

Assessing Basic Needs Insecurity Prevalence and Associated Factors among College Students
Enrolled at a Large, Public University in the Southeastern U.S.

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Abstract

Background: Basic needs insecurity (BNI), defined as having both food and housing insecurity, is an emerging issue on college campuses. Students experiencing BNI may be more likely to have poorer academic performance, as well as poorer physical and mental health compared to other students. This research assesses the prevalence of food insecurity (FI), housing insecurity (HI), and BNI among college students enrolled at a large, public university and identifies factors associated with experiencing FI, HI, and BNI.

Methods: A cross-sectional online survey was conducted at a large, public university in the Southeast U.S. Eligible, enrolled students (n=23,444) were asked to complete an online survey, 2,634 responded (11.2% response rate). Descriptive statistics were used to assess the prevalence of food, housing, and basic need insecurity and to identify sample characteristics. Multivariate logistic regression models were used to assess associations between demographic and financial factors and the outcomes of interest (BNI, FI, and HI).

Results: High rates of FI (48.5%), HI (66.1%), and BNI (37.1%) were identified. After controlling for confounders, factors that were significantly associated with increased odds of students having BNI included previous food insecurity ($P<0.001$; Odds Ratio (OR)=3.36; Confidence Interval (CI)=2.64-4.28), being employed ($P<0.001$, OR=1.70; CI=1.34-2.17), not receiving family financial support ($P<0.001$, OR=1.61; CI=1.30-2.00), and living off-campus ($P<0.001$, OR=1.67; CI=1.25-2.22). Juniors ($P<0.001$, OR=1.78; CI=1.31-2.42), seniors ($P<0.001$, OR=2.06; CI=1.52-2.78), Masters ($P=0.004$, OR=1.68; CI=1.18-2.40), and PhD or EdD ($P=0.029$, OR=1.55; CI=1.05-2.31) students were significantly more likely to experience BNI than sophomore students.

Conclusions: This research identifies high rates of BNI and related factors among college students enrolled at a large public university. Strategies to support students experiencing BNI are needed, such as systematic monitoring of BNI rates and prioritization of funding for programs to support to these students and increase graduation rates and retention among students experiencing BNI.

Keywords

Food insecurity, housing insecurity, basic needs insecurity, college, university, food security status, hunger, student, Hunger Vital Sign

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CHAPTER 1: LITERATURE REVIEW

Introduction

Health and nutrition has been shaped by hunger in households in the U.S.¹ While nutrition assistance programs have worked to address extreme hunger, food insecurity (FI) is still a major issue afflicting members of the U.S. population.¹ In 2017, the U.S. Department of Agriculture (USDA) assessed the national household FI rate to be 11.8%, with 4.5% of households experiencing very low food security.² In the same year, the average household FI rate for Tennessee was 13.9%, with 5.7% of households experiencing very low food security.³ According to the nation's largest domestic hunger-relief organization, Feeding America, an estimated one in eight Americans were food insecure in 2017, equating to 40 million Americans, including more than 12 million children.⁴ The Hunger in America study, conducted by Feeding America, reflects the demographics of those using food assistance through charitable organizations. This study specifically examined FI in certain population groups such as seniors, children, rural communities, and select racial and ethnic minority households,⁵ but has not traditionally included college students as a population of interest. Recent studies have indicated high rates of FI among college students;^{6,7} thus, more research is needed to understand the issues surrounding FI in this population.

Another basic need includes having safe and affordable housing. Housing prices have continued to rise since the mid-1980's, making housing payments increasingly difficult for low-income households.⁸ According to the National Alliance to End Homelessness, 7.8 million low-income households pay 50% or more of their income towards housing, increasing their risk for housing insecurity (HI) and homelessness.⁸ While most HI is caused by lack of financial

resources to pay housing costs, this could be caused by various reasons related to a lack of jobs in the area, being underpaid, a lack of education, poor health or a disability, or a criminal record.⁹

In 2018, 552,830 people out of the U.S. population experienced homelessness on at least one occasion, with homelessness rates based on point-in-time counts and comparisons to state, county, and city population data from the Census Bureau's Population Estimates Program. The homeless population includes families with children (33%) and individuals (67%), which is further categorized into youth under the age of 25 (7%), veterans (7%) and chronically homeless individuals (18%).¹⁰ Eighty-nine percent of homeless youth were between the ages 18-24 years.¹¹ Youth experiencing homelessness are more likely to have been involved in foster care or the child welfare system, identify as LGBTQ+, and/or to be a youth of color.¹¹ These data are collected by communities as a point-in-time count, which is mandated by the U.S. Department of Housing and Urban Development (HUD). To conduct point-in-time counts, on one designated night, all homelessness shelters or assistance programs count the number of individuals using that organization's facilities or assistance and provide a headcount to estimate the rate of homelessness. While this is a standard way of measuring homelessness, it could significantly undercount the number of youth experiencing homelessness because unsheltered youth may not be counted if they do not visit a shelter or areas where homeless populations gather.^{11,12} While it is difficult to accurately assess youth homelessness, college and university campuses have recently begun research in this area. Initial studies have shown that basic needs insecurity (BNI), which specifically includes FI and HI, is prevalent across college and university campuses.¹³ A nation-wide grey literature report assessed BNI at both two- and four-year institutions with both types of institutions reporting high rates of BNI. Two-year institutions reported rates of FI (48%) and HI (60%). While four-year institutions reported rates slightly lower than two-year

institutions, the rates of FI (41%) and HI (48%) were still high.¹³ Additional peer-reviewed research is needed to assess the prevalence of this issue at colleges and universities, and to better understand the problem and the factors related to BNI.

According to Maslow's Hierarchy of Needs theory, psychological and self-fulfillment needs cannot be met if basic needs have not been met. When applying Maslow's theory to the university environment, students who do not have access to nutritious foods or safe housing may have difficulty concentrating in and completing courses and degree tracks.¹⁴ Given that scholarly and creative work is often considered hallmarks of the college experience, BNI could be particularly problematic for college students. As students apply themselves to their studies, focus on academic pursuits, and the social involvement of attending higher education, BNI may be a barrier to a successful academic experience and healthy social interactions.¹⁵ Thus, a better understanding of BNI in the college and university population can help to identify students most at risk and assist in determining appropriate solutions to address the issue.

Defining Basic Needs Insecurity

BNI includes insecurity or instability related to food, shelter, water and safety.¹³ In college and university population, BNI has been primarily measured through assessments of FI and HI,^{13,16–20,21} though emerging research may include other factors such as financial insecurity, as an aspect of BNI.²²

Food Insecurity

FI exists when access to adequate and safe food is limited or uncertain, or when such food cannot be accessed in socially acceptable ways.¹³ The USDA defines FI as lack of “access by all people at all times to enough food for an active, healthy life.”² There are four categories developed by the USDA to describe an individual's level of food security.²³ The levels include

high food security, marginal food security, low food security and very low food security.²³

Individuals defined as high or marginally food secure are considered *food secure*, while individuals falling in the low or very low food security levels are described as *food insecure*.²³ In general, individuals classified as having high food security do not experience problems or anxiety with accessing enough food on a consistent basis.²³ Marginal food security is defined as individuals sometimes having problems or anxiety about accessing adequate food, but the quality, quantity, and variety of their food are not substantially reduced.²³ Low food security is defined as having reduced quality, variety, and desirability of the diet, but the quantity of food intake and normal eating patterns would not be substantially disrupted.²³ Very low food security includes individuals that at times during the year, eating patterns are disrupted and food intake reduced because the individual lacked money or other resources for food.²³

Housing Insecurity

To date, HI has not been as readily researched as FI; thus there are some challenges that are associated with an emerging field. For example, there is no standard definition for HI or housing instability. Healthy People 2020 reports that housing instability “encompasses a number of challenges, such as having trouble paying rent, overcrowding, moving frequently, staying with relatives, or spending the bulk of household income on housing,”²⁴ while the U.S. Department of Health and Human Services defines housing instability using five signs: high housing costs relative to income (greater than 50%), low housing quality (insufficient plumbing, heat, electricity, leaks, or holes), neighborhood instability (high rates of poverty, crime, and unemployment; and poor city services such as litter; noise, and pollution), overcrowding, and the condition of homelessness as the most severe form of HI.²⁵

The Washington Center for Equitable Growth (WCEG) is a non-profit research and grantmaking organization that promotes evidence-based economic growth. The WCEG released a roadmap to a unified measure of HI in 2017.²⁶ In this roadmap, standardized definitions and validated measurements of HI were proposed based on the process of the development of the U.S. Household Food Security Survey Module incorporated into the Current Population Survey.²⁶ The proposed definitions were adapted from the DHHS and the United Nations' definitions. For housing security, the proposed definition is “availability of and access to stable, safe, adequate, and affordable housing and neighborhoods regardless of gender, race, ethnicity, or sexual orientation.”²⁶ Likewise, HI would be defined as, “limited or uncertain availability of stable, safe, adequate, and affordable housing and neighborhoods; limited or uncertain access to stable, safe, adequate, and affordable housing and neighborhoods; or the inability to acquire stable, safe, adequate, and affordable housing and neighborhoods in socially acceptable ways.”²⁶

Last, the Wisconsin HOPE lab is a nonprofit action research center “focused on rethinking and restructuring higher education and social policies, practices, and resources to create opportunities for all students to complete college degrees.”¹³ The Wisconsin HOPE Lab is the leader in assessing and addressing BNI on college and university campuses. The Wisconsin HOPE lab also produces an annual report of BNI among U.S. college students defining HI as “a broader set of challenges such as the inability to pay rent or utilities or the need to move frequently.”¹³

Assessing Basic Needs Insecurity

Food Insecurity

The current gold standard methods for assessing FI have been developed and validated by the USDA.¹ These methods include the 18-item Household Food Security Survey Module

(HFSSM), the 10-item Adult Food Security Survey Module (AFSSM), and the 6-item subset, which is an abbreviated version of the 18-item HFSSM.¹ The 18-item Household Food Security Survey Module (HFSSM), or the core module, is the most robust measurement tool, differentiating between the four levels of severity of FI over a modifiable 12-month reference period.¹ The 18-item HFSSM covers four types of circumstances associated with FI, including anxiety or perception that the food budget or food available is inadequate; perceptions that adult or child food intake is inadequate in quality; reported instances or consequences from reduced food intake for adults; and reported instances or consequences from reduced food intake for children.¹ While the 18-item HFSSM captures both adult and child FI, it has the longest response time and the data on child FI may not be as relevant to college students, as the population is predominantly adults without children. Both the 6-item subset and the 10-item AFSSM are shortened versions of the 18-item HFSSM. The 6-item subset has the least participant burden; however, it may not capture severe levels of FI. The 10-item AFSSM is appropriate to screen adults who do not have children by omitting the eight questions pertaining to children on the 18-item HFSSM.¹ Each of these measures have been validated and are reliable.^{27,28} The Wisconsin HOPE lab recommends using either the 18-item, 10-item AFSSM or the 6-item survey module, but the scale should be chosen that best fits the context of the college or university administering the survey.¹⁴

The 2-item Hunger Vital Sign is a validated measure to quickly assess food security status and has less participant burden than other validated measures, such as the 18-item Household Food Security Survey Module (HFSSM).²⁹ The Hunger Vital Sign includes the first two questions of the 18-item HFSSM: 1) “Within the past 12 months, we worried whether our food would run out before we got money to buy more,” and 2) “Within the past 12 months, the

food we bought just didn't last and we didn't have money to get more." The Hunger Vital Sign is quick, easy to administer and has a sensitivity of 97% and specificity of 83%²⁹ and has been used previously in the literature.³⁰ Survey respondents may answer 'often true,' 'sometimes true,' or 'never true' to questions asking about frequency of an experience related to FI. An affirmative response to either question classifies the respondent as 'food insecure.'

Housing Insecurity

Similarly to having variations in the definitions for HI, there currently is no validated instrument to measure HI, making HI difficult to assess and research.³¹ The WCEG proposed the need of a standardized national measure that represents the problems of HI as a continuum and by severity level, but that tool has not yet been developed.²⁶ There is much debate on the best method of measuring HI because it can take different forms based on age and circumstance.²⁶

The Wisconsin HOPE Lab and other researchers of BNI in higher education have recommended a series of six questions adapted from the national Survey of Income and Program Participation (SIPP) Adult Well-Being Module to measure students' access to and ability to pay for safe and reliable housing.¹⁴ This series of six multiple choice questions asks about rent or mortgage increases that made it more difficult to pay, whether or not a rent or mortgage has not been paid or underpaid; not paying the full amount of the gas, oil, or electricity bill; moving two or more times; moving in with other people because of financial problems; or living with others beyond the expected capacity of the house or apartment.¹⁴ This series of questions allows for a yes or no answer, with one affirmative answer to the six questions counting the respondent as housing insecure.

While measuring HI in the college population is still an emerging field, multiple institutions have reported HI rates based on this six item series of questions recommended by the

Wisconsin HOPE Lab.^{18,19,32,33} The consistent use of this measurement tool is recommended, because the use of shared measures and metrics across institutions could facilitate national comparisons over time.¹⁴ HI experiences can be measured in the past 30 days or the past 12 months or can include both.¹⁴ Including both time periods allows for a more distinct measure of those who may experience more HI over time, but also increases the respondent burden. Choice of time period is most dependent on the context and needs of the institution administering the survey.¹⁴

In Fall of 2019, the Wisconsin HOPE lab updated their recommendation for measuring HI in the college population.³⁴ The new recommendation is a series of nine questions adapted from the national Survey of Income and Program Participation (SIPP) Adult Well-Being Module.³⁴ The questions are similar to the six-item series, but includes changes such as increasing the number of times a student has moved to three or more times, and adding three questions about whether or not the student had an account default or went into collections, left a household because of feeling unsafe, or received a summons to appear in housing court.³⁴

Basic Needs Insecurity Prevalence on University Campuses

Measuring the prevalence of basic needs insecurities on college and university campuses is an emerging field. While there are recommended assessments to measure BNI, these assessments may change as more research is completed in the field, and newer tools are developed. While the assessments may become more developed over time, the assessments being used currently are able to allow for college and university campuses to administer surveys online quickly to large numbers of enrolled students, providing useful cross-sectional data from student samples.

Basic Needs Insecurity Prevalence

The Wisconsin HOPE lab annually reports on the prevalence of basic needs insecurities. In their most recent national survey, 123 two- and four-year colleges and universities from 24 states and Washington, D.C. participated in administering the HOPE lab's survey, which included the 18-item HFSSM and the six recommended questions for assessing HI.¹³ In April 2019, the HOPE lab reported that ~86,000 students responded to the survey with 41% of four-year college or university students experiencing FI.¹³ Forty-eight percent of four-year university students had experienced HI over the past year, using the six-item series of questions from the SIPP.¹³ Of note, student prevalence of BNI was high, but use of public assistance remained low, with only 20% of food insecure and ~20% of housing insecure students surveyed using Supplemental Nutrition Assistance Program (SNAP) benefits.¹³ In this assessment, having BNI as a student was associated with being a former foster youth (FI (66%), HI (77%)), a Pell grant recipient (FI (54%), HI (62%)), a parent (FI (53%), HI (66%)), a veteran (FI (46%), HI (61%)), and living off-campus (FI (66%), HI (77%)). Students that identified as a minority race/ethnicity were also more likely to experience FI and HI. Specifically, Black students experienced the highest rates of FI (58%), while those identifying as Native American or Mixed/Other experienced the highest rates of homelessness (67%).¹³ The LGBTQ community experienced higher rates of FI. In terms of sexual orientation, students identifying as non-binary (57%) experienced the highest rates of FI, followed by transgender students (55%), females (47%), and then males (42%).¹³ Students that identified as bi-sexual (54%) experienced higher rates of FI than those identifying as gay or lesbian (52%), while those identifying as heterosexual (44%) experienced the lowest rates of FI, comparatively.¹³

While the Wisconsin HOPE lab provides important information on college BNI, the annual report on BNI is not published in peer-reviewed outlets, leaving room for additional work in this area. Additionally, the HOPE lab collects data from participating colleges and universities (90 two-year and 33 four-year colleges from 24 states) that primarily collect the data independently and send it to the HOPE lab. While this creates a very robust dataset, it has the potential to create methodological variations (such as differences in sampling strategies, participant recruitment and incentivization, and data collection methods) that are important to consider when examining these data, which may be part of the reason that the report only includes descriptive statistics, rather than inferential statistics.

Outside of the Wisconsin HOPE lab report, most research in this area comes from individual colleges and universities, with some university systems and alliances reporting data from multiple campuses. The University of California System has contributed to the grey literature regarding BNI. The University of California System assessed FI in 2016 using the six-item USDA food security module.³² Students were surveyed across all University of California campuses (UC Davis, UC Irvine, UCLA, UC Merced, UC San Diego, UC San Francisco, and UC Santa Cruz), with 8,932 respondents (13.5% of the UC System population).³² Forty-four percent of undergraduate respondents had experienced FI over the past year, while 26% of graduate students had experienced FI over the past year.³² Five percent of respondents reported experiencing homelessness in the last 12 months.³² Similarly to the Wisconsin HOPE lab's report, identifying as a racial or ethnic minority, as part of the LGBTQ community, and as a former foster youth was associated with having BNI within the UC System.³² Sixty-two percent of African American students and 57% of Hispanic/Latino(a) students reported FI, compared to 35% of students who identified as White. LGBTQ students (51%) reported FI compared to 43%

of non- LGBTQ students. Students who were former foster youth (61%) reported FI, compared to students who were not former foster youth (44%). Additionally, first generation college students (56%) were associated with BNI more frequently than non-first generation students (35%).³²

The California State University (CSU) System also assessed BNI recently across 23 campuses, adding to the grey literature.³³ Using the 10-item AFSSM, CSU students (n=24,324 respondents) reported high rates of FI at 41.6%, with 21.6% experiencing very low food security.³³ Measurement of homelessness was gathered based on the U.S. HUD and U.S. Department of Education definitions, with 10.9% reporting at least one experience of homelessness, but the ranges of HI were not reported.³³ FI and homelessness were associated with Pell grant recipients, minority students, and first-generation students.³³ Students who received Pell Grants reported higher rates of FI and homelessness (59%) compared to those who did not receive Pell Grants (34.8%). Most distinctly, students identifying as Black had the highest rates of FI and homelessness.³³ Black students reported a homelessness rate of 12.1% compared to White students (7.0%), and a rate of FI (46.8%) over 16 percentage points higher than White students (30.3%). First-generation students reported higher rates of FI (40.6%) compared to nonfirst-generation students (30.4%).

In 2016, a partnership including the College and University Food Bank Alliance, National Campaign Against Student Hunger and Homelessness, Student Government Resource Center, and Student Public Interest Research Group reported on the prevalence of FI, HI, and homelessness for college students using the 10-item AFSSM, and the recommended six questions for both HI and homelessness.¹⁸ Adding to the grey literature, twenty-six colleges and universities participated in the survey, with 3,765 survey respondents.¹⁸ Forty-eight percent of

surveyed students were food insecure, with 22% experiencing very low food security.¹⁸ At university campuses, 46% reported HI and 7% reported having experienced homelessness at least once in the past year.¹⁸ Importantly, 64% of food insecure students also reported experiencing HI over the past year, and 15% of food insecure students reported having experienced homelessness.¹⁸ Students that identified as Hispanic or Latino and Black or African American were more likely to experience FI, as well as first-generation college students.¹⁸ Black or African American students reported a 56% rate of FI, while Hispanic or Latino students reported a rate of 56%, compared to White students who reported a rate of 40%. First-generation students reported a higher rate of FI (56%) compared to students who were not first-generation status (45%).

Another report in the grey literature comes from the City University of New York (CUNY), which assessed the rates of FI and HI as part of the Healthy CUNY Initiative, an effort sponsored by the CUNY School of Public Health at Hunter College and the CUNY Chancellor's Office, to promote health and well-being CUNY-students, faculty and staff. Thirty-nine percent of CUNY students were food insecure.¹⁷ FI was measured by asking four questions adapted from the USDA 10-item AFSSM to survey respondents (n=1,086).¹⁷ Specifically, the questions were 1) How often did you worry that you would not have enough money for food?, 2) How often did you cut or skip a meal because you didn't have enough money to buy food?, 3) How often were you unable to eat balanced or nutritious meals because of a lack of money?, 4) How often did you go hungry because of a lack of money?¹⁷ If two or more of the four questions were answered with "sometimes" or "often," students were categorized as food insecure in the past year.¹⁷ Students identifying as Black or Latinx were more likely to experience FI than those who identified as White or Asian.¹⁷ Of survey respondents, 42.7% reported experiencing HI in the

past year.¹⁹ Women experienced more HI than men, as well as students with children.¹⁷ HI was measured through 12 questions about housing-related experiences.¹⁹ These included experiences of not having enough money to pay rent, experiencing a rent increase that made it difficult to pay rent, being required to appear in housing court, leaving because of feeling unsafe in the household, being threatened with foreclosure, being thrown out by someone in the household, being evicted by a landlord, trying but not being able to get into a shelter, being removed from a shelter, losing housing as a result of fire or other building problems, losing housing as a result of a foreclosure, and losing housing as a result of a Workfare requirement (work requirements to continue to receive welfare benefits).¹⁹ Experiencing one or more of these occurrences defined a student as housing insecure.¹⁹ FI and HI were both experienced by 24.3% of the CUNY survey respondents.¹⁹ Collectively, student FI and HI was associated with students who supported themselves financially, worked over 20 hours per week, and participated in the federal work study program.¹⁷

Recently, a peer-reviewed study from a large, public Midwestern university assessed the cumulative burden of experiencing FI and HI, as well as financial insecurity.²² The 10-item AFSSM was used to measure FI of survey respondents (n=793). HI was measured through a 2-item screener. Questions asked about ability to pay rent or mortgage on time and worrying about losing housing, with an affirmative answer to either question screening the student as housing insecure.²² Questions from the Community College Survey of Student Engagement was used to assess financial insecurity. Responses (yes or no) were collected regarding students' financial health, perceptions of their financial state, budgeting practices, and other financial management skills.²² Affirmative answers were summed on a scale 0-7 with a score of two or more indicating the student as financially insecure.²² The highest prevalence was financial insecurity (40.3%),

then FI (33.6%) and HI (17.4%).²² Eleven percent of students experienced all three insecurities (food, housing, financial), while 17% experienced two insecurities, and 24% experienced one insecurity.²² Experiencing all three insecurities was associated with anxiety and/or depression (odds ratio [OR] = 4.65, 95% CI: 4.31-5.01), fair/poor health (OR = 4.06, 95% CI: 3.73-4.42), and lower GPA ($\beta = -0.19$, 95% CI: -0.30 to -0.09) compared to students who did not experience any insecurities.²²

Food Insecurity Prevalence

FI on college campuses has emerged within recent years as a major area of concern. The evidence indicates that FI among college students is much higher than in the general population of U.S. households.^{6,7} Two reviews recently studied the average rates of FI across college campuses.^{6,7} In both reviews, peer-reviewed and grey literature were used to assess FI on college campuses.^{6,7} The systematic review conducted in accordance with PRISMA guidelines by Bruening et al, included 18 peer-reviewed articles and 41 grey literature sources. Inclusion criteria included articles published in English between January 2001 and August 2016 and articles from all geographic regions in the U.S. Studies that assessed FI among postsecondary student populations (including vocational, undergraduate, graduate, and professional students) were included. From these studies, Bruening et al estimated the rate of FI across post-secondary education campuses to be 42%.⁶ Another systematic review by Nazmi et al included three peer-reviewed articles, four reports, and one Master's thesis. Inclusion criteria included studies that collected primary data on food security prevalence, used a random or representative sampling strategy, and utilized any of the three standardized, validated USDA food security assessment tools. Undergraduate and graduate students from two- or four-year U.S. institutions

of higher education were included. In this systematic review, Nazmi et al found the average student FI rates at these schools was 43.5%.⁷

A recent study measured the prevalence of FI among college students in the Appalachian and Southeastern region of the U.S.⁵³ This multi-campus, cross-sectional study used the USDA Adult Food Security Survey Module (AFSSM) across 10 four-year public universities in the region for a sample of 13,642 college students.⁵³ The universities included in the study were part of the Southeastern University Consortium on Hunger, Poverty, and Nutrition and included schools from Mississippi, North Carolina, Tennessee, and West Virginia.⁵³ A convenience sample of undergraduate and graduate students were recruited between Spring 2016 and Spring 2018, with the majority of respondents being students who were full-time, White, female, and living off-campus.⁵³ The prevalence of FI on the ten campuses ranged from 22.4% to 51.8%, averaging to 30.5%.⁵³

Within this university's system, the rate of FI was assessed. The rate was also assessed for each campus, as well as identified which students were most likely to experience FI. Wooten et al implemented the 10-item AFSSM to measure FI in September-October of 2017.³⁵ A convenience sample of 4,824 respondents in the university system were included with the sample being majority white, female, and full-time students.³⁵ The rate of FI for this study's university system was 35.6%, with a rate of 31.9% at this study's specific campus, a rate of 44.1%, 43.5%, 18.3% at the university system's other campuses.³⁵ Within the university system, having experienced previous FI (OR = 4.78, 95% CI: 4.00-5.71), having loans (OR = 1.42, 95% CI: 1.22-1.66), or no familial financial support (OR = 1.56, 95% CI: 1.33-1.84), and using personal savings as an income source (OR = 1.21, 95% CI: 1.04-1.40) were associated with FI.³⁵ Additionally, having a part-time job (OR = 1.28, 95% CI: 1.10-1.50), being a senior (OR = 1.41,

95% CI: 1.12-1.79), and having a GPA <3.00 (OR = 2.85, 95% CI: 2.23-3.64) were associated with being food insecure.³⁵

Summary of Basic Needs Insecurity Prevalence

The USDA has developed validated FI survey modules, creating a standard for assessments and comparisons across institutions. It is likely that both FI and HI are likely to be reported by the same student as these basic needs insecurities are rooted in financial hardship, but additional research is needed in this area. A multitude of studies have found associations between FI and identifying with a minority race/ethnicity,^{17,18,32,33,36} the LGBTQ community,³⁵ former foster youth,³⁵ first-generation college students,^{27,28} and previous experiences with FI.²⁶ Pell grant recipients,^{27,35} transfer students,²⁷ students supporting themselves financially,^{32,35} students working over 20 hours per week,^{28,32,35} and students participating in a federal work study program²⁷ were associated with experiencing FI. While FI has commonly been researched, HI has been less studied and assessments of overall BNI are lacking in the peer-reviewed literature.

Public Health Implications of Basic Needs Insecurity

The negative impact of FI and HI on the general population has been well-established, but more research is needed in the college and university population. College is a transitional time for students where they gain the ability to make independent decisions and financial independence,³⁷ have increased stress and work to achieve academically.³⁸ This transitional time increases challenges in the student population, making this population more vulnerable to BNI.

Food Insecurity

FI may have a negative impact on dietary intake, related to the manner in which individuals cope with FI. The Hunger in America 2014 survey identified purchasing inexpensive,

unhealthy food (79%) as a major coping strategy for food insecure households.⁵ This coping strategy may be reflected in dietary intakes, as a review of 13 studies showed a modest association with FI and a lower intake of fruits and vegetables, and certain micronutrients and more reliance on high energy dense foods.³⁹ FI has been associated with lower diet quality in nationally-representative samples as well. Using National Health and Nutrition Examination Survey (NHANES) data, Dixon et al found that adults aged 20-59 years had significantly lower intakes of calcium compared to those who were food secure.⁴⁰ Also using NHANES data, Basiotis and Lino found that women who were food insecure had significantly lower Healthy Eating Index scores compared to women who were food secure.⁴¹

In addition, FI has been associated with overweight and obesity³⁹ and chronic diseases.⁴² A U.S. population-based study of data from the 2009 Behavioral Risk Factor Surveillance Survey showed that women had a 48% greater risk for obesity if they had experienced FI.⁴³ Using nationally-representative data from the 2007-08 NHANES, FI was associated with a higher BMI for women, but not for men.³⁴ While there is unclear evidence for obesity in men related to FI, there is a well-defined association of obesity among women in households with FI.⁴³ Seligman et al examined the association of FI and clinical evidence of chronic diseases that are diet-related through NHANES data, and found that FI was associated with hypertension and diabetes in adults between 18-65 years-old who reported household income $\leq$ 200% of the federal poverty level.⁴² FI and poverty can have a negative influence on health that can create difficulties in improving diet quality, leading to the development of diet-related chronic disease and challenges to managing those diseases once they are developed.⁴⁴

Housing Insecurity

HI has been associated with negative health impacts in the general population. In an analysis of 8,415 respondents to the 2011 Washington State Behavioral Risk Factor Surveillance System (BRFSS), housing insecure respondents reported poorer overall health status and poorer mental health status than housing secure respondents; further, those who were housing insecure reported delaying doctor visits because of costs.⁴⁵ Another study reported a significant increased frequency of insufficient sleep and mental distress of respondents who were housing insecure compared to respondents who were housing secure.⁴⁶ The impact of foreclosure on mental health and health behaviors was assessed in a review of 25 studies, finding that all studies reported associations with depression, anxiety, increased alcohol use, psychological distress, and suicide.⁴⁷

Lack of housing puts people at risk for higher morbidity in regard to physical and mental health and increases risk of mortality.⁴⁸ Risk of trauma is also higher⁴⁹ and may result in high health care expenditures as homelessness is associated with more frequent emergency department use.⁵⁰ Additionally, unstable housing disrupts employment, social lives, education, and benefits from social services.⁵¹

Factors Related to Basic Needs Insecurity among College Students

Studies of BNI on college and university campuses have noted that students experiencing FI and HI suffer academically in addition to having poorer overall well-being compared to students not experiencing basic needs insecurities. FI has been associated with lower grades¹³ and grade point average (GPA),^{32,33} poorer self-reported physical health,^{17,32,33,36} and poorer mental health measured as more symptoms of depression and higher perceived stress.^{17,32,33,36}

Additionally, while less studied, HI has been associated with lower grades,³⁶ and poorer physical and mental health.¹⁹

As higher education has become more accessible regardless of socioeconomic status through beneficial state and local-level educational access programs that provide more high school graduates the opportunity to attend 2- or 4-year colleges with little to no tuition or mandatory fees, the characteristics of university student populations are shifting.⁵² Currently 71% of students identify as non-traditional students.⁵² Many of the characteristics associated with FI and HI, such as being a parent, being employed, and being financially independent from family, are also associated with being a non-traditional student rather than a traditional student.⁵² Students experiencing BNI must make trade offs related to time, finances, school, and work, putting an extra burden on them compared to other students. These trade offs may include deciding whether to buy textbooks for class or purchasing food, deciding to go to work or to go to class, or working in place of using time to study. These trade offs likely take a toll on the academic outcomes of basic needs insecure students with research also showing lower grades¹² and GPAs^{26,27} obtained by students experiencing basic needs insecurities and a higher risk for not completing degree programs. The disparity between students experiencing BNI and those who do not may become more pronounced and highlights the need for more prevalence data to understand the scope of the problem. Additional knowledge of the rates of BNI will inform administrators of the extent of the issue. Gaining more data on the prevalence of BNI may be essential first steps in increasing college graduation rates and retention rates and ensuring all students are able to reach degree attainment.

Gaps in the Literature

In 2017, the university campus involved in this study had a high rate of FI at 32%,³⁵ which is consistent with college and university rates across the country.^{6,7} Research related to FI suggests that high rates of FI may also indicate high rates of HI, however this is understudied in the peer-reviewed literature and has not yet been measured at large universities in the Southeast, like this campus.¹⁷⁻¹⁹ There is research documenting associations between FI, HI, and poorer academic outcomes and physical and mental health;^{27,32,35} however, research on BNI on college and university campuses is an emerging field.

As no student should be faced with choosing between paying for a college education and food or housing, assessing BNI will help colleges and universities understand the extent of this issue. Research is needed to understand BNI and identify the factors that increase the likelihood of experiencing BNI. Understanding and then addressing the factors driving these experiences will strengthen the evidence in this area and will allow university administrators to make better, more informed decisions about how to address these issues in college and university student population.

Specific Aims

High rates of BNI, specifically FI and HI have been reported from one university^{17,19} and two national reports;^{13,18} however, none were published in the peer-reviewed literature.¹⁹ Two additional studies in the grey literature assessed FI and homelessness; however, the scope of the housing measures in these studies is limited.^{20,33} The university in the this study's rate of FI was measured to be 32% in 2017 indicating high FI on the campus, but HI has not yet been measured. This research aims to use cross sectional survey data to 1) assess the prevalence of FI and HI of

students attending the university in the Fall 2019 semester and 2) identify factors that are associated with experiencing student FI and HI.

The results of this study will provide more information on BNI in the college population, adding to the evidence of this emerging public health concern. This study will increase our understanding of these issues at the university and help strengthen the evidence in this area overall, thereby providing critical information to university administrators who have the ability to create programs that can be directed towards students who need it most and alleviate the issue of BNI.

CHAPTER 2: MANUSCRIPT

Introduction

Basic needs insecurity (BNI) includes insecurity or instability related to food, shelter, water and safety.¹³ According to Maslow's Hierarchy of Needs theory, psychological and self-fulfillment needs cannot be met if basic needs, such as the need for nutritious foods and safe housing, are not met.¹⁴ Applying this theory to a college or university setting, one could extrapolate that students experiencing BNI may have difficulty concentrating in and completing courses and degree tracks. Given that scholarly and creative work is often considered hallmarks of the college experience, BNI could be particularly problematic for college students. As students apply themselves to their studies, focus on academic pursuits, and the social involvement of attending higher education, BNI may be a barrier to a successful academic experience and healthy social interactions.¹⁵

There is emerging evidence that there are high rates of BNI among college students. While this is an emerging issue in the grey literature, it is almost entirely lacking from the peer-reviewed literature, which has instead focused mainly on the components of BNI, such as food insecurity (FI)^{6,7} and housing insecurity (HI).^{13,18-20} Given the health and economic impacts of BNI, additional peer-reviewed assessments are warranted.¹³

Among college students, BNI is measured through assessments of FI and HI.⁵³ The U.S. Department of Agriculture (USDA) defines FI as “the lack of consistent access to enough food for an active, healthy life.”²³ HI is identified by the U.S. Department of Health and Human Services using five signs: high housing costs relative to income (greater than 50%), low housing quality (insufficient plumbing, heat, electricity, leaks, or holes), neighborhood instability (high rates of poverty, crime, and unemployment; and poor city services such as litter, noise, and

pollution), overcrowding, and the condition of homelessness as the most severe form of HI.²⁵ College students have not traditionally been included in FI and HI assessments, until recently.

Despite the dearth of peer-reviewed literature, there are a handful of campus community assessments reporting both FI and HI or homelessness from between 2011 and 2019 in the grey literature, but none from the Southeastern region. In these five reports, the rate of FI ranged from 39-48%.^{13,16-18,20} Three of the five reports from the grey literature reported rates of HI ranging from 43-48%, by implementing multiple questions to assess HI.^{13,18,19} Two of the five reports only assessed homelessness and not HI, with 5% and 11% of surveyed students reporting experiences of homelessness in the past year.^{16,20} Each of these reports provides valuable but difficult to interpret information given inconsistencies in both FI and HI measures used. Only one report included measures of BNI, or students that were experiencing both FI and HI. This report found that 30% of students were basic needs insecure, or both food and housing insecure compared to 39% of students experiencing no insecurities or were basic needs secure.¹³

Of the components of BNI, FI among college students has been more commonly documented in the peer-reviewed literature. Two systematic reviews of studies assessing college FI found rates of 42%⁶ and 43.5%.⁷ While there is a lack of peer-reviewed literature in relation to BNI, we can look to these previous studies of FI to start to identify factors that could also be influencing basic need insecurity status. Studies have found that student FI is associated with identifying as a minority race/ethnicity,^{13,16-18,20} being a member of the LGBTQ community,¹³ a former foster youth,¹³ a first-generation college student,^{16,18} and having previous experiences with FI.²⁰ Characteristics such as being a Pell grant recipient,^{13,16} transfer student,¹⁶ a student supporting themselves financially,^{13,17} working over 20 hours per week,^{13,17,18} or participating in a

federal work study program¹⁶ were associated with FI. One study found that HI was more likely for students with children than without, and women compared to men.¹⁹

According to a U.S. Government Accountability Office report, research has shown that full-time college students who work more than 15 hours a week or reduce their college course load to attend part time in order to increase their work hours, are less likely to complete degree or educational programs.⁵⁴ A national report surveying university Presidents, demonstrated that student health and wellness has become a major concern in relation to retention and the general well-being of students compared to previous years with 82% of public, four-year university presidents (n=400) indicating reallocating or finding additional funding for these issues.⁵⁵ As issues related to student well-being are becoming more recognized across the nation, assessing BNI will help colleges and universities understand the extent of this issue. To date, BNI has not been measured at a large, land-grant, public university in the Southeast. Southeastern states consistently rank among the worst for health in the U.S.,⁵⁶ making research in this region particularly important. Peer-reviewed research is needed to understand BNI and identify the factors that are associated with an increased likelihood of experiencing BNI. Understanding and addressing factors related to these experiences will strengthen the evidence in this area and will allow university administrators to make better, more informed decisions about how to address these issues in on their campuses. This research aims to use cross sectional survey data to 1) assess the prevalence BNI, defined as the percent of students experiencing both FI and HI, among students attending a large, public university in the Southeast and 2) identify factors that are associated with experiencing student BNI.

Methods

Study Design and Survey Development

This study used an online cross-sectional survey to assess FI and HI status and associated factors. The survey, capturing food and housing security status of college students, was developed by the Southeastern University Consortium on Hunger, Poverty, and Nutrition.⁵⁷ The Southeastern University Consortium on Hunger, Poverty, and Nutrition is a partnership of researchers from universities across the Southeast, as well as food assistance program professionals and obesity and chronic disease prevention specialists⁵⁷ with a shared goal of reducing FI and reducing health disparities.⁵⁷ The survey developed by the consortium was used for this study.

Population, Participants and Sampling

Students enrolled at a large, public university in the Southeast were recruited to participate in this survey through a series of three emails to an all-campus listserv. All students enrolled in October 2019 (total n=29,871) were sent emails through a listserv over five weeks in October-November 2019. Freshman students (n=6,427) were included on the listserv but were excluded from the analyses, because freshman students had only been on campus for a few weeks at the time of the survey. Removal of freshman made the total possible n=23,444 (sophomores, juniors, seniors, graduate, and professional students). There were 2,634 total survey respondents for a response rate of 11.2%. Responses with incomplete BNI data were dropped (n=120), creating a sample size of 2,514 (10.7% response rate).

Sociodemographic information on the student population at this university (as compared to the sample) can be seen in Table 1. In October 2019, an initial email to all students explained

the anonymous, online survey and invited students to participate through the survey link. Two reminder emails were sent over the course of a month to all students who had not yet completed

Table 1. Participant Demographics and Characteristics of the General Population at a Large, Public Southeastern University, and the Study Sample by Food Security Status, Housing Security Status, and Basic Needs Security Status (n=2,514)^a, 2019

Variable	University Population n (column %)	Total Sample n (column %)	Food Insecure n (column %)	Food Secure n (column %)	Housing Insecure n (column %)	Housing Secure n (column %)	Basic Needs Insecure n (column %)	Basic Needs Secure n (column %)
Gender (n=2,510)								
<i>Female</i>	15,272 (51.8) ^e	1,754 (69.8) ^e	858 (70.5)	896 (69.3)	1,196 (72.0)	558 (65.7)	672 (72.3)	1,082 (68.5)
<i>Male</i>	14,188 (48.2) ^e	720 (28.6) ^e	336 (27.6)	384 (29.7)	441 (26.6)	279 (32.9)	241 (25.9)	479 (30.3)
<i>Other</i>	-	36 (1.4)	23 (1.9)	13 (1.0)	24 (1.4)	12 (1.4)	17 (1.8)	19 (1.2)
Race (n=2,507)								
<i>AIAN^b</i>	55 (0.2)	4 (0.2)	4 (0.3)	0 (0.0)	1 (.06)	3 (0.4)	1 (0.1)	3 (0.2)
<i>Asian</i>	1105 (3.9) ^e	174 (6.9) ^e	64 (5.3)	110 (8.5)	102 (6.1)	72 (8.5)	46 (5.0)	128 (8.1)
<i>Black or African American</i>	1705 (6.1) ^e	106 (4.2) ^e	71 (5.8)	35 (2.7)	66 (4.0)	40 (4.7)	48 (5.2)	58 (3.7)
<i>Caucasian or White</i>	22,575 (80.3) ^e	2,082 (82.8) ^e	994 (81.9)	1,088 (84.1)	1,386 (83.6)	696 (81.9)	766 (82.6)	1,316 (83.3)
<i>Bi or Multiracial</i>	1,043 (3.7)	97 (3.9)	54 (4.4)	43 (3.3)	73 (4.4)	24 (2.8)	45 (4.9)	52 (3.3)
<i>Other</i>	1,646 (5.9) ^e	44 (1.8) ^e	27 (2.2)	17 (1.3)	29 (1.8)	15 (1.8)	21 (2.3)	23 (1.5)
Ethnicity (n=2,509)								
<i>Hispanic or Latino</i>	1,331 (4.5)	125 (5.0)	81 (6.7)	44 (3.4)	82 (4.9)	43 (5.1)	61 (6.6)	64 (4.0)
<i>Not Hispanic or Latino</i>	28,129 (95.5)	2384 (94.8)	1134 (93.3)	1250 (96.6)	1,577 (95.1)	807 (94.9)	867 (93.4)	1,517 (96.0)
Age mean ± SD (n=2,512)								
<i><18-20</i>	13,126 (44.6) ^e	758 (30.2) ^e	23.57 ± 5.746	24.4 ± 6.584	23.98 ± 5.505	24.04 ± 7.387	23.94 ± 5.621	24.04 ± 6.525
<i>21-25</i>	11,526 (39.2) ^e	1130 (44.9) ^e						
<i>26-30</i>	2,523 (8.6) ^e	339 (13.5) ^e						
<i>31 and over</i>	2,249 (7.6) ^e	285 (11.3) ^e						
Year in school (n=2,514)								
<i>Sophomore</i>	5,015.8 (24.0) ^e	479 (19.1) ^e	241 (19.8)	238 (18.4)	204 (12.3)	275 (32.3)	122 (13.1)	357 (22.6)
<i>Junior</i>	5,272.2 (25.3) ^e	459 (18.3) ^e	260 (21.3)	199 (15.4)	304 (18.3)	155 (18.2)	186 (20.0)	273 (17.3)
<i>Senior</i>	5,694.5 (27.3) ^e	595 (23.7) ^e	291 (23.9)	304 (23.5)	447 (26.9)	148 (17.4)	247 (26.5)	348 (22.0)
<i>Master's</i>	3,892.5 (18.6) ^f	468 (18.6) ^f	207 (17.0)	261 (20.2)	321 (19.3)	147 (17.3)	183 (19.6)	285 (18.0)
<i>PhD or EdD</i>	--- ^f	392 (15.6) ^f	161 (13.2)	231 (17.8)	300 (18.0)	92 (10.8)	142 (15.2)	250 (15.8)
								69 (4.4)
First Generation Student Status (n=2,513)								
<i>First Generation student</i>	—	609 (24.2)	348 (28.6)	261 (20.2)	427 (25.7)	182 (21.4)	273 (29.3)	336 (21.2)
<i>Not First Generation student</i>	—	1904 (75.7)	870 (71.4)	1034 (79.8)	1,235 (74.3)	669 (78.6)	658 (70.7)	1,246 (78.8)

^aItem-level sample size varied slightly

^bAmerican Indian and Alaskan Native

^cUniversity age data only available in shown age ranges

^dUniversity data combined PhD or EdD demographics into Master's demographic

^eSignificant differences between university population and sample, $p \leq 0.05$

^fMaster's and PhD sample totals combined for comparison to the university population data, significant differences were identified between the sample and university population

the survey. The survey remained available for a total of five weeks. After completing the survey, participants had the opportunity to enter a drawing to win one of ten \$50 Amazon e-gift cards by entering their email into a separate survey linked to the end of the data collection survey. All participants were provided an informed consent statement and agreed to participate. This study was reviewed and deemed exempt by the Institutional Review Board at the university (IRB-19-05519-XM).

Survey Components

Demographic Factors

Demographic information was collected (gender identity, age, race, ethnicity, year in school, residence type, first generation student status, marital status, previous food security status). The race/ethnicity variable and marital status variable were condensed to dichotomous responses before data analysis due to small sample sizes among certain categories. Students reported their age in years and previous food security status (food secure/food insecure). Previous food security status was collected through two questions adapted from a previously developed food security status screener.²⁹ Two statements were used, similarly to previous literature: ‘before I came to college, we (my parent/guardian and/or I) worried whether our food would run out before we had money to buy more’ and ‘before I came to college, the food we (my parent/guardian and/or I) bought just didn't last and we didn't have money to get more.’³⁵ Responses were ‘often,’ ‘sometimes,’ and ‘never,’ with an affirmative response to either question indicating the student as previously food insecure. Academic status information collected included the student’s year in school (‘Sophomore,’ ‘Junior,’ ‘Senior,’ ‘Masters,’ ‘PhD or EdD,’ ‘Professional’) and identification as a first-generation college student (yes/no) and residence type (on-campus/off-campus).

Financial Factors

Financial information was collected through questions about employment status, average monthly income, financial aid status, and family financial support. Employment status had four answer choices ('unemployed,' 'one or more part-time jobs,' 'one full-time job,' or 'other') and the average monthly income of students (not the student's family) was collected by a sliding scale in which students could answer \$0-8000.⁵⁸ Students also answered whether or not they receive some type of financial aid⁵⁹ (yes/no) or financial support from family (yes/no).⁶⁰

Food Insecurity

The 2-item Hunger Vital Sign was used to assess food security status.²⁹ The 2-item Hunger Vital Sign is a validated measure to quickly assess food security status and has less participant burden than other validated measures.²⁹ The Hunger Vital Sign includes two questions: 1) "Within the past 12 months, we worried whether our food would run out before we got money to buy more", and 2) "Within the past 12 months, the food we bought just didn't last and we didn't have money to get more." The Hunger Vital Sign is quick, easy to administer and has a sensitivity of 97%, specificity of 83%²⁹ and has been used previously in the literature.³⁰

In this study the Hunger Vital Sign questions were modified, to begin with "Since starting college," followed by the question to capture FI status during college rather than collecting data from the standard timeframe used in the survey. Survey respondents could answer 'often true,' 'sometimes true,' or 'never true' to questions asking about frequency of an experience related to FI. An affirmative response to either question classified the respondent as 'food insecure.'

Housing Insecurity

A 6-item series of questions modified from the national Survey of Income and Program Participation (SIPP) from the United States Census Bureau was used to assess HI status.⁶¹ This 6-item series was recommended for use with college students.¹⁴ Questions were modified to ask about the student's experiences since starting college. Survey questions asked about whether or not there was a rent or mortgage increase that made it difficult to pay, if the student did not pay or underpaid their rent or mortgage, if the student did not pay the full amount of a gas, oil, or electricity bill, if the student moved two or more times, if the student moved in with other people, even for a little while, because of financial problems, and if the student lives with others beyond the expected capacity of the house or apartment. All six questions prompted a 'yes' or 'no' response. When scoring, an affirmative response to any of the six HI questions signified the student as housing insecure.¹⁴

Basic Needs Insecurity

Those who were both food and housing insecure on the 2-item Hunger Vital Sign and HI questions, respectively, were classified as 'basic needs insecure.' The category for 'basic needs secure' included all other classifications ('food secure and housing secure,' 'food secure and housing insecure,' 'food insecure and housing secure').

Data Management

Upon completion of data collection, survey data were uploaded to SPSS Software 2.0 (IBM SPSS Statistics for Windows Version 25.0, Armonk, New York) for data cleaning and analysis. The race/ethnicity variable and marital status variable were condensed to dichotomous responses before data analysis due to small sample sizes among certain categories. The race/ethnicity variable was collected using six categories (as seen in Table 1), then condensed to

a binary variable of white/non-white for analysis. The marital status variable was collected using five categories (single, live with partner, married, divorced, widowed) and condensed to single/partnered for analysis. Participants' gender identity was collected and analyzed with three possible responses ('male,' 'female,' and 'other'). Missing data and incomplete responses were examined and frequencies were conducted to identify the amount of missing data. Little's Missing Completely at Random (MCAR) test identified that missing data were missing at random ($p=.123$). Because the missing data were determined to be missing at random, participants with missing data for any given analysis were dropped from the analysis, thus the sample sizes for these analyses vary slightly and are noted in the relevant tables or figures. Outliers were examined to determine if they were true outliers by exploring if the responses are greater or less than three times the interquartile range for each variable.⁶² There were numerous true outliers for the students' monthly income ($n=79$) variable. True outliers remained in the dataset, while unfounded responses were removed from the dataset. In the case of numerous outliers, sensitivity analyses were conducted and found that the outliers did not influence the data analysis results.

Statistical Analyses

Descriptive statistics were conducted to determine characteristics of the sample and levels of BNI, as well as FI and HI. Chi square tests were used to compare the university population to the study sample. Then, chi square tests and independent t-tests were used to determine associations between the variable, BNI, and the variables related to student demographics (gender identity, age, race, ethnicity, year in school, residence type, first generation student status, marital status, previous food security status), financial factors (employment status, student average monthly income, financial aid status/receiving financial aid,

family support). Similar analyses were also conducted with the other dependent variables, FI and HI.

Next, for the adjusted analyses, three separate logistic regression models were built. One model had basic needs security status (categorized as basic needs secure versus basic needs insecure) as the dependent variable. The second model and third model had food security status (categorized as food secure versus food insecure) and housing security status (categorized as housing secure versus housing insecure), respectively, as the dependent variables. Significant relationships identified in the chi square and t-tests, along with insight from the literature,^{13,16–20} were used to inform the variables included in the logistic regression models.⁶³ The independent variables included student demographics (year in school, marital status, first-generation college student status, previous food security status, on- or off-campus residence) and financial factors (employment status, student average monthly income, family financial support). Confounders were included in the model based on previous literature, including age, race/ethnicity, and gender.^{58,64–67} Each logistic regression model was checked for the assumptions that the variables were independent, the sample size was large enough (400+), and that the dependent variables were binary.⁶⁸ Multi-collinearity was assessed, and the financial aid variable was removed due to issues with multi-collinearity (the similar variable student monthly income, was retained). In addition, professional students (dental, law, medical, and nursing students) were removed from the analyses due to small sample size (n=121). The Hosmer Lemeshow goodness of fit test was used with each of the three logistic regression models to assess how well each model predicted the outcomes, and found that the fit of the models was good.⁶⁸ Statistical significance for all tests was determined at $\alpha \leq .05$ level.

Results

Sample

Survey respondents were 28.6% (n=720) male and 69.8% (n=1,754) female, and 1.4% identified their gender other than male or female (n=36) (Table 1). The majority of survey respondents were undergraduate students at 61.1% (n=1,533), while 39.0% were graduate/professional students (n=981). Approximately eighty-three percent of survey respondents identified as White (n=2,082), 6.8% as Asian (n=172), 0.1% Native Hawaiian or Pacific Islander (n=2), 4.2% as Black or African American (n=106), 0.2% as American Indian or Alaska Native (n=4), 3.9% as two or more races (n=97), and 1.8% as other (n=44). Five percent of the study sample identified as Hispanic of any race (n=125). The mean age of survey respondents was 24.0 ± 6.20 years. Last, 24.2% of the study sample identified as a first-generation college student (n=609). Survey respondent demographics and characteristics can be seen in Table 1. Of the student respondents, 48.5% were classified as food insecure. Nearly forty-six percent reported that since starting college they worried whether food would run out before they got money to buy more, (n=1,153), and 31.7% reported that the food they bought just didn't last and not having the money to get more (n=796). Using the 6-item series of questions to score HI status, 66.1% of the sample (n=2,514) were classified as housing insecure. A breakdown of the responses to each HI question can be seen in Figure 1. Of this sample (n=2,514), 37.1% of student were classified as basic needs insecure (both food insecure and housing insecure). A breakdown of the four combinations of food and housing security status can be seen in Figure 2.

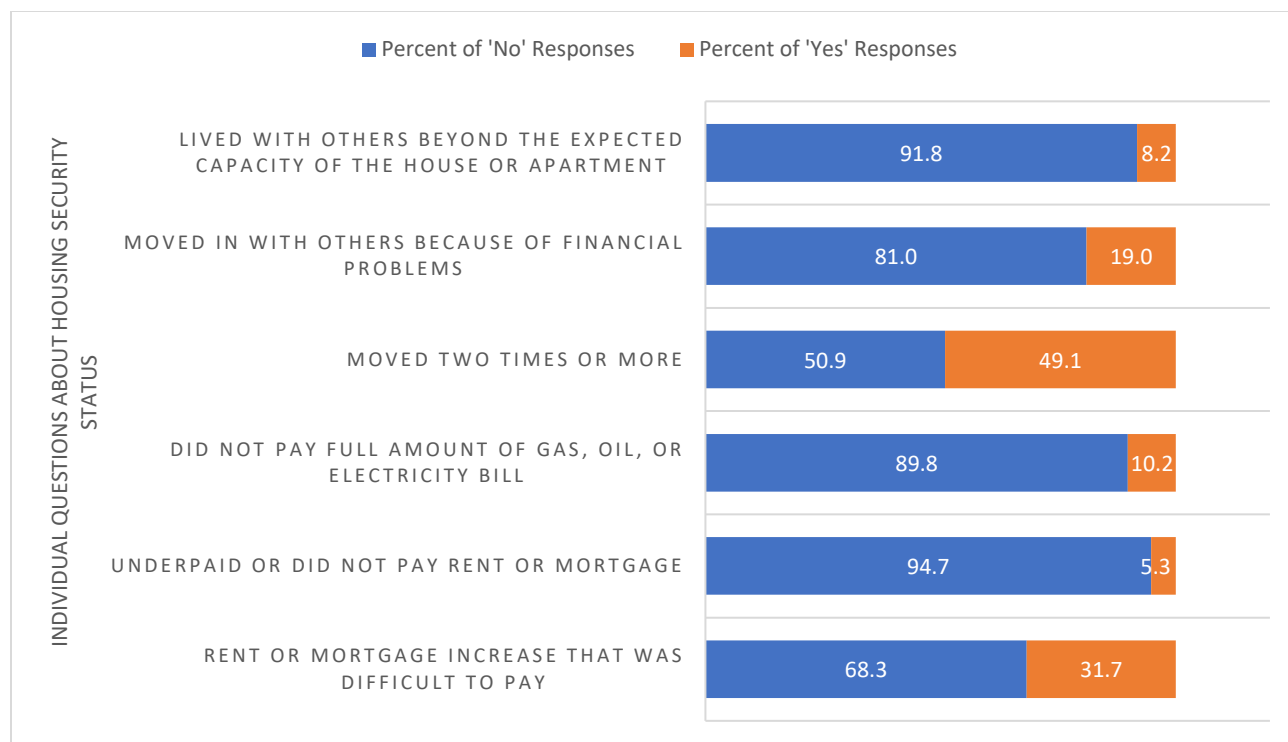


Figure 1. Reported Housing Security & Insecurity by Question (n=2,514), 2019

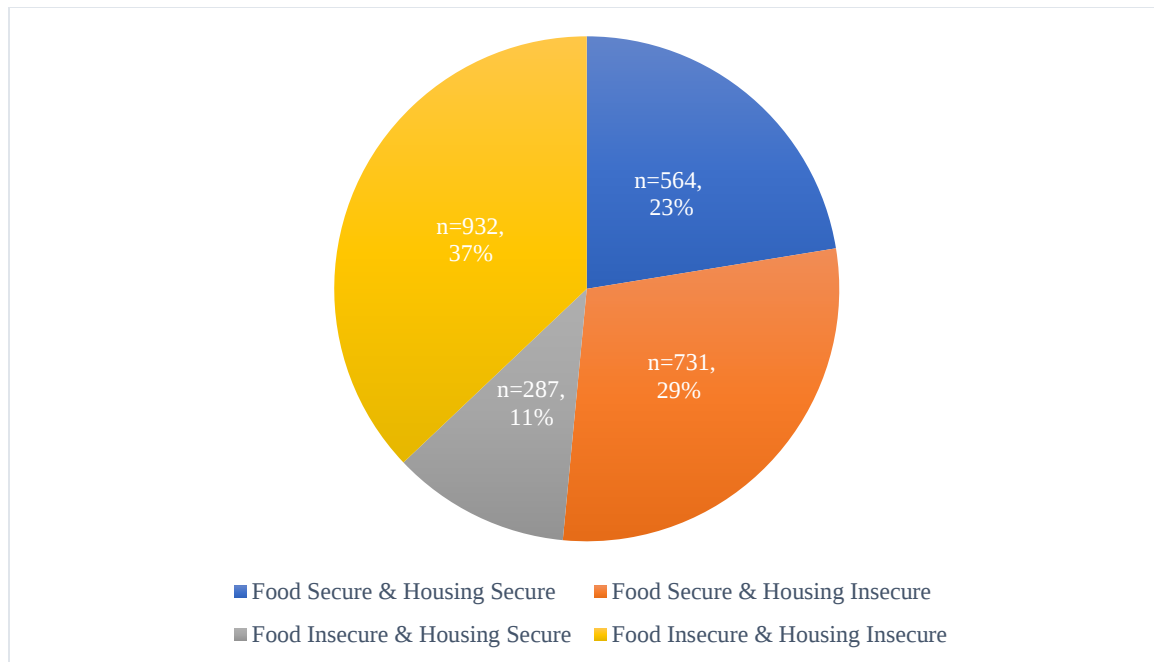


Figure 2. Reported Combinations of Food and Housing Security Status (Food Secure & Housing Secure, Food Insecure & Housing Secure, Food Secure & Housing Insecure, and Food Insecure and Housing Insecure), (n=2,514), 2019

Individual Factors Associated with Basic Needs Insecurity, Food Insecurity, and Housing Insecurity

Chi square analyses and independent t-tests between factors of interest (food security status before college, on- or off-campus residency, first-generation student status, employment status, family financial support, student monthly income) and food, housing and basic need insecurity statuses indicated similar results with some variation. Chi square analyses showed students who were employed ($p<0.01$), were a first-generation college student ($p<0.01$), experienced FI before college ($p<0.01$), and did not receiving family financial support ($p<0.01$) had significant associations with BNI, FI, and HI. Independent t tests showed students who had lower student monthly income ($p<0.01$) were also associated with BNI, FI, and HI.

Students who identified as Hispanic ($p=0.01$), female ($p=0.03$), living off-campus ($p<0.01$), and receiving financial aid ($p=0.03$) were associated with BNI, FI, or HI, but there was no consistency across all outcomes of interest. The variables ‘year in school’ and ‘age’ were also significant in the bivariate analyses with BNI, but were not consistent in the bivariate analyses with FI and HI. (See Supplemental Tables 2, 3, and 4 in the Appendix).

Factors Associated with BNI, HI, and FI Using Adjusted Multivariate Logistic Regression Models

Three adjusted multivariate logistic regression models were constructed to assess the relationships between dependent factors (employment status, first generation status, previous food security status, family financial support, student monthly income, marital status, residence,

year in school) and outcomes of interest BNI, FI, HI.

Basic Needs Insecurity

In the BNI model, previous food security status was the strongest correlate of BNI (odds ratio (OR), 3.36; 95% confidence interval (CI), 2.64-4.28), indicating that students with previous FI were 3.36 times more likely to experience BNI than the students who did not experience FI before college. Seniors were 2.06 times (CI, 1.52-2.78) more likely to be basic needs insecure than sophomore students. Students who were employed were 1.70 times more likely to have BNI than students who were not employed (CI, 1.34-2.17). Students not receiving family financial support were 1.61 times more likely to have BNI compared to students receiving family financial support (CI, 1.30-2.00), and BNI was 1.67 times more likely for students who lived off-campus compared to students who lived on-campus (CI, 1.25-2.22). Race, age, gender, ethnicity were controlled for in the model and the Hosmer-Lemeshow test indicated the model was a good fit ($\chi^2=2.530$, $p=0.960$). Results can be seen in Table 2.

Food Insecurity

Similarly to the BNI model, previous food security status was the strongest correlate in the FI model (CI, 3.68-6.26), with students being 4.80 times more likely to being FI in college if the student was previously FI. Students who were employed and not receiving family financial support were also more likely to have FI. If employed, students were 1.44 times more likely to experience FI compared to those who were unemployed (CI, 1.16-1.80), and those who had not received family financial support were 1.30 times more likely to be food insecure than those who had received familial financial support (CI, 1.05-1.61). Race, age, gender, ethnicity were controlled for in the model and the Hosmer-Lemeshow test indicated the model was a good fit ($\chi^2=10.70$, $p=0.22$). Results can be seen in Table 3.

Table 2. Multivariate Logistic Regression of Factors Associated with Basic Needs Insecurity among College Students at a Large, Public University in the Southeastern U.S., 2019

Variable (reference category ^a)	<i>B</i>	<i>P value</i>	Odds Ratio	95% CI
Year in school (Sophomore)				
<i>Junior</i>	0.58	<0.01	1.78	1.31-2.42
<i>Senior</i>	0.72	<0.01	2.06	1.52-2.78
<i>Masters</i>	0.52	<0.01	1.68	1.18-2.40
<i>PhD or EdD</i>	0.44	0.03	1.55	1.05-2.31
Previous Food Security Status (Previously Food Secure)				
<i>Previously Food Insecure</i>	1.21	<0.01	3.36	2.64-4.28
Student monthly income	-0.17	<0.01	0.85	0.77-0.92
Family financial support (Yes)				
<i>No</i>	0.48	<0.01	1.61	1.30-2.00
Employment status (Employed)				
<i>Unemployed</i>	0.53	<0.01	1.70	1.34-2.17
Gender (Male)				
<i>Female</i>	0.15	0.16	1.16	0.94-1.42
Race (Caucasian/white)				
<i>Non-white</i>	-0.07	0.57	0.93	0.73-1.19
Ethnicity (Non-Hispanic)				
<i>Hispanic</i>	0.40	0.06	1.49	0.98-2.25
Marital Status (Single)				
<i>Partnered</i>	0.06	0.67	1.06	0.82-1.36
Residence (On-campus)				
<i>Off-campus</i>	0.51	<0.01	1.67	1.25-2.22
First Generation Student Status (Yes)				
<i>No</i>	-0.04	0.74	0.96	0.77-1.20
Age	-0.03	0.01	0.97	0.95-0.99

α , $p < 0.05$, significant values are bolded

^aReference category included for categorical variables

Table 3. Multivariate Logistic Regression of Factors Associated with Food Insecurity among College Students at a Large, Public University in the Southeastern U.S., 2019

Variable (reference category ^a)	<i>B</i>	<i>P value</i>	Odds Ratio	95% CI
Year in school (Sophomore)				
<i>Junior</i>	0.18	0.23	1.19	0.89-1.59
<i>Senior</i>	-0.01	0.94	0.99	0.75-1.31
<i>Masters</i>	-0.27	0.11	0.76	0.54-1.07
<i>PhD or EdD</i>	-0.36	0.06	0.69	0.48-1.01
Previous Food Security Status (Previously Food Secure)				
<i>Previously Food Insecure</i>	1.57	<.01	4.79	3.68-6.26
Student monthly income	-0.11	<0.01	0.89	0.83-0.96
Family financial support (Yes)				
<i>No</i>	0.26	0.02	1.30	1.05-1.61
Employment status (Employed)				
<i>Unemployed</i>	0.37	0.01	1.443	1.16-1.80
Gender (Male)				
<i>Female</i>	0.03	0.80	1.03	0.85-1.25
Race (Caucasian/white)				
<i>Non-white</i>	-0.10	0.44	0.91	0.72-1.16
Ethnicity (Non-Hispanic)				
<i>Hispanic</i>	0.51	0.02	1.66	1.08-2.53
Marital Status (Single)				
<i>Partnered</i>	-0.05	0.72	0.96	0.74-1.23
Residence (On-campus)				
<i>Off-campus</i>	-0.08	0.55	0.92	0.71-1.20
First Generation Student Status (Yes)				
<i>No</i>	-0.10	0.39	0.91	0.73-1.13
Age	-.018	0.09	0.98	0.96-1.00

α , $p < 0.05$, significant values are bolded

^aReference category included for categorical variables

Housing Insecurity

Previous food security status was again a strong correlate of HI (CI, 1.53-2.68), indicating that students with previous FI were twice as likely to be housing insecure than the students who did not experience FI before college. Being employed and not receiving family financial support increased the likelihood of being housing insecure. Employed students were 1.53 times more likely to experience HI (CI, 1.22-1.92), and students not receiving family financial support were 1.70 times more likely to experience HI if not receiving family financial support (CI, 1.34-2.15).

In the HI model, students who identified as female were 1.36 times more likely to be housing insecure compared to students who identified as male (CI, 1.11-1.67). Last, using sophomores as the reference group, juniors, seniors, Master's, or PhD or EdD students were significantly more likely to have HI. Notably, seniors were 4.45 times (CI, 3.31-5.97) more likely and PhD or EdD students were 6.25 times (CI, 4.16-9.39) more likely to be housing insecure than sophomores. Race, age, gender, ethnicity were controlled for in the model and the Hosmer-Lemeshow test indicated the model was a good fit ($\chi^2=9.349$, $p=0.314$). Results can be seen in Table 4.

Discussion

This is one of the first studies to assess the prevalence of BNI among college students,¹³ and the first to independently assess students attending a large, public university in the Southeast and to identify factors that are associated with experiencing student BNI. One non-peer reviewed report included measures of BNI, finding that 30.0% of students were both food and housing insecure.¹³ The current study found a slightly higher rate of BNI (37.1%). Further, this study

Table 4. Multivariate Logistic Regression of Factors Associated with Housing Insecurity among College Students at a Large, Public University in the Southeastern U.S., 2019

Variable (reference category ^a)	<i>B</i>	<i>P value</i>	Odds Ratio	95% CI
Year in school (Sophomore)				
<i>Junior</i>	0.91	<0.01	2.48	1.85-3.31
<i>Senior</i>	1.49	<0.01	4.45	3.31-5.97
<i>Masters</i>	1.24	<0.01	3.44	2.42-4.88
<i>PhD or EdD</i>	1.83	<0.01	6.25	4.16-9.39
Previous Food Security Status (Previously Food Secure)				
<i>Previously Food Insecure</i>	0.71	<0.01	2.03	1.53-2.68
Student monthly income	-0.14	<0.01	0.87	0.80-0.93
Family financial support (Yes)				
<i>No</i>	0.53	<0.01	1.70	1.34-2.15
Employment status (Employed)				
<i>Unemployed</i>	0.42	<0.01	1.53	1.22-1.92
Gender (Male)				
<i>Female</i>	.31	<0.01	1.36	1.11-1.67
Race (Caucasian/white)				
<i>Non-white</i>	0.10	0.46	1.10	0.85-1.42
Ethnicity (Non-Hispanic)				
<i>Hispanic</i>	-0.06	0.79	0.94	0.61-1.46
Marital Status (Single)				
<i>Partnered</i>	0.30	0.04	1.35	1.02-1.79
Residence (On-campus)				
<i>Off-campus</i>	0.68	<0.01	1.98	1.52-2.57
First Generation Student Status (Yes)				
<i>No</i>	-0.01	0.95	0.99	0.78-1.26
Age	-0.08	<0.01	0.93	0.91-0.95

α , $p < 0.05$, significant values are bolded

^aReference category included for categorical variables

found a higher rate of HI (66.1%) than the rates of student HI in previous reports, which range from 42.7-48%.^{13,18,19} In previous reports, the prevalence of FI ranged from 39-48%,^{13,16-18,20} while two systematic reviews of studies assessing college FI found rates of 42%⁶ and 43.5%⁷. The prevalence of FI in this study (48.5%) was similar to one report,¹⁸ but slightly higher than the average. However, comparisons of rates across studies can be difficult because there is inconsistency in the tools being used to measure FI across studies, which likely impacts the results. Thus the differences seen across studies could be due to differences in tools used to measure FI. The same reasoning applies to HI. One national report used the exact same questions as this study and found that 56% of students experienced HI,¹³ while this study found 66.1% had HI. Currently, there is not a validated measure for HI, increasing the difficulty in comparing results across studies. The development of a validated measure for HI and consistent use of the measure will help move this field forward.

Results from the multivariate regression analyses indicated that students who had experienced FI before coming to college were 3.36 times more likely be basic needs insecure. This is similar to the findings of another study focused solely on FI in the the Southeastern region,³⁵ thus this paper expands on the previous literature. Taken together, these findings imply that high rates of BNI among college students may be due in part to FI among students before entering college. University administrators may have limited ability to address structural issues before college. Access to higher education has increased through educational programs and initiatives providing high school graduates the opportunity to attend 2- or 4-year colleges or universities with little to no tuition and mandatory fees. As student populations shift towards more non-traditional students,⁵² who may have more factors associated with BNI than traditional college students, universities should be aware of the relationship with BNI and allocate funding

for systematic assessments of BNI and resources to assist students experiencing this issue. Students who were employed or did not receive family financial support were also more likely to experience BNI. While BNI is an emerging focus in the college population, employment^{35,58} and not receiving family financial support^{69,70} have been previously associated with experiencing FI in the college population. Juniors, seniors, masters, and doctoral students were more likely to be housing insecure than sophomores, with seniors and doctoral students having the highest risk. Employment, lack of family financial support, and longer length of time in a degree program may indicate that as students transition to becoming more independent, they may be more susceptible to BNI. These are factors to be aware of as university administrators address issues of FI and HI. Informed administrators have the ability to create more strategic interventions for students as they become more independent and transition towards adulthood.

This study is novel as BNI among college students in an emerging area of research with little published in the peer-reviewed literature. Additionally, the grey literature on this topic identifies FI and HI prevalence among college students in the Northeast,^{17,19} on the West coast^{16,20} and nationally.^{13,18} This study fills a gap by providing research from a large, public university in the Southeast, which is a region that consistently ranks among the worst for nutrition-related outcomes in the U.S.⁵⁶ Also, a response rate of 11.2% was achieved, which is higher than the average response rate for web-based surveys.⁷¹

FI has been studied more than HI, and has validated measurement tools such as the Hunger Vital Sign used in this study. HI assessment lacks validated measurement tools, which makes it difficult to assess. This study measured HI to be higher than previous reports of HI, but is difficult to compare because of the use of different assessment tools.

In addition, recall and social desirability biases may be present as the study used a self-report survey data, although this is consistent in the literature related to college FI.^{6,7}

A strength of the study included the ability to systematically invite all enrolled students to participate in the survey, but as a result, a convenience sample responded. The sample that completed this survey contained more white, female, older, graduate students than the overall population at the university. Thus, we can not conclude that this convenience sample accurately represents the overall student population at the university, and is not generalizable to other universities.

Conclusion

Students from this large, public university in the Southeast reported high rates of BNI (37.1%), FI (48.5%), and HI (66.1%). Factors that increased the likelihood of BNI included previous FI, being employed, and not receiving familial financial support.

College BNI is an emerging field and an important area of future study. A validated measurement tool for HI and consistent use is need to advance this field, along with more consistent use of FI measurement tools. Future research should move beyond cross-sectional study designs and include longitudinal or cohort studies of college BNI, FI, and HI to more dynamically understand the factors associated with BNI, FI, and HI. These study designs would allow a better understanding of the directionality of the relationships between BNI, FI, and/or HI and related factors, which is missing in the current literature. Additionally, some research indicates differences between these relationships across 2- and 4-year public universities.¹³ Comparisons across different types of schools, such as large, public and small, private colleges and universities, and universities from different geographical regions, may be one way to determine if some students or schools are at higher risk and will allow measures to be put in

place that mitigate that risk. Future studies should also investigate systematic interventions and programming that may alleviate experiences of BNI while in college.

CHAPTER 3: EXTENDED METHODOLOGY

Conceptual Framework for Factors Related to College BNI

A conceptual framework was developed to explain the relationships between the hypothesized factors related to BNI, and explore the directionality of the relationships. It was hypothesized that financial factors (employment status, student monthly income, family financial support, financial aid) increase the likelihood of experiencing BNI, as well as certain demographics. For example, a lower monthly income would increase BNI. Structural inequities such as racism may cause certain demographics (indicated in Figure 3) to have an increased likelihood of experiencing BNI. Thus, these financial and demographic factors are shown at the top of the framework with directional arrows pointing toward BNI. We also hypothesize that those experiencing BNI are more likely to have poorer academic performance (as indicated by the arrow from BNI to academic performance), which may create a feedback loop that further impacts financial factors, such as eligibility for financial aid or family financial support. In this framework, experiencing BNI increases the likelihood of poorer physical and mental health. It is likely that these poor health factors feed back into increased experiences of BNI. This rationale assumes that poor physical or mental health may negatively influence a person's ability to manage stress and daily life, further exacerbating stress related to FI and HI, or BNI.⁴⁴ The framework can be seen in Figure 3. The financial factors and demographics in the upper portion of the framework were chosen as the focus of the study. Steps were taken in the extended methods to assess the relationships of academic factors and health factors in the bottom portion of the framework.

Additional Survey Components

In addition to the survey components described in the main portion of the thesis, a few

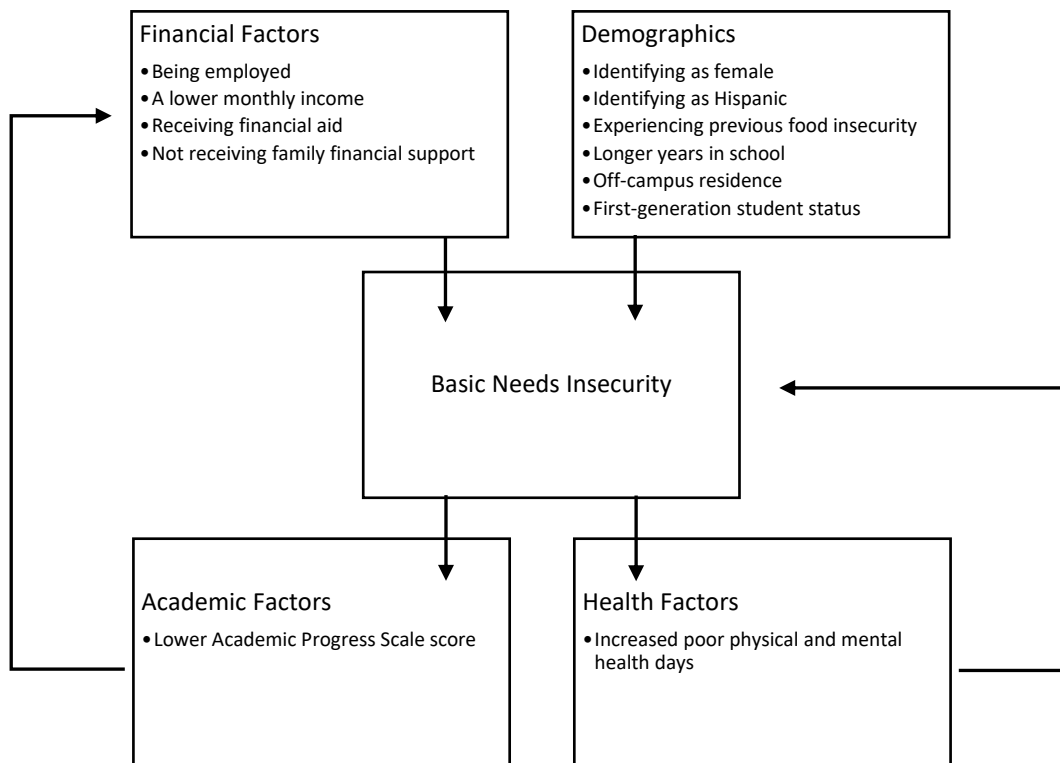


Figure 3. Framework of Hypothesized Relationship between Variables

additional factors were measured. These factors include academic factors and health factors.

Academic Factors

Measures of academic success were collected in the survey. The Academic Progress Scale (APS)^{72,73} was used to measure students' perceived academic progress. The APS consists of four questions and participants are asked to rate ('excellent,' 'good,' 'fair,' 'poor') their overall progress in school, class attendance, attention span in class, and understanding of concepts taught in class.^{72,73} These questions are scored on a four-point Likert scale with 'excellent' = 4 points, 'good' = 3 points, 'fair' = 2 points, and 'poor' = 1 point, and summed. The APS scores can range from four to sixteen points, with a higher score representing better perceived academic progress. For this study, the Cronbach's alpha for the APS scores were 0.73, which is considered to be in the acceptable range.⁷⁴

Health Factors

Health factors collected included self-reported health of survey respondents by asking the survey respondent to rate their health ('excellent,' 'good,' 'fair,' or 'poor').^{72,73,75} Respondents indicated the number of days in a month of experiencing poor physical health and poor mental health (0-30 days or 'don't know'). The number of poor physical and mental health days in a month were summed and represented on a 0-60 day scale and responses of 'don't know' were removed from analyses (n=134).

Statistical Analyses of Academic and Health Factors

Additional statistical analyses were conducted to assess the relationships between BNI (as well as HI and FI) and the outcomes of health and academic factors. As a first step in these analyses, descriptive statistics were run to determine characteristics of the sample and levels of BNI, as well as FI and HI. A multiple linear regression was built to predict the FI and HI

variables effect on students' Academic Progress Scale (APS) score. Age, gender, race, and ethnicity were included in the model as confounders and entered into the model in the first block. The second block included the FI and HI variables (independent variables) and the APS score (dependent variable). An interaction term of FI and HI was included, but later dropped because it was nonsignificant and did not add to the model.

A Poisson regression was used to predict the FI and HI variables effect on students' reported number of poor physical and mental health days. Many students (13.4%) indicated experiencing zero days of poor physical or mental health leading to using the Poisson regression for zero-inflated models. Multiple linear regression with log transformation of the number of poor physical and mental health days was used to compare to the results from the Poisson regression model with similar results. An interaction term of FI and HI was included in this model too, but dropped because it did not add to the model. Confounders included age, gender, race, and ethnicity. Data were analyzed using SPSS Software 2.0. Statistical significance for all tests was determined at $\alpha \leq .05$ level.

Results

Association of Food and Housing Insecurity and Student Academic Progress Using Multiple Linear Regression

A multiple linear regression was used to predict the Academic Progress Scale (APS) score based on food security status and housing security status. When controlling for age, gender, race and ethnicity, both of the predictors, HI ($B = -.19, p = .04$) and FI ($B = -.93, p < .01$), were significant in the model (Table 5.) Students who were food insecure scored ~ 1 point lower on the APS, while students who were housing insecure scored lower by ~ 0.2 . The overall model fit was R^2 value = 0.095.

Table 5. Multiple Linear Regression Predicting APS Score among College Students at a Large, Public University in the Southeastern U.S., 2019

Variable (reference category^a)	B	P value	95% CI
Food Insecurity <i>Food secure = 0</i> <i>Food insecure = 1</i>	-0.93	<0.01	-1.10- -0.76
Housing Insecurity <i>Housing secure = 0</i> <i>Housing insecure = 1</i>	-0.19	0.04	-0.37- -0.01
Age (<i>continuous</i>)	0.06	<0.01	0.05-0.07
Gender <i>Female = 0</i> <i>Male = 1</i>	0.10	0.30	-0.09-.028
Race <i>White = 0</i> <i>Non-white = 1</i>	-0.49	<0.01	-0.72- -0.27
Ethnicity <i>Non-Hispanic = 0</i> <i>Hispanic = 1</i>	-0.24	0.22	-0.63-0.15

α , $p < 0.05$, significant values are bolded

^aReference categories included for categorical variables

Association of Food and Housing Insecurity and Number of Days of Poor Physical or Mental Health Using Poisson Regression

Using the Poisson regression, both of the predictors, HI ($B = -.23, p < .01$) and FI ($B = -.50, p < .01$), were significant in the model (Table 6.) when controlling for age, gender, race, and ethnicity. Students who were food insecure reported ~5 more days of poor physical or mental health than students who were food secure. Students who were housing insecure reported 2.13 more days of poor physical or mental health compared to students who were housing secure.

Discussion

The framework hypothesizing the relationship between BNI and other socioeconomic, demographic, health and academic factors was developed to provide more clarity regarding the directionality of these relationships. Additional thought is needed about the dynamic relationships between the factors related to FI, HI, and BNI. While outside the scope of this thesis, additional statistical modeling methods or systems dynamics models that can account for these feedback loops may be needed to better understand these relationships. Using the conceptual framework as a guide, both the APS score and number of poor physical and mental health days were hypothesized to be dependent variables, while FI and HI acted as the independent variable. This hypothesis informed the chosen analyses, with interesting results. The result of being food insecure showed nearly a one point decrease on the APS compared to students who were food secure, while those who were housing insecure indicated a 0.2 point decrease on the APS compared to those who were housing secure. Those who were food insecure reported ~5 more days of poor physical and mental health, and those who were a housing insecure indicated ~2 days more of poor physical or mental health.

As there is a small amount of research documenting associations between FI, HI, and

Table 6. Poisson Regression Predicting Number of Poor Physical and Mental Health Days among College Students at a Large, Public University in the Southeastern U.S., 2019

Variable (reference category ^a)	<i>B</i>	<i>P value</i>	95% <i>CI</i>
Food Insecurity <i>Food secure = 0</i> <i>Food insecure = 1</i>	-0.49	<0.01	-0.52- -0.46
Housing Insecurity <i>Housing secure = 0</i> <i>Housing insecure = 1</i>	-0.21	<0.01	-0.24- -0.18
Age (<i>continuous</i>)	-0.01	<0.01	-0.01- -0.01
Gender <i>Female = 0</i> <i>Male = 1</i>	0.38	<0.01	0.35-0.41
Race <i>White = 0</i> <i>Non-white = 1</i>	0.01	0.59	-0.03-0.05
Ethnicity <i>Non-Hispanic = 0</i> <i>Hispanic = 1</i>	-0.03	0.35	-0.09-0.03

α , $p < 0.05$, significant values are bolded

^aReference categories included for categorial variables

poorer academic outcomes and physical and mental health,^{13,16,17} these results concur with previous research and provide additional information on the directionality of the relationship between BNI and academic and health factors. Future research is needed to properly model these complex relationships. Additional support for students experiencing BNI is needed to reduce this disparity and increase university graduation and retention rates.

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APPENDICES

A-1 Consent Page

Survey Intro

Hello!

Research Study Title: *Assessment of Basic Needs Insecurity in College Students*

Invitation to Complete Survey

We are asking you to be in this research study because you are enrolled at the University of Tennessee, Knoxville. You must be age 18 or older to participate in the study. The information in this consent form is to help you decide if you want to be in this research study. Please take your time reading this form and contact the researcher(s) to ask questions if there is anything you do not understand.

Why is the research being done?

The purpose of the research study is gain knowledge about UTK students' usual access to food and housing.

This study is being conducted by researchers at the University of Tennessee, Knoxville and de-identified information will be shared researchers at West Virginia University. This study is being conducted by Dr. Elizabeth Anderson Steeves and Dr. Marsha Spence, two professors in the Department of Nutrition at the University of Tennessee.

What will I do in this study?

If you agree to be in this study, you will complete an online survey. The survey includes questions about food and housing access and should take you about 15 minutes to complete. We request that you complete it in a private setting. You can skip questions that you do not want to answer.

We would appreciate you completing it by Tuesday, November 12th, 2019.

Can I say “No”?

Being in this study is up to you. You can stop up until you submit the survey. After you submit the survey, we cannot remove your responses because we will not know which responses came from you.

Either way, your decision won't affect your grades, your relationship with your instructors, employment or standing with the University of Tennessee, Knoxville.

Are there any risks to me?

There are no foreseeable risks. It is possible that someone could find out you were in this study or see your study information, but we believe this risk is small because of the procedures we use to protect your information. These procedures are described later in this form.

Another possible risk is that you might not want to answer some questions on the surveys. However, we try to leave out questions that might make you uncomfortable. At any time, you can skip questions, or we can stop the survey and you will not be penalized.

Are there any benefits to me?

We do not expect you to benefit from being in this study. Your participation may help us to learn more about university students' access to food and housing. We hope the knowledge gained from this study will benefit others in the future.

What will happen with the information collected for this study?

The survey is anonymous, and no one will be able to link your responses back to you. Your responses to the survey will not be linked to your computer, email address or other electronic identifiers.

Information collected for this study will be published and possibly presented at scientific meetings but will not include any information that could be linked to your responses.

Will I be paid for being in this research study?

Participants will be able to enter an email address for an incentive drawing by clicking a link to take them to a new survey (with one question asking them to enter contact information for the drawing). These email addresses will not be a part of the main dataset and therefore cannot be connected to participants' responses. Email addresses will be randomized to choose ten winners (\$50 e-gift card to Amazon each).

Winners will be sent the e-gift card to Amazon through the email provided. Once the winners are chosen and sent their e-gift card, the email address file will be deleted. All students invited to participate in the research study who provide their email address in the second survey will be equally eligible to receive a gift card, even if they choose not to answer any of the survey questions. If students want to enter the gift card drawing without taking the survey, they have the right to do so. They will be informed that they can email Dr. Anderson Steeves at eander24@utk.edu and request to be entered into the gift card drawing.

Who can answer my questions about this research study?

If you have questions or concerns about this study, or have experienced a research related problem or injury, contact the researchers. If you have any questions about this study, please contact Drs. Anderson Steeves or Spence at the telephone numbers or e-mail addresses listed below.

Respectfully,

Elizabeth (Betsy) Anderson Steeves, PhD, RD

Assistant Professor

Department of Nutrition

University of Tennessee, Knoxville

Jessie Harris Building, Room 229

Email: eander24@utk.edu

Office phone: 865.974.6254

Marsha Spence, PhD, MPH, RDN, LDN

Associate Professor of Practice

Director, Public Health Nutrition Graduate Program

Department of Nutrition

University of Tennessee, Knoxville

Jessie Harris Building, Room 229

Email: mspence@utk.edu

Office phone: 865.974.6265

For questions or concerns about your rights or to speak with someone other than the research team about the study, please contact:

Institutional Review Board

The University of Tennessee, Knoxville

1534 White Avenue

Blount Hall, Room 408

Knoxville, TN 37996-1529

Phone: 865-974-7697

Email: utkirb@utk.edu

Statement of Consent

I have read this form, been given the chance to ask questions and have my questions answered. If I have more questions, I have been told who to contact. By clicking the “Continue” button below, I am agreeing to be in this study. I can print or save a copy of this consent information for future reference. If I do not want to be in this study, I can close my internet browser.

A-2 Email with Survey Link

Invitation to Complete Survey.

Subject line: Participate in a food and housing access survey and get a chance to win 1 of 10 \$50 gift cards!

Hello! You are invited to take part in a research study about your usual access to food and housing. This study is being conducted by Dr. Elizabeth Anderson Steeves and Dr. Marsha Spence, two professors in the Department of Nutrition at the University of Tennessee.

If you agree to participate, it will take about 15 minutes of your time to complete the following self-administered, questionnaire. We request that you complete it in a private setting.

Being a part of this study is up to you, and you will not receive any compensation or academic credit for participating. However, you will have the opportunity to enter your email address to enter a drawing for one of ten \$50 Amazon Gift Cards. We assure you that your answers will be kept confidential and will not be connected to your email address in any way. Your answers will help us to design activities about how to enhance student access to nutritious food and safe housing.

Take the survey by clicking here.

We would appreciate you completing it by Tuesday, November 19th, 2019. Study results will be shared during the Spring 2020 semester. If you have any questions about this study, please contact Drs. Anderson Steeves or Spence at the telephone numbers or e-mail addresses listed below.

Respectfully,

Elizabeth (Betsy) Anderson Steeves, PhD, RD
Assistant Professor
Department of Nutrition
University of Tennessee, Knoxville
Jessie Harris Building, Room 229
Email: eander24@utk.edu
Office phone: 865.974.6254

Marsha Spence, PhD, MPH, RDN, LDN
Associate Professor of Practice
Director, Public Health Nutrition Graduate Program
Department of Nutrition
University of Tennessee, Knoxville
Jessie Harris Building, Room 229
Email: mspence@utk.edu
Office phone: 865.974.6265

A-3 Email Reminder to Complete Survey

Subject line: Participate in a food and housing access survey and get a chance to win 1 of ten \$50 gift cards!

Hello! Last week, you were invited to take part in a research study about your usual access to food and housing. If you have already taken the survey, please disregard this email. This study is being conducted by Dr. Elizabeth Anderson Steeves and Dr. Marsha Spence, two professors in the Department of Nutrition at the University of Tennessee.

If you agree to participate, it will take about 15 minutes of your time to complete the following self-administered, questionnaire. We request that you complete it in a private setting.

Being a part of this study is up to you, and you will not receive any compensation or academic credit for participating. However, you will have the opportunity to enter your email address to enter a drawing for one of ten \$50 Amazon Gift Cards. We assure you that your answers will be kept confidential and will not be connected to your email address in any way. Your answers will help us to design activities about how to enhance student access to nutritious food.

Take the survey by clicking [here](#).

We would appreciate you completing it by Tuesday, November 26th, 2019. Study results will be shared during the Spring 2020 semester.

If you have any questions about this study, please contact Drs. Anderson Steeves or Spence at the telephone numbers or e-mail addresses listed below.

Respectfully,

Elizabeth (Betsy) Anderson Steeves, PhD, RD
Assistant Professor
Department of Nutrition
University of Tennessee, Knoxville
Jessie Harris Building, Room 229
Email: eander24@utk.edu
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University of Tennessee, Knoxville
Jessie Harris Building, Room 229
Email: mspence@utk.edu
Office phone: 865.974.6265

A-4 Final Reminder to Complete Survey

Subject line: Last Chance! Participate in a food and housing access survey and get a chance to win 1 of 10 \$50 gift cards!

Hello! Three weeks ago, you were invited to take part in a research study about your usual access to food and housing. If you have already taken the survey, please disregard this email. This study is being conducted by Dr. Elizabeth Anderson Steeves and Dr. Marsha Spence, two professors in the Department of Nutrition at the University of Tennessee.

If you agree to participate, it will take about 15 minutes of your time to complete the following self-administered, questionnaire. We request that you complete it in a private setting.

Being a part of this study is up to you, and you will not receive any compensation or academic credit for participating. However, you will have the opportunity to enter your email address to enter a drawing for one of ten \$50 Amazon Gift Cards. We assure you that your answers will be kept confidential and will not be connected to your email address in any way. Your answers will help us to design activities about how to enhance student access to nutritious food.

Take the survey by clicking [here](#).

We would appreciate you completing it by Tuesday, December 13th, 2019. Study results will be shared during the Spring 2020 semester. If you have any questions about this study, please contact Drs. Anderson Steeves or Spence at the telephone numbers or e-mail addresses listed below.

Respectfully,

Elizabeth (Betsy) Anderson Steeves, PhD, RD
Assistant Professor
Department of Nutrition
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University of Tennessee, Knoxville
Jessie Harris Building, Room 229
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Office phone: 865.974.6265

A-5 Survey

Collaborative College Survey of Student Food Resources and Well-being

Hello!

Research Study Title: *Assessment of Basic Needs Insecurity in College Students*

Invitation to Complete Survey

We are asking you to be in this research study because you are enrolled at the University of Tennessee, Knoxville. You must be age 18 or older to participate in the study. The information in this consent form is to help you decide if you want to be in this research study. Please take your time reading this form and contact the researcher(s) to ask questions if there is anything you do not understand.

Why is the research being done?

The purpose of the research study is gain knowledge about UTK students' usual access to food and housing.

This study is being conducted by researchers at the University of Tennessee, Knoxville and de-identified information will be shared researchers at West Virginia University. This study is being conducted by Dr. Elizabeth Anderson Steeves and Dr. Marsha Spence, two professors in the Department of Nutrition at the University of Tennessee.

What will I do in this study?

If you agree to be in this study, you will complete an online survey. The survey includes questions about food and housing access and should take you about 15 minutes to complete.

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Information collected for this study will be published and possibly presented at scientific meetings but will not include any information that could be linked to your responses.

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Participants will be able to enter an email address for an incentive drawing by clicking a link to take them to a new survey (with one question asking them to enter contact information for the drawing). These email addresses will not be a part of the main dataset and therefore cannot be connected to participants' responses. Email addresses will be randomized to choose ten winners (\$50 e-gift card to Amazon each).

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Knoxville, TN 37996-1529
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Email: utkirb@utk.edu

Statement of Consent I have read this form, been given the chance to ask questions and have my questions answered. If I have more questions, I have been told who to contact. By clicking the “Yes” button below, I am agreeing to be in this study. I can print or save a copy of this consent information for future reference. If I do not want to be in this study, I can close my internet browser.

- ☐ Yes (1)
- ☐ No (2)

Skip To: End of Survey If Hello! Research Study Title: Assessment of Basic Needs Insecurity in College Students Invit... = No

End of Block: Consent

Start of Block: Demographics

Q28 What university do you attend?

▼ West Virginia University (1) ... Northern Marianas College (24)

Q4 What is your sex?

☐ Male (1)

☐ Female (2)

Q5 What is your gender identity?

☐ Male (1)

☐ Female (2)

☐ Other, please list (3) _____

Q6 What is your age in years?

18 21 24 28 31 34 37 40 44 47 50

Age ()	
--------	--

Q7 What is your ethnicity?

☐ Hispanic (1)

☐ Non-Hispanic (2)

Q8 What is your race?

- ☐ White or Caucasian (1)
- ☐ Black or African American (2)
- ☐ American Indian or Alaska Native (3)
- ☐ Asian (4)
- ☐ Native Hawaiian or Other Pacific Islander (5)
- ☐ Bi or Multiracial (6) _____
- ☐ Other (7) _____
-

Q9 Are you a first generation college student?

- ☐ Yes (1)
- ☐ No (2)
-

Q10 Do you live

- ☐ On campus (1)
- ☐ Off campus (2)
-

Display This Question:

If Do you live = Off campus

Q11 If you live off campus, approximately how many miles from campus do you live?

0 10 20 30 40 50 60 70 80 90 100

Slide bar to miles off campus ()



Q104 Are you enrolled in a residential or online degree program?

- ☐ Residential (1)
- ☐ Online (2)
-

Q12 What year in school are you?

- ☐ Freshman (1)
- ☐ Sophomore (2)
- ☐ Junior (3)
- ☐ Senior (4)
- ☐ Master's (5)
- ☐ PhD or EdD (6)
- ☐ Professional School (medical, pharmacy, etc) (7)
-

Display This Question:

If What year in school are you? = Master's

Or What year in school are you? = PhD or EdD

Or What year in school are you? = Professional School (medical, pharmacy, etc)

Q107 If graduate or professional school, what year are you?

- ☐ First (1)
 - ☐ Second (2)
 - ☐ Third (3)
 - ☐ Fourth (4)
 - ☐ Fifth or more (5)
-

Q13 What is your marital status?

- ☐ Single (1)
 - ☐ Live with partner (2)
 - ☐ Married (3)
 - ☐ Divorced (4)
 - ☐ Widowed (5)
-

Q14 Do you have dependents that live with you?

- ☐ Yes (1)
 - ☐ No (2)
-

Display This Question:

If Do you have dependents that live with you? = Yes

Q15 If you have dependents, how many?

Q16 Do you have a physical or mental disability?

☐ Yes (1)

☐ No (2)

Display This Question:

If Do you have a physical or mental disability? = Yes

Q17 If you have a disability, please describe?

Q19 At any time before turning 18, were you an orphan, ward of the court, or in foster care?

☐ Yes (1)

☐ No (2)

Q105 While you were in high school, did you participate in free or reduced price school lunch?

☐ Yes (1)

☐ No (2)

Q143 Are you an international student?

☐ Yes (1)

☐ No (2)

Q144 Are you a veteran?

- ☐ Yes (1)
- ☐ No (2)

End of Block: Demographics

Start of Block: Food Insecurity

Q39 Select the answer choice that BEST applies to you. All questions concern your access to food since starting college.



Q41 Which statement best describes the food available to you since being in college? Check your answer.

- ☐ Enough of the kinds of food I want to eat (1)
 - ☐ Enough, but not always the kinds of food I want to eat (2)
 - ☐ Sometimes not enough to eat (3)
 - ☐ Often not enough to eat (4)
-



Q43 Since starting college, I worried whether my food would run out before I got money to buy more.

- ☐ Often (2)
 - ☐ Sometimes (1)
 - ☐ Never (0)
-



Q45 The food I bought just didn't last, and I didn't have money to get more.

- ☐ Often (2)
 - ☐ Sometimes (1)
 - ☐ Never (0)
-



Q47 I couldn't afford to eat balanced meals.

- ☐ Often (2)
 - ☐ Sometimes (1)
 - ☐ Never (0)
-



Q49 Since starting college, did you ever cut the size of your meals or skip meals because there wasn't enough money for food?

- ☐ Yes (1)
 - ☐ No (0)
-

Display This Question:

If Since starting college, did you ever cut the size of your meals or skip meals because there wasn't... = Yes



Q51 How often did this happen? Please choose the answer choice that BEST applies to you.

- ☐ Almost every month (2)
- ☐ Some months, but not every month (1)
- ☐ In only one or two months (0)



Q53 Since starting college, did you ever eat less than you thought you should because there wasn't enough money for food?

☐ Yes (1)

☐ No (0)

Q131 Since starting college, were you every hungry but didn't eat because there wasn't enough money for food?

☐ Yes (1)

☐ No (3)



Q57 Since starting college, did you lose weight because there wasn't enough money for food?

☐ Yes (1)

☐ No (0)



Q59 Since starting college, did you ever not eat for a whole day because there wasn't enough money for food?

☐ Yes (1)

☐ No (0)

Display This Question:

If Since starting college, did you ever not eat for a whole day because there wasn't enough money fo... = Yes



Q61 How often did you not eat for a whole day because there wasn't enough money for food?

- ☐ Almost every month (2)
 - ☐ Some months, but not every month (1)
 - ☐ In only one or two months (0)
-

Q62 Before I came to college, we (my parent/guardian and/or I) worried whether our food would run out before we had money to buy more.

- ☐ Never (1)
 - ☐ Sometimes (2)
 - ☐ Often (3)
-

Q63 Before I came to college, the food we (my parent/guardian and/or I) bought just didn't last and we didn't have money to get more.

- ☐ Never (1)
- ☐ Sometimes (2)
- ☐ Often (3)

End of Block: Food Insecurity

Start of Block: Housing Insecurity

Q21 Since starting college, was there a rent or mortgage increase that made it difficult to pay?

☐ Yes (1)

☐ No (2)

Q22 Since starting college, did you not pay or underpay your rent or mortgage?

☐ Yes (1)

☐ No (2)

Q23 Since starting college, did you not pay the full amount of a gas, oil, or electricity bill?

☐ Yes (1)

☐ No (2)

Q24 Since starting college, have you moved two times or more?

☐ Yes (1)

☐ No (2)

Q25 Since starting college, did you move in with other people, even for a little while, because of financial problems?

☐ Yes (1)

☐ No (2)

Q26 Since starting college, did you “live with others beyond the expected capacity of the house or apartment”?

☐ Yes (1)

☐ No (2)

Q27 Since starting college, have you ever been homeless?

☐ Yes (1)

☐ No (2)

End of Block: Housing Insecurity

Start of Block: Financial Questions

Q65 Which term best describes your employment status?

☐ Unemployed (1)

☐ One or more part-time jobs (2)

☐ One full-time job (3)

☐ Other (Please indicate) (4) _____

Q67 Do you currently receive income from some type of financial aid like a scholarship, grant, private or federal loan?

☐ Yes (1)

☐ No (2)

Display This Question:

If Do you currently receive income from some type of financial aid like a scholarship, grant, privat... = Yes

Q70 If yes, what type of financial aid do you receive?

- ☐ Graduate Stipend (1)
- ☐ Tuition Remission (6)
- ☐ Federal Loan (2)
- ☐ Personal Loan (3)
- ☐ Grant such as Pell Grant (7)
- ☐ Scholarship (4)
- ☐ Other (5) _____

Q69 What is your personal (not family) average monthly income? (Dollars)

0 800 1600 2400 3200 4000 4800 5600 6400 7200 8000

Slide bar to monthly personal income ()



Q73 How would you rate your overall understanding of personal finance?

- ☐ Very Low (1)
- ☐ Low (2)
- ☐ Moderate (3)
- ☐ High (4)
- ☐ Very High (5)

Q54 Since starting college, have you received Supplemental Nutrition Assistance Program (SNAP) benefits (Food Stamps)?

☐ Yes (1)

☐ No (2)

Q71 Do you receive financial support from family?

☐ Yes (1)

☐ No (2)

Q129 Do you receive a free meal plan or meals from your program of study or rotation sites?

☐ Yes (1)

☐ No (2)

☐ Sometimes (3)

End of Block: Financial Questions

Start of Block: Money Expenditure

Q31 Since starting college, about how often did you spend money on the following instead of using the money to buy food?

	Often (1)	Sometimes (2)	Never (3)
Purchased alcohol instead of using money to buy food (1)	☐	☐	☐
Purchased cigarettes instead of using money to buy food (2)	☐	☐	☐
Purchased recreational drugs instead of using money to buy food (3)	☐	☐	☐
Spent money on car repairs instead of using money to buy food. (4)	☐	☐	☐
Spent money on gasoline instead of using money to buy food. (5)	☐	☐	☐
Spent money on public transportation to school/work instead of using money to buy food. (6)	☐	☐	☐
Spent money on pet care instead of using money to buy food. (7)	☐	☐	☐
Spent money on tattoos instead of using money to buy food. (8)	☐	☐	☐

Q33 Did you spend money on anything else instead of using money to buy food? Please indicate:

End of Block: Money Expenditure

Start of Block: Coping Strategies

Q35 Below is a list of strategies that some people use to get food when their own food is low or when they have run out of food.

Q37 Please select how often you have used any of these strategies to get food since starting college.

	Often (1)	Sometimes (2)	Never (3)
Sold textbooks (1)	☐	☐	☐
Sold personal possessions (2)	☐	☐	☐
Taken fewer classes to save tuition money (3)	☐	☐	☐
Used less utilities (e.g. electricity, water) (4)	☐	☐	☐
Shared the rent with other people (5)	☐	☐	☐
Held one or more part-time or full-time jobs (6)	☐	☐	☐
Used a credit card to buy food (7)	☐	☐	☐
Planned menus before buying food (8)	☐	☐	☐
Cut out food coupons (9)	☐	☐	☐
Sold your blood/plasma to buy food (10)	☐	☐	☐
Sold your sperm/eggs to buy food (11)	☐	☐	☐
Participated in a research study/clinical trial to buy food (12)	☐	☐	☐
Borrowed money from family or friends (13)	☐	☐	☐
Attended on-campus or community functions where there was free food (14)	☐	☐	☐
Obtained food from a food bank or food pantry (15)	☐	☐	☐

Bartered (traded) services or items to get food (16)	☐	☐	☐
Participated in a federal or state food assistance program (e.g. SNAP, WIC, etc.) (17)	☐	☐	☐
Taken food home from on-campus dining hall (18)	☐	☐	☐
Saved money on medications or medical appointments to buy food (19)	☐	☐	☐
Stretched food to make it last longer (20)	☐	☐	☐
Shared groceries and/or meals with roommates (21)	☐	☐	☐
Obtained food from a dumpster or trash (22)	☐	☐	☐
Saved a supply of food in case of emergency (23)	☐	☐	☐
Ate more than normal when food was plentiful (24)	☐	☐	☐
Eaten meals at places where you can “pay what you can” (e.g. A Place at the Table) (25)	☐	☐	☐
Joined a church or other organizational group where free meals are provided (26)	☐	☐	☐
Ate less healthy meals so you could eat more food (27)	☐	☐	☐
Purchased cheap, processed food (e.g. ramen noodles, frozen pizza, candy, etc.) (28)	☐	☐	☐

Visited family on the weekend in order to bring back food to school (29)



End of Block: Coping Strategies

Start of Block: Academic Performance

Q56 How would you rate your overall progress in school including graduating on time?

☐ Excellent (1)

☐ Good (2)

☐ Fair (3)

☐ Poor (4)

Q58 How would you rate your class attendance?

☐ Excellent (1)

☐ Good (2)

☐ Fair (3)

☐ Poor (4)

Q60 How would you rate your attention span in class?

- ☐ Excellent (1)
 - ☐ Good (2)
 - ☐ Fair (3)
 - ☐ Poor (4)
-

Q62 How would you rate your understanding of concepts taught in class?

- ☐ Excellent (1)
 - ☐ Good (2)
 - ☐ Fair (3)
 - ☐ Poor (4)
-

Q64 What is your current grade point average (GPA)?

End of Block: Academic Performance

Start of Block: Health

Q66 About how much do you currently weigh? (Pounds)

Q68 About how tall are you?

☐

Feet (1) _____

☐

Inches (2) _____

Q70 How would you rate your current health?

☐ Excellent (1)

☐ Good (2)

☐ Fair (3)

☐ Poor (4)

Q72 Would you describe your personality as:

	Strongl y disagree (1)	Disagree moderatel y (2)	Disagre e a little (3)	Neither agree nor disagre e (4)	Agre e a little (5)	Agree moderatel y (6)	Strongl y agree (7)	Choos e not to answer (8)
Extroverted, enthusiastic (1)	☐	☐	☐	☐	☐	☐	☐	☐
Critical, quarrelsome (2)	☐	☐	☐	☐	☐	☐	☐	☐
Dependable, self- disciplined (3)	☐	☐	☐	☐	☐	☐	☐	☐
Anxious, easily upset (4)	☐	☐	☐	☐	☐	☐	☐	☐
Open to new experiences, complex (5)	☐	☐	☐	☐	☐	☐	☐	☐
Reserved, quiet (6)	☐	☐	☐	☐	☐	☐	☐	☐
Sympathetic, warm (7)	☐	☐	☐	☐	☐	☐	☐	☐
Disorganized , careless (8)	☐	☐	☐	☐	☐	☐	☐	☐
Calm, emotionally stable (9)	☐	☐	☐	☐	☐	☐	☐	☐
Conventional , uncreative (10)	☐	☐	☐	☐	☐	☐	☐	☐

Q74 Now thinking about your physical health, which includes physical illness and injury, how many days during the past 30 days was your physical health not good?

- ☐ Number of days (1) _____
- ☐ None (2)
- ☐ Don't know/not sure (3)
-

Q76 Now thinking about your mental health, which includes stress, depression, and problems with emotions, how many days during the past 30 days was your mental health not good?

- ☐ Number of days (1) _____
- ☐ None (2)
- ☐ Don't know/not sure (3)
-

Q78 During the past 30 days, for about how many days did poor physical or mental health keep you from doing your usual activities, such as self-care, work, or recreation?

- ☐ Number of days (1) _____
- ☐ None (2)
- ☐ Don't know/not sure (3)
-

End of Block: Health

Start of Block: Sleep

Q116 The following questions relate to your usual sleep habits during the past month only. Your answers should indicate the most accurate reply for the majority of days and nights in the past month. Please answer all questions.

Q117 When have you usually gone to bed?

Q118 How long (in minutes) has it taken you to fall asleep each night?

Q119 When have you usually gotten up in the morning?

Q120 How many hours of actual sleep do you get at night? (This may be different than the number of hours you spend in bed)

Q121 During the past month, how often have you had trouble sleeping because you...

	Not during the past month (1)	Less than once a week (2)	Once or twice a week (3)	Three or more times a week (4)
Cannot get to sleep within 30 minutes (1)	☐	☐	☐	☐
Wake up in the middle of the night or early morning (2)	☐	☐	☐	☐
Have to get up to use the bathroom (3)	☐	☐	☐	☐
Cannot breathe comfortably (4)	☐	☐	☐	☐
Cough or snore loudly (5)	☐	☐	☐	☐
Feel too cold (6)	☐	☐	☐	☐
Feel too hot (7)	☐	☐	☐	☐
Have bad dreams (8)	☐	☐	☐	☐
Have pain (9)	☐	☐	☐	☐
Other reason(s) (10)	☐	☐	☐	☐

Q122 If other reason(s) selected above, please describe, including how often you have had trouble sleeping because of this reason(s)

Q123 During the past month, how often have you taken medicine (prescribed or “over the counter”) to help you sleep?

- ☐ Not during the past month (1)
 - ☐ Less than once a week (2)
 - ☐ Once or twice a week (3)
 - ☐ Three or more times a week (11)
-

Q124 During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?

- ☐ Not during the past month (1)
 - ☐ Less than once a week (2)
 - ☐ Once or twice a week (3)
 - ☐ Three or more times a week (32)
-

Q125 During the past month, how much of a problem has it been for you to keep up enthusiasm to get things done?

- ☐ Not during the past month (1)
 - ☐ Less than once a week (2)
 - ☐ Once or twice a week (3)
 - ☐ Three or more times a week (4)
-

Q126 During the past month, how would you rate your sleep quality overall?

- ☐ Very good (1)
- ☐ Fairly good (2)
- ☐ Fairly bad (3)
- ☐ Very bad (4)

End of Block: Sleep

Start of Block: RLS

Q108 Do you have, or have you had, recurrent uncomfortable feelings or sensations in your legs while you are sitting or lying down?

- ☐ Yes (5)
 - ☐ No (6)
-

Q109 Do you, or have you had, a recurrent need or urge to move your legs while you were sitting or lying down?

- ☐ Yes (4)
 - ☐ No (5)
-

Display This Question:

If Do you have, or have you had, recurrent uncomfortable feelings or sensations in your legs while y... = Yes
Or Do you, or have you had, a recurrent need or urge to move your legs while you were sitting or lyi... = Yes

Q110 Are you more likely to have these feelings when you are resting (either sitting or lying down) or when you are physically active?

- ☐ Resting (1)
- ☐ Physically Active (2)

Display This Question:

If Do you have, or have you had, recurrent uncomfortable feelings or sensations in your legs while y... = Yes

Or Do you, or have you had, a recurrent need or urge to move your legs while you were sitting or lyi... = Yes

Q111 If you get up or move around when you have these feelings do these feelings get any better while you actually keep moving?

- ☐ Yes (1)
- ☐ No (2)
- ☐ Don't know (3)

Display This Question:

If Do you have, or have you had, recurrent uncomfortable feelings or sensations in your legs while y... = Yes

Or Do you, or have you had, a recurrent need or urge to move your legs while you were sitting or lyi... = Yes

Q112 Which times of day are these feelings in your legs most likely to occur?

- ☐ Morning (1)
- ☐ Midday (2)
- ☐ Afternoon (3)
- ☐ Evening (4)
- ☐ Night (5)
- ☐ About equal at all times (6)

Display This Question:

If Do you have, or have you had, recurrent uncomfortable feelings or sensations in your legs while y... = Yes

Or Do you, or have you had, a recurrent need or urge to move your legs while you were sitting or lyi... = Yes

Q113 Will simply changing leg position by itself once without continuing to move usually relieve these feelings?

- ☐ Usually relieves (1)
- ☐ Does not usually relieve (2)
- ☐ Don't know (3)

Display This Question:

If Do you have, or have you had, recurrent uncomfortable feelings or sensations in your legs while y... = Yes
Or Do you, or have you had, a recurrent need or urge to move your legs while you were sitting or lyi... = Yes

Q114 Are these feelings ever due to muscle cramps?

- ☐ Yes (1)
- ☐ No (2)
- ☐ Don't know (3)

Display This Question:

If Are these feelings ever due to muscle cramps? = Yes

Q115 If so, are they always due to muscle cramps?

- ☐ Yes (1)
- ☐ No (2)
- ☐ Don't know (3)

End of Block: RLS

Start of Block: Diet Screener

Q80 These questions are about the different kinds of foods you ate or drank during the past month, that is, the past 30 days. When answering, please include meals and snacks eaten at home, at work or school, in restaurants, and any place else. Although some of these dietary

questions may seem like they are repetitive, they are different questions and we need you to answer all of them completely and to the best of your ability.

Q82 During the past month, how often did you eat hot or cold cereals? Mark one.

▼ Never (1) ... 2 or more times per day (9)

Skip To: Q88 If During the past month, how often did you eat hot or cold cereals? Mark one. = Never

Q84 During the past month, what kind of cereal did you usually eat? (Search types of cereal by clicking on the box and typing the first letter of the cereal).

▼ 100% Bran (1) ... Zoom (336)

Q86 Was there another cereal you usually ate? Please specify. (Search types of cereal by clicking on the box and typing the first letter of the cereal).

▼ 100% Bran (1) ... Zoom (336)

Q88 During the past month, how often did you have any milk (either to drink or on cereal)? Include regular milks, chocolate or other flavored milks, lactose-free milk, buttermilk. Please do not include soy milk or small amounts of milk in coffee or tea. Mark one.

▼ Never (1) ... 6 or more times per day (11)

Skip To: Q92 If During the past month, how often did you have any milk (either to drink or on cereal)? Include re... = Never

Q90 During the past month, what kind of milk did you usually drink? Mark one.

- ☐ Whole or regular milk (1)
- ☐ 2% or reduced-fat milk (2)
- ☐ 1%, 1/2%, or low-fat milk (3)
- ☐ Fat-free, skim, or nonfat milk (4)
- ☐ Soy milk (5)
- ☐ Other kind of milk (please specify) (6)
- _____

Q92 During the past month, how often did you drink regular soda or pop that contains sugar?
Do not include diet soda. Mark one.

▼ Never (1) ... 6 or more times per day (11)

Q94 During the past month, how often did you drink 100% pure fruit juices such as orange, mango, apple, grape, and pineapple juices? Do not include fruit-flavored drinks with added sugar or fruit juice you made at home and added sugar to. Mark one.

▼ Never (1) ... 6 or more times per day (11)

Q96 During the past month, how often did you drink coffee or tea that had sugar or honey added to it? Include coffee and tea you sweetened yourself and presweetened tea and coffee drinks such as Arizona Ice Tea and Frappuccino. Do not include artificially sweetened coffee or diet tea.

▼ Never (1) ... 6 or more times per day (11)

Q98 During the past month, how often did you drink sweetened fruit drinks, such as Kool-Aid, lemonade, Hi-C, cranberry drink, Gatorade, Red Bull, or Vitamin Water? Include fruit juices you made at home and added sugar to. Do not include diet drinks or sweetened drinks.

▼ Never (1) ... 6 or more times per day (11)

Q100 During the past month, how often did you eat fruit? Include fresh, frozen, or canned fruit. Do not include juices.

▼ Never (1) ... 2 or more times per day (9)

Q102 During the past month, how often did you eat a green leafy or lettuce salad, with or without other vegetables?

▼ Never (1) ... 2 or more times per day (9)

Q104 During the past month, how often did you eat any kind of fried potatoes, including french fries, home fries, or hash brown potatoes?

▼ Never (1) ... 2 or more times per day (9)

Q106 During the past month, how often did you eat other kind of potatoes, such as baked, broiled, mashed potatoes, sweet potatoes, or potato salad?

▼ Never (1) ... 2 or more times per day (9)

Q108 During the past month, how often did you eat refried beans, baked beans, beans in soup, pork and beans, or any other type of cooked dried beans? Do not include green beans.

▼ Never (1) ... 2 or more times per day (9)

Q110 During the past month, how often did you eat brown rice or other cooked whole grains such as bulgur, cracked wheat, or millet? Do not include white rice.

▼ Never (1) ... 2 or more times per day (9)

Q112 During the past month, not including what you reported about (green salads, potatoes, cooked dried beans), how often did you eat other vegetables?

▼ Never (1) ... 2 or more times per day (9)

Q114 During the past month, how often did you have Mexican-type salsa made with tomato?

▼ Never (1) ... 2 or more times per day (9)

Q116 During the past month, how often did you eat pizza? Include frozen pizza, fast food pizza, and homemade pizza.

▼ Never (1) ... 2 or more times per day (9)

Q118 During the past month, how often did you have tomato sauces such as with spaghetti or noodles or mixed into foods such as lasagna? Do not include tomato sauce on pizza.

▼ Never (1) ... 2 or more times per day (9)

Q120 During the past month, how often did you eat any kind of cheese? Include cheese as a snack, cheese on burgers, sandwiches, and cheese in foods such as lasagna, quesadillas, or casseroles. Do not include cheese on pizza.

▼ Never (1) ... 2 or more times per day (9)

Q122 During the past month, how often did you eat red meat, such as beef, pork, ham, or sausage? Do not include chicken, turkey, or seafood. Include red meat you had in sandwiches, lasagna, stew, and other mixtures. Red meats may also include veal, lamb, and any lunch meats made with these meats.

▼ Never (1) ... 2 or more times per day (9)

Q124 During the past month, how often did you eat any processed meat, such as bacon, lunch meats, or hot dogs? Include processed meat you had in sandwiches, soups, pizza, casseroles and other mixtures. Processed meats are those preserved by smoking, curing, or salting, or by the addition of preservatives. Examples are: ham, bacon, pastrami, salami, sausages, bratwursts, frankfurters, hot dogs, and spam.

▼ Never (1) ... 2 or more times per day (9)

Q126 During the past month, how often did you eat whole grain bread including toast, rolls, and in sandwiches? Whole grain breads include whole wheat, rye, oatmeal, and pumpernickel. Do not include white bread.

▼ Never (1) ... 2 or more times per day (9)

Q128 During the past month, how often did you eat chocolate or any other types of candy? Do not include sugar-free candy.

▼ Never (1) ... 2 or more times per day (9)

Q130 During the past month, how often did you eat doughnuts, sweet rolls, Danish, muffins, pan dulce, or Pop-tarts? Do not include sugar-free items.

▼ Never (1) ... 2 or more times per day (9)

Q132 During the past month, how often did you eat cookies, cake, pie or brownies? Do not include sugar-free kinds.

▼ Never (1) ... 2 or more times per day (9)

Q134 During the past month, how often did you eat ice cream or other frozen desserts? Do not include sugar-free kinds.

▼ Never (1) ... 2 or more times per day (9)

Q136 During the past month, how often did you eat popcorn?

▼ Never (1) ... 2 or more times per day (9)

End of Block: Diet Screener

Start of Block: Cooking self-efficacy

Q142 Check the box that best describes your confidence to each statement

	Extremely Confident (1)	Very Confident (2)	Moderately Confident (3)	Not Very Confident (4)	Not Confident At All (5)
I can cook a nutritious meal (1)	☐	☐	☐	☐	☐
I can cook a meal in a short amount of time (2)	☐	☐	☐	☐	☐
I can cook a nutritious meal without spending a lot of money (3)	☐	☐	☐	☐	☐
I can follow a recipe (4)	☐	☐	☐	☐	☐

End of Block: Cooking self-efficacy

Start of Block: Campus Resources

Q137 Are you aware of resources on campus for students who have difficulty receiving enough food?

☐ Yes (1)

☐ No (2)

Display This Question:

If Are you aware of resources on campus for students who have difficulty receiving enough food? = Yes

Q138 If yes, what resources?

Q140 Do you use resources on campus that provide students with food?

☐ Yes (1)

☐ No (2)

Q127 Are you interested in participating in future research related to food security? If so, please provide your email.

☐ Yes (1) _____

☐ No (2)

End of Block: Campus Resources

A-6 Supplemental Tables

Supplemental Table 1. Frequency of Missing Data for Each Variable and Chi-square Analyses of Missing Data versus Variables of Interest^a

Variable	Missing Data n (%)	Food Security Status	Housing Security Status	Basic Needs Security Status
Current Health	135 (5.7)	$\chi^2 = 0.07$ p = 0.80	$\chi^2 = 0.65$ p = 0.42	$\chi^2 = 1.67$ p = 0.20
BMI	200 (8.6)	$\chi^2 = 0.54$ p = 0.46	$\chi^2 = 0.26$ p = 0.61	$\chi^2 = 3.43$ p = 0.06
Poor physical health days	148 (6.3)	$\chi^2 = 0.02$ p = 0.90	$\chi^2 = 0.03$ p = 0.87	$\chi^2 = 1.06$ p = 0.30
Poor mental health days	164 (7.0)	$\chi^2 = 0.32$ p = 0.57	$\chi^2 = 0.01$ p = 0.93	$\chi^2 = 1.70$ p = 0.19
Poor usual activities days	161 (6.8)	$\chi^2 < 0.01$ p = 0.99	$\chi^2 = 0.19$ p = 0.67	$\chi^2 = 2.15$ p = 0.14

α , $p < 0.05$, significant values are bolded

^aAll other variables of interest had less than 4% missing data

Supplemental Table 2. Bivariate Analyses of Basic Needs Security Status with Demographic, Financial, and Academic Factors among College Students at a Large, Public University in the Southeastern U.S., 2019

Variable	Sample n (%)	Basic Needs Secure n (%)	Basic Needs Insecure n (%)	χ^2	p
Current Health <i>Excellent/Good</i> <i>Fair/Poor</i>	1794 (71.4) 585 (23.3)	1216 (81.6) 274 (18.4)	578 (65.0) 311 (35.0)	82.68	<0.01
Employed <i>Yes</i> <i>No</i>	1857 (73.9) 619 (24.6)	1114 (70.5) 448 (28.4)	743 (79.8) 171 (18.4)	32.54	<0.01
Ethnicity <i>Hispanic</i> <i>Non-Hispanic</i>	125 (5.0) 2384 (94.8)	64 (4.0) 1517 (96.0)	61 (6.6) 867 (93.4)	7.88	0.01
First Generation <i>Yes</i> <i>No</i>	609 (24.2) 1904 (75.7)	336 (21.2) 1246 (78.8)	273 (29.3) 658 (70.7)	20.86	<0.01
Food insecure before college <i>Yes</i> <i>No</i>	469 (18.7) 2043 (81.3)	175 (11.1) 1405 (88.9)	294 (31.5) 638 (68.5)	161.75	<0.01
Family financial support <i>Yes</i> <i>No</i>	1617 (64.3) 880 (35.0)	1100 (70.2) 468 (29.8)	517 (55.7) 412 (44.3)	53.76	<0.01
Year in school <i>Sophomore</i> <i>Junior</i> <i>Senior</i> <i>Masters</i> <i>PhD or EdD</i> <i>Professional school</i>	479 (19.1) 459 (18.3) 595 (23.7) 468 (18.6) 392 (15.6) 121 (4.8)	357 (22.6) 273 (17.3) 348 (22.0) 285 (18.0) 250 (15.8) 69 (4.4)	122 (13.1) 186 (20.0) 247 (26.5) 183 (19.6) 142 (15.2) 52 (5.6)	37.77	<0.01
Gender identity <i>Male</i> <i>Female</i> <i>Other</i>	720 (28.6) 1754 (69.8) 36 (1.4)	479 (30.3) 1082 (68.5) 19 (1.2)	241 (25.9) 672 (72.3) 17 (1.8)	6.75	0.03
Race <i>White</i> <i>Non-White</i>	2082 (82.8) 425 (16.9)	1316 (83.3) 264 (16.7)	766 (82.8) 161 (17.4)	0.18	0.67
Residency <i>On campus</i> <i>Off campus</i>	385 (15.3) 2128 (84.6)	285 (18.0) 1297 (82.0)	100 (10.7) 831 (89.3)	23.90	<0.01
Financial Aid <i>Yes</i> <i>No</i>	1890 (75.2) 621 (24.7)	1167 (73.9) 413 (26.1)	723 (77.7) 208 (22.3)	4.54	0.03
Marital status <i>Single</i> <i>Partnered</i>	1929 (76.7) 584 (23.2)	1229 (77.7) 352 (22.3)	700 (75.1) 232 (24.9)	2.27	0.13
BMI <i>≤21.49</i> <i>21.50-23.89</i> <i>23.90-27.49</i> <i>≥27.50</i>	607 (26.2) 560 (24.2) 589 (25.5) 558 (24.1)	386 (26.7) 357 (24.7) 375 (26.0) 326 (22.6)	221 (25.4) 203 (23.3) 214 (24.6) 232 (26.7)	4.97	0.17
Poor physical health days <i>0 days</i> <i>1-3 days</i> <i>4-9 days</i> <i>10-30 days</i> <i>Don't know</i>	985 (39.2) 375 (14.9) 355 (14.1) 247 (9.8) 404 (16.1)	720 (48.6) 222 (15.0) 189 (12.7) 128 (8.6) 224 (15.1)	265 (30.0) 153 (17.3) 166 (18.8) 119 (13.5) 180 (20.4)	82.64	<0.01
Poor mental health days <i>0 days</i> <i>1-3 days</i> <i>4-9 days</i> <i>10-30 days</i> <i>Don't know</i>	482 (19.2) 317 (12.6) 439 (17.5) 858 (34.1) 254 (10.1)	380 (25.8) 234 (15.9) 287 (19.5) 407 (27.7) 163 (11.1)	102 (11.6) 83 (9.4) 152 (17.3) 451 (51.3) 91 (10.4)	157.30	<0.01
Poor usual activities days <i>0 days</i> <i>1-3 days</i> <i>4-9 days</i> <i>10-30 days</i> <i>Don't know</i>	893 (35.5) 412 (16.4) 370 (14.7) 396 (15.8) 282 (11.2)	676 (45.9) 269 (18.3) 210 (14.3) 162 (11.0) 155 (10.5)	217 (24.6) 143 (16.2) 160 (18.2) 234 (26.6) 127 (14.4)	158.66	<0.01
Student monthly income	1094.26 ± 1384.27	1164.67 ± 1534.58	977.51 ± 1081.06	-	<0.01

α , $p < 0.05$, significant values are bolded

Supplemental Table 3. Bivariate Analyses of Food Security Status with Demographic, Financial, and Academic Factors among College Students at a Large, Public University in the Southeastern U.S., 2019

Variable	Sample n (%)	Food Secure n (%)	Food Insecure n (%)	χ^2	P
Housing Security Status					
Housing Secure	851 (33.9)	564 (43.6)	287 (23.5)	112.26	<0.01
Housing Insecure	1663 (66.1)	731 (56.4)	932 (76.5)		
Current Health					
Excellent/Good	1794 (71.4)	1012 (82.7)	782 (67.7)	71.86	<0.01
Fair/Poor	585 (23.3)	212 (17.3)	373 (32.3)		
Employed					
Yes	1857 (73.9)	934 (72.2)	923 (75.8)	10.75	0.01
No	619 (24.6)	348 (26.9)	271 (22.3)		
Ethnicity					
Hispanic	125 (5.0)	44 (3.4)	81 (6.7)	14.12	<0.01
Non-Hispanic	2384 (94.8)	1250 (96.6)	1134 (93.3)		
First Generation					
Yes	609 (24.2)	261 (20.2)	348 (28.6)	24.22	<0.01
No	1904 (75.7)	1034 (79.8)	870 (71.4)		
Food insecure before college					
Yes	469 (18.7)	97 (7.5)	372 (30.5)	219.45	<0.01
No	2043 (81.3)	1197 (92.5)	846 (69.5)		
Family financial support					
Yes	1617 (64.3)	879 (68.4)	738 (60.9)	15.43	<0.01
No	880 (35.0)	406 (31.6)	474 (39.1)		
Year in school					
Sophomore	479 (19.1)	238 (18.4)	241 (19.8)	24.94	<0.01
Junior	459 (18.3)	199 (15.4)	260 (21.3)		
Senior	595 (23.7)	304 (23.5)	291 (23.9)		
Masters	468 (18.6)	261 (20.2)	207 (17.0)		
PhD or EdD	392 (15.6)	231 (17.8)	161 (13.2)		
Professional school	121 (4.8)	62 (4.8)	59 (4.8)		
Gender identity					
Male	720 (28.6)	384 (29.7)	336 (27.6)	4.50	0.11
Female	1754 (69.8)	896 (69.3)	858 (70.5)		
Other	36 (1.4)	13 (1.0)	23 (1.9)		
Race					
White	2082 (82.8)	1088 (84.1)	994 (81.9)	2.29	0.13
Non-White	425 (16.9)	205 (15.9)	220 (18.1)		
Residency					
On campus	385 (15.3)	181 (14.0)	204 (16.7)	3.72	0.05
Off campus	2128 (84.6)	1114 (86.0)	1014 (83.3)		
Financial Aid					
Yes	1890 (75.2)	958 (74.0)	932 (76.6)	2.19	0.14
No	621 (24.7)	336 (26.0)	285 (23.4)		
Marital status					
Single	1929 (76.7)	971 (75.0)	958 (78.6)	4.44	0.04
Partnered	584 (23.2)	323 (25.0)	261 (21.4)		
BMI					
≤ 21.49	607 (26.2)	321 (27.0)	286 (25.4)	6.89	0.08
21.50-23.89	560 (24.2)	287 (24.2)	273 (24.2)		
23.90-27.49	589 (25.5)	318 (26.8)	271 (24.0)		
≥ 27.50	558 (24.1)	261 (22.0)	297 (26.4)		
Poor physical health days					
0 days	985 (39.2)	619 (50.8)	366 (30.0)	105.90	<0.01
1-3 days	375 (14.9)	193 (15.8)	182 (15.9)		
4-9 days	355 (14.1)	159 (13.1)	196 (17.1)		
10-30 days	247 (9.8)	88 (7.2)	159 (13.9)		
Don't know	404 (16.1)	159 (13.1)	245 (21.3)		
Poor mental health days					
0 days	482 (19.2)	335 (27.8)	147 (12.9)	163.01	<0.01
1-3 days	317 (12.6)	193 (16.0)	124 (10.8)		
4-9 days	439 (17.5)	240 (19.9)	199 (17.4)		
10-30 days	858 (34.1)	305 (25.3)	553 (48.4)		
Don't know	254 (10.1)	134 (11.1)	120 (10.5)		
Poor usual activities days					
0 days	893 (35.5)	582 (48.0)	311 (27.3)	158.25	<0.01
1-3 days	412 (16.4)	215 (17.7)	197 (17.3)		
4-9 days	370 (14.7)	180 (14.9)	190 (16.7)		
10-30 days	396 (15.8)	114 (9.4)	282 (24.7)		
Don't know	282 (11.2)	121 (10.0)	161 (14.1)		
Age	24.0 $\pm$ 6.20	24.40 $\pm$ 6.58	23.57 $\pm$ 5.75	-	0.01
Academic Progress Scale	12.97 $\pm$ 2.17	13.49 $\pm$ 1.98	12.43 $\pm$ 2.23	-	<0.01
Student monthly income	1094.26 $\pm$ 1384.27	1224.91 $\pm$ 1555.67	957.51 $\pm$ 1163.52	-	<0.01

α , $p < 0.05$, significant values are bolded

Supplemental Table 4. Bivariate Analyses of Housing Security Status with Demographic, Financial, and Academic Factors among College Students at a Large, Public University in the Southeastern U.S., 2019

Variable	Sample n (%)	Housing Secure n (%)	Housing Insecure n (%)	χ^2	p
Food Security Status					
Food Secure	1295 (51.5)	564 (43.6)	731 (56.4)	112.26	<0.01
Food Insecure	1219 (48.5)	287 (23.5)	932 (76.5)		
Current Health					
Excellent/Good	1794 (71.4)	661 (82.5)	1133 (71.8)	32.94	<0.01
Fair/Poor	585 (23.3)	140 (17.5)	445 (28.2)		
Employed					
Yes	1857 (73.9)	557 (65.6)	1300 (78.2)	49.30	<0.01
No	619 (24.6)	281 (33.1)	338 (20.3)		
Ethnicity					
Hispanic	125 (5.0)	43 (5.1)	82 (4.9)	0.02	0.90
Non-Hispanic	2384 (94.8)	807 (94.9)	1577 (95.1)		
First Generation					
Yes	609 (24.2)	182 (21.4)	427 (25.7)	5.68	0.02
No	1904 (75.7)	669 (78.6)	1235 (74.3)		
Food insecure before college					
Yes	469 (18.7)	102 (12.0)	367 (22.1)	37.65	<0.01
No	2043 (81.3)	748 (88.0)	1295 (77.9)		
Family financial support					
Yes	1617 (64.3)	617 (73.5)	1000 (60.3)	42.70	<0.01
No	880 (35.0)	222 (26.5)	658 (39.7)		
Year in school					
Sophomore	479 (19.1)	275 (32.3)	204 (12.3)	162.06	<0.01
Junior	459 (18.3)	155 (18.2)	304 (18.3)		
Senior	595 (23.7)	148 (17.4)	447 (26.9)		
Masters	468 (18.6)	147 (17.3)	321 (19.3)		
PhD or EdD	392 (15.6)	92 (10.8)	300 (18.0)		
Professional school	121 (4.8)	34 (4.0)	87 (5.2)		
Gender identity					
Male	720 (28.6)	279 (32.9)	441 (26.6)	10.98	<0.01
Female	1754 (69.8)	558 (65.7)	1196 (72.0)		
Other	36 (1.4)	12 (1.4)	24 (1.4)		
Race					
White	2082 (82.8)	696 (81.9)	1386 (83.6)	1.24	0.27
Non-White	425 (16.9)	154 (18.1)	271 (16.4)		
Residency					
On campus	385 (15.3)	212 (24.9)	173 (10.4)	91.25	<0.01
Off campus	2128 (84.6)	639 (75.1)	1489 (89.6)		
Financial Aid					
Yes	1890 (75.2)	607 (71.5)	1283 (77.2)	9.81	<0.01
No	621 (24.7)	242 (28.5)	379 (22.8)		
Marital status					
Single	1929 (76.7)	697 (82.0)	1232 (74.1)	19.76	<0.01
Partnered	584 (23.2)	153 (18.0)	431 (25.9)		
BMI					
≤21.49	607 (26.2)	228 (29.2)	379 (24.7)	6.44	0.09
21.50-23.89	560 (24.2)	188 (24.1)	372 (24.3)		
23.90-27.49	589 (25.5)	192 (24.6)	397 (25.9)		
≥27.50	558 (24.1)	172 (22.1)	386 (25.2)		
Poor physical health days					
0 days	985 (39.2)	398 (49.8)	587 (37.5)	43.83	<0.01
1-3 days	375 (14.9)	112 (14.0)	263 (16.8)		
4-9 days	355 (14.1)	82 (10.3)	273 (17.4)		
10-30 days	247 (9.8)	69 (8.6)	178 (11.4)		
Don't know	404 (16.1)	139 (17.4)	265 (16.9)		
Poor mental health days					
0 days	482 (19.2)	205 (25.8)	277 (17.8)	44.90	<0.01
1-3 days	317 (12.6)	123 (15.5)	194 (12.5)		
4-9 days	439 (17.5)	156 (19.6)	283 (18.2)		
10-30 days	858 (34.1)	222 (27.9)	636 (40.9)		
Don't know	254 (10.1)	90 (11.3)	164 (10.6)		
Poor usual activities days					
0 days	893 (35.5)	381 (48.0)	512 (32.8)	63.29	<0.01
1-3 days	412 (16.4)	136 (17.1)	276 (17.7)		
4-9 days	370 (14.7)	108 (13.6)	262 (16.8)		
10-30 days	396 (15.8)	86 (10.8)	310 (19.9)		
Don't know	282 (11.2)	83 (10.5)	199 (12.8)		
Age	24.0 ± 6.20	24.04 ± 7.39	23.98 ± 5.51	-	0.83
Academic Progress Scale	12.97 ± 2.17	13.24 ± 2.10	12.84 ± 2.20	-	<0.01
Student monthly income	1094.26 ± 1384.27	1178.81 ± 1704.35	1052.19 ± 1191.83	-	0.03

$\alpha, p < 0.05$, significant values are bolded

VITA

Mary Kathleen (Mary Kate) Robbins was born in Tupelo, Mississippi. In December 2015, she graduated from the University of Mississippi with a Bachelor of Science degree in Nutrition and Dietetics. Mary Kate then worked in community nutrition for two years in the Boston, MA metro area and then in the Portland, OR metro area. In the fall of 2018, she began her graduate studies at the University of Tennessee, Knoxville for a Master of Science degree in Public Health Nutrition and Master of Public Health degree. During her graduate studies, she was a member of the Healthful Eating and Active Living Through Healthy Environments (HEALTHY) Lab under the supervision of Dr. Elizabeth Anderson Steeves. Mary Kate has also been a member of the Rape Prevention Education Evaluation team, under the supervision of Dr. Laurie Meschke, and worked as a Contact Tracer with the Student Health Center at the University of Tennessee during the COVID-19 pandemic.