missing data and was excluded in analysis.

was 71.40% during fall 2016. The majority of students at University 1 (77.97%) and University 2 (76.97%) lived off campus.

To identify how frequently students purchased from vending machines, they were provided a frequency range from less than 1 time per month to as often as daily (Table 2). Chi-squared analysis showed that students at University 1 made purchases from the vending machine significantly more with 74.24% purchasing vending items at least one time per week compared to 45.52% at University 2 ($\chi^2(4, N = 429) = 47.05, p < .001$). Other studies on purchasing frequency have shown 43%-54% of students purchase vending items daily to three times per week (Caruso et al., 2014; Pelletier & Laska, 2013). With concerns about freshmen students and weight gain, chi-

Table 2: Vending Purchasing Frequency by University

Frequency	University 1 (n = 295)		University 2 (n = 134)	
	n	%	n	%
Less than 1 time per month	16	5.42	22	16.42
1 time per month	15	5.08	17	12.69
2 times per month	45	15.25	34	25.37
1-3 times per week	150	50.85	56	41.79
Daily	69	23.39	5	3.73

$\chi^2(1, N = 429) = 47.05, p < .001$

square showed that freshmen did not purchase vending items at a significantly higher frequency than other classmen at both Universities except when compared to graduate students at University 1 ($\chi^2(16, N = 429) = 47.74, p < .001$).

Almost all students (94.50%) purchased the food or beverage item as a snack. Increased snacking among college students has been shown to contribute to weight gain (Crombie et al., 2009). No significant differences were found between frequency of purchasing and gender or living status within each University. Students at both universities identified, in the same order of prevalence, their main four reasons for vending item selection as 1) hunger or thirst, 2) convenience, 3) taste, and 4) price (Table 3), supporting similar results found by Caruso, Klein, and Kaye (2014). However, taste was selected at a significantly greater percentage at University 2 ($\chi^2(1, N = 429) = 13.12; p < .001$).

Nutritional value and "other" were identified as being the least two reasons for purchasing a vending item. Example of comments contributing to the other category included needing caffeine, needing energy, or no time. It has been surmised that nutritional quality of the food item may be important but when considered in tandem with taste and price, individuals may select a less nutritious food (French, 2003). Other explanations for nutritional value not being a higher ranked reason could be that students interested in eating a nutritious snack may seek other food venues that provide healthier food options or students are not aware that items in most vending machines on university campuses have been found to house energy dense low nutrient foods (Byrd-Bredbenner et al., 2012; Kubik, Lytle, & Farbaksh, 2011; Nickelson, Roseman, & Forthofer, 2010; Park et al., 2010). It may be that students select vending machine items when they want an energy dense low nutrient snack. However, one study did show that if healthy food items are placed in vending machines and identified as healthy, that student selection of those items increases (Brown et al., 2014). It has been reported that that students struggle with eating healthy due to a lack of healthy food choices on campuses and with snacking being used as a coping mechanism (LaFountaine et al., 2006).

Table 3: Reasons for Selecting Vending Beverage or Snack

Reason	University 1 (n = 295)			University 2 (n = 134)		
	n	%	Ranking	n	%	Ranking
Hungry/thirsty	193	65.42	1	87	64.93	1
Convenience	173	58.64	2	71	52.99	2
Taste***	78	26.44	3	59	44.03	3
Price	30	10.17	4	18	13.43	4
Other ^a	21	7.12	5	8	5.97	6
Nutritional value	13	4.41	6	9	6.72	5

*** $\chi^2(1, N = 429) = 13.12; p < .001$

^aOther includes "need energy," "caffeine," "cheaper than P.O.K.," "no time."

Note. Total responses may exceed 295 and 134 due to multiple responses.

Table 4: Students' Preference for Nutrition Information on Vending Items

	University 1 (n = 295)		University 2 (n = 134)	
	Yes n (%)	No n (%)	Yes n (%)	No n (%)
Would like to have nutrition information				
Males	87 (55.77)	69 (44.23)	24 (53.33)	21 (46.67)
Females	90 (64.75)	49 (35.25)	71 (79.78)	18 (20.22)
Nutrition information would influence my purchasing decision				
Males	81(51.92)	75(48.08)	23 (51.11)	22 (48.89)
Females	92(66.19)	47 (33.81)	61 (68.54)	28 (31.46)

Note. Chi square analysis showed a significant association ($p < .05$) between the following variables: University 1 Nutrition information and gender ($\chi^2(1, N = 295) = 5.55, p < .05$)

University 2 Nutrition information and gender ($\chi^2(1, N = 134) = 10.13, p < .01$)

University 2 Influence purchasing decision ($\chi^2(1, N = 134) = 3.88, p < .05$)

University 1 & 2 Nutrition information and gender ($\chi^2(1, N = 429) = 5.91, p < .01$)

While overall the price of the vending item ranked fourth at both universities and it can still play an important role in motivating students to select healthier foods. Even a small reduction in sales price of low fat vending snacks has shown to increase number of purchases (French, 2003). Campus environments that support healthy food choices by increasing their availability at lower prices than less healthy snacks, make it easier for students to achieve and maintain health goals (Byrd-Bredbenner et al., 2012). These actions could be especially impactful since a trend towards healthy eating habits has been shown in undergraduate female students (Schwarz et al., 2014).

Students in this study were asked if they would be interested in having nutrition information provided for vending food and beverage items. Table 4 shows that a greater percentage of females at University 1 (64.75%) and University 2 (79.78%) than males at University 1 (55.77%) and University 2 (53.33%) are in favor of having nutrition information for vending items. For University 1, chi-square showed no significant differences between females and males in their preference for having nutrition information provided, but a significant difference was shown at University 2 with females preferring more than males to have nutrition information available ($\chi^2(1, N = 134) = 10.13, p < .01$). A comparison between universities showed that females from University 2 were more interested in having nutrition information than those from University 1 ($\chi^2(1, N = 429) = 5.91, p < .01$). Female college students are becoming more interested in healthy eating (Schwarz et al., 2014), but may not take advantage of nutrition information due to; time constraints for reading each vending item nutrition label, lack of interest in food labels, or not knowing how to read food labels (Ali et al., 2015). Additionally, with nutrition information primarily on the back or side of the packaging it is difficult to read nutrition facts labels.

Students were also asked if nutrition information was available for vending food and beverage items, would it influence their item selection. Again, females at Universities 1 and 2 (66.19% and 68.54% respectively) had a greater percentage of agreement than males at Universities 1 and 2 (51.92% and 51.11%, respectively) that nutrition information would influence their vending item selection. Chi-square

analysis did show a significant difference between females and males and influence on vending item purchases at University 1 ($\chi^2(1, N = 295) = 5.55, p < .05$) and at University 2 ($\chi^2(1, N = 134) = 3.88, p < .05$). Chi square analysis showed no significant differences between Universities and gender and nutrition information influencing purchases.

Students, at both universities, who responded they were interested in having nutrition information were significantly more likely to respond that having nutrition information would influence their purchasing decisions ($\chi^2(1, N = 429) = 191.30, p < .01$). This supports previous research that reported an increase in the selection of healthier items when nutrient information on vending items was provided. However, since students in this study ranked nutrition as one of the least ranked reasons for the purchasing a vending item, it may be that students are aware that vending machines lack healthy food items and therefore when choosing to purchase a vending food item nutrition is not considered. Students have expressed the need to improve the nutrient quality of vending foods and recommended educational approaches in selecting healthy items by placing nutrition tips on vending machines and using peer education and support (Ali et al., 2015).

The nutritional content of vending items selected by students was evaluated for compliance with Smart Snacks. Table 5 shows that Smart Snack compliance was highest for beverages with 38.57% compliance at University 1 and 45.45% compliance at University 2. There were no compliant food items purchased at University 1 and only 2.22% purchases at University 2. To see if there was a relationship between the student's academic classification and selection of Smart Snack compliant items, a chi square analysis was conducted. The results found there was no significant relationships within either University (University 1: $\chi^2(4, N = 295) = 4.05, p = .39$; University 2: $\chi^2(4, N = 134) = 2.31, p = .67$).

The higher percentage of beverage compliance among students is not surprising since popular beverages selected were water or sugar-free beverages, such as diet colas and sports drinks which, if an appropriate size, comply with Smart Snack nutrient allowances for high school students. Costs of foods and beverages purchased were collected and found that price was determined by product size and type, not nutritional content. For example, there were no price differences between the same size regular and calorie free carbonated beverages. Juice was selected by five students but did not meet nutrient allowances due to being oversized and/or less than 100% juice. A nutritional assessment on foods and beverages sold in vending machines on 11 university campuses located in the U.S reported that the majority of snacks offered were high in calories and

Table 5: Healthy Snack Selection Compliance

	Compliant n (%)	Non-Compliant n (%)
University 1		
Beverage	81 (38.57)	129 (61.43)
Snack	0 (0)	85 (100)
University 2		
Beverage	20 (45.45)	24 (54.55)
Snack	2 (2.22)	88 (97.78)

fat and the majority of beverages were high in calories and sugar (Byrd-Bredbenner et al., 2012).

Neither University in the study had policies established for nutrient requirements of vending items. Few colleges have nutrition policies regarding healthy vending (Brown et al., 2014) but as of July 26, 2017, (extended compliance from December 1, 2016) all businesses that own or operate 20 or more vending machines must clearly post caloric content of all vending machine items (Food and Drug Administration, 2014). It will be interesting to see if calorie content information alone has any impact on vending item selection since past studies have shown that nutrition information coupled with marketing did not significantly decrease sales of poor nutritional quality foods (Brown et al., 2014).

CONCLUSION AND APPLICATIONS

In addressing overweight and obesity, much attention and support have been given to primary and secondary schools' nutrition environment through policies included in the Healthy Hunger-Free Kids Act, 2010, and more recently, Smart Snack nutrition standards for competitive foods. When students transition from high school to college, they may for the first time be solely responsible for their food purchases. They may not have the skills or knowledge for purchasing healthy foods (Schwarz et al., 2014). At this time no federal regulations address nutrition standards for any college campus food venues. While organizations such as the National Prevention Council and the American College Health Association Healthy Campus Coalition 2020 have established standards and goals providing guidance to universities in addressing students' health, it is university administrations' prerogative to implement such standards.

There is evidence that offering a greater variety of healthier foods, reducing energy dense low nutrient foods, encouraging the purchase of healthy foods through lower prices, and providing nutrition information can have a positive effect on healthier vending selections (Brown et al., 2014; Caruso et al., 2014; French, 2003). As recommended by the American College Health Association, strategies should be developed on how to provide nutrition education to all university students. However the most effective way to do this has not yet been established. This research showed that the majority of students would like (for whatever reason) nutrition information provided for vending items and if it were, it would influence their selection.

An assessment of all vending items in vending machines located on University 1's campus was conducted in a separate study not yet published. Preliminary results showed two percent of vending snacks and 40% of vending beverages met Smart Snack nutrition standards. These results coincide with previous research showing that the majority of vending items are energy dense low nutrient foods and beverages (Byrd-Bredbenner et al., 2012; Caruso et al., 2014). So, while students had the opportunity to purchase Smart Snack compliant beverages at some machines, less than 40% of total beverages purchased were compliant.

Now is the time for university foodservice management administrators to champion change by taking the lead in fostering healthy food offerings in all food venues. Strategies to improve the university food nutrition environment can begin with benchmark assessments of the various food venues and their healthy food offerings. These assessments can provide valuable input to university administrators, campus wellness programs, and students who want to establish campus policies to promote healthful eating (Byrd-Bredbenner et al., 2012). Improvement can begin by using a multi-layered approach of 1) providing a greater number of healthier

options in vending machines and/or, providing dedicated machines with only healthy options, 2) marketing healthy options by providing nutrition information and education to students, and 3) incorporating pricing strategies to encourage healthy selections. Vending machines could be viewed as a tool available for teaching and supporting students in healthy eating habits. However, it most likely will take financial and policy support by university administrations to improve the nutritional quality of campus food and beverage vending.

Data collection for this research was limited to only two southern universities and a small percentage of university students so it cannot be generalized to the overall university population or to other individual universities. While data was collected on students' ranking of reasons they purchased from vending machines, a more in-depth investigation as to the importance and influence of their reasons for purchasing vending items would provide greater insight on how changes can be made to motivate students to purchase healthier items. Additionally students were not asked what type of nutrition information they would like or what would influence them to select healthier items. Assessing and addressing students' nutrition education needs and best delivery methods could facilitate the demand by students for healthier vending options. Data was not collected from vending machines housed in restricted access buildings such as campus housing. Students who have access to vending machines 24 hours a day may have different reasons for purchasing vending items.

Further research should address these limitations in an effort to improve the nutritional make-up in the vending items students are purchasing. In addition, efforts should be made to address other campus food venues, assessing the nutrition environment as a whole and students' overall access to healthier food items.

REFERENCES

- Ali, H. I., Jarrar, A. H., Abo-El-Enen, M., Al Shamsi, M., & Al Ashqar, H. (2015). Students' perspectives on promoting healthful food choices from campus vending machines: a qualitative interview study. *BMC Public Health, 15*, 512. <http://doi.org/10.1186/s12889-015-1859-2>
- Alliance for a healthier generation. (n.d.). Alliance product calculator. Retrieved June 1, 2016, from https://www.healthiergeneration.org/take_action/schools/snacks_and_beverages/smart_snacks/alliance_product_calculator/
- American College Health Association. (2012). Healthy campus 2020: Student objectives. Retrieved June 1, 2016 from http://www.acha.org/HealthyCampus/Objectives/Student_Objectives/HealthyCampus/Student_Objectives.aspx?hkey=a9f191de-243b-41c6-b913-c012961ecab9
- Anderson, D. A., Shapiro, J. R., & Lundgren, J. D. (2003). The freshman year of college as a critical period for weight gain: An initial evaluation. *Eating Behaviors, 4*(4), 363–367. [http://doi.org/10.1016/S1471-0153\(03\)00030-8](http://doi.org/10.1016/S1471-0153(03)00030-8)
- Brown, M., V., Flint, M., & Fuqua, J. (2014). The effects of a nutrition education intervention on vending machine sales on a university campus. *Journal of American College Health, 62*(7), 512–516. <http://doi.org/10.1080/07448481.2014.920337>
- Byrd-Bredbenner, C., Johnson, M., Quick, V. M., Walsh, J., Greene, G. W., Hoerr, S., Horacek, T. M. (2012). Sweet and salty. An assessment of the snacks and beverages sold in vending machines on US post-secondary institution campuses. *Appetite, 58*(3), 1143–1151. <http://doi.org/10.1016/j.appet.2012.02.055>
- Caruso, M. L., Klein, E. G., & Kaye, G. (2014). Campus-based snack food vending consumption. *Journal of Nutrition Education and Behavior, 46*(5), 401–405. <http://doi.org/10.1016/j.jneb.2014.02.014>
- Crombie, A. P., Ilich, J. Z., Dutton, G. R., Pantan, L. B., & Abood, D. A. (2009). The freshman weight gain phenomenon revisited. *Nutrition Reviews, 67*(2), 83–94.
- Food and Nutrition Service: National school lunch program and school breakfast program: Nutrition standards for all foods sold in school as required by the Healthy, Hunger-Free Kids Act, 7 C.F.R. § 210.215 (2014).

- Retrieved September 15, 2015 at http://www.fns.usda.gov/sites/default/files/allfoods_flyer.pdf
- Food and Drug Administration. (2014). Food labeling: Calorie labeling of articles of food in vending machines. Retrieved September 15, 2015 at <https://www.federalregister.gov/regulations/0910-AG56/food-labeling-calorie-labeling-of-articles-of-food-sold-in-vending-machines>.
- French, S. A. (2003). Pricing effects on food choices. *The Journal of Nutrition*, 133(3), 841S–843S.
- Hennessy, E., Oh, A., Agurs-Collins, T., Chriqui, J. F., Mâsse, L. C., Moser, R. P., & Perna, F. (2014). State-level school competitive food and beverage laws are associated with children's weight status. *Journal of School Health*, 84(9), 609–616.
- Hoffman, D. J., Policastro, P., Quick, V., & Lee, S.-K. (2006). Changes in body weight and fat mass of men and women in the first year of college: A study of the "freshman 15." *Journal of American College Health*, 55(1), 41–46.
- Kicklighter, J. R., Koonce, V. J., Rosenbloom, C. A., & Commander, N. E. (2010). College freshmen perceptions of effective and ineffective aspects of nutrition education. *Journal of American College Health*, 59(2), 98–104.
- Kubik, M. Y., Lytle, L. A., & Farbakhsh, K. (2011). School and district wellness councils and availability of low-nutrient, energy-dense vending fare in Minnesota middle and high schools. *Journal of the American Dietetic Association*, 111(1), 150–155.
- LaFountaine, J., Neisen, M., & Parsons, R. (2006). Wellness factors in first year college students. *American Journal of Health Studies*, 21(4), 214–218.
- Lyn, R., O'Meara, S., Hepburn, V. A., & Potter, A. (2012). Statewide evaluation of local wellness policies in Georgia: An examination of policy compliance, policy strength, and associated factors. *Journal of Nutrition Education and Behavior*, 44(6), 513–520.
- Metos, J., & Nanney, M. S. (2007). The strength of school wellness policies: One state's experience. *Journal of School Health*, 77(7), 367–372. <http://doi.org/10.1111/j.1746-1561.2007.00221.x>
- Mihalopoulos, N. L., Auinger, P., & Klein, J. D. (2008). The freshman 15: Is it real? *Journal of American College Health*, 56(5), 531–534.
- Nickelson, J., Roseman, M. G., & Forthofer, M. S. (2010). Associations between parental limits, school vending machine purchases, and soft drink consumption among Kentucky middle school students. *Journal of Nutrition Education and Behavior*, 42(2), 115–122.
- National Center for Education Statistics. (2016). Digest of education statistics. Retrieved May 1, 2017 from https://nces.ed.gov/programs/digest/d16/tables/dt16_105.20.asp?current=yes
- Park, S., Sappenfield, W. M., Huang, Y., Sherry, B., & Bensyl, D. M. (2010). The impact of the availability of school vending machines on eating behavior during lunch: The youth physical activity and nutrition survey. *Journal of the American Dietetic Association*, 110(10), 1532–1536.
- Pelletier, J. E., & Laska, M. N. (2013). Campus food and beverage purchases are associated with indicators of diet quality in college students living off campus. *American Journal of Health Promotion*, 28(2), 80–87.
- Schwarz, S., Levandoski, L., & Edelstein, S. (2014). Food selection among college women. *Journal of Foodservice Business Research*, 17(5), 439–449.
- Smith-Jackson, T., & Reel, J. J. (2012). Freshmen women and the "freshman 15." Perspectives on prevalence and causes of college weight gain. *Journal of American College Health*, 60(1), 14–20.
- Snelling, A. M., & Kennard, T. (2009). The impact of nutrition standards on competitive food offerings and purchasing behaviors of high school students. *Journal of School Health*, 79(11), 541–546.
- Surgeon General. (2014, April). National prevention council action plan: Implementing the national prevention strategy. Retrieved July 6, 2015 from <http://www.surgeongeneral.gov/priorities/prevention/about/actionplan.html>