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Associations between food security status and diet-related outcomes among students at a large, public Midwestern university

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Abstract

BACKGROUND—Food insecurity is a growing issue of concern on college campuses. While many studies have focused on predictors of food insecurity, fewer studies have examined how food insecurity affects diet and diet-related outcomes among college students.

OBJECTIVE—The objectives of this study were to examine differences in dietary intake, food and cooking agency, and body mass index by food security status in a sample of college students at a large, public Midwestern university

DESIGN—Cross-sectional online survey administered from March–June 2018.

PARTICIPANTS—Students were recruited from a random sample (n=2,000) provided by the university, which included an oversample of minority racial/ethnic students, from lower-income households, and first-generation students. The response rate was 43% (n=851). After excluding students with missing data, the final sample was 754 enrolled students.

MAIN OUTCOME MEASURES—Food security status was measured using the U.S. Adult Food Security Survey Module. Dietary intake was assessed using the National Cancer Institute dietary screener questionnaire. Cooking and food agency was measured using the Cooking and Food

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Provisioning Action Scale (CAFPAS), a new validated questionnaire. BMI was calculated from self-reported height and weight.

STATISTICAL ANALYSIS PERFORMED—Differences between food security categories and diet-related outcomes were examined using generalized linear models. Models adjusted for sociodemographic covariates, such as student's age, sex, race/ethnicity, and receipt of financial aid.

RESULTS—Compared to students with high food security, low food security was associated with lower intake of fruits, and very low food security was associated with higher intakes of total added sugar and added sugar from sugar-sweetened beverages. Marginal and very low food security were positively associated with BMI. Marginal, low, and very low food security were inversely associated with cooking and food agency.

CONCLUSION—Students with food insecurity experience diet-related challenges that could translate into health disparities over time. More research is needed to understand the longitudinal effects of food insecurity on student health and well-being.

Keywords

food insecurity; dietary intake; body mass index; cooking and food agency; college students

INTRODUCTION

Food insecurity, a condition of limited or uncertain access to nutritious food, is a critical socioeconomic issue that can lead to health disparities across the life course.[1] In 2017, 11.8% of US households were food insecure.[2] However, recent studies have demonstrated levels of food insecurity on college campuses three to four times higher than the general population.[3, 4] Because college represents a unique period when young adults attempt to gain upward economic and social mobility, food insecurity on college campuses is an alarming academic and health issue.

To date, much of the research of food insecurity among college students has focused on the prevalence and risk factors for food insecurity.[3] A report across 66 institutions from the Wisconsin HOPE lab estimated that almost half of students across all institutions were not able to afford balanced meals, and 25–31% of students skipped meals due to financial constraints.[4] In another report on food insecurity across the 10 University of California campuses, food insecurity was more common among students from underrepresented or disadvantaged backgrounds, including students of minority race/ethnicity, of older age, those who were financially independent from their parents, and students from low-income families.[5] These studies are important for identifying student groups to target with interventions. However, research is needed to understand how food insecurity is associated with health behaviors and health outcomes, specifically in the college population.

Food insecurity has also been associated with lower academic performance and poorer mental health among college students.[6–10] Fewer studies have examined associations between food insecurity and dietary intake, even though nutritional inadequacy and disrupted eating patterns are fundamental to the conceptualization of food insecurity.[2] In

previous studies, students experiencing food insecurity had lower intake of fruits and vegetables when compared to food-secure students, but associations with other foods or nutrients are unknown.[11–13] Furthermore, only two prior studies assessed dietary intake with a more comprehensive screener, while most studies have relied on self-reported intake of basic food groups. Other studies have examined associations between student food insecurity and diet-related outcomes –such as cooking efficacy and body mass index (BMI)– with mixed results.[7, 14–17] Differences in these associations may be attributed to the differential ways in which cooking efficacy is defined, such as the ability to prepare certain types of foods (e.g. vegetables), the ability to cook from scratch, or the ability to cook a healthy meal. A new method of examining cooking efficacy is through cooking and food agency, which is based on the intersection of one's abilities, skills, and social structure to provide them the agency or capacity to cook and prepare food.[18] The objectives of this study were to examine differences in dietary intake, food and cooking agency, and body mass index by food security status in a sample of college students at a large, public Midwestern university.

MATERIAL AND METHODS

Survey design and study population

An online (Qualtrics) survey was sent to a sample of 2,000 students enrolled during the Winter (January – April) 2018 term at the University of Michigan. The student sample was generated by the Office of the Registrar to include undergraduate, graduate, and professional degree students, with an oversample of students of minority race/ethnicity backgrounds, from households with incomes <$65,000, and first-generation college students. All students received a pre-survey notification e-mail, the survey link, and up to four reminder e-mails. In total, students had three weeks to complete the survey. Students were recruited in waves until all 2,000 students were contacted. Data collection occurred from March-June 2018.

Overall, 851 students responded, yielding a response rate of 43%. Informed consent was obtained at the beginning of the survey, and a second layer of consent was requested to link their survey responses to student record data from the Office of the Registrar to obtain demographic data. If consent for the latter was not provided, students had the option of self-reporting these variables in the first part of the survey. Among all respondents, 92% consented to link their survey responses to their data from the Office of the Registrar. Students received a $10 Amazon.com gift card upon completion of the survey. Respondents who had missing data for sex, race/ethnicity, degree type, residency, food security status, or the outcomes of the present study were excluded, yielding an analytic sample of 754 students. The study was approved by the Health Sciences and Behavioral Sciences Institutional Review Board (IRB-HSBS) at the University of Michigan.

Food security status

Food security status was measured using the 10-item U.S. Adult Food Security Survey Module.[19] Questions are ordered by severity and attribute experiences and behaviors to insufficient resources to acquire food over the past 12 months. Affirmative responses to the 10 items were summed to create a total score. Food security categories were assigned

according to USDA guidelines: high food security (score of 0), marginal food security (score of 1–2), low food security (score of 3–5), and very low food security (score of 6–10). Per USDA definitions, high food security refers to individuals who had no issues or anxiety about consistent food access. Marginal food security refers to individuals who may have worried about their food running out, but the quality and quantity of foods consumed was unaffected. Low food security refers to individuals who may have reduced the quality or diversity of foods consumed, but the quantity of foods consumed was unaffected. Very low food security refers to individuals whose quality, quantity, and diversity of foods consumed was disrupted due to insufficient resources. Food insecurity is used to refer to both categories of low and very low food security.

Outcomes

The three primary outcomes of interest were dietary intake, food and cooking agency, and body mass index.

Dietary intake was assessed using the National Cancer Institute (NCI) dietary screener questionnaire.[20] The NCI screener is comprised of 26 questions pertaining to how frequently specific foods and beverages are consumed over the past month. Predicted intakes of food groups and nutrients were estimated using publicly available scoring algorithms, which were developed from nationally representative dietary data and account for the participant's age and sex.[20] The dietary outcomes for analysis were intakes of fruits (in cup equivalents), vegetables (in cup equivalents), dairy (in cup equivalents), whole grains (in ounce equivalents), added sugars (in teaspoon equivalents), calcium (mg), and fiber (g). Cooking and food agency was measured using the Cooking and Food Provisioning Action Scale (CAFPAS).[18] CAFPAS is a 28-item scale that measures cooking and food agency through various statements about cooking and food provisions. Each item is rated on a 5-point Likert scale from strongly agree to strongly disagree. The measure can be divided onto three sub-scales: food self-efficacy (perception of cooking skills and food procurement, 13 items, Cronbach's alpha = 0.92), food attitudes (attitudes towards food and cooking, 10 items, Cronbach's alpha = 0.62), and structure (barriers to cooking and food preparation, 6 items, Cronbach's alpha = 0.77). An additional question, "My school responsibilities prevent me from having time to prepare meals," was added to the structure subscale. The scores of each sub-scale were standardized to facilitate comparison across sub-scales. The overall CAFPAS score (Cronbach's alpha = 0.87) represents the sum of the three standardized sub-scales, and a higher score is indicative of greater cooking and food agency. Body mass index (BMI) was calculated from self-reported height and weight.

Statistical analysis

Post-stratification weights were constructed to account for non-response and unequal representation by certain demographic groups among the survey respondents. Weights were constructed from all possible combinations of sex (male, female), race/ethnicity (White, Black, Asian, Hispanic, Other), residency (in-state, out-of-state), and degree type (undergraduate, graduate/professional) using data from the Office of the Registrar on student enrollment in the Winter 2018 term. These weights were applied to all subsequent analyses to generate results that were representative of the university student body (n=36,208).

Sociodemographic characteristics of students by food security categories were compared using chi-squared tests for categorical variables and univariate regression for continuous variables. Next, we compared dietary intake by food security categories using generalized linear models with a gamma distribution and log-link function to account for the skewed distributions of most dietary variables.[21] Relative differences are interpreted as the percentage difference between groups. To examine associations with cooking and food agency and BMI, multivariable-adjusted least squares means were estimated using generalized linear models with cooking and food agency or BMI as the outcomes and food security categories as the predictors. Adjustment for multiple comparisons were performed using the Tukey-Kramer method. Covariates in all models included student's age, sex, race/ethnicity, degree type, first generation student status, and receipt of financial aid, and were hypothesized to be potential confounders of the relationships between food security status and diet-related outcomes.

All statistical tests were two-sided and significance was considered at the $p < 0.05$ level. Statistical analyses were performed in SAS, version 9.4.

RESULTS

According to USDA categories for food security, 52.3% of students had high food security, 16.6% had marginal food security, 15.8% had low food security, and 15.3% had very low food security. Sociodemographic characteristics of students by food security status are shown in Table 1. Combined levels of marginal, low, and very low food security were higher among females, Non-Hispanic Black, Hispanic, and "other" race/ethnicity or multi-racial students, first-generation college students, and students who received financial aid.

Among all students, mean intakes of whole grains, fruits, and vegetables were low, while mean intakes of added sugar were high (Table 2). After adjustment for sociodemographic variables and multiple comparisons, there were significant differences in dietary intake by food security status. Students with very low food security had 9% lower intake of whole grains (95% CI −17%, 0%), 9% lower intake of fruits (95% CI −17%, −1%), 3% lower intake of fiber (95% CI −7%, −0%), 8% higher intake of total added sugar (95% CI 2%, 14%) and 21% higher intake of added sugar from sugar-sweetened beverages (95% CI 12%, 30%), compared to students with high food security. Differences in total added sugar and added sugar from sugar-sweetened beverages remained significant after adjustment for multiple comparisons. Similarly, students with low food security had 17% lower intake of fruits (95% CI −24%, −10%), 5% lower intake of vegetables (95% CI −9%, −0%) and 4% lower intake of calcium (95% CI −7%, −1%) when compared to students with high food security. After adjustment for multiple comparisons, fruit intake was significantly lower among students with low food security compared to marginal food security, though other associations were attenuated. Compared to students with high food security, students with marginal food security had 5% higher intakes of total added sugar (95% CI 0%, 11%) and 10% higher intake of added sugar from sugar-sweetened beverages (95% 2%, 18%); however, these associations were attenuated after adjustment for multiple comparisons.

In the total sample, the mean BMI was 24.2 kg/m (SE 0.2) and the mean CAFPAS score was 15.8 (0.07). Multivariate-adjusted least square mean CAFPAS and BMI scores are shown in Table 3. Compared to high food security, the differences in mean BMI between marginal and very low food security were +2.3 kg/m^2 (SE 0.5, *P<0.001*) and +2.6 kg/m^2 (SE 0.5, *P<0.001*), respectively. Marginal, low, and very low food security were also associated with lower CAFPAS scores (i.e. lower cooking and food agency). Compared to high food security, CAFPAS scores were 0.8 points lower among students with marginal food security, 1.5 points lower for low food security, and 1.1 points lower for very low food security. When looking at the CAFPAS subscales individually, differences were observed on the food self-efficacy subscale [high vs. marginal food security difference: −0.3 (0.1), *P=0.02*)], food attitudes subscale [high vs. low food security difference: −0.5 (0.1), *P<0.001;* marginal vs. low food security difference: −0.5 (0.1), *P=0.0002*], and the structure subscale [high vs. marginal food security difference: −0.6 (1), *P<0.0001;* high vs. low food security difference: −0.9 (0.1), *P<0.001;* high vs. very low food security difference: −0.9 (0.1), *P<0.0001;* marginal vs. low food security difference: −0.3 (0.1), *P=0.03*]. Results were similar in unweighted analyses (Supplemental Tables 1–2).

DISCUSSION

Food insecurity is a growing concern on college campuses. In the present study of 754 students at a large, public Midwestern university, students with low food security had lower mean intakes of fruits, and students with very low food security had higher mean intakes of added sugar from sugar-sweetened beverages, after adjusting for sociodemographic characteristics. These differences in diet by food security categories are consistent with prior studies of college students and the general population.[11–13, 22–24] For example, a study of students at the University of Alberta found that severely food-insecure students had lower intakes of fruits, vegetables, and legumes.[11] A prior study at the same institution as the present study found that marginal and low food security were both associated with lower fruit and vegetable consumption among students living off campus without food provision. Food insecurity was also associated with higher consumption of sugar-sweetened beverages among lower-income adults in a national sample.[22] Compared to students with high food security, mean BMI was also significantly higher among marginal and very low food secure students, and cooking and food agency scores was significantly lower among marginal, low and very low food secure students.

College students face several challenges to healthy eating, including learning how to cook and acquire food, wanting to eat out with peers, balancing the cost of school and other financial obligations, and navigating a new food environment. Food insecurity can exacerbate these existing challenges making it even more difficult for students to maintain proper nutrition while balancing their academic responsibilities.[14] In the present study, when compared to high food secure students, marginal, low, and very low food secure students all had lower scores on the CAFPAS structure subscale, which includes items like not having enough time to plan or prepare meals, and that responsibilities for family, social life, school, and work affect their ability to prepare meals.[18] Furthermore, marginal food secure students reported lower food self-efficacy and low food secure students had more negative attitudes around cooking and food preparation. These findings are similar to a prior study by Knol

and colleagues, which found that very low food secure students had lower cooking self-efficacy and food preparation scores than food-secure students, using the seven-item Food Preparation and Purchasing Behaviors Questionnaire.[15] Together, these studies present initial evidence that food-insecure college students face additional barriers to healthy eating concerning nutrition knowledge, perceived efficacy, and attitudes towards cooking and food preparation. In addition to having limited financial resources and exposure to an unfamiliar food environment, this combination of factors could explain the observed associations between food security categories and dietary intake.

Although we found a positive association between food insecurity and BMI in the present study, this association has not been consistent in prior research. Several studies have noted higher mean BMI or higher prevalences of overweight/obesity when comparing food-insecure to food-secure students; however, these differences disappeared after statistical adjustment or no statistical adjustment was performed.[7, 17, 25] In one study at a Malaysian university, food insecurity was positively associated with the fat mass index (FMI), but no associations were observed with the other anthropometric measures.[26] Prior studies that examined traditional BMI categories rather than continuous BMI may have missed this association given that college students may be less likely to be overweight or obese compared to the general population. While the differences in mean dietary intake and BMI may not appear large or result in clinically significant health differences during the college years, the facts that these disparities are already apparent in young adulthood could hold important implications for weight-related health in later life.[27] Cross-sectional studies have found that food insecurity is associated with obesity and higher burden of chronic disease in non-college adult populations.[28–33] In a prospective analysis, moderate weight gain of 2.5–10 kg during adulthood was associated with increased incidence of type 2 diabetes, cardiovascular disease, obesity-related cancer, and mortality in later life.[34]

To address the dual burden of food security and inadequate nutrition, one strategy that universities have employed is to open on-campus food pantries to help ensure nutritious food access, and a space to provide nutrition education, cooking lessons, and connections to other social services. While food pantries are not a perfect solution to campus food insecurity, they can act as a first step in recognizing the existence of food insecurity among students.[35] At the present time, more research is needed to evaluate the effectiveness of food pantries in alleviating food insecurity and diet-related health disparities, as well as whether food pantry use may result in additional anxiety, stigma, or other unintended consequences among college students.[36]

This study has some limitations. First, the data are cross-sectional, making it difficult to determine the temporality of some of the associations studied. For example, food and cooking agency could be a predictor of food insecurity if students with lower food agency spend more money on prepared meals, leading to a faster depletion of their food budget. Food and cooking agency is a relatively novel concept in the nutrition literature and more research is needed to understand how this measure performs in a college population, with particular respect to food attitudes. Second, dietary intake was assessed using a screener that focused primarily on whole grains, fruits, vegetables, and a few nutrients. Although this screener has been validated, it does not capture overall dietary quality, total energy intake,

macronutrient composition, or meal patterns, which could also vary by food security status. Measurement error may also result from social desirability bias, since college students may be savvy about which foods are perceived as healthy or unhealthy. Similarly, BMI was estimated from self-reported height and weight, which may have lowered the precision in the observed associations. However, prior studies have established the reliability and validity of self-reported height and weight data among adolescents[37–40] and college students.[41–43] These studies conclude that while measurement error does exist, the discrepancy is not substantial and self-reported height and weight remains an economical method of obtaining these data from college students. Future studies may want to consider measuring height, weight, and other anthropometric measurements to reduce this bias. Another limitation is that the time frame in which food security was assessed was over the past 12 months, while outcomes were measured at the time of the survey. Food security can vary over the semester, month, or season, and may have resulted in exposure misclassification. More rigorous studies of college food insecurity are needed that can better address these limitations, including longitudinal studies with repeated measures of current food security, socioeconomic factors, dietary intake, and health behaviors, to better understand the complex nature of these associations. Finally, the response rate of the present study was 43%. Although this response is higher than other studies of student food insecurity[4, 5,44] and the student population was weighted based on sex, race/ethnicity, degree type, and residency, there is still the potential for non-generalizability and non-response bias if students who did not respond to our survey differed from survey respondents in other meaningful characteristics, such as parental income or socioeconomic status. Additional research is needed at similar institutions to better understand the internal and external validity of the study's findings.

CONCLUSION

In the present study, college food insecurity was associated with aspects of lower dietary quality, greater perceived barriers to cooking and food preparation, and higher BMI, which may have lifelong implications for health and well-being. Although further research is needed to understand the long-term health and academic consequences of experiencing food insecurity during college, the high prevalence of food insecurity across diverse institutions of higher learning should compel campus administrators to find sustainable solutions that ensure the availability of affordable, nutritious foods in order to promote food security and healthful eating habits for all college students.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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RESEARCH SNAPSHOT

RESEARCH QUESTION

How does dietary intake, cooking and food agency, and body mass index differ by food security status among college students?

KEY FINDINGS

In a diverse sample of 754 college students, very low food security was associated with higher intake of added sugar, higher body mass index, and lower cooking and food agency. Marginal food security was also associated with higher body mass index and lower cooking and food agency. These associations were observed independent of sociodemographic factors.

Table 1:

Sociodemographic characteristics of students by food security status among college students at a large public university (n=754)

	Total		High food security (52.3%)		Marginal food security (16.6%)		Low food security (15.8%)		Very low food security (15.3%)		*P-value*
	n	**Weighted %**	**n**	**Weighted %**	**n**	**Weighted %**	**n**	**Weighted %**	**n**	**Weighted %**	
Age, mean (SE)	22.4 (0.1)		22.5 (0.2)		22.4 (0.3)		22.2 (0.2)		22.7 (0.4)		*0.72*
Sex											*<0.001*
Male	265	47.7	144	54.3	44	12.8	41	15.1	36	17.8	
Female	489	52.3	224	50.5	91	20.1	92	16.4	82	13.0	
Race/ethnicity											*<0.001*
White	214	60.6	98	51.1	43	16.3	39	15.8	34	16.8	
Black	90	5.6	32	41.7	12	12.2	16	15.4	30	30.7	
Hispanic	143	3.4	60	46.0	29	20.3	24	12.7	30	21.0	
Asian	247	25.0	148	59.5	37	15.2	46	16.4	16	8.9	
Other/Multi-racial	60	5.4	30	47.4	14	29.0	8	14.9	8	8.6	
Degree type											*<0.001*
Undergraduate	693	73.3	334	52.3	125	16.6	126	16.8	108	14.3	
Graduate	61	26.8	34	52.4	10	16.7	7	13.0	10	18.0	
First-generation student											*<0.001*
No	455	75.1	235	54.3	86	15.6	71	14.4	63	15.7	
Yes	299	24.9	133	46.1	49	19.5	62	20.1	55	14.3	
Financial aid											*<0.001*
No	107	16.8	71	64.7	17	15.2	13	11.6	6	8.6	
Yes	647	83.2	297	49.8	118	16.9	120	16.6	112	16.7	

Table 2:

Multivariable-adjusted relative differences in dietary intake[a], as measured by the Dietary Screener Questionnaire, by food security status among college students (n=754)

	Total	High food security			Marginal food security			Low food security			Very low food security		
	Mean (SE)	Mean (SE)	RD[b]	95% CI	Mean (SE)	RD[b]	95% CI	Mean (SE)	RD[b]	95% CI	Mean (SE)	RD[b]	95% CI
Whole grains[c]	0.77 (0.02)	0.77 (0.02)	Ref.	-	0.80 (0.04)	1.08	0.99, 1.19	0.78 (0.05)	1.02	0.93, 1.12	0.70 (0.03)	0.91[g]	0.83, 1.00
Fruits[d]	0.89 (0.02)	0.94 (0.02)	Ref.	-	0.94 (0.04)	1.03	0.94, 1.11	0.77 (0.03)	0.83[f,g]	0.76, 0.90	0.86 (0.04)	0.91	0.83, 0.99
Vegetables[d]	1.41 (0.01)	1.43 (0.02)	Ref.	-	0.94 (0.04)	1.03	0.99, 1.08	1.34 (0.03)	0.95[g]	0.91, 1.00	1.41 (0.03)	0.99	0.94, 1.03
Dairy[d]	1.62 (0.02)	1.64 (0.03)	Ref.	-	1.62 (0.05)	1.02	0.96, 1.08	1.52 (0.05)	0.94	0.89, 1.00	1.68 (0.07)	1.00	0.94, 1.06
Added sugar[e]	15.0 (0.17)	14.8 (0.24)	Ref.	-	15.1 (0.34)	1.05	1.00, 1.11	14.6 (0.50)	1.00	0.95, 1.05	16.1 (0.46)	1.08[f]	1.02, 1.14
Added sugar from SSBs[e]	6.1 (0.11)	5.9 (0.16)	Ref.	-	6.0 (0.20)	1.10	1.02, 1.18	5.9 (0.32)	1.02	0.95, 1.10	7.2 (0.33)	1.21[f,h]	1.12, 1.30
Calcium (mg)	997 (7.7)	1007 (10.6)	Ref.	-	996 (20.1)	1.02	0.99, 1.05	954 (18.1)	0.96[g]	0.93, 0.99	1023 (23.2)	0.99	0.96, 1.03
Fiber (g)	16.5 (0.12)	16.6 (0.18)	Ref.	-	16.6 (0.27)	1.02	0.99, 1.06	16.1 (0.30)	0.98	0.95, 1.02	16.2 (0.29)	0.97	0.93, 1.00

RD, Relative difference

[a]Adjusted for age, sex, race/ethnicity, degree type, first generation college student, and financial aid

[b]Relative differences are interpreted as the percentage difference between each group and the reference group (i.e. high food security)

[c]Units are ounce equivalents

[d]Units are cup equivalents

[e]Units are teaspoon equivalents

[f]Significantly different from high food security after Tukey-Kramer adjustment for multiple comparisons

[g]Significantly different from marginal food security after Tukey-Kramer adjustment for multiple comparisons

[h]Significantly different from low food security after Tukey-Kramer adjustment for multiple comparisons

Table 3:

Multivariable-adjusted least squares means[a] (and standard errors) of body mass index and CAFPAS scores by food security status among college students (n=754)

	Total	High food security	Marginal food security	Low food security	Very low food security
BMI	24.2 (0.2)	23.5 (0.4)	25.8 (0.5)[b]	24.7 (0.5)	26.1 (0.5)[b]
Cooking and food agency[d]	15.8 (0.07)	16.4 (0.1)	15.6 (0.2)[b]	14.9 (0.2)[b,c]	15.2 (0.2)[b]
Food self-efficacy subscale	4.5 (0.04)	4.5 (0.1)	4.2 (0.1)[b]	4.4 (0.1)	4.4 (0.1)
Food attitudes subscale	7.5 (0.04)	7.7 (0.1)	7.8 (0.1)	7.2 (0.1)[b,c]	7.5 (0.1)
Structure subscale	3.8 (0.04)	4.2 (0.1)	3.6 (0.1)[b]	3.3 (0.1)[b,c]	3.3 (0.1)[b]

[a]Adjusted for age, sex, race/ethnicity, degree type, first generation college student, and financial aid

[b]Significantly different from high food security

[c]Significantly different from marginal food security

[d]Measured using the Cooking and Food Provisioning Action Scale (CAFPAS), where a higher score indicates higher cooking and food agency