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## Impact of food security on coping strategies: a comparison of high school and college perceptions

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### ABSTRACT

**Objective:** To examine coping strategies in relation to student experience of food insecurity during the transitional period from high school to college.

**Participants:** Freshmen undergraduates ( $n=231$ ) enrolled in one of two public universities during December of 2021, living in traditional student housing.

**Methods:** Participants were emailed a link to a USDA 6-item food insecurity and coping strategies survey to investigate if students' degree of food insecurity correlates to coping strategies used. Questions were answered about experiences as a high school senior and college freshman. Data was analyzed with group comparison tests.

**Results:** Food insecurity rates approximately doubled from students' high school experience to college. Students with lower food security during both their high school and college experience were significantly more likely to practice coping strategies.

**Conclusion:** Improving education on utilization of available resources may help students obtain adequate nutrition, decreasing their need to rely on coping strategies.

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Coping strategies; food insecurity; freshmen; high school; students; university

### Introduction

An individual's access to nutrient-dense foods to manage a healthy lifestyle may appear to be a basic human right; however, a large proportion of households face the challenge of food insecurity. Defined as the lack of consistent access to nutrient dense foods to manage a healthy lifestyle, food insecurity impacts approximately 10.7% of households in the United States.<sup>1,2</sup> Food insecurity is a difficult subject to study, as it is transient in nature and influenced by a multitude of factors both within and around an individual. As the body of literature continues to grow, researchers are aiming to identify factors which perpetuate one's food insecurity.

Specific populations, such as adolescents (i.e., ages 10 through 19), face an even greater risk for the consequences of food insecurity due to environmental and social factors. Moreover, with their increased nutritional needs and experience with social pressures, adolescents are twice as likely to experience the burden of food insecurity compared to younger children living in low-income, urban households.<sup>3,4</sup> This is of concern because poor dietary behaviors have been linked to health risks such as weight gain, low bone mineralization, and poor academic performance.<sup>3,5</sup> One study conducted focus groups composed of teenagers to assess their perceptions of the factors that influence food security.<sup>3</sup> With 44% of this group classified as food-insecure, they provided valuable insights into the concerns this population faces, which included a negative perception of the support provided by their school meal programs, the stigma and bullying

from peers that accompanies receiving meal assistance, and the socioeconomic pressures from their families to provide food.<sup>3</sup>

Similarly, undergraduate students remain a poorly understood population in the context of food insecurity, fitting in neither the adult nor the adolescent subpopulations, yet they report food insecurity prevalence ranging from 14% to 43%.<sup>6-9</sup> The typical college-student lifestyle of inconsistent meal patterns, unhealthy eating habits, alcohol use, low physical activity, and poor mental health has been associated with the occurrence of food insecurity.<sup>10,11</sup> Undergraduates experience a culmination of physical and environmental risk factors, such as inadequate financial and employment status and forfeiting healthy food choices to afford educational costs.<sup>9,12</sup> Additionally, the mental pressures of life, including stressful coursework requirements, limited time availability, and unanticipated difficulties of living independently have been identified as facilitators of low food security.<sup>12</sup> Food insecurity for undergraduate students was determined to begin freshman year, with 22% of first-year students reporting food insecurity at one point during the year and 42% of these students believing their access to food had worsened over the course of the year.<sup>13</sup>

Freshmen students at public universities also characteristically live in on-campus dormitories and are required to purchase a meal plan. However, this requirement has not lightened the burden of food insecurity among students. A large, midwestern university reported 14% of first-year students with an unlimited meal plan—unrestricted access to buffet-style dining halls—faced food insecurity.<sup>14</sup> With food

availability not in question, researchers have shifted their attention to students' utilization of their meal plans. Another study assessed food insecurity in relation to students' unused meals within their meal plans. Researchers found that food insecure students did not use all of their available meals even when enrolled in the most economical meal plan (8 meals/week) and reported a significantly higher percentage of food insecurity compared to those students enrolled in more expensive meal plans.<sup>15</sup>

A plausible explanation for this behavior among food insecure students is that in needing employment for greater financial stability, a work schedule may hinder students from accessing the dining halls during hours of operations. Previous studies show a positive relationship between increasing levels of food insecurity and the total number of hours an employed student works each week.<sup>14–16</sup> Other factors, such as food insecurity's relationship with stress and food intake or the impact of former dietary habits, have been suggested as mechanisms that may facilitate food insecurity in students with meal plans. The paradoxical nature of these findings calls for further investigation into this vulnerable population.<sup>14</sup>

In the analysis of food insecurity, researchers have questioned the concept of food-related coping strategies as an additional means of monitoring food security status.<sup>17</sup> Coping strategies have been defined as short-term responses in efforts to mitigate the effects of household food insufficiencies.<sup>18</sup> As the mechanisms used in coping strategies are transient by definition, there reaches a point in the severity of a household's food insecurity status in which these mechanisms may no longer adequately buffer insufficiencies.<sup>19</sup>

Previous research on coping strategies—conducted by Maxwell—identified six commonly practiced means of coping, which were obtained from focus group discussions with undergraduate students. This study captured a well-rounded picture of how individuals perceive and handle instances of food deficiency. These strategies—ranked from least severe to most severe in practice—included eating foods that are less preferred and less expensive to adapt to lower income, limiting portion sizes, borrowing food or money to buy food, maternal buffering (mothers voluntarily lessen their intake to provide for children), skipping meals, and skipping eating for whole days.<sup>17</sup> Expanding on Maxwell's work, Woods et al. observed a pattern in the strategies used specifically by food pantry clients. This pattern of first limiting the number of eating instances, then restricting second helpings, and lastly reducing portion sizes of food given to children was noted among clients classified with a higher degree of food insecurity.<sup>19</sup>

In light of the COVID-19 pandemic, as specified by the World Health Organization (WHO) as the time between March of 2020 to May of 2023, food insecure households experienced environmental stressors that intensified both the physical and economic barriers to accessing nutrient dense foods with one study noting the significantly higher likelihood of food-insecure households to utilize coping strategies.<sup>20</sup> The strategies this research identified, closely resembling the themes Maxwell observed, included disrupted eating patterns, purchasing lower priced foods, receiving food from friends and family, and utilizing available food

assistance programs.<sup>20</sup> Disrupted eating patterns alone have been shown to be associated with poorer mental and emotional health as well as a decreased immune function.<sup>1</sup> Therefore, as households begin integrating coping mechanisms to endure food insufficiencies, the use of such mechanisms is indicative of a worsening food accessibility, thus, becoming an increasingly greater public health concern.<sup>18</sup>

Therefore, the purpose of this study was to investigate how food-related coping strategies were associated with the level of food security (low or very low) of students during their senior year of high school and freshmen undergraduate experiences. Three hypotheses were established:

(H1) The status of a student's food security impacts the type and extent of coping strategies used during their freshman year of college.

(H2) The status of a student's food security status impacts the type and extent of coping strategies used during their senior year of high school.

(H3) The type and extent of the coping strategy used changes as students transition from senior year in high school to freshman year in college.

## Methods

### Survey development

A 37-item survey was developed with questions assessing students' food security, food-related coping behaviors, demographic characteristics, financial aid status, meal plan usage and anthropometric measurements. Food security status was determined using the USDA 6-item Household Food Security Survey Module (Table 1).<sup>21</sup> Questions were used to capture the food security status of students, who at the time of the survey were first semester college freshmen, living in campus housing. The questions were directed to two specific time periods, once in reference to their experience during their senior year of high school and the other in reference to their experience during the fall semester of their freshman year of college.

As established by USDA, food security status is determined by the number of affirmative responses from the food security questions. Each affirmative response, answering

**Table 1.** USDA 6-item household food security survey module.

- |   |
|---|
| 1. While you were a senior in high school, the food that you had available didn't last, and you didn't have enough money to buy more food.<br><i>Often true, sometimes true, never true, don't know</i>           |
| 2. While you were a senior in high school, you couldn't afford to eat balanced meals.<br><i>Often true, sometimes true, never true, don't know</i>  |
| 3. While you were a senior in high school, did you ever reduce the size of your meals or skip meals because there wasn't enough money for food?<br><i>Yes, No, Don't Know</i>                                     |
| 4. How often did you reduce or skip meals because there wasn't enough money during your senior year in high school?<br><i>Almost every month, some months but not every month, only 1 or 2 months, don't know</i> |
| 5. While you were a senior in high school, did you ever eat less than you felt you should because there wasn't enough money for food?<br><i>Often true, sometimes true, never true, don't know</i>                |
| 6. While you were a senior in high school were you ever hungry but didn't eat because there wasn't enough money for food?<br><i>Yes, No, Don't Know</i>   |

(“yes,” “often true,” or “sometimes true”) to a question, was totaled to produce a raw score that reflected an individual’s food security status. A total score between 0 and 1 affirmative responses indicated high or marginal food security, a total score between 2 and 4 affirmative responses indicated low food security, and a total score between 5 and 6 affirmative responses indicated very low food security.

The use and frequency of food-related coping strategies were determined by the adaptation of 5 of the 6 coping practices, identified by Maxwell (Table 2). The concept of maternal buffering was not included in the present study because this practice refers to toddlers and is not applicable to undergraduate freshmen living in on-campus housing.

A six-point Likert scale was used to determine the frequency of use of each coping strategy (Table 2). The response options included 1 = “every meal,” 2 = “at least once per day,” 3 = “several times per week,” 4 = “several times per month,” 5 = “several times per year,” and 6 = “never.” Coping strategies were presented in reference to students’ experiences during their senior year of high school and the fall semester of their freshman year of college. A total of 6 questions were derived, with the question on borrowing food or money to buy food being separated into two questions (Table 2). The survey was pilot tested for clarity and functionality with one focus group of freshmen students and an introductory Nutrition college course. Demographic characteristics, including, age, gender, and race/ethnicity were also included in the survey.

### Data collection

Undergraduate students classified as freshmen (less than 30 academic hours) were recruited through the Student Housing Directors at two universities (one southern and one mid-western) in the United States. Universities were of comparable size in student population and required freshmen students to live on campus in student housing and purchase a meal plan. All freshmen were sent a link to their school email, inviting them to take a survey *via* an anonymous Qualtrics link. Students were incentivized to participate by receiving a hyperlink to enter a raffle to win one of six \$25 Amazon gift cards upon survey completion. This study was approved by both universities’ Institutional Review Board.

Data were collected using self-report methods during November and December of 2021. The survey was sent to

**Table 2.** Maxwell adapted food-related coping strategies.

1. How often did you eat foods that were less preferred because there was not enough money for foods that you would rather eat?
2. How often did you limit how much you ate at a meal to have food last longer?
3. How often did you need to ask other people for food so that you did not go hungry?
4. How often did you borrow money to buy food so that you did not go hungry?
5. How often did you skip a meal to eat a larger meal at a later time because there was not enough money?
6. How often did you skip eating for a day or more because there was not enough money for food?

Frequency scale: 1=Every meal, 2=At least once per day, 3=Several times per week, 4=Several times per month, 5=Several times per year, 6=Never.

2223 students at the southern university and 1313 students at the midwestern university. The researchers received 205 responses from the southern university and 156 responses from the midwestern university resulting in 9.22% and 11.88% response rates, respectively. While the response rate percentages in the study were low, online surveys distributed *via* emails are expected to be lower than paper surveys.<sup>22</sup> Furthermore, response rates are one of the measures of reliable data and attention to other measures of data quality is of value.<sup>23</sup> Thus, the responses were evaluated following the criteria: students must have completed the survey in greater than 72 seconds (at least 2 seconds per question), answered the attention check questions correctly, and completed more than 65% of the survey.<sup>24</sup> A total of 231 responses met the criteria and were used for further data analyses.

### Data analysis

Prior to analyses, the data were checked for normality for each food security status group (low food secure and very low food secure) and each of the 5 coping strategy variances. Independent *t*-tests were used to test hypotheses H1 and H2 to evaluate if data were normally distributed for each group of food insecurity status. Levene’s tests were performed to assess the homogeneity of variance assumption of independent *t*-tests. The assumptions were met if Levene’s test *p*-value was greater than 0.05. Non-parametric Mann-Whitney tests were used to test hypotheses H1 and H2 if data was not normally distributed for each group of food insecurity status.

A paired *t*-test was performed to test hypothesis H3 if data were normally distributed for each coping strategy variance and each group of food security status. Otherwise, the Wilcoxon signed-rank test was used for testing H3. An alpha level of 0.05 was utilized for all tests. SPSS 27 was employed for all tests in the study.

## Results

### Sample description

Data collected from both universities were combined with the intent for generalizability of the results. Table 3 shows the distribution of race/ethnicity, gender, and age of the students (*N*=231) who participated. Student food security status in high school and college is presented in Table 4, which shows the prevalence of students reporting low and very low food security in college almost doubled in comparison to high school. Students also reported the frequency of the use of their meal plan, with approximately 43% accessing their meal plan twice per day, 24% once per day, and 16% did not use it every day.

### Results of hypothesis H1 testing

Descriptive statistics showed that data was normally distributed for coping strategies 1, 2, and 5 in freshmen students with low food security status (LFS) and very low food security status (VLFS). Thus, independent *t*-tests were conducted

**Table 3.** Student demographics.

Race/Ethnicity	Sample
White or Caucasian	77.1%
Black or African American	12.6%
Hispanic, Latino, or Spanish	1.3%
Asian or Asian Indian	3.0%
Native Hawaiian or Other Pacific Islanders	0.4%
Other	4.8%
Gender	
Male	14.3%
Female	80.5%
Non-binary/ Third Gender	3.0%
Prefer not to say	0.9%
Other	0.4%
Age	
18 years old	71.4%
19 years old	25.5%
20 years old	1.3%
21 years old	0.4%
22 years old and older	0.9%

**Table 4.** Food security status of sample ( $N=231$ ) in high school and college.

Food Security Status	High School	College
Very Low Food Security	( $n=34$ ) 14.7%	( $n=60$ ) 25.5%
Low Food Security	( $n=26$ ) 11.3%	( $n=52$ ) 22.5%
Food Secured	( $n=170$ ) 74.0%	( $n=119$ ) 51.9%

to test hypothesis H1, which was to test the differences in coping strategies between LFS and VLFS freshmen students.

As shown in Table 5, the independent-samples  $t$ -tests revealed a statistically significant difference between coping strategy 1 used by VLFS freshmen students and LFS freshmen students,  $t(109) = -3.16$ ,  $p = 0.002$ . Thus, the VLFS freshmen students denied themselves preferred food items more often than the LFS freshmen students while on their meal plans.

For coping strategy 2, VLFS freshmen students limited how much they ate at each meal more often than the LFS freshmen students,  $t(109) = -3.21$ ,  $p = 0.002$ .

For coping strategy 5, VLFS freshmen students skipped meals to eat larger meals at a later time more often than the LFS freshmen students,  $t(109) = -3.68$ ,  $p < 0.001$ . The effect sizes were moderate for strategies 1, 2 and 5<sup>25</sup> (Table 5).

The data was not normally distributed for coping strategies 3, 4, and 6 in the VLFS and LFS students. Thus, the non-parametric Mann-Whitney test was used to test hypothesis H1 and compare the ranks of coping strategies 3, 4 and 6 between LFS and VLFS freshmen students. No differences were observed in coping strategy 3 ( $p = 0.26$ ), coping strategy 4 ( $p = 0.47$ ), or coping strategy 6 ( $p = 0.06$ ).

### Results of hypothesis H2 testing

Descriptive statistics showed that data was normally distributed for coping strategies 1, 2, and 5 in two groups of students (LFS and VLFS) during their high school experience. Thus, independent  $t$ -tests were conducted to test hypothesis H2, which was to test differences in coping strategies between LFS and VLFS students during their senior high school year.

As shown in Table 5, the independent-samples  $t$ -test revealed a statistically significant difference between coping strategy 1 for freshmen who had VLFS as high school students and LFS as high school students,  $t(58) = -2.27$ ,  $p = 0.03$ . Thus, those freshmen with VLFS as high school students denied themselves preferred food items more often than freshmen that were LFS in high school. According to results of the independent  $t$ -test for coping strategy 2, freshmen who reported VLFS as high school students limited how much they ate at each meal more often than reported by freshmen who were LFS as high school students. The difference was statistically significant,  $t(58) = -2.38$ ,  $p = 0.02$ . The results of the independent  $t$ -test showed a statistically significant difference in coping strategy 5 as VLFS high school students skipping meals to eat larger meals at a later time more often than those freshmen reporting as LFS high school students,  $t(58) = -3.63$ ,  $p = 0.001$ . Effect sizes for coping strategies 1 and 2 were moderate, and large for coping strategy 5<sup>25</sup> (Table 5).

The data was not normally distributed for coping strategies 3, 4 and 6 in the food security status groups. Thus, the non-parametric Mann-Whitney test was used to test hypothesis H2 and compare the ranks of coping strategies 3, 4 and 6 between two groups of students during their high school experience with low and very low food security status. No differences were observed between very low food security status and low food security status for coping strategy 3 ( $p = 0.18$ ), 4 ( $p = 0.35$ ), or 6 ( $p = 0.77$ ).

### Results of hypothesis H3 testing

Descriptive statistics showed that data was normally distributed for coping strategies 1, 2, 5 and 6 in students with food insecurity during their freshman year and food insecurity during their high school experience. Students that were food insecure both in college and high school constituted a sample size  $n = 49$ . Variances were homogenous for these coping strategies. Thus, paired  $t$ -tests were conducted to test hypothesis H3, which was to test the differences in the coping strategies used by food insecure students in their college freshman year and high school year.

As shown in Table 6, on average, the practice of coping strategy 1 for food insecure freshmen students was significantly higher than the practice of the first coping strategy for food insecure students' high school experience,  $t(48) = 2.84$ ,  $p = 0.007$ . The effect size was weak.<sup>25</sup> The use of coping strategy 2 among students during their freshman year and high school experience was not statistically significantly different,  $t(48) = 1.28$ ,  $p = 0.21$ . Students limited how much they ate at each meal during their high school experience and during their freshman year experience to a similar extent. On average, the practice of coping strategy 5 for food insecure freshmen students was significantly higher, compared to the practice of coping strategy 5 among their high school experience,  $t(48) = 4.19$ ,  $p < 0.001$ . The effect size was moderate.<sup>25</sup> The use of coping strategy 6 among freshmen students and high school students was not significantly different  $t(48) = 1.90$ ,  $p = 0.06$ . During freshman year and high school

**Table 5.** Independent *t*-test results of hypotheses H1 and H2 testing.

Coping Strategy	<i>M</i> ( <i>SD</i> )	<i>t</i> -value	df	Cohen's <i>d</i>
1. How often did you eat foods that were less preferred because there was not enough money for foods that you would rather eat?				
H1		-3.16**	109	-0.60
College VLSF	2.86 (1.18)			
College LFS	3.60 (1.26)			
H2		-2.27*	58	-0.59
High School VLSF	3.29 (1.09)			
High School LSF	4.04 (1.46)			
2. How often did you limit how much you ate at a meal to have food last longer?				
H1		-3.21**	109	-0.61
College VLFS	3.63 (1.23)			
College LFS	4.40 (1.32)			
H2		-2.38*	58	-0.62
High School VLSF	3.44 (1.54)			
High School LFS	4.38 (1.50)			
5. How often did you skip a meal to eat a larger meal at a later time because there was not enough money?				
H1		-3.63***	98	-0.70
College VLFS	3.58 (1.18)			
College LFS	4.50 (1.46)			
H2		-3.63***	58	-0.95
High School VLFS	3.79 (1.32)			
High School LFS	4.96 (1.11)			

Note: Likert scale: from 1=every meal to 7=never.  
\* $<0.05$ , \*\* $<0.01$ , \*\*\* $<0.001$ .

**Table 6.** Paired sample *t*-test results of hypothesis H3 testing.

Coping Strategy	<i>M</i> ( <i>SD</i> )	<i>t</i> -value	Cohen's <i>d</i>
1. How often did you eat foods that were less preferred because there was not enough money for foods that you would rather eat?		2.84**	0.41
FI High School	3.43 (1.29)		
FI College	2.84 (1.26)		
2. How often did you limit how much you ate at a meal to have food last longer?		1.28	0.18
FI High School	3.67 (1.57)		
FI College	3.39 (1.19)		
5. How often did you skip a meal to eat a larger meal at a later time because there was not enough money?		4.19***	0.60
FI High School	4.10 (1.34)		
FI College	3.33 (1.30)		
6. How often did you skip eating for a day or more because there was not enough money for food?		1.90	0.27
FI High School	4.69 (1.37)		
FI College	4.31 (1.64)		

Note: Likert scale: from 1=every meal to 7 never; df = 48; FI=food insecure students.  
\* $<0.05$ , \*\* $<0.01$ , \*\*\* $<0.001$ .

experience, they skipped eating for a day or more to a similar extent.

The data was not normally distributed for coping strategies 3 and 4. Thus, the non-parametric Wilcoxon signed ranks test was used to test hypothesis H3 and compare the medians of coping strategy 3 and the medians of coping strategy 4 between freshmen and high school experiences. The median of the frequency of coping strategy 3 ( $p=0.22$ ) and coping strategy 4 ( $p=0.49$ ) did not significantly differ for freshmen and high school students.

Students' responses to the optional open-ended question: *What suggestions do you have for your university in terms of making food more accessible or more likely to meet your needs* provides insight into the perception of students' current circumstances both living on-campus and with a purchased meal plan. Responses were categorized into five major themes that included: (1) healthier food options (37%), (2)

more affordable food options (37%), (3) extended dining hall hours of operation (13%), (4) more options for dietary restricted students (5%), and (5) accessibility to dining halls (4%). Overall, students expressed frustration with unhealthy food choices as their only options.

## Discussion

The purpose of this study was to investigate how food-related coping strategies were associated with food security status in students while they were seniors in high school and at the end of their first semester in college. The results of students' high school and freshman experiences revealed those facing a lower food security status had a greater dependency on specific coping strategies. These strategies included eating less preferred foods because there was not enough money,

limiting the quantity of food consumed in a meal, and skipping meals.

Coping strategy 1 (*eating foods that are less preferred*) is a relatively common means of adjusting to a decrease in income across all income groups.<sup>17</sup> In circumstances of increased physical and economic barriers, food insecure individuals have been known to buy different, cheaper foods as a way to cope.<sup>20,26</sup> Food secure students may practice this strategy as well, in light of a multitude of factors such as the student's weekly or monthly budget, the type of meal plan or school lunch program the student has access to, or the obtainability of the student's preferred foods.<sup>12,15</sup>

Similarly, coping strategy 2 (*limiting portion sizes*) is a highly variable and less invasive strategy among food insecure individuals in comparison to the other coping strategies. Students who limited portion sizes were likely able to eat enough to be satisfied but had to remain conscious of the amounts they ate in order to not run out of food for later.<sup>17</sup> For example, the restriction of second helpings has previously been associated with a higher degree of food insecurity.<sup>19</sup> With undergraduate students having access to meal plans on-campus, the implementation of this coping strategy may indicate a more complex situation at play in food insecure freshmen, requiring additional investigation.

Coping strategy 5 (*skipping meals to eat a larger meal at a later time*) is the more severe manifestation of limiting portion sizes, in which individuals would eat fewer meals per day in order to feel satisfied after these meals.<sup>17</sup> The significance of skipping meals among high school students may be linked to their food availability within their household. One study found that food insecure middle school and high school students reported a limited availability of healthy foods in their household.<sup>27</sup> Therefore, students are consuming more energy dense foods, containing excessive carbohydrates, processed sugars, or saturated fats, which typically have lower nutritional value.<sup>28</sup> This presents a greater risk for food insecure students in middle school and high school, as dietary habits have been noted to be formed at an early age and maintained further in life.<sup>29</sup>

Conversely, with no significant differences observed between food security status and coping strategies 3, 4, and 6, this may be a result of the underlying social implication of these questions. In assessing whether students are borrowing food or money from others, these questions may also be identifying each student's tendency toward help-seeking behaviors rather than solely their use of the coping strategies. One study found that the subjective behavior of individuals with low levels of social support did not facilitate help-seeking behaviors.<sup>30</sup> With the severity of their situation not being a predictor for seeking help, another study found that students' perception of themselves and others may be hindering them from using the available resources, such as food pantries.<sup>7</sup> Thus, the influence of these factors on students are highly variable, which explains the present study's lack of normal distribution.

In college, the per meal cost (a meal swipe) purchased through a meal plan allows for "all you can eat" during the dining hall hours. If meal swipes are used at another eating

establishment, on or off campus, students may need to use more than one meal swipe to cover their meal costs to obtain enough food to feel satiated. Having insufficient finances, food insecure students may still be choosing more expensive eating establishments, therefore limiting the number of meals and food afforded by their meal plan.

In comparing students who were both food insecure in high school and during the freshmen year of college, a notably smaller sample population ( $n=49$ ), this study revealed that food insecure freshmen use both coping strategy 1 (*eating foods that are less preferred*) and coping strategy 5 (*skipping meals to eat a larger meal at a later time*) more often than when they were food insecure during high school. A high school student's household environment and food management skills may likely play a prominent role in the development of similar, if not the same, coping strategies when they transition into college. While in high school, students typically are not purchasing the food for the household, but instead rely on their guardian's purchases. As students move into the new environment of college, they are faced with a multitude of mental and physical stressors, which may exacerbate their food insecurity.<sup>9,12</sup> During these stressful times, freshmen students may more easily revert to food-related coping strategies used in high school, whether they need to or not, in order to manage their stress.

In looking specifically at the eating behaviors and the perception of food among food insecure middle school and high school students, one study found that the eating patterns of the food insecure students differed significantly from their food secure peers.<sup>27</sup> Compared to food secure students, food insecure students were more likely to perceive healthy eating as inconvenient with healthy foods not tasting good, thus, leading food insecure students to consume more calories from fat in their diets.<sup>27</sup> More studies are needed to understand how food insecure students perceive their school meal programs and how their perception may perpetuate their food insecurity in light of resources.

Additionally, the developmental trend of a student's eating behaviors may play a more prominent role in their decision to eat less preferred foods and skip meals more often. Previous research suggests that children's eating behavior and the subsequent development of eating patterns is predominantly influenced by parental food habits and feeding strategies.<sup>29,31</sup> With a greater consistency of food insecurity reported, these students likely also experienced times of food insecurity as children and adolescents, in which these coping strategies were reinforced. Therefore, these students are possibly reenacting that which their families did in times of food scarcity.

On the other hand, as many students must contend with the time constraints of employment, coursework requirements, and extracurricular activities, food insecurity may be indicative of a lack of food preparation efforts. With 84% of freshmen reporting accessing their meal plan at most twice per day, the majority of students in this sample were not obtaining 3 meals per day from on-campus dining. Even as extraneous factors—such as employment and class schedules—may be hindering these students from accessing their purchased meal plans at certain points in the day, food access was being restricted for reasons other than food

availability. To circumvent such restrictions, education could target how to use dining hall operations to obtain the necessary food for later. Previous studies have suggested teaching budgeting skills as well as providing students with information on stretching available resources.<sup>26,32</sup> In learning how to manage meals along with their schedules, students could greatly benefit from improvement in the quality of food offered through their dining hall.

In addition, the time in which this study was conducted, during November and December of 2021, was identified as a period of heightened food insecurity for college students due to the COVID-19 pandemic. Specifically, college students who experienced housing insecurity or a loss of income during the pandemic were more likely to be impacted by food insecurity.<sup>33,34</sup> One study specifically showed 38% percent of students experienced a change in food security as a result of the pandemic, with 59.6% becoming less food secure and 40.4% becoming more food secure.<sup>34</sup> Therefore, college students face a multitude of risk factors that may be contributing to their high prevalence of food insecurity.

Many of the responses obtained from the open-question were similar from research reporting that food insecure students have been noted to express frustration with their lack of diet diversity, and desiring more accessibility for produce.<sup>32</sup> By highlighting students' concerns regarding food access on-campus, useful information can be provided to university administration for implementing more safeguards for students who face food insecurity. With 48% of freshmen students experiencing some level of food insecurity in this study, which is four times the national average, it is essential that the barriers regarding students' ability to access their meal plan and the quality of food be addressed.

A common means by which many universities address the problem of food insecurity among students is through food pantries, which may provide temporary relief for students experiencing acute food insecurity.<sup>6</sup> However, even with the improvements to food access, some students may still resist seeking help due to social barriers.<sup>7</sup> With 22% more students reporting food insecurity in their first semester of freshman year compared to their senior year in high school, factors outside of physical accessibility are influencing student food security, and it is possible that implementation of food-related coping strategies is perpetuating an avoidable condition. Thus, in determining why certain strategies are used more frequently than others, researchers may gain insights into both the severity and longevity of food insecurity.<sup>17</sup>

### **Study strengths and weaknesses**

This study fills an important gap in the literature of food insecurity, providing a more detailed picture of the type and frequency of coping strategies that food insecure students' practice. Through implementing a cross-sectional study of each student's current and previous experience, the fluidity of one's food security status is more clearly depicted across two time periods as opposed to only one time period. However, cross-sectional studies provide only a transient picture of food insecurity, so we were not able to determine

a causal relationship between food insecurity and coping strategies between the high school and freshman student experience. For this reason, there is the need for longitudinal studies to capture the evolution of food insecurity throughout a period of life.<sup>10,35</sup>

This study captures the fluidity of food insecurity from the transition from high school to college at two public universities within different regions of the United States. Moreover, students were observed at a similar point in their academic career with similar access to dining halls across campus. All data collected was self-reported, which may be subject to social desirability and recall bias. In efforts to reduce reporting errors and bias, data was collected through validated tools, including the USDA 6-item HFSSM and the Coping Strategies Questionnaire. While the USDA 6-item HFSSM is a validated tool with an established time period, researchers changed the reporting time from 12 months to the blocks of time during first semester freshman year and during the high school senior year, which calls into question the extent of validity with a different recall time frame. All data collected was self-reported and could have posed recall bias for the students because of the retrospective nature of the survey asking about experiences during two separate time periods. However, in cross-sectional studies, where data collection is only a retrospective evaluation of change, it is not necessarily less valid than a prospective evaluation but may be subject to recall bias and therefore acknowledged.<sup>36</sup> Additionally, two of the coping strategies (5 and 6) were similar to HFSSM questions 3 and 6 (see [Tables 1 and 2](#)). However, the HSSFM was used to establish the existence and the extent of food insecurity, while the coping strategy survey was used to establish the extent of coping strategy use based on food insecurity status.

Finally, this study was limited in that additional information, such as outside employment and student and family income were not requested, which may influence the relationship between food insecurity and coping strategies.

### **Conclusion**

This study found that certain food-related coping strategies are associated with increasing levels of food insecurity among both high school and freshmen college students. Moreover, these results provide insights into how students are coping with food insufficiencies. Food insecurity is a multifaceted condition in which no singular cause can be defined as the sole contributor. Thus, policymakers and university administration should not only focus on taking steps to alleviate food insecurity's ill-effects by addressing the noted food restrictions, but also focus on educating students on how to use these facilities in times of food insecurity.

### **Future research directions**

The complex nature of food insecurity and its extensive impact on students throughout their transitional period from high school to college remains an understudied topic. This study provides several prompts for future research



regarding the impact of coping strategies within those facing food insecurity. In combining the concepts of food-related coping strategies with the student experience of food insecurity, this research has redirected the attention from food insecurity intervention through access to resources to, instead, food insecurity intervention through education on how to manage resources that are available, within the constraints of a college environment.

Future research on the data obtained from this study should analyze the relationship between food insecurity and student demographics, meal plan usage, and financial aid status. Also, if this study were repeated, a longitudinal study that follows students from high school into and during the college years may provide valuable information regarding this transitional period. By obtaining a well-rounded picture of the food insecure students who practice coping strategies, researchers can target interventions to these specific populations and overall, better understand how food insecurity is facilitated.

### Conflict of interest disclosure

The authors have no conflicts of interest to report. The authors confirm that the research presented in this article met the ethical guidelines, including adherence to the legal requirements, of the United States and received approval from the Institutional Review Board of both the University of Mississippi and Eastern Michigan University.

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