RESEARCH
Original Research: Brief

Factors Related to the High Rates of Food Insecurity among Diverse, Urban College Freshmen

Meg Bruening, PhD, MPH, RD; Stephanie Brennhofer, MS, DTR; Irene van Woerden, MS; Michael Todd, PhD; Melissa Laska, PhD, RD

ARTICLE INFORMATION

Article history:
Submitted 1 December 2015
Accepted 4 April 2016
Available online 18 May 2016

Keywords:
Food insecurity
College students
Eating behaviors
Obesity

http://dx.doi.org/10.1016/j.jand.2016.04.004

ABSTRACT

Background Food insecurity is a persistent public health concern; however, few studies have examined the factors related to food insecurity among college students, particularly college freshmen living in dormitories.

Objective Our aim was to examine the prevalence of food insecurity and associations with health outcomes among college freshmen.

Design A diverse sample of freshmen (n=209) attending a large southwestern university and living in campus residence halls completed online surveys. Anthropometrics were measured by trained staff.

Statistical analyses Using mixed logistic regression, associations were examined between food insecurity and health outcomes, adjusting for sociodemographic characteristics and clustering of students within residence halls.

Results Food insecurity was prevalent, with 32% reporting inconsistent access to food in the past month and 37% in the past 3 months. Food-insecure freshmen had higher odds of depression (odds ratio=2.97; 95% CI 1.58 to 5.60) compared to food-secure students. Food-insecure freshmen had significantly lower odds of eating breakfast, consuming home-cooked meals, perceiving their off-campus eating habits to be healthy, and receiving food from parents ($P<0.05$).

Conclusions Interventions are needed to support students struggling with food insecurity, as it is related to health outcomes.
J Acad Nutr Diet. 2016;116:1450-1457.

FOOD INSECURITY, OR THE LACK OF CONSISTENT access to healthy, safe food, is a critical public health problem facing 48.1 million American households.[1] Food insecurity has been associated with poor nutritional health,[2] increased risk of obesity for some,[3] and chronic disease.[4] Although post-secondary education might once have been primarily accessible to only higher socioeconomic groups, higher education is becoming more and more accessible to all populations, including those from low-income households.[5-8] Transitioning to college comes with new independence and stressors,[9,10] including shifts in financial burdens,[11,12] which can result in higher rates of food insecurity. Others have shown that health disparities are prevalent in college populations[13,14]; however, very few studies have been conducted on food insecurity in US college students.[15,16]

To date, there has been limited scientific work on food insecurity among college students, and that work has focused almost exclusively on demographic and economic correlates. Food-insecure students face multiple social and economic barriers that may be related to their health and well-being. For example, food insecurity has been shown to be 1.5 times higher among black and Hispanic students compared to white or Asian students.[17] Food-insecure students were more likely to receive financial aid,[15] not live with family,[14,18,19] to have jobs while taking classes,[17,19] and to have lower grades.[16]

To a limited extent, food insecurity has been shown to be associated with some aspects of health among college students. To date, there has only been one peer-reviewed study of food insecurity and health correlates among US college students.[16] This cross-sectional study found that food-insecure students were more likely to report their health as being "fair" or "poor." Studies from Australia have shown lower fruit and vegetable consumption among food-insecure students[2] and null associations between weight status and food insecurity.[2,19] Although it is likely that college students in other international settings may differ from those in the United States, more research is needed in this area.

Of the three published peer-reviewed studies on food insecurity among US college students,[14-16] two excluded college freshmen entirely,[14,15] and none examined food insecurity specifically among college freshmen living in residence halls. Given the multiple changes occurring during the transition from high school to college and the move away from home, freshmen residing in residence halls may be an important population to study. For many students, this transitional period marks the first time they have had to make decisions and solve problems without assistance from

their parents. Their newfound autonomy is coupled with the everyday stressors of a new environment, school, and social pressures.[20] The primary purpose of this study was to describe the prevalence of food insecurity among college freshmen living in residence halls in an urban setting at one of the largest, most diverse public universities in the United States. This study also examined differences between food-secure and food-insecure college freshmen on health behaviors and outcomes. Findings will help guide prevention and intervention efforts, as well as future research, for this vulnerable population.

METHODS

Study Design

This article is based on a secondary analysis of data from a pilot study for a large, National Institutes of Health–funded study, SPARC (Social Impact of Physical Activity and Nutrition in College), aimed at assessing the nutrition and physical activity behaviors of college freshmen. College freshmen living in two residence halls during the fall and spring of the 2014-2015 academic year were recruited to participate via floor meetings held at the residence halls. In total, 533 students were living in the two residence halls. Of those, 278 (52.2%) attended their floor meetings, where they were invited to participate in the study. The participation rate among those who were invited was 79.5% (n=221); the overall student response rate from the two residence halls was 41.5% (221 of 533). The demographic characteristics of the students participating compared to those in the overall population of students living in the targeted residence halls were slightly more diverse, with 53.6% nonwhite participants vs 47.7% nonwhite, respectively. Participants were compensated up to $50. All study protocols were approved by the Arizona State University Institutional Review Board.

Measures

All participants completed a 128-item online survey with questions on demographic characteristics, dietary, and physical activity behaviors, and social-environmental factors related to nutrition, physical activity, and weight. The survey took approximately 25 to 30 minutes to complete. One week after the initial survey, the questionnaire was administered to a subsample (n=55), and test–retest correlations were computed (Table 1). In addition to the survey measures, trained researchers measured participant weight and height using standard research protocols. Of the 221 students who responded to the survey, 11 students who were not freshman and one transgender participant were removed, yielding an analytic sample of 209 respondents.

Food Insecurity. The measure of food insecurity used was adapted from the US Household Food Security Survey Model[21] and a validated two-item screening instrument.[22] In order to understand the temporality of changes related to food insecurity that can occur during the freshman year in college, the time frame in the validated question was adapted[23] and the framing of the question was changed from "we" to "I." Participants were asked, "Within the past month, I worried whether my food would run out before I got money to buy more" and, "Within the past month, the food I bought just did not last and I did not have money to get more." Participants were asked the same question again, but with a 3-month reference frame. Students giving an affirmative answer to either question were categorized as food insecure in the past month or the past 3 months, respectively.

Weight Status. Participant weight and height were measured by trained research assistants. Weight was recorded to the nearest 0.1 kg using portable Seca flat scales (models 874 or 869) and height to the nearest 0.1 cm using portable Seca stadiometers (model 217). If the two weights or heights were off by >0.5 kg or >0.5 cm, respectively, a third weight or height was taken. Body mass index was calculated using weight and height measurements. Participants with a body mass index ≥25 were classified as overweight/obese.[24]

Health Behaviors. An array of health behaviors and attributes were assessed using survey items adapted from those used in national surveillance systems or other large-scale research efforts in the United States (Table 1). Participants' consumption of breakfast, fast food, and home-cooked meals were assessed. These measures of eating behaviors were then dichotomized at the medians. The breakfast measure was coded as 4 or more days per week vs less. Fast food and home-cooked meals were coded as 2 or more days per week vs less. Fruit and vegetable intake items were summed, and dichotomized to five or more fruits and vegetables per day vs less. Participants rated their perception of the healthfulness of their eating behaviors on and off campus.[25] These items were recoded to percent agree vs percent disagree. Participants who reported ever having consumed alcohol were asked about their binge-drinking habits.[26] Responses were converted to presence (yes/no) of binge drinking.

Access to Food from Parents. Participants were also asked about access to food from parents (see Table 1); responses were dichotomized to two or more times per semester vs less.

Mental Health. Stress, depression, and anxiety were three mental health disorders investigated in this study.[27,28] The response options for the stress and depression scales were changed slightly from the original items (from never/almost never/sometimes/fairly often/very often to never/rarely/sometimes/often).

Sociodemographic Characteristics. Data on participants' sex, age, race/ethnicity, meal plan, Pell grant status, highest parental education, and current residence hall were collected. Age was determined from the participant's date of birth. Every participant was asked if he or she was a Pell grant recipient, with responses coded as yes or no. Due to low numbers in some categories, race/ethnicity was categorized as Hispanic or non-Hispanic white, non-Hispanic black, non-Hispanic Asian, and mixed/other.[29] Students were asked to indicate which meal plan they were enrolled in, ranging from 8 meals per week to unlimited meals.[30] Participants were asked to report the highest level of education attained by their parents using seven response options, which were then grouped by the highest educational level attained by either parent: high school or less, some college, and bachelor's degree or higher.

Table 1. Key measures and test−retest correlations[a] used to examine the association between food insecurity and health behaviors among college freshmen

Variables	Measure	Test−retest (n=55)
Breakfast consumption	In the past 7 days, how often did you eat breakfast? (Response options: never, 1 day, 2 to 3 days, 4 to 6 days, and every day)	0.79
Fast-food consumption	In the past 7 days, how often did you eat fast food? (Response options: never, 1 day, 2 to 3 days, 4 to 6 days, and every day)	0.60
Home-cooked meals eaten	In the past 7 days, how often did you eat home cooked meals? (Response options: never, 1 day, 2 to 3 days, 4 to 6 days, and every day)	0.58
Fruit consumption	Thinking back over the past week, how many servings of fruit did you usually eat on a typical day? (A serving is half a cup of fruit or 100% fruit juice or a medium piece of fruit.) (Response options: 0 to 6 or more servings per day)	0.63
Vegetable consumption	Thinking back over the past week, how many servings of vegetables did you usually eat on a typical day? (A serving is $^1/_2$ cup of cooked vegetables or 1 cup raw) (Response options: 0 to 6 or more servings per day)	0.60
Healthy eating habits on campus	How would you rate your eating habits on campus? (Response options: very unhealthy, unhealthy, healthy, very healthy)	0.64
Healthy eating habits off campus	How would you rate your eating habits off campus? (Response options: very unhealthy, unhealthy, healthy, very healthy)	0.67
Binge drinking	During the last 2 weeks, how many times have you had four/five alcoholic drinks in a row?[b] (Response options: never to 4 or more days)	0.66
Parents purchase/send food	How often do your parents/guardians typically purchase or send food for you? (Response options: never, once per semester, 2 to 3 times per semester, monthly, weekly)	0.61
Stress levels	How often in the past 1 month have you felt: 1) Unable to control the important things in your life; 2) Confident about your ability to handle your personal problems?; 3) Things were going your way?; 4) Difficulties were piling up so high that you could not overcome them? (Response options: never, rarely, sometimes, often)	0.74
Depression levels	How often in the past 1 month have you felt: 1) Things were hopeless; 2) Overwhelmed by all you had to do; 3) Very lonely?; 4) Very sad; 5) So depressed that it was difficult to function?; 6) Overwhelming anxiety? (Response options: never, rarely, sometimes, often)	0.89
Anxiety (diagnosed/treated in past 12 months)	In the past 12 months, have you been told by a doctor or health care professional that you have anxiety? (Response options: no; yes, diagnosed and treated; yes, diagnosed; yes, treated)	0.71

[a]Test−retest correlations based on a subsample (n=55) who took the survey a second time 1 week after their original responses.
[b]Females are asked about four drinks; males are asked about five drinks.

Statistical Analysis

χ^2 and *t*-tests were used to examine bivariate associations of weight status, health behaviors, frequency of parents providing food, mental health variables, and sociodemographic factors with food insecurity. Mixed-effects logistic regressions were then used to model the association of food insecurity with measures of weight status, eating behaviors, frequency of parents providing food, and mental health variables, adjusted for sex, age, race/ethnicity, meal plan, Pell grant status, highest parental education, and the clustering of students within residence halls. Covariates were treated as fixed effects and residence hall-level intercepts were treated as random effects. All analyses were conducted using R statistical software (version 3.2.3, 2015). Statistical significance was determined at $P<0.05$.

RESULTS

Data were collected from 209 college freshmen (mean age=18.8±0.5 years; 62% female; Table 2). The percentage of participants who reported food insecurity in the previous month was 32% (data not shown), and 37% of participants reported food insecurity in the previous 3 months. There

were no differences in the odds of reported food insecurity by overweight status, reported healthy eating on campus, or stress. Bivariate analyses, however, showed that students who rarely consumed breakfast, students who rarely ate home-cooked meals, and students with higher levels of depression were significantly more likely to report food insecurity in the past 3 months ($P<0.05$; Table 2). Students who often consumed fast food, who reported unhealthy eating habits off campus, and whose parents did not regularly send/purchase food for them were more likely to report food insecurity in the last 3 months ($P=0.09$, $P=0.07$, and $P=0.10$, respectively).

Multivariate analyses show that students reporting food insecurity in the past 3 months, compared with those who did not report food insecurity, had significantly higher odds of reporting depression (odds ratio [OR]=2.97; 95% CI 1.58 to 5.60; Table 3) and anxiety (OR=1.49; 95% CI 0.99 to 6.66). The odds of consuming regular breakfast (OR=0.41; 95% CI 0.22 to 0.77) and healthy eating off campus (OR=0.46; 95% CI 0.24 to 0.88) were inversely related to food insecurity. Associations of food insecurity with being overweight, fast-food consumption, fruit and vegetable consumption, healthy eating on campus, binge drinking, and stress were not significant.

DISCUSSION

This study examined the prevalence of food insecurity and its association with health outcomes among a diverse group of college freshmen living in residence halls. One in three students reported being food insecure, and food insecurity was associated with higher odds of mental health issues, unhealthy eating, and alcohol use behaviors. Findings provide insights on an understudied population in need of additional support to prevent adverse outcomes related to food insecurity.

Because college freshmen living in residence halls have access to institutional supports—including personnel and programming dedicated to assisting them with the transition to university life; safe, high-quality housing; and university meal plans—they may be perceived as being protected from stressors that are often linked to poverty, such as food insecurity. Despite having access to these resources, one-third of the college freshmen in this study reported inadequate access to food, similar to the rates that others have reported in college populations in both peer-reviewed and non–peer-reviewed literature,[14,15,17] and significantly higher than the national average for children and adults.[1]

Dealing with food insecurity has significant implications that can affect the long-term health and well-being of students. For example, among children, adolescents, and college students, food insecurity has been linked to poorer academic success.[16] Among adults, food insecurity has been related to higher risk of poor dietary quality, binge eating, chronic disease, and lower work productivity.[4,31,32] Given that this study found the odds of anxiety and depression to be almost 3 times as high among food-insecure freshmen compared with their peers, it is important to consider how the combination of food insecurity and mental health issues might affect learning and ultimate success as a student. More studies are needed to examine the relationship of food insecurity to academic achievement among college students, as well as long-term health and career effects. In addition, students reporting mental health issues also report higher levels of emotional eating,[33] which might, in turn, impact their weight gain during college.[34] While a relationship between food insecurity and weight status was not observed in this cross-sectional study, over time, it is possible that the unhealthy eating behaviors reported by food insecure freshmen in the current study may result in excess weight gain. Future research should examine the longitudinal effects of food insecurity on weight and weight-related behaviors, at least through the freshmen year and until graduation.

Food-insecure students likely do not have the resources to fulfill their needs (eg, money for higher-priced meal plan, material support from family).[15] As higher education becomes more accessible, college student populations are becoming more diverse, with more first-generation college students[6] who, along with their families, might need even more support navigating the transition to college life.[35] Unlike kindergarten through grade 12 schools, where food is provided to students at free/reduced rates for those in need,[36] many universities have limited supports for students who are in need of food assistance. Some universities have instituted innovative solutions, such as on-site food pantries for students who do not have consistent access to food.[37] While emergency food (food pantries and food banks) provide short-term solutions for students in need, systems providing long-term benefits (eg, budgeting and meal-planning skills), which can better support students in need, should be developed and tested. For example, universities could test the effectiveness of more affordable meal plans with minimum requirements that would cover all meals and/or subsidized breakfast or lunches for students to increase students' access to healthy food (as the National School Lunch Program does for low-income kindergarten through grade 12 students). Given decreased public funding for higher education, stakeholder buy-in and creative funding solutions would need to be explored. More opportunities for work placement through university and/or community partnerships may also be effective in addressing potential income shortfalls that students might face. Finally, considerations for expanding the student eligibility criteria[38] for participation in the Supplemental Nutrition Assistance Program can be helpful in decreasing food insecurity among college students.

Limitations

With a cross-sectional survey conducted in a convenience sample, this study has several limitations. The lack of temporally ordered measurement precludes making any causal statements, and findings might not be generalizable to other populations of college freshmen or college students (eg, students at private institutions). All items were self-reported and might be prone to recall and social desirability biases, as well as misinterpretation of questions (eg, students may have perceived dining hall food to be "home cooked"); however, test–retest reliabilities for the study measures were generally good. The food-insecurity items used in this study have been validated among adults with children using a different time frame[22]; college students may respond to these items differently. Despite the limitations of this work, this study yields important contributions to the

Table 2. Demographics and key nutrition/health variables by food-security status in the past 3 months among college freshmen (n=209)

Variable	Total (n=209)	Food secure (n=131 [63%])	Food insecure (n=78 [37%])	*P* value[a]
Sex, n (%)				1.00
Male	79 (38)	50 (38)	29 (37)	
Female	130 (62)	81 (62)	49 (63)	
Age, y, mean±SD	18.8±0.5	18.8±0.4	18.8±0.5	0.98
Race/ethnicity, n (%)				0.12
Hispanic	56 (27)	33 (25)	23 (29)	
Non-Hispanic white	97 (46)	61 (47)	36 (46)	
Non-Hispanic black	13 (6)	5 (4)	8 (10)	
Non-Hispanic Asian	26 (12)	21 (16)	5 (6)	
Mixed/other	17 (8)	11 (8)	6 (8)	
Meal plan, >8 meals/wk, n (%)	132 (63)	84 (64)	48 (62)	0.82
Pell Grant status, yes, n (%)	73 (35)	41 (31)	32 (41)	0.20
Highest parental degree, n (%)				0.18
High school or less	37 (18)	28 (21)	9 (12)	
Some college	63 (30)	39 (30)	24 (31)	
Bachelor's degree or higher	109 (52)	64 (49)	45 (58)	
Residence hall, n (%)				0.02
A	98 (47)	53 (40)	45 (58)	
B	111 (53)	78 (60)	33 (42)	
Overweight/obese, n (%)	70 (33)	39 (30)	31 (40)	0.18
Breakfast consumption				
Mean±SD	3.58±2.54	3.94±2.58	2.96±2.35	0.01
4+ d/wk, n (%)	89 (43)	65 (50)	24 (31)	0.01
Fast-food consumption				
Mean±SD	1.50±1.58	1.32±1.44	1.81±1.77	0.04
2+ d/wk, n (%)	77 (37)	42 (32)	35 (45)	0.09
Home-cooked meals eaten				
Mean±SD	1.66±2.05	1.95±2.15	1.17±1.78	0.01
2+ d/wk, n (%)	73 (35)	56 (43)	17 (22)	<0.01
Fruit and vegetable consumption				
Mean±SD	3.60±2.42	3.78±2.52	3.28±2.23	0.14
5+ servings/d, n (%)	65 (31)	46 (35)	19 (24)	0.14
Healthy eating habits on campus, agree, n (%)	117 (56)	76 (58)	41 (53)	0.53
Healthy eating habits off campus, agree, n (%)	133 (64)	90 (69)	43 (55)	0.07
Binge drinking (past 2 wk), yes, n (%)	79 (38)	50 (38)	29 (37)	1.00
Parents purchase/send food (times/semester)				
Mean±SD	2.96±1.43	3.05±1.38	2.81±1.50	0.26
n (%)	134 (64)	90 (69)	44 (56)	0.10

(*continued on next page*)

Table 2. Demographics and key nutrition/health variables by food-security status in the past 3 months among college freshmen (n=209) (*continued*)

Variable	Total (n=209)	Food secure (n=131 [63%])	Food insecure (n=78 [37%])	*P* value[a]
Stress levels[bc]				
Mean±SD	2.22±0.64	2.14±0.61	2.37±0.67	0.01
High, n (%)	81 (39)	47 (36)	34 (44)	0.30
Depression levels[bc]				
Mean±SD	2.18±0.78	2.06±0.75	2.40±0.80	<0.01
High, n (%)	70 (34)	32 (24)	38 (49)	<0.01
Anxiety (diagnosed/treated in past 12 mo), yes, n (%)[b]	24 (12)	12 (9)	12 (16)	0.24

[a]χ^2 and *t*-test *P* values compare the difference by food-security status and demographic characteristics and key variables.
[b]Total=208 due to 1 respondent with missing values.
[c]On a scale of 1 to 4, with higher numbers indicating more stress and depression. The score was dichotomized at 2.5 based on the sample distribution, with scores ≥2.5 categorized as high.

field, particularly given the paucity of research to date on the issue of food insecurity among college students.

CONCLUSIONS

A significant portion of college freshmen living in residence halls may face food insecurity. When addressing healthy eating with college students, considerations should be made for their limited resources. It cannot be assumed that these students have access to high-quality foods, and may even be struggling with regular access to food. College students have a reputation for engaging in unhealthy eating habits. These habits may reflect, in part, choices based on barriers to healthier eating, including lack of consistent

Table 3. Multivariate mixed-effects logistic regression examining the association between food insecurity in the past 3 months and nutrition/health outcomes among college freshmen (n=209)[a]

Variable	Odds ratio	95% CI	*P* value
Weight status			
Overweight/obese (BMI≥25)	1.37	0.73 to 2.58	0.33
Health behaviors			
Consume breakfast ≥4×/wk	0.41	0.22 to 0.77	0.01
Consume fast food ≥2×/wk	1.63	0.87 to 3.06	0.13
Consume home-cooked meals ≥2×/wk	0.34	0.16 to 0.72	<0.01
Consume ≥5 fruit and vegetables/d	0.58	0.30 to 1.13	0.11
Healthy eating habits on campus[b] (agree)	0.81	0.44 to 1.47	0.48
Healthy eating habits off campus[b] (agree)	0.46	0.24 to 0.88	0.02
Reported binge drinking in last 2 wk	0.93	0.49 to 1.79	0.84
Food access			
Parents purchase/send food ≥2×/semester	0.51	0.28 to 0.94	0.03
Mental health			
High stress levels (high)[c]	1.42	0.77 to 2.60	0.26
High depression levels (high)[c]	2.97	1.58 to 5.60	<0.01
Anxiety (diagnosed/treated in past 12 mo)	1.49	0.99 to 6.66	0.05

[a]Model controlled for sex, age, race/ethnicity, meal plan, Pell Grant status, highest parental education, and clustering within residence hall.
[b]Participants reported perceptions of their healthy eating on and off campus, which was recoded to agree vs disagree.
[c]On a scale of 1 to 4, with higher numbers indicating more stress and depression. The score was dichotomized at 2.5 based on the sample distribution, with scores of 2.5 and higher categorized as high.

access to affordable, nutritious food. More research is needed to understand the scope of the prevalence of food insecurity among college students. Regardless, interventions are needed to better support young people in college who have inconsistent access to healthy foods.

References

1. Coleman-Jensen A, Rabbitt M, Gregory C, Singh A. Household food security in the United States in 2014. US Department of Agriculture, Economic Research Service website. http://www.ers.usda.gov/media/1896841/err194.pdf. Published September 2015. Accessed December 2, 2015.
2. Gallegos D, Ramsey R, Ong KW. Food insecurity: Is it an issue among tertiary students? *J High Educ*. 2014;67(5):497-510.
3. Martin KS, Ferris AM. Food insecurity and gender are risk factors for obesity. *J Nutr Educ Behav*. 2007;39(1):31-36.
4. Seligman HK, Laraia BA, Kushel MB. Food insecurity is associated with chronic disease among low-income NHANES participants. *J Nutr*. 2010;140(2):304-310.
5. Prescott BT, Bransberger P. Knocking at the college door: Projections of high school graduates. 8 ed. Western Interstate Commission for Higher Education website. http://www.wiche.edu/info/publications/knocking-8th/knocking-8th.pdf. Published December 2012. Accessed December 5, 2015.
6. Engle J, Tinto V. Moving beyond access: College success for low-income, first-generation students. Pell Institute for the Study of Opportunity in Higher Education website. http://www.pellinstitute.org/downloads/publications-Moving_Beyond_ Access_2008.pdf. Published 2008. Accessed December 5, 2015.
7. Pryor JH, Hurtado S, Saenz VB, Santos JL, Korn WS. The American freshman: Forty year trends: 1966-2006. Higher Education Research Institute at UCLA website. http://www.heri.ucla.edu/PDFs/pubs/briefs/40yrTrendsResearchBrief.pdf. Published January 2008. Accessed January 31, 2016.
8. Eagan K, Stolzenberg E, Ramirez J, Aragon MC, Suchard RS, Hurtado S. The American Freshman: National Norms Fall 2014. Cooperative Institutional Research Program at the Higher Education Research Institute at UCLA website. http://www.heri.ucla.edu/monographs/theamericanfreshman2014.pdf. Published 2014. Accessed January 30, 2016.
9. Pancer SM, Hunsberger B, Pratt MW, Alisat S. Cognitive complexity of expectations and adjustment to university in the first year. *J Adolesc Res*. 2000;15(1):38-57.
10. Kerr S, Johnson VK, Gans SE, Krumrine J. Predicting adjustment during the transition to college: Alexithymia, perceived stress, and psychological symptoms. *J Coll Stud Dev*. 2004;45(6):593-611.
11. Cason KL, Wenrich TR. Health and nutrition beliefs, attitudes, and practices of undergraduate college students: A needs assessment. *Top Clin Nutr*. 2002;17(3):52-70.
12. Greaney ML, Less FD, White AA, et al. College students' barriers and enablers for healthful weight management: A qualitative study. *J Nutr Educ Behav*. 2009;41(4):281-286.
13. Nelson TF, Gortmaker SL, Subramanian S, Cheung L, Wechsler H. Disparities in overweight and obesity among US college students. *Am J Health Behav*. 2007;31(4):363-373.
14. Chaparro PM, Zaghloul SS, Holck P, Dobbs J. Food insecurity prevalence among college students at the University of Hawai'i at Mānoa. *Public Health Nutr*. 2009;12(11):2097-2103.
15. Gaines A, Robb CA, Knol LL, Sickler S. Examining the role of financial factors, resources and skills in predicting food security status among college students. *Int J Consum Stud*. 2014;38(4):374-384.
16. Patton-López MM, López-Cevallos DF, Cancel-Tirado DI, Vazquez L. Prevalence and correlates of food insecurity among students attending a midsize rural university in Oregon. *J Nutr Educ Behav*. 2014;46(3):209-214.
17. Freudenberg N, Manzo L, Jones H, Kwan A, Tsui E, Gagnon M. Food insecurity at CUNY: Results from a survey of CUNY undergraduate students. Campaign for a Healthy CUNY. City University of New York website. http://www.gc.cuny.edu/CUNY_GC/ media/CUNY-Graduate-Center/PDF/Centers/Center%20for%20Human%20Environments/cuny-foodinsecurity.pdf. Published April 2011. Accessed September 18, 2015.
18. Micevski DA, Thornton LE, Brockington S. Food insecurity among university students in Victoria: A pilot study. *Nutr Diet*. 2014;71(4):258-264.
19. Hughes R, Serebryanikova I, Donaldson K, Leveritt M. Student food insecurity: The skeleton in the university closet. *Nutr Diet*. 2011;68(1):27-32.
20. Parker JD, Summerfeldt LJ, Hogan MJ, Majeski SA. Emotional intelligence and academic success: Examining the transition from high school to university. *Pers Individ Dif*. 2004;36(1):163-172.
21. US Department of Agriculture Economic Research Service. US Household Food Security Survey Module: Three-Stage Design, With Screeners. US Department of Agriculture website. http://www.ers.usda.gov/datafiles/Food_Security_ in_the_United_States/Food_Security_Survey_Modules/hh2012.pdf. Published September 2012. Accessed September 19, 2015.
22. Hager ER, Quigg AM, Black MM, et al. Development and validity of a 2-item screen to identify families at risk for food insecurity. *Pediatrics*. 2010;126(1):26-32.
23. US Department of Agriculture Economic Research Service. Guide to Measuring Household Food Security. US Department of Agriculture website. http://www.fns.usda.gov/guide-measuring-household-food-security-revised-2000. Published October 2013. Accessed September 19, 2015.
24. Centers for Disease Control and Prevention. About child & teen BMI. http://www.cdc.gov/healthyweight/assessing/bmi/childrens_bmi/about_childrens_bmi.html. Revised May 15, 2015. Accessed January 13, 2016.
25. Silliman K, Rodas-Fortier K, Neyman M. A survey of dietary and exercise habits and perceived barriers to following a healthy lifestyle in a college population. *Calif J Health Promot*. 2004;2(2):10-19.
26. Wechsler H, Davenport A, Dowdall G, Moeykens B, Castillo S. Health and behavioral consequences of binge drinking in college: A national survey of students at 140 campuses. *JAMA*. 1994;272(21):1672-1677.
27. Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. *J Health Soc Behav*. 1983;224(4):385-396.
28. American College Health Association, National College Health Assessment II. Spring 2013 Reference Group Data Report. http://www.acha-ncha.org/docs/ACHA-NCHA-II_ReferenceGroup_DataReport_Spring2013.pdf. Published 2013. Accessed October 17, 2015.
29. US Department of Commerce. United States Census 2010. US Census Bureau website. https://www.census.gov/schools/pdf/2010form_info.pdf. Published September 2008. Accessed September 17, 2015.
30. Arizona State University. Resident meal plans at ASU Tempe campus. http://sundevildining.asu.edu/tempe/mealplans/resident. Published 2014. Accessed July 16, 2014.
31. Bruening M, MacLehose R, Loth K, Story M, Neumark-Sztainer D. Feeding a family in a recession: Food insecurity among Minnesota parents. *Am J Public Health*. 2012;102(3):520-526.
32. Nord M. Food insecurity in households with children: Prevalence, severity, and household characteristics: US Department of Agriculture website. http://www.ers.usda.gov/publications/eib-economic-information-bulletin/eib56.aspx. Published September 2009. Revised May 26, 2012. Accessed December 5, 2015.
33. Bennett J, Greene G, Schwartz-Barcott D. Perceptions of emotional eating behavior. A qualitative study of college students. *Appetite*. 2013;60(1):187-192.
34. Gropper SS, Simmons KP, Gaines A, et al. The freshman 15—A closer look. *J Am Coll Health*. 2009;58(3):223-231.
35. McCarron GP, Inkelas KK. The gap between educational aspirations and attainment for first-generation college students and the role of parental involvement. *J Coll Student Dev*. 2006;47(5):534-549.
36. US Department of Agriculture. School Meals. Healthy Hunger-Free Kids Act. http://www.fns.usda.gov/school-meals/healthy-hunger-free-kids-act. Published March 2014. Accessed November 18, 2015.
37. Jordan M. Colleges launch food pantries to help low-income students. *The Wall Street Journal* website. http://www.wsj.com/articles/colleges-launch-food-pantries-to-help-low-income-students-1428408001. Published April 2015. Accessed September 17, 2015.
38. US Department of Agriculture. Supplemental Nutrition Assistance Program (SNAP): Students. http://www.fns.usda.gov/snap/students. Published October 2015. Accessed November 2, 2015.

AUTHOR INFORMATION

M. Bruening is an assistant professor, S. Brennhofer and I. van Woerden are graduate students, and M. Todd is an associate professor of research, Arizona State University, Phoenix. M. Laska is an associate professor, University of Minnesota, Minneapolis.

Address correspondence to: Meg Bruening, PhD, MPH, RD, Arizona State University, 500 N 3rd St, Phoenix, AZ 85004. E-mail: meg.bruening@asu.edu

STATEMENT OF POTENTIAL CONFLICT OF INTEREST

No potential conflict of interest was reported by the authors.

FUNDING/SUPPORT

This study was supported by the National Institutes of Health Common Fund from the Office of the Director and the Office of Behavioral and Social Sciences Research, grant number 1DP5OD017910-01 (Principal Investigator: M. Bruening). The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institute of Health.

ACKNOWLEDGEMENTS

The authors would like to thank the students for taking the time to participate in this study. We would like to thank the devilSPARC research team for their assistance in collecting the data.