Freshmen At A University In Appalachia Experience A Higher Rate Of Campus Than Family Food Insecurity

By: **Laura H. McArthur**, **Kimberly S. Fasczewski**, Elaine Wartinger, & Jordan Miller

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McArthur, L. H., et al. (2018). "Freshmen at a University in Appalachia Experience a Higher Rate of Campus than Family Food Insecurity." Journal of Community Health 43(5): 969-976. https://doi.org/10.1007/s10900-018-0513-1. Publisher version of record available at: https://link.springer.com/article/10.1007/s10900-018-0513-1

Freshmen at a University in Appalachia Experience a Higher Rate of Campus than Family Food Insecurity

Laura H. McArthur[1] · Kimberly S. Fasczewski[2] · Elaine Wartinger[1] · Jordan Miller[1]

Abstract
Food insecurity means having limited or uncertain access, in socially acceptable ways, to an adequate and safe food supply. Ample evidence has identified college students as vulnerable to this problem, but little research has focused on freshmen. This cross-sectional study examined family and campus food insecurity among freshmen at a university in Appalachia. An online questionnaire contained sociodemographic items and scales that measured food security status, academic progress, coping strategies for accessing food, and social support. T-tests and Chi square analyses compared food insecure and food secure students. Statistical significance was $p < .05$. Participants were 456 freshmen, 118 males (26%) and 331 females (73%). Family and campus food insecurity were experienced by 32 (7.1%) and 98 (21.5%) of the freshmen, respectively, and 42.5% of those who experienced campus food insecurity believed their food access had worsened since starting college. Family and campus coping strategies, respectively, included stretching food (72.9 vs. 18.4%) and purchasing cheap, processed food (68.8 vs. 16.3%). Food secure students scored significantly higher on self-rated measures of academic progress ($p < .01$), and greater proportions of food secure students (60.7 vs. 43.9%, $p < .01$) perceived their eating habits since starting college as "healthy/very healthy," and perceived their health status as "good/excellent" (86.0 vs. 71.4%, $p < .01$). Students requested assistance with job opportunities (19.4%), affordable meal plans (18.4%), money management (13.3%), and eating healthy (11.2%). Findings suggest that college student food insecurity begins during the freshmen year, and that there is a need for campus and community-based interventions to increase food access among these freshmen and their families.

Keywords Food insecurity · College freshmen · Appalachia · Coping strategies · Academic progress

Introduction

Food insecurity means having limited or uncertain access, in socially acceptable ways, to an adequate and safe food supply that promotes an active and healthy life for all household members, while hunger refers to the physiological responses of the body to food insecurity [1]. The U.S. Department of Agriculture Economic Research Service (USDAERS) developed the 10-item Adult Food Security Survey Module (AFSSM) and the extended 18-item Household Food Security Survey Module (HHFSSM) to measure the percentage of U.S. adults and households, respectively, that experience food insecurity at some time during a given year [2]. Survey questions focus on the quantity, aff dability, and quality of the available food supply, and are worded such that they distinguishes between high food security (no reported indications of food-access problems or limitations), marginal food security (one or two reported indications, typically of anxiety over food sufficiency or shortage of food), low food security (reduced quality, variety, or desirability of diet, with little or no indication of reduced food intake), and very low food security (multiple indications of disrupted eating patterns and reduced food intake). In 2016 12.3% of U.S. households, accounting for 41.2 million people, were food insecure, of whom 10.8 million were very low food secure [1].

Researchers have identified several risk factors for food insecurity, including poverty [3], living in food deserts [4], low educational attainment [5], substance abuse [6], and physical and psychological disabilities [7]. Associated health outcomes include restricted growth and development

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in infants, children, and adolescents [5, 8] and compromised physical, cognitive, and emotional functionality in persons of all ages [9–12]. Additionally, epidemiologic data have linked food insecurity among adults to obesity, type 2 diabetes, and the metabolic syndrome, sometimes termed the "hunger–obesity paradox" [13–15]. A variety of food assistance programs are available in the U.S. at the federal, state, and community levels to aid persons living with food insecurity [1, 16]. Additionally, food insecure individuals use a variety of coping strategies to access food, including: selling personal possessions; saving money on utilities and medications; bartering; holding multiple part-time jobs; planning menus and cutting food coupons; purchasing less expensive, energy-dense foods to eat more and feel full; eating more than usual when food is plentiful; stretching food to make it last longer; selling their blood; dumpster-diving; participating in research studies; and stealing food or money [17–19].

Research fi from post-secondary U.S. campuses indicate that college students are among the population groups vulnerable to food insecurity [20], with reported rates ranging from 14.8% at an urban university in Alabama [21] to 59.0% at a rural university in Oregon [22]. Among the correlates associated with college student food insecurity are: lower grade point average [22, 23], on-campus residence [24], living off-campus with roommates [25], being employed while in school [22], older age, receiving food assistance, having lower self-efficacy for cooking cost-effective, nutritious meals, having less time to prepare food, having less money to buy food, and identifying with a minority race [21], and having an increased risk for depression, anxiety, and stress [26, 27].

Although considerable evidence indicates that college student food insecurity is a public health problem associated with unfavorable health and academic outcomes [20], searches in PubMed, ScienceDirect, and Google Scholar located one peer-reviewed article that studied this problem among freshmen [27]. These authors measured food insecurity among 209 freshmen living in dormitories on a southwestern campus and reported that 32% had experienced inconsistent food access in the previous month and 37% in the previous 3 months. Additionally, these young students had higher odds of depression, and lower odds of consuming breakfast, perceiving their on campus eating habits as healthy, and receiving food from parents. The authors concluded that there is a need for interventions to support food insecure students, given that food deprivation is related to various negative outcomes. Since these findings suggest that Freshmen, like older college students, may be risking their health and academic success because of food insufficiency, more research is needed that assesses the scope of this problem among first year college students and identifies predisposing factors and coping behaviors. Accordingly, the aims of this cross-sectional study were to measure the prevalence of family and campus food insecurity and identify correlates among a nonprobability sample of freshmen attending a university in Appalachia, and to compare food insecure and food secure families and freshmen on correlates. The study site was a university located in western North Carolina that shows high rates of poverty, obesity, and food insecurity [28, 29].

Methods

Participants and Recruitment

A computer-generated randomized sample of all freshmen (n = 2744) enrolled during the spring, 2017 semester were sent electronic recruitment letters, followed by a reminder email 1 and 2 weeks later [30] that included a link to the questionnaire. Interested students clicked on a link that took them to a screen that outlined the elements of informed consent, and those who wished to proceed clicked an "accept" button that took them to the questionnaire. Upon completion, students could click on a link to a screen where they typed their name and email address to enter a drawing for one of two $100.00 gift cards to Amazon.com. This link was detached from the questionnaire link to insure confidentiality of responses. This research was approved by the Offi of Research Protections at the university.

Survey Questionnaire

Data were collected using a cross-sectional, anonymous, online questionnaire administered using Qualtrics survey software (Qualtrics, November 22, 2015, Provo, UT). Initial close-ended questions elicited the following types of information: demographic and anthropometric [gender, age, race, family composition, and self-reported weight and height for calculating body mass index (BMI)], economic (employment status, personal monthly income, financial aid status, and meal plan participation), academic [year in school, enrollment status, on or off campus residence, grade point average (GPA), and academic progress]. Their academic progress was assessed using an Academic Progress Scale where the students self-rated their transition to college, overall progress in school including graduating on time, class attendance, attention span in class, and understanding of concepts taught by selecting either "poor," "fair," "good," or "excellent."

Food security status was measured using the 10-item USDA AFSSM, which was completed for the family and campus settings [2]. Next the students responded to a "yes/no" item asking whether they believed their access to food had worsened since starting college. Those who selected "yes," checked, from the following reasons, those that

they believed explained this change: I don't have enough money to buy food, my meal plan card runs out too soon, I often spent money on nonfood items rather than using the money to buy food, I have trouble budgeting my money, and I spend money when I shouldn't because I want to be included in social activities with my friends. Their money spending behaviors were assessed using a Money Expenditure Scale that asked the students to estimate how often they spent money on the following items instead of using the money to buy food by selecting either "never," "sometimes," or "often,": alcohol, cigarettes, recreational drugs, car repairs, gasoline, entertainment, tattoos or piercings, prescription medications, make-up and fashion, and school fees. They also checked, from a scrambled list of 17 positive and negative descriptors, those that best reflected how they felt about their food security status on campus, (e.g., satisfi ashamed, secure, frustrated, etc.). Coping behaviors for accessing food were identified using a Coping Strategies Scale focusing on saving (n = 7 items), social support (n = 8 items), direct access to food (n = 10 items), and selling personal possessions (n = 2 items). This scale was completed once for the family setting and again for the campus setting by checking all of the strategies used at each location.

The students rated their eating habits since starting college by selecting either "very unhealthy," "unhealthy," "healthy," or "very healthy," and they rated their health status by selecting either "poor," "fair," "good," or "excellent." Follow-up questions assessed their meal skipping and food consumption behaviors for the campus location only. Meal skipping was assessed using a Meal Skipping Scale that asked how often the students skipped breakfast, lunch, and dinner with the response options "never," "seldom," "most days," and "always." Food consumption data were collected with questions asking approximately how many days/week, on a scale from 0 (zero) to 7, they consumed fruits/juice, vegetables/juice, fast foods, and sweets.

The final two items concerned sources of social support for accessing food on campus. The students checked, from a list of 13 sources (e.g., parents, campus food pantry, etc.), those that had provided them with food assistance, and checked, from a list of 12 policies and learning activities (e.g., more financial aid from school, learn how to shop for affordable, healthy food, etc.), those they believed would help them improve their access to food. The Coping Strategy Scale was compiled with guidance from the food security literature [17–19], while the Academic Progress, Meal Skipping, and Money Expenditure scales were developed by the authors.

Content validity of all items was determined by two nutrition professors with experience in questionnaire construction and familiarity with the food security literature. The questionnaire was pilot tested online with a computer-generated randomized sample of 50 freshmen who did not participate in the fi al study. Student feedback indicated that the links and buttons operated accurately and that the screens displayed an appropriate amount of items. Pilot test data prompted deletion of items from the Coping Strategies Scale and addition to items on the Money Expenditure Scale.

Statistical Analyses

Data were analyzed using SPSS version 24 (IBM, SPSS Statistics, 2016). The students' food security status was measured using the USDA/ERS scoring scheme for the 10-item AFSSM, such that zero affirmative answers reflected high, 1–2 marginal, 3–5 low, and 6–10 very low food security. Students who scored 0–2 points were classifi as food secure, and those who scored 3–10 points as food insecure [2]. The single item concerning perceived health status and the five-item Academic Progress Scale were scored by allotting 1 point to the "poor" and 4 points to the "excellent" responses. The Meal Skipping Scale was scored by allotting 1 point to the "never" and 4 points to the "always" responses, and the Money Expenditure Scale was scored by allotting 1 point to the "never" and 3 points to the "often" responses. Descriptive statistics were obtained for sociodemographic and behavioral variables. Correlational analyses measured associations between AFSSM scores and sociodemographic and behavioral variables, and independent samples t-tests and Chi square analyses compared food insecure and food secure students on these variables. Findings concerning coping strategies and sources of social support were reported only for the food insecure students and their families, in accord with the food security literature [17–19]. Statistical significance was $p < .05$.

Results

Participant Characteristics

Questionnaires were submitted by 494 of the 2000 recruited freshmen, of whom 38 were disqualified due to insufficient data, resulting in a sample of 456 participants comprising 22.8% of those recruited. Table 1 summarizes the characteristics of the food secure and food insecure freshmen separately, and for the entire freshmen sample.

The gender distribution of the overall sample was about one-quarter female and three-quarters male. Their mean age was 18.5 years (± 1.04, range 18–33). More than three-fourths of the freshmen identified as white, not of Hispanic origin, refl the low level of racial diversity at the university, and about three-fourths were from two-parent households. Findings related to campus life indicated that almost the entire sample were full time students, on campus residents, and participated in a university meal plan.

Table 1 Characteristics of food secure and food insecure freshmen and of the entire freshmen sample

Characteristic (n)[a]	FS n (%)	FI n (%)	Total n (%)
Gender (455)			
Male	87 (24.4)	31 (31.6)	118 (25.9)
Female	268 (75.1)	63 (64.3)	331 (72.7)
Other	2 (0.56)	4 (4.08)	6 (1.32)
Age (454)			
18–25	354 (99.4)	97 (99)	451 (99.3)
26–30	0 (0)	1 (1.0)	1 (0.22)
31–40	2 (0.56)	0 (0)	2 (0.44)
Race/ethnicity (475)[b]			
White	311 (83.4)	81 (79.4)	392 (82.5)
African American	19 (5.09)	8 (7.84)	27 (5.68)
Hispanic	17 (4.56)	9 (8.82)	26 (5.47)
Asian	17 (4.56)	0 (0)	17 (3.58)
American Indian	5 (1.34)	2 (1.96)	7 (1.47)
Other	4 (1.07)	2 (1.96)	6 (1.26)
Family composition (456)			
Two parent family	276 (77.1)	75 (76.5)	351 (77.0)
Single parent—mother	61 (17.0)	17 (17.3)	78 (17.1)
Single parent—father	6 (1.68)	2 (2.04)	8 (1.75)
Other	15 (4.19)	4 (4.08)	19 (4.17)
Weight category by BMI (433)			
Underweight/normal	255 (75.0)	62 (66.7)	317 (73.2)
Overweight/obese	85 (25.05)	31 (33.3)	116 (26.8)
Perceived health status (456)			
Poor/fair	52 (14.5)	28 (28.6)	80 (17.5)
Good/excellent	306 (85.5)	70 (71.4)	376 (82.5)
Perceived eating habits (456)			
Very unhealthy/unhealthy	142 (39.7)	55 (56.1)	197 (43.2)
Healthy/very healthy	216 (60.3)	43 (43.9)	259 (56.8)
Enrollment status (454)			
Part-time	2 (0.56)	0 (0)	2 (0.44)
Full-time	354 (99.4)	98 (100)	452 (99.6)
Residency (456)			
On-campus	346 (96.6)	93 (94.9)	439 (96.3)
Off-campus	12 (3.35)	5 (5.1)	17 (3.73)
Meal plan participation (456)			
Yes	348 (97.2)	94 (95.9)	442 (96.9)
No	10 (2.79)	4 (4.08)	14 (3.07)
Meal plan option (442)			
Low ($1035/semester)	12 (3.45)	3 (3.19)	15 (3.39)
Standard ($1330/semester)	285 (81.9)	82 (87.2)	367 (83.0)
High ($1545/semester)	45 (12.9)	8 (8.51)	53 (12.0)
Super ($1880/semester)	6 (1.72)	1 (1.06)	7 (1.58)
Receiving financial aid (456)			
Yes	233 (65.1)	78 (79.6)	311 (68.2)
No	125 (34.9)	20 (20.4)	145 (31.2)
Hours worked per week (454)			
None	286 (80.3)	71 (72.4)	357 (78.6)
≤ 10	41 (11.5)	19 (19.4)	60 (13.2)
11–20	22 (6.18)	6 (6.12)	28 (6.17)
21–40	7 (1.97)	2 (2.04)	9 (1.98)
Personal monthly income (428)			
≤ $500	322 (97.6)	93 (94.9)	415 (97.0)
$501–$1000	2 (0.61)	5 (5.10)	7 (1.64)
$1001–$1500	4 (1.21)	0 (0)	4 (0.93)
$1501–$2000	0 (0)	0 (0)	0 (0)
> $2000	2 (0.61)	0 (0)	2 (0.47)

[a]Not all characteristics total 456 due to missing data from some participants

[b]Some participants reported more than one category

Economic data indicated that approximately two-thirds of the freshmen received financial aid, about three-fourths were unemployed, and their mean personal monthly income was $83.22 (± $259.35). The students' mean BMI (calculated from self-reported height and weight data) was 23.5 kg/m^2 (± 4.44, range 14.7–45.8); about three-fourths of the students were underweight or normal weight by BMI and about one-fourth were overweight or obese. When rating their eating habits since starting college, about 40% of the freshmen chose the "very unhealthy" or "unhealthy" responses while approximately 60% chose the "healthy" or "very healthy" responses, and when rating their health status, approximately 20% chose the "poor" or "fair" responses while about 80% chose the "good" or "excellent" responses.

Family Food Insecurity

The AFSSM scores indicated that 32 freshmen (7.1%) had experienced food insecurity at home during the year before starting college, while 424 (92.9%) were from food secure families. Gender-based comparisons revealed that 9.5% of the males and 6.3% of the females were from food insecure families. Additionally, 56% of the food insecure and 78.5% of the food secure students were from two-parent families, and 75% of the food insecure and 86.8% of the food secure students were white, not of Hispanic origin.

The mean Coping Strategies Scale score for the 32 food insecure families was 2.3 (± 3.1, range 0–18) out of a possible 27 points. There was a significant correlation between family AFSSM scores and their scores on this scale ($r = .52$, $p < .01$), such that families experiencing more severe food insecurity used a greater number of coping strategies for accessing food. Table 2 shows the frequency counts and percentages, in descending order, of coping strategy use by food insecure families and by food insecure freshmen on campus.

The strategies used most often by the food insecure families were: stretched food to make it last longer (72.9%),

Table 2 Coping strategy frequency for family and school settings

Coping strategy	Family FI n = 32	School FI n = 98
Stretched food	23 (71.9%)	16 (16.3%)
Ate cheap food	22 (68.8%)	18 (18.4%)
Used coupons for food	21 (65.6%)	6 (6.1%)
Taken leftovers home from a social gathering	17 (53.1%)	11 (11.2%)
Used a credit card to buy food	16 (50%)	3 (3.1%)
Ate less-healthy meals	15 (46.9%)	12 (12.2%)
Planned meals	13 (40.6%)	13 (13.3%)
Used less utilities	12 (37%)	n/a
Family member worked more than one job	12 (37.5%)	n/a
Borrowed money for food	12 (37.5%)	8 (8.2%)
Ate at church or other free meal	10 (31.3%)	2 (2.0%)
Ate a community function with free food	10 (31%)	9 (9.2%)
Used federal assistance (e.g. SNAP)	10 (31.3%)	0
Sold household items	10 (31.3%)	n/a
Sold personal possessions	10 (31.3%)	2 (2.0%)
Ate less at a restaurant to have leftovers	9 (28.1%)	8 (8.2%)
Overate when food was plentiful	9 (28.1%)	5 (5.1%)
Skipped medication/medical care for food money	8 (25%)	1 (1%)
Used a food bank/food pantry	7 (21.9%)	n/a
Shared groceries/meals with relatives, friends, etc	5 (15.6%)	15 (15.3%)
Saved food for emergencies	5 (15.6%)	4 (4.1%)
Shared rent with other people	4 (12.5%)	n/a
Bartered/traded for food	1 (3.1%)	4 (4.1%)
Gotten food from dumpster/trash	1 (3.1%)	0
Other	1 (3.1%)	0
Ate at a "pay what you can" restaurant	0	3 (3.1%)
Stole money for food	0	0
ASU Food pantry	n/a	1 (1%)
Got a job to pay for food	n/a	8 (8.2%)
Stolen food	n/a	1 (1%)

n/a—not asked

Questions were modified to apply to a family or school setting, so some questions were only applicable in one of the situations. A comparable question was asked for the other situation

purchased cheap, processed food (68.8%), and cut out food coupons (65.6%).

Comparisons of Food Insecure and Food Secure Students on Campus

The AFSSM scores indicated that 98 freshmen (21.5%) were food insecure at some point during their fi t year of college, and 358 (78.5%) were food secure. Among the food insecure freshmen, 24.3% were males and 74.9% were females, while among the food secure freshmen 31.6% were males and 64.3% were females. Correlational analyses indicated that there was no significant association between the students' AFSSM scores and their age, number of weekly hours worked, personal monthly income, or their GPA. However, a significant difference ($p < .01$) emerged between the mean scores on the Academic Progress Scale earned by the food insecure students (15.5 ± 2.36, range 9–20) and food secure students (16.2 ± 2.13, range 9–20) out of a possible 20 points.

A comparison of the rates of family and campus food insecurity revealed a significantly higher proportion of food insecure freshmen on campus ($p < .01$). Additionally, 14 (43.8%) of the 32 freshmen who had experienced food insecurity at home were also food insecure on campus. When comparing their food security status at home and on campus, 42.5% of the freshmen who experienced campus food insecurity believed that their access to food had worsened since starting college, and they believed that the most important reasons that explained this change were: my meal plan card runs out too soon (15.3%), I often spend money on nonfood items rather than using the money to buy food (13.3%), and I don't have enough money to buy food (12.2%). The findings concerning their money spending behaviors revealed that the three nonfood items purchased "often" by the food insecure students were: school-related fees (26.5%), entertainment (21.4%), and gasoline (15.3%), while those purchased "often" by the food secure students were: entertainment (17.7%), school-related fees (16.6%), and make-up and fashion (14.3%). The correlation between the students' AFSSM scores and their Money Expenditure Scale scores trended toward significance ($r = .09$, $p = .06$), suggesting that the more frequently the students spent money on nonfood items, the more severe was their level of food insecurity. The terms most often chosen by the food insecure freshmen to describe their feelings about their food access on campus were: fine/okay (22.4%), anxious (16.3%), worried (12.2%), and frustrated (12.2%), while those chosen most often by the food secure students were: fine/okay (21.9%), satisfied (21.6%), and secure (20.2%).

The findings concerning self-assessed eating habits since starting college and perceived health indicated that a greater proportion of food secure students (60.7%) than food insecure students (43.9%) regarded their eating habits as "healthy" or "very healthy" ($p < .01$), and that a greater proportion of food secure students (86.0%) than food insecure students (71.4%) perceived their health status as "good" or "excellent" ($p < .01$). A signifi diff ence emerged between the mean Meal Skipping Scale scores of the food insecure and food secure students, respectively, (5.8 ± 1.60, range 3–10 vs. 6.3 ± 1.41, range 3–9, $p < .01$) out of a possible 12 points, indicating that the food insecure students tended to skip fewer meals. Breakfast was the meal most often skipped by both food insecure (62.3%) and food secure

(52.4%) students. Food consumption data indicated that food insecure and food secure students, respectively, consumed fruits/juice an average of 4.8 versus 4.7 days/week, vegetables/juice 4.9 versus 4.8 days/week, fast food 3.9 versus 4.1 days/week, and sweets 3.9 versus 4.2 days/week. No significant diff ences emerged between any of these mean food consumption scores.

Coping Strategies and Sources of Support Used by Food Insecure Students on Campus

The mean Coping Strategy Scale score for the 98 freshmen who experienced food insecurity on campus was 1.0 points (± 1.6, range 0–14) out of a possible 27 points, and a significant positive correlation emerged between the students' AFSSM and their scores on this scale ($r = .26$, $p < .05$), indicating that students who experienced more severe food insecurity used a greater number of strategies for accessing food. The three most frequently used strategies were: purchased cheap, processed food (18.4%), stretched food to make it last longer (16.3%), and shared groceries and/or meals with relatives, friends, or neighbors (15.3%). These food insecure freshmen identified the following sources as those that had off ed the most help in accessing food at school: parents (28.6%), friends (15.3%), and boyfriend or girlfriend (8.2%). They also identified the following items as those they thought would be most helpful in improving their food access: part time or full time job (19.4%), more affordable meal plan (18.4%), learn how to manage their money and make a budget (13.3%), learn how to shop for affordable, healthy food (12.2%), and learn how to eat healthy (11.2%).

Discussion

The freshmen in this study experienced food insecurity at a rate that was three times higher on campus compared to when they lived at home, suggesting that the problem of college student food insecurity begins during the freshman year. The present findings support those of Bruening [27] in documenting a high rate of food insecurity among first year college students and in identifying associated health concerns. The present findings also add to the Ample evidence from U.S. post-secondary campuses that college student food insecurity is a public health problem [20] that could compromise the students' mental and physical health [9, 11–15] and possibly jeopardize their academic success [22, 23]. Accordingly, in the present study, smaller proportions of food insecure than food secure freshmen assessed their health status as either "good" or "excellent." Additionally, the food secure freshmen earned a significantly higher mean score on the Academic Progress Scale, suggesting that, for the food insecure students, their transition to college, class attendance, attention span in class, and ability to understand concepts taught may have been adversely impacted by the discomforts associated with hunger.

The considerably lower rate of family than campus food insecurity reported by the freshmen may have been partially attributable to parental coping strategies intended to protect their children from food deprivation at home, and that once their children moved away, these protective measures were more difficult to implement. Examples of such parental "buffering" activities reported in the food security literature include asking relatives for money and stretching meals to mitigate family food shortages [31, 32]. Similar familial coping strategies were identified by the food insecure freshmen the year before starting college, i.e., stretching food to make it last longer and purchasing cheap, processed food. Subsequently, these same practices were used by the students on campus. Such dietary practices, likely learned at home, suggest that at times these students avoided the discomforts of hunger by consuming diets featuring foods high in fats and simple carbohydrates and low in protein, micronutrients, and fiber. Regular consumption of such energy-dense diets is risky since such eating habits could compromise the students' nutrient reserves and increase their risk for overweight and obesity in the long-term [13–15]. This speculation is supported by the findings that the food insecure freshmen, like their food secure peers, did not consume fruits or vegetables on a daily basis, consumed fast foods and sweets at least 3 days per week, and frequently skipped meals. Although such eating habits have been widely reported for college students in general [33, 34], in the present study smaller proportions of food insecure than food secure students regarded their eating habits since starting college as either "healthy" or "very healthy."

The unhealthy dietary practices of the food insecure students in particular are of concern because these behaviors may have, in some instances, been due to food scarcity rather than to personal food preferences and busy lifestyles. In this regard, a greater proportion of food insecure than food secure freshmen believed that their food access had worsened since starting college. This belief was refl in the terms these students chose to describe their feelings concerning their food situation on campus, i.e., anxious, worried, and frustrated. Perhaps the reasons the fi ay descriptor was chosen most frequently were a reluctance to admit that they were unable to access as much food as they would like or to complain about their food situation. Two of the most frequently reported reasons for their worsening food security concerned fi constraints, i.e., the monetary value of their meal card ran out too soon and they lacked money to buy food. Similar fi were reported for food insecure college students in Alabama and Oregon, respectively [21, 22]. It is also possible that the students' misuse of their limited funds may have played a significant

role in their declining food access, given that they "often" spent money on nonfood items rather than using the money to buy food. To illustrate, 21% of the food insecure freshmen reported that they "often" spent money on entertainment.

The fi from this study indicate that the participating freshmen need, and have asked for, various kinds of assistance to improve their food access and diet quality. For example, the students requested learning opportunities that would teach them how to manage their money, make a budget, purchase nutritious, aff dable foods (whether using their meal cards on campus or using personal funds on or off campus), and make healthy food choices. They also suggested policies and programs they believed would improve their food access on campus, i.e., more part-time and full-time jobs and more aff dable meal plans. Community health professionals including Registered Dietitians, social workers, and health educators, are uniquely qualified to make positive contributions toward decreasing food insecurity and hunger among these young adults by implementing interventions and engaging in policy advocacy that address these student concerns. Additionally, offering similar programs to parents from food insecure households in community settings might assist these parents to provide healthy daily meals to their families. Lohse et al. [35] found that participation in such interventions enhanced the food budgeting and healthy meal planning skills of food insecure women.

Study Limitations and Strengths

This study had limitations that prevent the generalizability of the findings to the population of U.S. college freshmen, i.e., use of a nonprobability sample, data collection on a single campus located in a rural county, self-reporting of all measures, and overrepresentation of females and white students. Additionally, the small number (n = 32) of freshmen who reported family food insecurity made it difficult to identify relationships between family food security status and other correlates. This small number may have been attributable to the students' reluctance to disclose family food insecurity out of concern that their parents would be perceived as negligent or incapable, despite the anonymity of their responses. Nevertheless, the present fi add to the growing evidence that food insecurity is a serious health problem among freshmen and their families that deserves further study. For example, more research is needed with larger, more diverse samples in urban and rural communities to glean a better understanding of the scope of the problem and contributing factors in family and school settings. Research is also needed that evaluates the effectiveness of campus and community food assistance programs such as food pantries to determine whether they are being used by needy freshmen and their families and whether the food off ings are of the quality that promote healthy families.

Acknowledgements The authors thank the freshmen who completed the questionnaire.

Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflicts of interest.

Ethical Approval This research was not funded, and approval was obtained from the Office of Research Protections at the university prior to data collection.

Informed Consent An informed consent letter was included in the questionnaire prior to the first item. Students who did not wish to participate after reading this letter could exit the questionnaire by clicking on an "exit" button.

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