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Food Insecurity Among College Students at a Historically Black College & University: Prevalence, Social Support & Coping Skills, and Academic Outcomes

Rebecca L. Larson

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FOOD INSECURITY AMONG COLLEGE STUDENTS AT A HISTORICALLY BLACK COLLEGE
& UNIVERSITY: PREVALENCE, SOCIAL SUPPORT & COPING SKILLS, AND ACADEMIC
OUTCOMES

by

REBECCA LARSON

(Under the Direction of Andrew Hansen)

ABSTRACT

Introduction: College students experience food insecurity (FI) at higher rates than the U.S. adult population. Food insecurity among college students is frequently associated with several sociodemographic factors; limited social support and coping skills; poor mental and physical health; and poor academic outcomes. The purpose of this study was to determine the prevalence of FI among students at Fort Valley State University (FVSU), a Historically Black College & University, factors associated with FI, the impact of FI on academic outcomes, and the influence of social support and coping skills on the relationship between FI and academic outcomes.

Methods: A stratified random sample of students enrolled at FVSU completed an anonymous online survey, which assessed food security status and sociodemographic, social support, coping skills, and academic outcomes variables. Univariate logistic regression was computed to determine associations between participant characteristics and FI. Lasso regression analysis was computed to predict FI based on student characteristics. Linear regression analysis was computed to determine if FI predicted academic outcomes. Multiple regression analysis was computed to determine the influence of social support and coping skills on the relationship between FI and academic outcomes.

Results: Among survey respondents, 47.3% were food insecure. Parental level of education was associated with FI, as was household income, campus meal plan, parental financial and food support, adequacy of money to buy food and food selection in stores, total food skills and resources score, and class attendance. The total coping skills score and several coping strategies were associated with FI, including sharing food responsibilities, stretching meals, using coupons, borrowing money to purchase food, etc. The two key predictors of FI were hours worked and the coping skills score. FI did not predict academic outcomes. Social support and coping skills did not influence the relationship between FI and academic outcomes.

Discussion: Students at FVSU experienced a high rate of FI, higher than reported on several other U.S. campuses. Students use limited resources and social supports to alleviate FI; however they do utilize several coping strategies. Several universities are successfully implementing interventions which may be replicated across other U.S. campuses to alleviate FI.

INDEX WORDS: Food insecurity, College students, Historically Black College and University, Social ecological model, Social support, Transactional model of stress and coping, Academic outcomes

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A Dissertation Submitted to the Graduate Faculty of Georgia Southern University

in Partial Fulfillment of the Requirements for the Degree

DOCTOR OF PUBLIC HEALTH

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OUTCOMES

by

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Electronic Version Approved:
July 2019

DEDICATION

This effort is dedicated to my husband and daughter, who have kept me grounded throughout this process with their love of owls (puffs), penguins (fluffs), ostriches (fuzzes) and ratites, orangutans, all things nature, Winnie-the-Pooh, Star Trek, Star Wars, and English literature.

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TABLE OF CONTENTS

ACKNOWLEDGMENTS	3
LIST OF TABLES	6
LIST OF FIGURES	7
CHAPTER	8
1 INTRODUCTION	8
Food Insecurity Among College Students	9
Statement of the Problem.....	13
Purpose of the Study	14
Research Questions.....	14
Significance of the Study	15
Delimitations.....	16
Assumptions.....	17
Definition of Terms.....	18
Organization of the Remaining Chapters.....	18
2 LITERATURE REVIEW	20
Literature Review Search Methods.....	20
Food Insecurity Among College Students Literature	21
Theoretical Model.....	45
Conceptual Model.....	52
Summary of the Literature	54
Gaps in the Literature	54
3 METHODOLOGY	56
Purpose of the Study	56
Research Design	56
Institutional Review Board Approval	57
Population, Sampling, and Recruitment	57
Data Collection Method.....	59
Data Analysis Process.....	65
4 RESULTS	68
Participant Demographics.....	68
Results by Research Question.....	70
5 DISCUSSION	83

Prevalence of Food Insecurity	83
Factors Associated with Food Insecurity	84
Impact of Food Insecurity on Academic Outcomes.....	96
Social Support and Coping Skills Influence on the Relationship Between Food Insecurity and Academic Outcomes	98
Study Strengths	99
Study Limitations.....	99
Public Health Implications.....	100
Recommendations to Address Food Insecurity on Campuses Across the U.S.	100
FVSU Food Environment and Recommendations to Address Food Insecurity	104
Future Research	105
Conclusions.....	106
REFERENCES	108
APPENDICES	121
A FORT VALLEY STATE UNIVERSITY INSTITUTIONAL REVIEW BOARD APPROVAL	122
B GEORGIA SOUTHERN UNIVERSITY INSTITUTIONAL REVIEW BOARD APPROVAL	123
C RECRUITMENT EMAIL	124
D STUDENT SURVEY.....	127
E INFORMED CONSENT FORM.....	136
F U.S. ADULT FOOD SECURITY SURVEY MODULE: THREE-STAGE DESIGN, WITH SCREENERS.....	138
G FREQUENCIES OF STUDENT CHARACTERISTIC BY FOOD SECURITY STATUS	145
H UNIVARIATE LOGISTIC REGRESSION OF STUDENT CHARACTERISTICS AND FOOD INSECURITY.....	154

LIST OF TABLES

	Page
Table 1: Survey Questions Categorized by Social Support Concepts and Transactional Model of Stress & Coping Constructs.....	62
Table 2: Survey Participant Demographics	68
Table 3: Student Responses to the USDA U.S. Adult Food Security Survey Module	71
Table 4: Student Classification by Food Security Status	72
Table 5: Student Characteristics Statistically Significantly Associated with Food Insecurity	74
Table 6: Sources of Student Social Support.....	76
Table 7: Student Coping Skills	78

LIST OF FIGURES

	Page
Figure 1. Theoretical model of food insecurity: Food insecurity described and predicted within the context of the Social Ecological Model.....	47
Figure 2. Conceptual model of food insecurity.....	53
Figure 3. Conceptual model of food insecurity among college students	53

CHAPTER 1

INTRODUCTION

Food insecurity is commonly recognized as a problem for developing countries (FAO, IFAD, UNICEF, WFP, & WHO, 2018), however, it remains an issue in the United States (Coleman-Jensen, Rabbitt, Gregory, & Singh, 2018). Food insecurity is defined by the United States Department of Agriculture, Economic Research Service (2017) as “reduced quality, variety, or desirability of diet” and very low food security is defined as “multiple indications of disrupted eating patterns and reduced food intake”, at some time during the year. Food insecurity among adults is associated with decreased nutrient intake, diabetes, hypertension, hyperlipidemia, worse outcomes on health exams, being in poor or fair health, poor oral health, depression, increased rates of mental health problems, and poor sleep outcomes (Gunderson & Liliak, 2015; Seligman, Bindman, Vittinghoff, Kanaya, & Kushel, 2007).

The most recent survey on food insecurity in the United States, *Household Food Security in the United States in 2017* (Coleman-Jensen et al., 2018), identified that 11.8% of U.S. households were food insecure and 4.5% had very low food security. Several types of households had rates of food insecurity significantly above the national average – households with incomes below the federal poverty threshold (36.8%), households with incomes below 185% the federal poverty threshold (30.8%), Black and Hispanic headed households (21.8% and 18.0%, respectively), households with children (15.7%), households with children headed by a single parent (30.3% for single women and 19.7% for single men), and single adults living alone (13.9% for women and 13.4% for men). Most of these same households also had significantly higher than average rates of very low food security. Coleman-Jensen et al. (2017) also studied food insecurity by locale and found that households in rural areas had higher than average rates of food insecurity (13.3%) and very low food security (6.6%). Additionally, regionally, the South had the highest rate of food insecurity, 13.4%, compared to all other regions. In Georgia, 13.0 % of households were food insecure and 4.4% had very low food security (Coleman-Jensen et al., 2017). Feeding America (2017) estimated that 18.7% of households in Peach County, Georgia, the home of Fort Valley State University (FVSU), were food insecure in 2016.

Research on food insecurity in unique adult populations – those with military service, those with a disability, and those who classify themselves lesbian, gay, bisexual, and transgender LGBT – is limited. Schure, Katon, Wong, and Liu (2106) studied food insecurity among those with military service and found that those without previous service had a higher prevalence of food insecurity than those who had served (23.1% and 13.1%, respectively). Brostow, Gunzburger, and Thomas (2017) also studied food insecurity among veterans and found similar results; non-veterans were more likely than veterans to be food insecure (11.9% and 6.4%, respectively). Coleman-Jensen and Nord (2013) studied households with adults with disability and found that the prevalence of low food security and very low food security was much more prevalent in households with an adult who was not in labor force-disabled (unable to work due to a disability) than in households with an adult with other reported disabilities (had a disability but was still able to work) or in households with an adult who was not disabled (low food security: 33.5%, 24.8%, and 12.0%, respectively; very low food security: 17.3%, 11.8%, and 4.6%, respectively). Brown, Romero, and Gates (2016) studied food insecurity among the LGBT community and found that 27% of LGBT adults did not have enough money to feed themselves or their family some time during that last year compared to 17% of non-LGBT adults.

Food Insecurity Among College Students

Research on food insecurity among college students is limited over the past decade. In 2015, the Hope Center for College, Community, and Justice conducted the first multi-college study (non-peer reviewed) of food insecurity among college students; 10 community colleges across seven states participated in the study (Goldrick-Rab, Broton, & Eisenberg, 2015). Overall, 19% of respondents reported experiencing low food security and 21% reported very low food security; however, more African American and Hispanic or Latino students reported low food security than non-Hispanic White students (23%, 22%, and 16%, respectively) (Goldrick-Rab, et al, 2015). In an effort to gain a broader understanding of food insecurity among college students, Dubik, Mathews, and Cady (2016) conducted a non-peer reviewed study in 34 community colleges and 4-year universities across 12 states and found that 48% of respondents were food insecure and 22% had very low food security. This survey found

that 57% of Black or African American students were food insecure, while only 40% of non-Hispanic White students were food insecure. Additionally, 56% of first-generation students were food insecure compared to 45% of non-first-generation students. Information about other characteristics of respondents was also collected – 56% of food insecure students reported working, 43% of students who had a meal plan were food insecure, 75% of food insecure students received financial aid, and 61% of food insecure students reported utilizing an assistance program, such as the Supplemental Nutrition Assistance Program (SNAP). Students in this study were also asked if hunger or a housing problem had impacted their education; 32% responded that it did. Of these students, 53% reported missing a class due to hunger or a housing problem, 54% missed a study session, 55% did not buy a required textbook, 25% dropped a class, and 81% did not perform as well in their academics as they otherwise could have (Dubik et al., 2016).

Following the well-publicized reports by Goldrick-Rab et al. (2015) and Dubik et al. (2016), Bruening, Argo, Payne-Sturges, and Laska (2017) sought to conduct a more rigorous and comprehensive review of food insecurity among college students and performed systematic literature review of the peer-reviewed and gray international literature on the subject. The authors found that the average rate of food insecurity among students was 32.9% (ranging from 14.1% - 58.8%) from the nine peer-reviewed U.S. journal articles and 35.6% (ranging from 12.4% - 56%) from the 41 sources of gray literature (37 of 41 sources were from the U.S.). Bruening and colleagues (2017) pointed out that the prevalence of food insecurity among college students was well above the national average in several of the studies they reviewed. The authors stated that more research is needed in small institutions, rural institutions, and in Historically Black Colleges and Universities (HBCU), and among male students, underserved students, nontraditional students, and graduate students. Nazmi et al. (2018) also completed a systematic review of the literature regarding food insecurity among college students, although the authors restricted their study to research conducted in U.S. colleges and universities, but included peer-reviewed literature, reports, and a master's thesis, and omitted gray literature about student food insecurity. Nazmi et al. (2018) reported an average rate of food insecurity of 43.5%

(ranging from 21% - 58.8%) among the 8 studies included in their review.

In 2017, Goldrick-Rab, Richardson, Schneider, Hernandez, and Cady (2018) conducted a large study (non-peer reviewed) of food insecurity that included a voluntary, non-random sample 129,489 undergraduate students from 33 community colleges and 36 colleges and universities in 20 states and the District of Columbia. Students (8,127) from eleven 4-year colleges and universities in Georgia participated in this survey; Fort Valley State University did not participate in this survey (Hope Center for College, Community, and Justice, 2018). Among these students, 37% were food insecure (23% low food security, 14% very low food security). This study also measured food insecurity by several sociodemographic variables: 29.7% of males, 39.2% of females, and 49.3% of non-binary students were classified as food insecure; 29.0% of students aged 18 to 20, 41.2% 21 to 25, 48.5% of students aged 25 to 30, and 43.2% of students over the age of 30 were food insecure; 30.9% of White, non-Hispanic, 45.4% of Black, 25.9% of Asian, 37.1% of Hispanic, and 42.3% of student of other/more than one race were food insecure; 34.8% of heterosexual, 43.9% of homosexual, 47.3% of bisexual, and 46.2% of students who identified as no sexual orientation were food insecure; 41.3% of students with children and 36.0% of students without children were food insecure; 36.5% of students with military service and 36.7% of students with no military service were food insecure; 64.1% of students raised in foster care and 36.4% who were not were food insecure; 50.2% of students working 40+ hours per week, 46.7% of students working 21-40 hours per week, 35.4% of students working 6-20 hours per work, 31.3% of students working 1-5 hours per week, 41.0% of students looking for work, and 22.5% of students looking for work were food insecure; 27.2% of students living on campus and 39.8% of those living off campus were food insecure; 44.6% of students who received a Pell grant and 30.9% who did not were food insecure; and 26.8% of students with a meal plan and 39.9% of those without a meal plan were food insecure. Additionally, 12% of food insecure Georgia students reported using SNAP, 3.2% reported using the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), and 0.47% reported using Temporary Assistance for Needy Families (TANF). (Hope Center for College, Community, and Justice, 2018)

In response to a request by several U.S. Senators, the U.S. Government Accounting Office (GAO) (2018) recently conducted a study of food insecurity among college students. The study included a systematic review of the literature, an analysis of the 2015-2016 National Postsecondary Student Aid Study (NPSAS) data; site visits to 14 colleges and universities across the United States, which included interviewing administrators, faculty, and students; interviews with researchers and staff at policy organizations; a review of federal legislation, regulations, and policy; and interviews with state, regional, and federal agency directors and staff. The GAO (2018) found that the rate of food insecurity ranged from 9% to over 50% among the 31 studies included in their review, while a majority of studies found a rate of over 30%. The GAO (2018) also identified several significant risk factors for food insecurity, including a low income, being a first-generation college student, receiving SNAP, and being a single parent; other risk factors identified included being disabled, homeless, or a former foster child.

Most recently, the Hope Center conducted a multi-state and multi-college and university online non peer-reviewed survey of food insecurity among students in the fall of 2018 (Goldrick-Rab, Baker-Smith, Coca, Looker, & Williams, 2019). Ninety 2-year colleges and 33 4-year colleges in 24 states participated in the study; approximately 86,000 students responded to the survey. Among students at 4-year colleges and universities, 18% reported low food security and 24% reported very low food security. Across the 4-year institutions, food insecurity rates ranged from 19% to 65%. Food insecurity was experienced differently by groups of students. Transgender students more often reported being insecure than male or female students (55%, 42%, and 47%, respectively). African American or Black and Latinx students reported higher rates of food insecurity compared to White or Caucasian students (58%, 50%, and 39%, respectively). Gay or lesbian and bisexual students reported food insecurity at a higher rate than heterosexual or straight students (52%, 54%, and 44%, respectively). Students with parents who had earned at least a bachelor's degree experienced a lower rate of food insecurity compared to students with parents who had no high school diploma or who had a high school diploma (32%, 52%, and 48%, respectively). Younger students, aged 18 – 20, reported less food insecurity than students aged

21 – 25 or 26 – 30 (37%, 50%, and 55%, respectively). Students independent of parent support had a higher rate of food insecurity compared to dependent students (50% and 39%, respectively). Students receiving a Pell grant reported more food insecurity than those who did not receive the grant (54% and 39%, respectively). Students with children experienced more food insecurity than those without children (53% and 43%, respectively). Divorced students and widowed students experienced food insecurity at higher rates than single students, students in a relationship, and students who were married or in a domestic partnership (63%, 55%, 45%, 48%, and 41%, respectively). Students who had been in foster care had a higher rate of food insecurity than those who were not raised in the foster system (66% and 45%, respectively). Students who were employed and students who were not employed but were looking for work experienced a higher rate of food insecurity than students who were not employed and not looking for work (50%, 47%, and 31%, respectively). Students who had previously been convicted of a crime reported food insecurity at a higher rate than those who had not been convicted (64% and 45%, respectively). Students who had served in the military experienced food insecurity at the same rate, 46%, as those students who had not served in the military. And finally, students who had a disability or medical condition had higher rates of food insecurity compared to those with no disability or medical condition (49-58% depending on the disability vs. 40%).

Statement of the Problem

Bruening et al. (2017), who conducted an analysis of the international literature from January 2001 through August 2016, identified 18 peer reviewed articles and 41 sources of gray literature that met their inclusion criteria from the 18,606 sources of information originally reviewed. Nine peer reviewed articles were from the United States and nine were from international sources; 37 sources of gray literature were based in the United States and four were international. Very few studies were conducted in rural institutions, and only one study was conducted at a minority-serving institution. The average sample size was 442 participants but ranged from 15 to 4,972 participants. The majority of peer reviewed articles used the USDA's methods for classifying food insecurity, while much of the gray literature did not report on the method for defining food insecurity. All but one study employed a convenience sample or a

random sample of students enrolled in specific classes. Response rates in all studies were low. Half of the peer reviewed articles used multivariate regression for analysis, while others provided descriptive or bivariate analysis. Relationships between sociodemographic factors and food insecurity were reported by almost all the literature. Academic outcomes, as well as health and eating behaviors, were only reported by some of the studies. None of the studies evaluated the effectiveness of interventions to alleviate food insecurity, but most included discussion of possible solutions, including personal, interpersonal, institution, and policy and systems level interventions. Bruening and colleagues (2017) stated that more research is needed that employs a more rigorous study design and analysis. As mentioned previously, the authors also stated that more research is needed in small institutions, rural institutions, and in Historically Black Colleges and Universities (HBCUs) and among male students, underserved students, nontraditional students, and graduate students.

In their summary of the student food insecurity research, the GAO (2018) also found that the majority of studies used a non-random convenience sample of students from a single college or university and noted that the study limitations and sampling challenges resulted in an incomplete picture of food insecurity among college students nationally.

Fort Valley State University is a small rural HBCU with a high percentage of traditionally underserved students; however, the extent of food insecurity at this university, and other HBCUs, is unknown. Research at this university will help fill the gaps in knowledge regarding food insecurity among minority students and in HBCUs.

Purpose of the Study

The purpose of this research study is to examine the prevalence of food insecurity among students at a Historically Black College & University, factors associated with food insecurity, the impact of food insecurity on students' education, and the influence of social support and coping skills on the relationship between food insecurity and academic outcomes.

Research Questions

Four research questions and three sub questions are investigated in this study.

- 1) What is the prevalence of food insecurity among students at Fort Valley State University?
 - a. How does the prevalence of food insecurity among FVSU students compare with the prevalence of food insecurity among students across the nation?
- 2) What factors are associated with or predict food insecurity among FVSU students?
 - a. How do these factors among FVSU students compare with those among students across the nation?
- 3) How does food insecurity impact academic outcomes of FVSU students?
 - a. How do academic outcomes related to food insecurity among FVSU students compare with academic outcomes among students across the nation?
- 4) How do social support and coping skills influence the relationship between food insecurity and academic outcomes?

Significance of the Study

As there is limited research on food security among college students overall, this study adds to that body of work. As Fort Valley State University is a small rural HBCU with a high percentage of traditionally underserved and nontraditional students, and may be representative of similar HBCUs (personal communication with D. McCarthy, Associate Director, FVSU Office of Institutional Research, Planning and Effectiveness; McCarthy & Bezewada, 2016), this study helps to meet the need for more research regarding food insecurity in small colleges, rural colleges, and in minority serving institutions, and includes graduate, professional, nontraditional, and underserved students. One study (Lin et al., 2013) investigated food insecurity among a small sample of female students at an HBCU in relation to student characteristics; however, the authors did not report the prevalence of food security in their sample. This study is the first to define the prevalence of food insecurity among students at an HBCU, report on the student characteristics related to food insecurity among both females and males at an HBCU, and describe the social support and coping skills utilized by these students. The results of this study are important because this study is one of only a few that uses a stratified random sampling method of all students at a university, rather than using a convenience sample or a sample of students in only a few

classes, and this study employs rigorous statistical analysis methods (Bruening et al., 2017).

Delimitations

The literature review for this study includes peer-reviewed research conducted in the United States, as study designs, methodology, and analytic process are more rigorous and well defined in the peer reviewed literature. Gray literature is included only in the discussion of university and community interventions and resources to alleviate food insecurity among college students. Although the majority of research found in the peer-reviewed and gray literature regarding food insecurity used a convenience sample, this method is not representative of the student population, and authors Bruening and colleagues (2017) recommended that more rigorous study designs and sampling methods be employed for future research. A stratified random sample of all students currently enrolled at FVSU was surveyed in this study to limit selection bias and to increase the generalizability of the results. This study included only adult students (≤ 18 years old) in the population surveyed. This population was chosen because most of the literature on food insecurity among college students assessed this age group. Many food insecurity studies among college students used the 10 question USDA U.S. Adult Food Security Survey Module (USDA, Economic Research Service, 2012) to determine the level of food insecurity among the student population; this study utilized the same survey in an effort to limit the number of questions asked of students, and because this survey has been found to be valid in households with both adults and children (USDA, Economic Research Service, 2012). As many students at FVSU are non-traditional and many have children, this measure would describe well the food insecurity among the students and their households. Univariate logistic regression was used to ascertain differences in the level of food insecurity based on student characteristics, such as gender, race/ethnicity, marital status, etc. Lasso regression analysis was computed to predict food insecurity based on student characteristics. Linear regression analysis was computed to determine if food insecurity can predict GPA and academic outcomes scores. Multiple regression will be computed to ascertain how social support and coping skills influence the relationship between food insecurity and academic outcomes. These methods were employed because authors Bruening and colleagues (2017) emphasized that while much of the college student food

insecurity literature does not include rigorous analytic methods, it is needed to better understand this issue.

Some gaps remain in the literature that this study did not address. This study was conducted in a public HBCU and so did not collect information from a Hispanic serving institution, nor from a community college or a for-profit college. In an effort to limit the time it would take for students to complete the survey, this study focused on sociodemographic factors, social support and coping skills, and academic outcomes, and not on other possible causes or associations to food insecurity, such as food insecurity experienced before college, student debt, or students' ability to cope with transition to college and the additional responsibilities they may be forced to take on. This study did not address being raised in the foster system or a prior criminal conviction. Additionally, this study did not address physical or mental health outcomes associated with food insecurity among college students. This study did not address the use of emotional or informational social support, or the use of emotion-focused or meaning-based-coping strategies to alleviate food insecurity. Nor did this study address the effectiveness of any interventions to alleviate food insecurity among college students. As this study is cross-sectional, it cannot add to the body of knowledge regarding the prevalence or impacts of food insecurity over time or in the long term. And lastly, due to the additional time that would be required to complete the study and difficulties in recruiting students who are categorized as food insecure, this study did not address the gap in the literature regarding students' perceptions about the impact of food insecurity, perceptions about coping with food insecurity, or suggestions for possible to interventions to alleviate student food insecurity.

Assumptions

Assumptions in this study include:

- 1) Because participants will be offered the nominal incentive of being eligible to win one of ten \$20 gift cards, participants will not be unduly influenced to participate in the study.
- 2) While questions asked of students are personal, they should cause minimal or only slight discomfort; therefore, study participants will respond honestly and accurately to study questions.

Definition of Terms

This study used the definitions of food security and insecurity provided by the United States Department of Agriculture, Economic Research Service (2017).

High food security: no reported indications of food-access problems or limitations.

Marginal food security: one or two reported indications—typically of anxiety over food sufficiency or shortage of food in the house. Little or no indication of changes in diets or food intake.

Low food security: reports of reduced quality, variety, or desirability of diet. Little or no indication of reduced food intake.

Very low food security: Reports of multiple indications of disrupted eating patterns and reduced food intake.

This study used the definition of military service used by researchers Schure et al., (2016): Active duty in the United States Armed Forces, either in the regular military or in a National Guard or military reserve unit.

This study also used the classification of disability utilized by researchers Coleman-Jensen & Nord (2013): Deaf; blind; physical, mental, or emotional condition that causes serious difficulty concentrating, remembering, or making decisions; serious difficulty walking or climbing stairs; difficulty dressing or bathing; physical, mental, or emotional condition that causes difficulty doing errands alone such as visiting a doctor's office or shopping.

This study used the classification of sexual orientation used by Brown, Romero, and Gates (2016): Lesbian or gay; straight, that is, not lesbian or gay; or bisexual.

This study used the definition of Latinx provided by the Merriam-Webster (n.d.) dictionary: of, relating to, or marked by Latin American heritage – used as a gender-neutral alternative to *Latino* or *Latina*.

Organization of the Remaining Chapters

The first chapter of this dissertation provided an overview of food insecurity among households

and select populations in the United States. It also included a brief overview of what is known about food insecurity among college students, including the prevalence of food insecurity, characteristics of those with food insecurity, and health and academic outcomes associated with food insecurity. The second chapter will include a review of the peer-reviewed literature regarding food insecurity among college students and the theoretical and conceptual models utilized in this study. The third chapter of this dissertation will describe the methodology employed in this study. Chapter four of this study will report the results of this study and chapter five will provide a discussion of the findings and implications of the study and recommendations for action.

CHAPTER 2

LITERATURE REVIEW

The purpose of this study is to assess food insecurity among college students at an HBCU. This chapter will include a review of the peer-reviewed literature regarding food insecurity among college students, including study designs, samples, food security measurement tools, data analysis, prevalence of food insecurity, sociodemographic factors related to food insecurity, resources, social support, coping skills, physical and mental health outcomes of food insecurity, academic outcomes of food insecurity, student perceptions of food insecurity, and university and community interventions and resources to alleviate food insecurity. The Social Ecological Model (SEM), social support concepts, and constructs of the Transactional Model of Stress and Coping will be reviewed as they relate to food insecurity.

Literature Review Search Methods

To better understand the extent of food insecurity among college students, a comprehensive review of the literature was undertaken. Prevalence of food insecurity, factors associated with food insecurity, health and academic impacts of food insecurity, and resources to combat food insecurity among college students were investigated. PubMed and ERIC were the primary databases used to search for peer-reviewed articles about the subject. Original research articles published in peer-reviewed journals were included in this review; abstracts, thesis, and dissertations were not included in this review. From literature identified in the search, relevant references were then also investigated. Information from systematic literature reviews and gray literature was included only when the authors provided recommendations for food insecurity resources, interventions, or research. Studies were limited to those conducted in the United States, as the scope of this research study is limited to the United States and because the education environment, policies, and resources for college students in other countries are likely significantly different. Studies on food insecurity among children were not included in this literature review; only studies focusing on adult populations, as this population is most relevant to college student. Literature was included in the review if it was conducted in the past 15 years. This date was chosen because the prevalence of and factors associated with food insecurity can change rapidly and most

earlier studies likely would not be relevant; additionally, the systematic review by Bruening et al. (2017), Nazmi et al. (2018), and the GAO (2018) did not identify any peer-reviewed articles related to food insecurity among college students conducted before this date. Key words and Boolean operator terms used in the literature search included: food security, food insecurity, hunger, food security and college, food security and college students, food insecurity and college, food insecurity and university, food insecurity and college students, food insecurity and college, food insecurity and university students, hunger and college, hunger and university, hunger and college students, hunger and university students, prevalence of food insecurity in college students, food insecurity and health outcomes, household food insecurity, food insecurity and military service, food insecurity and disability, and food insecurity and LBGT. These terms were chosen because they were frequently used in news articles and gray literature on the subject, as well as in the systematic review of food insecurity among college students by Bruening and colleagues (2017).

Data extracted from articles included the sample population; study setting; study design; demographic characteristics; food insecurity, student characteristics, and outcomes measurement methods; data analysis approach; prevalence of food insecurity; participant characteristics related to food insecurity, including sociodemographic and other related factors; physical and mental health and academic outcomes; resources available to students to alleviate food insecurity; recommendations by authors for resources, interventions, and future research. Quality assessment of articles was undertaken, and strengths and limitations were identified.

The following review of the peer-reviewed literature includes a discussion of food insecurity among college students, including study design, samples, food security measurement tools, data analysis, prevalence of food insecurity, sociodemographic and related factors; resources, social support, coping strategies, physical and mental health outcomes, academic outcomes, and university interventions.

Food Insecurity Among College Students Literature

Thirty-nine journal articles were identified in the peer-reviewed literature that reported on original food insecurity research among college students in the U.S. (Biediger-Friedman, Sanchez, He,

Guan, & Yin, 2016; Broton & Goldrick-Rab, 2018; Bruening, Nelson, van Woerden, Todd & Laska, 2016; Bruening, van Woerden, Todd & Laska, 2018; Buch, Langley, Johnson, & Coleman, 2016; Chaparro, Zaghoul, Holck, & Dobbs, 2009; Couch, Gilboy, & Delshad, 2017; Davidson & Morrell, 2016; El Zein, Mathews, House, & Shelnutt, 2018; Forman, Mangini, Dong, Hernandez, & Fingerman, 2018; Freudenberg, Manzo, Mongiello, Jones, Boeri, & Lamberson, 2013; Gaines et al., 2014; Hagedorn & Olfert, 2018; Hanna, 2014; Henry, 2017; Kinarsky, 2017; Lin et al., 2013; Knol, Robb, McKinley, & Wood, 2017; Knol, Robb, McKinley, & Wood, 2019; Maroto, Snelling, & Linck, 2015; Martinez, Frongillo, Leung, & Ritchie, 2018; Martinez, Webb, Frongillo, & Ritchie, 2018; McArthur, Ball, Danek, & Holbert, 2018; McArthur, Fasczewski, Wartinger, & Miller, 2018; Meza, Altman, Martinez, & Leung, 2019; Miles, McBeath, Brockett, & Sorenson, 2017; Mirabitor, Peterson, Rathz, Matlen, & Kasper, 2016; Morris, Smith, Davis, & Null., 2016; Nikolaus, Ellison, & Nickols-Richardson, 2019; Patton-Lopez, Lopez-Cevallos, Cancel-Tirado, & Vazquez, 2014; Payne-Sturges, Tjaden, Caldeira, Vincent, & Arria, 2018; Phillips, McDaniel, & Croft, 2018; Silva, Kleinert, Sheppard, Cantrell, Freeman-Coppadge, Tsoy....Pearrow, 2017; Soldavini, Bernerb, & Da Silva, 2019; Twill, Bergdahl, & Fensler, 2016; Watson, Malan, Glik, & Martinez, 2017; Wattick, Hagedorn, & Olfert, 2018; Wood & Harris, 2018; Zollinger, Mills, Brandt, & Rohleder-Sook, 2018).

Study designs. The majority of food insecurity studies among college students employed a cross-sectional quantitative design. Only one study (Bruening et al., 2018) was a longitudinal study of food insecurity over a year's time. Three articles were descriptive case studies of campus interventions (Buch et al., 2016; Freudenberg et al., 2013; Twill et al., 2016). Three articles described qualitative research studies that employed in-depth interviews and focus groups of student perceptions of food insecurity (Henry, 2017; Meza et al., 2019; Watson et al., 2017). The use of cross-sectional study design limits the ability to determine the causation or the timing of exposure to risk factors; care must also be taken when interpreting associations and the direction of associations (Bruening, et al. 2017; GAO, 2018; Nazmi et al., 2018).

Samples. Most studies that reported sampling methodology used some version of a convenience

sample. Several authors (Biediger-Friedman et al., 2016; Bruening et al. 2016; Couch et al., 2017; Davidson & Morrell, 2016; El Zein et al., 2018; Gaines et al., 2014; Hanna, 2014; Henry, 2017; Kinarsky, 2017; Lin et al., 2013; Maroto et al., 2015; Meza et al., 2019; Patton-Lopez et al., 2014; Twill et al., 2016; Wattick et al., 2018) used a traditional convenience sample of students. One study (Watson et al., 2017) used students from a convenience sample and a purposive sample referred by program leaders; participants were then screened and selected for various characteristics. Forman et al. (2018) used a convenience sample of students enrolled in undergraduate courses designated by deans of the colleges of Liberal Arts and Natural Sciences. McArthur, Ball, et al. (2018) used a non-probability sample of sophomore, junior senior, and graduate students. Bruening et al. (2016, 2018) used a convenience sample of freshmen living in residence halls. Couch et al. (2017) used a convenience sample of students enrolled in community nutrition classes. Payne-Sturges et al., (2018) used a convenience sample of students enrolled in classes for family science, community health, or agriculture undergraduate majors. Hanna (2014) and Biediger-Friedman et al. (2016) used a convenience sample of students from courses whose faculty chose to participate. Gaines and colleagues (2014) used a convenience sample and a random sample of sophomore, junior, and senior level classes. One study (Kinarsky, 2017) included all students enrolled in a campus program, Guardian Scholars, for current and former foster youth and another study (Meza et al., 2019) sampled students who had used a campus food pantry. Hagedorn & Olfert (2018) emailed all university professors across all three university campuses, sharing the invitation for all students to participate. Miles et al. (2017) included all undergraduate and graduate students in enrolled in a school of social work. Knol et al. (2017, 2019) included all undergraduate students living off campus who did not live in a sorority or fraternity or with parents. One study (Twill et al., 2016) included all enrolled students by providing a link to a survey on the university student login page. One study (Morris et al., 2016) included all enrolled students by contacting them through the university's email and one study (Soldavini et al., 2019) included all enrolled students except those that requested confidentiality and did not provide a publicly available email in the university directory. Silva et al. (2017) used a random sample of undergraduate and graduate courses, and then included students in which the instructor agreed

to participate. Chaparro and colleagues (2009) used a random sample of sophomore, junior, senior, and graduate courses. Wood and Harris (2018) used a random sample of courses across 10 community colleges. Broton & Goldrick-Rab (2018) reported that two of the studies included in their research used a random sample of students from a STEM program for low to moderate income students. McArthur, Fasczewski, et al. (2018) used a random sample of freshman students and Zollinger et al. (2018) used a random sample of students but excluded freshman students. One study (Phillips et al., 2018) used a random sample of undergraduate students. Martinez, Frongillo et al. (2018) and Martinez, Webb et al. (2018) used a random sample of students across 10 community colleges. One study (Nikolaus et al., 2019) used a stratified random sample of undergraduate students, 1,000 students per class year. The convenience sample design used in most of these studies frequently limited the ability to generalize the findings to the entire university population or to other universities; the high food insecurity rate in some studies may not have been reflective of entire campuses, as students who experienced food insecurity may have been more likely to respond to a survey about food insecurity (Bruening, et al. 2017; GAO, 2018; Nazmi et al., 2018).

Another methodological issue encountered in some of the studies was the small sample size and limited response rate. For example, a 1.8% response rate was reported in the study by Maroto and colleagues (2015), 3.5% in the study by Knol et al. (2019), and 3.9% in the study by Morris et al. (2016). These small sample sizes and response rates also significantly limit the ability to generalize findings to the study population or to other colleges and universities (Bruening, et al. 2017; GAO, 2018; Nazmi et al., 2018).

Of the studies that reported the location, all but three (Broton & Goldrick-Rab, 2018; Maroto et al., 2015; Wood & Harris, 2018) were conducted in four-year colleges or universities. The majority of studies were conducted in public schools in urban settings. Only one study (Lin et al., 2013) was conducted in a Historically Black College and University.

Food security measurement tools. Of the studies that reported how food insecurity was measured, most employed a version of the USDA Food Security Module (either the 6-item, 10-item, or

18-item Module) to assess the prevalence and severity of food insecurity. Bruening and colleagues (2016) used an adapted version of the USDA Food Security Module. Broton and Goldrick-Rab (2018) reported that one study in their paper used the two USDA screener questions and some of the questions from the 6-item USDA Food Security Module. Kinarsky (2017) used two questions from the USDA Food Insecurity Measure to assess food security. Silva and colleagues (2017) asked questions similar to those in the USDA Adult Food Security Module; Freudenberg et al. (2013) also asked questions similar to the USDA Food Security Module. Wood and Harris (2018) asked a single question about experiencing hunger and Lin and colleagues (2013) asked a single question about whether the students had experienced problems with food insecurity in the past month.

Data analysis. Many studies provided descriptive or bivariate analysis, while others used multivariate analysis. The use of simple data analysis in some studies provided a limited picture of the predictors and outcomes of food insecurity, as controlling for confounding variables is not possible without multivariate analysis (Bruening, et al. 2017; GAO, 2018; Nazmi et al., 2018).

Study findings. Studies on food insecurity among college students report on the prevalence of food insecurity among the students; sociodemographic characteristics and other factors related to student food insecurity; social support, coping skills, and other resources used by students to alleviate food insecurity; physical and mental health outcomes and academic outcomes of student food insecurity; student perceptions of food insecurity; and university interventions to alleviate student food insecurity.

Prevalence of food insecurity. The rate of food insecurity among college students varied widely among the studies (14.1% - 58.8%) that reported the rate; Lin and colleagues (2013) did not report the rate of food insecurity in their study. Broton and Goldrick-Rab (2018) reported the prevalence rate among the four studies included in their paper, but included students who were marginally food secure, making their findings not comparable to the rates reported in other studies that included only students who had low and very low food security status. All studies that reported rates of food insecurity reported rates above the 2017 U.S. average food insecurity rate of 11.8% (Coleman-Jensen et al., 2018). Patton-Lopez and colleagues (2014), who studied food insecurity among a convenience sample of undergraduate

and graduate students at a rural university in Oregon, reported the highest rate of food insecurity at 58.8%, while Gaines et al. (2014) reported the lowest rate of food insecurity, 14.1%, among students in a random and convenience sample of 16 sophomore, junior, and senior courses at the University of Alabama. In the one study that looked at food insecurity over time, Bruening et al. (2018) found that students were more likely to be food insecure at the end of the first and second semesters, 35% and 36%, respectively, compared to the start of the school year, 28% (OR = 1.5, 99% CI [1.1, 2.0]; OR = 1.5, 99% CI [1.1, 2.0]).

Individual SEM level – sociodemographic factors related to food insecurity. Several sociodemographic factors related to food insecurity among college students were reported by the researchers.

Several researchers found associations between food insecurity and race and ethnicity. Maroto and colleagues (2015) discovered that African American and multiracial students were more likely than White students to be food insecure ($p = .005$); Morris and colleagues (2016) too found that food insecurity was significantly associated with African American students ($p < .001$). El Zein and colleagues (2018) reported that Black students were more likely to experience food insecurity than White students ($p < .0001$); and Wood and Harris (2018) reported that multiethnic and Black students experienced the most food insecurity in their study ($p < .001$). Phillips et al. (2018) found that African American students were more likely than students of other races/ethnicities to be food insecure (OR = 2.90, $p < .05$). Payne-Sturges et al. (2018) found that African American students were more likely than White students to be food insecure (AOR = 4.00, 95% CI [1.83, 8.71], $p < .0001$), as were students who classified themselves as other race/ethnicity (AOR = 5.26, 95% CI [1.85, 14.98], $p = .002$). Martinez, Web et al. (2018) found Hispanic and Black students had higher odds (OR = 1.9, 95% CI [1.5, 2.3]; OR = 1.7, 95% CI [1.2, 2.5], respectively) of food insecurity compared to White students. Soldavini et al. (2019) found that Hispanic, African American, and multiracial undergraduate students had a higher odds of experiencing food insecurity than White students (OR = 1.78, 95% CI [1.20, 2.64], $p < .01$; OR = 3.00, 95% CI [1.97, 4.58], $p < .001$; OR = 1.78, 95% CI [1.13, 2.81], $p < .05$, respectively); African American graduate students

were also more likely than White students to experience food insecurity (OR = 3.77, 95% CI [2.25, 6.30], $p < .001$). Forman et al. (2018) found that Hispanic students were more likely to experience food insecurity (OR = 1.90, 95% CI [1.26, 2.87], $p = .02$). Mirabatur et al. (2016) found that underrepresented minorities living in households without food provision were more likely than White students to be food insecure (OR = 2.73, 95% CI [1.56, 4.73], $p < .001$), and Miles et al. (2017) reported that food insecure students were more likely to be a person of color ($p < .05$) and Hispanic ($p < .01$). Chaparro and colleagues (2009) found that students who were Native Hawaiian or Pacific Islander or Filipino and students with multiple ethnicities were significantly more likely to be food insecure than Japanese students ($p = .004$).

Researchers reported conflicting results in relation to gender and food insecurity. McArthur, Ball, et al. (2018) reported that being male students was predictive of food insecurity ($p < .001$). Mirabatur et al. (2016) also found that males, living in households with food provision, were more likely than females to be food insecure (OR = 2.21, 95% CI [1.16, 4.22], $p < .02$), as were males living in households without food provision (OR = 1.75, 95% CI [1.05, 2.92], $p < .03$). However, Miles et al. (2017) reported that food insecure students in their study were more likely to be female than male ($p < .05$).

Age has also been found to be related to food insecurity. Phillips et al. (2018) discovered that non-traditional students (24 years or older) were more likely than younger students to be food insecure ($p < .01$). And Wood and Harris (2018) also found that White students between that ages of 25 – 31 had higher odds of being food insecure than White students of other ages (OR = 3.38, $p < .01$).

Maroto and colleagues (2015) discovered that students who were single parents were more likely to be food insecure than those who were not single parents ($p = .011$). Phillips et al. (2018) reported that students with children or who were financially responsible for others were more likely to be food insecure ($B = 1.586$, $SE = 0.575$, OR = 4.89, $p < .01$). Soldavini et al. (2019) also found that graduate students with children had an increased odds of experiencing food insecurity (OR = 3.46, 95% CI [2.01, 5.97], $p < .001$).

Other family situations were reported in the literature to impact food insecurity. Martinez, Webb et al. (2018) discovered that students who had been food insecure as children had higher odds of being food insecure (OR = 7.4, 95% CI [5.8, 9.4]). Forman et al. (2018) reported that a higher percentage of students who were third-born than students who were an only child experienced food insecurity ($p < .01$).

One study assessed the relationship between social class and food insecurity. Nikolaus et al. (2019) discovered that a higher perceived social class decreased the odds of food insecurity among students (middle class: OR = 0.28, SE = 0.14, $p < .05$).

Several researchers investigated the relationship between food insecurity and class year. Mirabatur et al. (2016) discovered that doctoral students, living in households without food provision, were less likely to be food insecure than undergraduate students (OR = 0.32, 95% CI [0.18, 0.56], $p < .001$). El Zein and colleagues (2018) also found that undergraduate students were more likely to experience food insecurity compared to graduate students ($p = .01$). Martinez, Webb et al. (2018) also reported that undergraduate students had 2.0 to 4.1 times the odds (95% CI [1.4, 6.2]) of being food insecure compared to graduate or professional students. Hagedorn and Olfert (2018) also reported that academic year was predictive of food insecurity, with the highest odds for freshmen compared to graduate students (OR = 2.85, CI [1.36, 5.97]). Soldavini et al., (2019) found similar results; graduate students in their study were less likely to experience food insecurity than undergraduate students (OR = 0.47, 95% CI [0.37, 0.60]), but sophomores and juniors had higher odds of experiencing food insecurity than freshmen students (OR = 1.75, 95% CI [1.29, 2.39], $p < .05$; OR = 1.49, 95% CI [1.03, 2.15], $p < .001$, respectively). Nikolaus et al. (2019) too reported that sophomores, juniors, and seniors had higher odds of experiencing food insecurity compared to freshman students (OR = 3.09, SE = 1.42, $p < .05$; OR = 4.61, SE = 2.07, $p < .01$; OR = 2.81, SE = 1.31 $p < .01$, respectively). Phillips et al. (2018) also reported that more advanced undergraduate students were more likely than students in lower class rank to be food insecure ($p < .01$).

Researchers reported similar results regarding the impact of credit hours on food insecurity. Hanna (2014) discovered that food insecurity was significantly associated ($p = .019$) with taking 13 or

more credit hours. Wood and Harris (2018) found that Latino students, but not other ethnicities, who were enrolled full-time had higher odds of being food insecure (OR = 1.78, SE = 0.16, $p < .01$).

Soldavini et al. (2019) also reported that part-time graduate students had lower odds of experiencing food insecurity than full-time graduate students (OR = 0.45, 95% CI [0.25, 0.82], $p < .01$).

Researchers also reported similar results regarding international students and food insecurity. El Zein and colleagues (2018) discovered that international students were more likely to experience food insecurity compared to in-state and out-of-state students ($p = .006$). Soldavini et al. (2019) also found that international undergraduate students had an increased odds of experiencing food insecurity (OR = 1.92, 95% CI [1.14, 3.23], $p < .05$).

Researchers all found similar results concerning first-generation status students. Davidson and Morrell (2016) discovered that students who were first-generation students were more likely to be food insecure (OR = 1.73; 95% CI [1.17, 2.54]). Forman et al. (2018) also found that a higher percentage of students who were first-generation students experienced food insecurity ($p < .01$), and Miles et al. (2017) reported that food insecure students were more likely to be a first-generation ($p < .05$). Phillips et al. (2018) too found that first-generation students were more likely to be food insecure (B = 0.545, SE = 0.234, OR = 1.72, $p < .01$).

Researchers reported that other stressors also influenced food insecurity. Gaines and colleagues (2016) discovered that students who experienced exogenous shock (i.e. a tornado) were more likely to experience food insecurity (Estimate 0.49, 95% CI [0.24, 0.76], $p < .001$). And, Wood and Harris (2018) reported that students of all ethnicities who had legal concerns had higher odds of food insecurity than students without legal concerns (OR = 1.83-3.51, SE = 0.18-0.38, $p < .05-.001$).

In their case study of the development and implementation of a campus food pantry, Buch et al. (2016) reported that graduate students, international students, and student living alone were the most frequent users of their food pantry. El Zein et al., (2017) also identified that international students used their campus food pantry more frequently than in-state and out-of-state students. Twill et al. (2016) reported that students who used their food pantry most often were 20 years or younger, first year students,

full-time students, Black or African American, lived with a roommate, had no dependents, received a Pell grant and loans, and were unemployed; additionally, 51% of visits to the food pantry were repeat visits.

Students participating in focus groups (Watson et al., 2017) identified that commuter, international, and undocumented students were most likely to suffer from food insecurity.

Individual and interpersonal SEM levels – resources, social support, and coping skills used by students to alleviate food insecurity. Several resources, social supports, and coping strategies were linked with food insecurity.

Resources and social support. All researchers, except one, reported similar results regarding employment and food insecurity. Patton-Lopez and colleagues (2014) discovered a significant association between food insecurity and being employed (OR = 1.73; 95% CI [1.04, 2.88], $p = .04$). Forman et al. (2018) found that a higher percentage of students who worked for pay experienced food insecurity ($p = .04$). Nikolaus et al. (2019) reported that students who received financial support through employment had higher odds of experiencing food insecurity (OR = 1.63, SE = 0.48, $p < .10$). Soldavini et al. (2019) found that undergraduate students with a part-time job or a full-time job had higher odds of experiencing food insecurity than those students who were unemployed (OR = 1.66, 95% CI [1.34, 2.06], $p < .001$; OR = 2.23, 95% CI [1.01, 4.88], $p < .05$, respectively), as did graduate students with a part-time job compared to unemployed graduate students (OR = 1.51, 95% CI [1.11, 2.05], $p < .01$). The results of Wood and Harris (2018) differed somewhat from other researchers; Asian students who had employment challenges had higher odds of food insecurity than students without employment challenges (OR = 2.33, SE = 0.30, $p < .01$).

Researchers also investigated the relationship between different financial factors and food insecurity. Hanna (2014) discovered that 100% of students who were food insecure reported not having enough money. Patton-Lopez and colleagues (2014) reported a significant association between food insecurity and having an income of less than \$15,000 per year (OR = 2.23; 95% CI [1.07, 4.63], $p = .03$). Zollinger et al. (2018) found that students with a lower household income were more likely to be food insecure ($r = .262$, $p = .004$). Wood and Harris (2018) reported that White and Asian students who had an

income below \$30,000 had higher odds of being food insecure (OR = 1.82, SE = 0.22, $p < .01$; OR = 2.58 SE = 0.36, $p < .01$, respectively). Gaines and colleagues (2016) found that food insecurity was associated with different financial factors: students that had a credit card to use were less likely to be food insecure (Estimate -0.35; 95% CI [-0.61, -0.10], $p < .01$), while students who actively budgeted were more likely to be food insecure (Estimate 0.43; 95% CI [0.17, 0.69], $p < .01$). Miles et al. (2017) discovered that food insecure students were more likely to have a larger debt than food secure students ($p < .05$). Phillips et al. (2018) reported that students currently carrying debt were more likely to be food insecure (B = 0.767, SE = 0.225, OR = 2.152, $p < .001$). Zollinger et al. (2018) also discovered that students who paid for a higher percentage of their educational and living costs from savings were less likely to be food insecure ($r = .175$, $p = .036$).

Several researchers examined the role of living arrangements on food insecurity and all reported similar results. Chaparro and colleagues (2009) discovered that those living on campus, or off campus with roommates, were significantly more likely to be food insecure than students living with parent or relatives ($p < .001$). Maroto and colleagues (2015) also found that those living alone or with spouses or roommates were more likely to be food insecure than if they lived with parents or relatives ($p = .007$). Morris and colleagues (2016) also reported that food insecurity was significantly associated with living off campus without parents or guardians ($p < .001$). Hagedorn and Olfert (2018) found a higher prevalence of food insecurity among students who lived off campus compared to those who lived on campus ($p = .027$). Martinez, Webb et al. (2018) reported that students who were living with friends or were homeless had higher odds of being food insecure than students living at home (OR = 2.1, 95% CI [1.4, 3.3]). Wood and Harris (2018) also reported that students of all ethnicities who experienced housing insecurity had higher odds of being food insecure than those who had secure housing (OR = 2.81-4.69, SE = 0.18-0.33, $p < .01$ -.001). Payne-Sturges et al. (2018) too found that students who were experiencing housing insecurity were more likely be food insecure (Adjusted OR = 8.00, 95% CI [3.57, 17.93], $p < .0001$). Phillips et al. (2018), who assessed distance from campus, discovered that students living off campus within walking distance were more likely to be food insecure (B = 1.072, SE = 0.312, OR =

2.922, $p < .01$) and students living off campus outside of walking distance were more likely to be food insecure ($B = 0.869$, $SE = 0.335$, $OR = 2.384$, $p < .01$) than those students who lived on campus.

Researchers examined the relationship between food insecurity and campus meals plans and reported conflicting results. Davidson and Morrell (2016) discovered that those who had a campus meal plan were less likely to be food insecure ($B = -1.03$, $OR = 0.36$; 95% CI [0.24, 0.54], $p < .001$). Soldavini et al. (2019) reported that undergraduate students who had a campus meal plan had lower odds of food insecurity than students who had no meal plan ($OR = 0.68$, CI [0.51, 0.91], $p < .01$). However, Martinez, Web et al. (2018) found different results; they reported that a higher proportion of students who were food insecure reported commonly receiving food from campus meal plan compared to students who were food secure ($p < .01$).

Two studies reported the relationship between transportation and food insecurity. Wood and Harris (2018) reported that White and Latino students who had transportation challenges had higher odds of food insecurity than students without transportation challenges ($OR = 2.48$, $SE = 0.20$, $p < .001$; $OR = 2.44$, $SE = 0.18$, $p < .001$, respectively). McArthur, Ball, et al. (2018) found that owning a car was predictive of food security ($B = -0.77$, $SE = 0.17$, $p < .001$).

Gaines and colleagues (2016), who assessed a combination of resources, discovered that those with a higher resource adequacy score, which included cooking skills, money to buy food, appliances for food preparation, food selection in local stores, and time to prepare food (Estimate -0.09; 95% CI [-0.14, -0.04], $p < .001$) were less likely to be food insecure.

Two researchers assessed the relationship of cooking self-efficacy and food insecurity. Food secure students reported a higher cooking self-efficacy than food insecure students ($p < .05$) in the study by Gaines and colleagues (2016). Knol et al. (2019) also found that cooking self-efficacy was differed by food security status ($p = .008$); food secure students had higher self-efficacy for cooking than students who had low food security and very low food security ($p = .02$ and $p = .001$, respectively).

Several researchers reported on the impact of family financial support and food insecurity and all reported similar results. Gaines and colleagues (2016) discovered that students who were financially

independent were more likely to be food insecure (Estimate 0.59; 95% CI [0.23, 0.96], $p < .01$), while students who received familial financial support were less likely to be food insecure (Estimate -0.51; 95% CI [-0.90, -0.12], $p < .05$). Forman et al. (2018) found that a higher percentage of students who did not have parents that helped pay for tuition or living expenses experienced food insecurity ($p < .01$). Phillips et al. (2018) reported that students who were financially independent of their parents were more likely to be food insecure ($B = 0.779$, $SE = 0.248$, $OR = 2.18$, $p < .01$). Payne-Sturges et al. (2018) found that students who received family financial support were less likely to be food insecure (Adjusted $OR = 0.28$, 95% CI [0.12, 0.67], $p = .004$). Broton and Goldrick-Rab (2018) discovered that a higher percentage of food insecure students compared to food secure reported borrowing money from family and friends to help pay bills ($p < .001$). And, Nikolaus et al. (2019) reported that students who received financial support from family had lower odds of experiencing food insecurity ($OR = 0.32$, $SE = 0.11$, $p < .01$).

Several researchers assessed the relationship between financial aid and food insecurity; all but one reported similar results. Gaines and colleagues (2016) discovered that students who received financial aid were more likely to be food insecure (Estimate 0.35; 95% CI [0.08, 0.62], $p < .05$). Morris and colleagues (2016) found that food insecurity was significantly associated with using student loans and other repayment programs ($p < .001$). Davidson and Morrell (2016) also reported that students who received financial aid were more likely to be food insecure ($B = 0.61$, $OR = 1.84$; 95% CI [1.18, 2.88], $p < .007$). Forman et al. (2018) found that a higher percentage of students who received financial aid at the university experienced food insecurity ($p = .01$) and El Zein and colleagues (2018) found that Pell grant recipients were more likely to experience food insecurity than non-recipients ($p < .0001$). Martinez, Webb et al. (2018) reported that students who received needs-based financial aid had higher odds of food insecurity ($OR = 1.6$, 95% CI [1.3, 2.0]). McArthur, Ball, et al. (2018) found that receiving financial aid was predictive of food insecurity ($B = 0.28$, $SE = 0.13$, $p = .03$). Payne-Sturges et al. (2018) also found that students receiving multiple sources of financial aid were more likely to be food insecure (Adjusted $OR = 3.43$, 95% CI [1.85, 6.37], $p < .001$). Soldavini et al. (2019) reported that undergraduate students had higher odds of experiencing food insecurity than students who did not receive financial aid ($OR = 2.00$,

95% CI [1.61, 2.49], $p < .001$). Nikolaus et al. (2019) also reported that students who received loans had higher odds of experiencing food insecurity (OR = 1.75, SE = 0.54, $p < .10$). However, in contrast to the previous findings, Couch et al. (2017) reported that fewer food insecure students than food secure students in their study to have applied for financial aid ($p = .008$).

One study by Wood and Harris (2018) assessed relationship challenges and food insecurity; the authors discovered that White, Black, and Latino students who had relationship challenges had higher odds of food insecurity than students without relationship challenges (OR = 1.75-2.21, SE = 0.19-0.29, $p < .05-.01$).

Coping skills. Several researchers evaluated the relationship between various coping skills and food insecurity. Couch et al. (2017) discovered that students who were food insecure were more likely than food secure students to borrow money from family and friends ($p = .000$), and Martinez, Web et al. (2018) found that students who were food insecure were more likely to ask friends or family to cover costs than those who were food secure ($p < .001$). Martinez, Web et al. (2018) also discovered that students who were food insecure were more likely to have choose between paying for food and paying educational expenses, housing and utilities, and medicine than those who were food secure ($p < .001$). McArthur, Ball, et al. (2018) reported that a higher money expenditure score, which included student report of spending more money on alcohol, gasoline, and car repairs, rather than food, was predictive of food insecurity ($p < .001$). Hagedorn and Olfert (2018) also reported that scoring higher on a money expenditure scale, when students more often spent money on alcohol, cigarettes, recreational drugs, public transportation fees, car repairs, gasoline, pet care, and tattoos than on food, was predictive of food insecurity (OR = 1.44, 95% CI [1.24, 1.67], $p < .07$). Forman et al. (2018) discovered that students who were not confident in their ability to manage finances, compared to students who were confident, were more likely to experience food insecurity (OR = 2.51, 95% CI [1.15, 6.05], $p < .01$), as did students who had little confidence to manage their finances (OR = 2.43, 95% CI [1.33, 4.41], $p < .01$).

Three researchers utilized a coping scale to compare to food insecurity. Hagedorn and Olfert (2018) discovered that scoring higher on a coping strategies scale was predictive of food insecurity (OR =

1.20, 95% CI [1.16, 1.23], $p < .0001$). Twenty-nine questions in this scale (Hagedorn & Olfert, 2018) asked students to report how often they saved, used supports, changed intake, or sold items related to food, such as stretching meals, visiting family on the weekends to bring back food, eating less healthy meals, or selling personal items to buy food. McArthur, Ball, et al. (2018) used the same coping skills scale and also found that a higher coping strategies score was predictive of food insecurity ($B = 0.13$, $SE = 0.01$, $p < .001$). Students in this study (McArthur, Ball, et al., 2018) most frequently purchased cheap processed food, were employed, planned menus before shopping, stretching food to make it last longer, and eating less healthy meals to eat more food. Using this same coping skills score, McArthur, Fasczewski, et al. (2018) also reported a higher proportion of food insecure freshmen students utilized more coping strategies than food secure students ($r = .26$, $p < .05$), such as purchasing cheap processed food, stretching food to make it last longer, and sharing meals and groceries with family and friends.

Other researchers assessed individual food related coping strategies and food insecurity. Bruening et al. (2016) discovered that students who were food insecure were less likely to receive food from parents ($OR = 0.51$; 95% CI [0.28, 0.94], $p = .03$). Martinez, Web et al. (2018) reported different results from Bruening et al. (2016); they found that a higher proportion of students who were food insecure than food secure received free food from parents or friends ($p < .001$). Couch et al. (2017) also found that students who were food insecure were more likely than food secure students to receive free food or meals ($p = .000$). Broton and Goldrick-Rab (2018) also reported that a higher percentage of food insecure students compared to food secure received free food from family and friends ($p < .001$). Martinez, Web et al. (2018) discovered that a higher proportion of students who were food insecure than food secure students received free food on and off campus events ($p < .001$). Martinez, Web et al. (2018) also reported that a higher proportion of food insecure students than food secure students received food from a food pantry, free food program, or a garden ($p < .001$). Zollinger et al. (2018) also found that a correlation between food insecurity among students and use of community resources; food insecure students were more likely to use a campus food pantry ($r = .251$, $p = .002$), use a campus or community garden ($r = .176$, $p = .030$), and have someone in their household use a food pantry in the last year ($r =$

.327, $p = .000$). Miles et al. (2017) reported that food insecure students were more likely than food secure student to use a food bank ($p < .01$), SNAP benefits ($p < .05$), or the NSLP ($p < .01$). Broton and Goldrick-Rab (2018) discovered that a higher percentage of food insecure students compared to food secure reported using public food assistance ($p < .001$). Martinez, Web et al. (2018) reported that more students who were food insecure than those who were food secure bought cheap unhealthy food ($p < .001$). Miles et al. (2017) also reported that food insecure students were more likely buy inexpensive food ($p < .01$). Miles et al. (2017) also found that food insecure students were more likely than food secure students to share food ($p < .01$), work beyond their capacity ($p < .01$), and avoid paying bills on time ($p < .01$) as coping skills.

Three studies evaluated cooking and food insecurity. McArthur, Ball, et al. (2018) discovered that students who often cooked for themselves or others, compared to those who never did this, was predictive of food security ($B = -0.58$, $SE = 0.23$, $p = .02$). Soldavini et al. (2019) found that among undergraduates, students who sometimes cooked for themselves or often cooked for themselves had higher odds of food insecurity than students who were never cooked for themselves ($OR = 1.68$, 95% CI [1.26, 2.24] $p < .001$; $OR = 1.78$, CI [1.23, 2.57], $p < .01$, respectively). Knol et al. (2019) also assessed food security and food preparation; the food preparation score included purchasing fresh vegetables, writing a grocery list, developing a grocery budget, planning a menu, and preparing a salad, a menu that includes meat and vegetables, and a dinner for two or more people. Knol et al. (2019) found that the food preparation score significantly differed based on food security status ($p = .009$), with very low food secure students preparing food less often than other students.

Other researchers assessed other health behaviors related to coping skills associated with food insecurity. Mirabatur et al. (2016) discovered that food insecure ate fewer fruits and vegetables per day than food secure students ($p = .01$). Bruening and colleagues (2016) discovered that those students who were food insecure were less likely to eat breakfast regularly ($OR = 0.41$; 95% CI [0.22, 0.77], $p < .05$), eat home cooked meals ($OR = 0.34$; 95% CI [0.16, 0.72], $p < .05$), or have healthy eating habits off campus ($OR = 0.46$; 95% CI [0.24, 0.88], $p < .05$). Bruening et al. (2018) also found that students who

were food insecure were less likely to have frequent breakfast consumption (OR = 0.67, 99% CI [0.49, 0.99], $p \leq .01$), frequent evening meal consumption (OR = 0.55, 99% CI [0.36, 0.86], $p \leq .01$), or health eating habits on campus (OR = 0.68, 99% CI [0.46, 1.00], $p \leq .01$). McArthur, Fasczewski, et al. (2018) reported that a higher proportion of food secure students skipped more meals than food insecure students ($p < .01$). McArthur, Fasczewski, et al. (2018) also found that more food secure freshmen students rated their eating habits as healthy or very healthy compared to food insecure students ($p < .01$).

Kinarsky (2017) reported on coping among students who had been in foster care. Kinarsky (2017) found that the majority of students who had been foster youth did not seek campus support to help alleviate food insecurity; however, those that did most often reported turning to Guardian Scholars program staff as a source of support.

Several students who participated in focus groups and/or in-depth interviews regarding their thoughts and opinions about food insecurity reported having multiple sources of income to help pay for college, bills, and food, but most were reluctant to ask family for assistance (Henry, 2017). Some students reported that although they were enrolled in a campus meal plan, they could not afford the comprehensive plan and so still struggled with food insecurity (Watson et al., 2017). Some students also reported not having kitchen space to cook meals (Watson et al., 2017). Many students reported several coping strategies for dealing with food insecurity – skipping meals, eating smaller meals, drinking more fluids to suppress hunger, attending campus or community events with free food, using a friend's campus dining plan, bringing food from home, purchasing cheap fast food or less nutritious food, eating repetitive meals, sharing food with roommates, or traveling beyond campus to find culturally appropriate food (Henry, 2017; Watson et al., 2017). Other coping strategies included getting short term loans, selling plasma, stealing, getting a part-time or second job, not paying a bill, or relying on faith for support (Henry, 2017; Watson et al, 2017).

Physical and mental health outcomes of food insecurity. Physical and mental health outcomes associated with food insecurity were investigated in several of the studies.

Researchers assessing the relationship between food insecurity and physical health all reported

similar results. Patton-Lopez and colleagues (2014) discovered an association between student food insecurity and fair/poor health in their study (OR = 2.08; 95% CI [1.09, 03.95], $p = .03$). Couch et al. (2017) found that students who were food insecure were less likely than food secure students to report their health as excellent ($p = .011$). Knol et al. (2017) reported that food insecure were more likely than food secure students to report poor/fair health (OR = 2.2, 95% CI [1.1, 4.2], $p < .01$). McArthur, Fasczewski, et al. (2018) also found that more food secure freshmen students reported their health as good or excellent than food insecure students ($p < .01$). McArthur, Ball, et al. (2018) also reported that a rating of poor or fair health, rather than excellent or good, was predictive of food insecurity ($p = .02$). Researchers Wood and Harris (2018) discovered that students of all ethnicities, except Asian students, who had health challenges had higher odds of food insecurity than students with no health challenges (OR = 2.31-3.40, SE = 0.17-0.33, $p < .01-.001$). Hagedorn and Olfert (2018) found that fair or poor health compared to good or excellent health was predictive of food insecurity (OR = 2.88, 95% CI [1.54, 5.41], $p < 0.07$). Soldavini et al. (2019) reported that among undergraduate students, those that rated their health as poor, fair, or good, had higher odds of experiencing food insecurity compared to students who rated their health as excellent (OR = 20.54, 95% CI [8.68, 48.63], $p < .001$; OR = 10.14, 95% CI [7.00, 14.69], $p < .001$; OR = 3.70, 95% CI [2.88, 4.76], $p < .001$); likewise, graduate students had higher odds of experiencing food insecurity if they rated their health poor, fair, or good compared to excellent (OR = 5.30, 95% CI [1.34, 20.98], $p < .05$; OR = 7.04, 95% CI [4.34, 11.42], $p < .001$; OR = 3.31, 95% [CI 2.42, 4.54], $p < .001$).

Researchers found differing results when assessing the relationship between weight and food insecurity. Knol et al. (2017) reported no association between food insecurity and overweight and obesity, while McArthur, Ball, et al. (2018) reported that a higher proportion of food insecure students compared to food secure students were overweight or obese ($p < .001$).

Bruening et al. (2018) discovered that students who were food insecure were less likely to have healthy physical activity habits on campus (OR = 0.68, 99% CI [0.44, 1.00]).

Researchers studying the relationship between mental health and food insecurity reported similar

results. Bruening and colleagues (2016) discovered that those students who were food insecure had higher odds of being depressed (OR = 2.97; 95% CI [1.58, 5.60], $p < .05$). Martinez, Frongillo et al. (2018) found that more food insecure students than food secure students reported experiencing several mental health issues, including feeling hopeless, overwhelmed, exhaustion, lonely, sad, overwhelming anxiety, depression, and stress ($p < .05$). Bruening et al. (2018) reported that food insecure students were more likely to experience stress (OR = 1.69; 99% CI [1.16, 2.46], $p \leq .01$) and more likely to experience a depressed mood (OR = 2.98; 99% CI [1.34, 2.91], $p \leq .01$). Wattick et al. (2018) found that food insecurity was a predictor of depression in males (OR = 1.99, 95% CI [1.13, 3.53]) and in females (OR = 2.26, 95% CI [1.67, 3.07]); food insecurity was also a predictor of anxiety among males (OR = 2.33, 95% CI [1.47, 3.71]) among females (OR = 2.33, 95% CI [1.47, 3.71]).

Lin and colleagues (2014) discovered that food insecure females at an HBCU in Texas were significantly ($p < .05$) more likely to have lower self-esteem, have conflict with a partner, have used drugs in the last month, and have a lower future orientation.

During in-depth interview and/or focus groups, many food insecure students reported feeling fatigue, a lack of energy, and an inability to focus (Henry, 2017; Watson et al., 2017). Some students also reported limiting their physical activity because they did not have enough calories or energy to participate and a few students even reported passing out from lack of food. Some students reported headaches, disrupted sleep, and weight gain as a result of food insecurity. (Henry, 2017; Watson et al., 2017)

Students who participated in focus groups and/or in-depth interviews (Henry, 2017; Meza et al., 2019; Watson et al., 2017) about food insecurity also reported depression, irritability, mood changes, stress, anxiety, and worry. Many students described awkwardness or shame related to talking about or seeking help for being food insecure. Some students reported feeling sadness while interacting with other more affluent students or when reflecting on their situation. Some students mentioned jealousy or resentment towards food secure students and some reported difficulty developing meaningful relationships with other students due to embarrassment during or avoidance of social situations. Students also mentioned being concerned about revealing their food insecurity to their family. Some students

reported feeling hopeless about being food insecure and some felt undeserving of help compared to other students. Some students reported feeling frustration and anger about their situation and some specifically towards their university for not providing more assistance. Several students reported decreasing their participation in social activities because they could not afford to purchase food or because they felt awkward for not being able to purchase food. (Henry, 2017; Meza et al., 2019; Watson et al., 2017)

Academic outcomes of food insecurity. Several researchers assessed the relationship between food insecurity and academic outcomes.

Grade point average and food insecurity were investigated by several researchers. Patton-Lopez and colleagues (2014) discovered that students were less likely to be food insecure if they had an average GPA of 3.1 or higher (OR = 0.40; 95% CI [0.22, 0.69], $p = .001$). Morris and colleagues (2016) also saw comparable results as the other researchers; students in their study with lower GPAs were more likely to be food insecure ($p < .001$). McArthur, Ball, et al. (2018) also discovered a correlation between that food secure status and GPA ($r = -0.26$, $p < .001$), with food insecure students performing more poorly. Phillips et al. (2018) reported that food insecure students had a 0.17-point lower GPA than food secure students ($B = -0.174$, $SE = 0.064$, $p < .001$). Martinez, Frongillo et al. (2018) found that food insecurity was related to a lower GPA ($B = -0.08$, $p < .001$); a significantly higher proportion of students who were food secure had a cumulative A average than food insecure students and a significantly higher proportion of students who were food insecure had a cumulative C average than food secure students. Hagedorn and Olfert (2018) found more food insecure students lower GPAs by 0.18 points compared to food secure students ($p < .0001$). Martinez, Webb, et al., 2018 also reported a higher proportion of food insecure students had lower GPAs ($p < .001$). Maroto and colleagues (2015) reported that students who were food insecure were more likely to have a lower GPA ($B = -0.941$, OR = 0.390, $p = .042$). However, Davidson and Morrell (2018) discovered no association between GPA and food insecurity. Likewise, Payne-Sturges et al. (2018) reported no statistically significant differences in GPA by food security status. Additionally, McArthur, Fasczewski, et al. (2018) also reported no correlation between food insecurity and GPA.

Researchers also reported on the relationship between food insecurity and academic outcomes other than GPA. Silva and colleagues (2017) discovered that students' ability to attend classes and perform in class was significantly impacted if they were food insecure ($p < .01$) and were more likely to withdraw from school. Phillips et al. (2018) found that food insecure students were more likely than food secure students to report neglecting their studies ($B = 1.230$, $SE = 0.243$, $OR = 3.422$, $p < .0001$), reducing their course load ($B = 1.277$, $SE = 0.260$, $OR = 3.584$, $p < .0001$), and consider dropping out of college due to money owed ($B = 1.251$, $SE = 0.262$, $OR = 3.49$, $p < .0001$). McArthur, Fasczewski, et al. (2018) found a significant difference ($p < .001$) on an academic progress score between food secure and insecure freshmen students, with insecure students scoring lower; this score consisted of student ratings of class attendance, attention span, understanding of concepts taught in class, progress towards graduation, and transition to college. McArthur, Ball, et al. (2018) also found a correlation between that food secure status and the academic score ($r = -.28$, $p < .001$), with food insecure students performing more poorly; this score also consisted of student ratings of class attendance, attention span, understanding of concepts taught in class, and progress towards graduation. Additionally, a lower proportion of food insecure students reported excellent or good responses on these individual academic variables ($p < .001$) (McArthur, Ball, et al., 2018). Hagedorn and Olfert (2018) also reported a significant relationship between an academic progress score and food insecurity; those with a high academic score were less likely to experience food insecurity ($OR = 0.079$, $95\% CI [0.73, 0.86]$, $p < .0001$).

In focus groups and interviews with students who shared their perceptions about food insecurity, students reported decreased ability to concentrate on their schoolwork and dropping grades due to food insecurity (Henry, 2017). Students in another qualitative study (Meza et al., 2019) talked about the negative impact of food insecurity on their academic success due to feeling tired and lacking energy, sleeping longer than usual, focusing too much on food instead of schoolwork, or having to work to pay bills instead of studying. Martinez, Web et al. (2018) also found that students who were food insecure were more likely to report difficulty concentrating due to hunger than those who were food secure ($p < .001$).

Student perceptions of food insecurity. During focus groups and in-depth interviews (Henry, 2017), students described being food insecure as being unsure about when they would eat again or where their next meal would come from. Some students reported that not having enough to eat seemed to be considered a normal part of being a college student (Henry, 2017), while other students reported that food insecurity was an invisible issue on their campus (Watson et al., 2017). Many students stated that the high cost of attending college was the main cause of their food insecurity (Henry, 2017). Several students described that significant life events, such as medical issues, family issues, loss of employment, current housing situations, or issues with food stamps or FASFA as contributing to their food insecurity (Henry, 2017); other students reported that disruptions to the academic schedule, like the end of a quarter, breaks and holidays, and summer time caused increasing food insecurity (Watson et al., 2017). In the study of food insecurity among freshman (McArthur, Fasczewski, et al. (2018), food insecure students reported that they thought their food insecurity had worsened since coming to campus and stated that the reasons for this were due to their meal plan running out too soon, spending money on items other than food, and not having enough money to buy food.

During interviews and/or focus groups about students' perceptions of food insecurity, students mentioned that more information about free food resources was needed (Watson et al., 2017). Some students stated that the university should provide basic life skills education, either through a required course or through food demonstrations, regarding menu planning, food preparation and cooking, and budgeting (Watson et al., 2017). Other students mentioned that they would like to have access to a campus food pantry, and several students also recommended that campus dining distribute leftover food to students, provide meal vouchers to campus dining facilities, and create a reduced priced dining plan for students in need; students also suggested that it would be helpful to food insecure students if they could be allowed to work for food in a campus garden, in campus dining, or in a work study program (Henry, 2017, Watson et al., 2017). Some students were skeptical of the university's commitment to students because they perceived that the university was not doing enough to provide adequate resources to students and instead focused too much on academic outcomes (Watson et al., 2017).

In the study of college freshmen (McArthur, Fasczewski, et al., 2018), students reported getting a job, having a more affordable meal plan, and learning how to budget, shop for affordable healthy food, and eat healthy food would all be helpful in improving their access to food. Students in another study by McArthur, Ball, et al. (2018) identified several similar resources that would be helpful to them to access food; students most often reported that getting a job, receiving financial aid from the university, and learning how to budget, eat healthy, and how to shop would be most helpful. Martinez, Web et al. (2018) found that students commonly reported not receiving but wanting information about the federal assistance process, food pantries, food banks, free food, how to cook simple or cheap healthy meals, budgeting, or campus resources about who to talk with about food insecurity.

Organizational and community SEM levels – university and community interventions and resources to alleviate food insecurity. As the issue of food insecurity among students has become known to colleges and universities, several institutions are beginning to implement programs and provide services for students to help alleviate the problem; however, very few peer-reviewed studies document the process of development or outcomes of actual interventions.

Three authors described campus food pant. Buch and colleagues (2016) and Twill and colleagues (2016) described the development, implementation, and use of a campus food pantry; El Zein and colleagues (2017) described the use of a previously established campus food pantry. These researchers (Buch et al., 2016; El Zein et al., 2017) described some of the barriers students faced to using a campus food pantry: lack of understanding of food insecurity, lack of awareness of the food pantry policies and operations (location, hours of operation), social stigma associated with using the food pantry, self-identity – feeling that the using the food pantry was not for them, lack of desirable options at the food pantry, lack of ethnic choices at the food pantry, inconsistent quality of food items at the food pantry, lack of knowledge about how to prepare food items from the food pantry, inconvenient location of the food pantry, and limited hours of operation at the food pantry. Buch et al. (2016), El Zein et al. (2017), and Twill et al. (2016) provided several recommendations or plans for operational changes, including building partnerships with community businesses and organizations, expanding partnerships with on-campus

university departments, adding more university and community members to their advisory board, conducting a food pantry client satisfaction survey, utilizing social media to reach more students, providing students with more information about the policies and operations of the food pantry, altering the operations of the food pantry to better fit student needs, providing better training to food pantry volunteers to help minimize participants' feelings of stigma, altering marketing strategies or rebranding the pantry as a community wellness resource to reduce student stigma rather than identifying it as a food-shortage resource, providing participants more education about how to cook with food pantry items or about cooking on a budget, and providing more referrals to university programs and off-campus community partners.

Freudenberg et al. (2013) provided a brief description of Single Stop Centers housed in several community colleges, which screened students for eligibility in local, state, and federal benefits programs, such as SNAP, and then assisted students throughout the enrollment process.

Several other researchers discussed recommendations for future interventions to alleviate food insecurity. Bruening and colleagues (2017) provided a summary of interventions and employed a Social Ecological Model to group them by SEM level. At the intrapersonal level, food and/or financial educational programming and vouchers for meals were interventions and recommended solutions to food insecurity. At the interpersonal level, peer-to-peer mentoring; food donation among peers, faculty, and staff; and apps that allow students in need to connect with others with excess meals were current practices employed on some campuses. Campus food pantries, increasing employment opportunities, and altering meal plan costs were practices and recommendations at the organizational/ institutional level. Community gardens, developing a network of stakeholders, and increasing the number of healthy retailers in and around campus were interventions and suggestions for the community level. Policy/systems level practices and recommendations included changing the eligibility criteria for SNAP for students, providing on-campus retailers that accept SNAP, enacting laws that improve student access to healthy foods, increasing financial aid, and/or creating a basic living stipend for students.

The GAO (2018) identified and summarized three main approaches currently being used by

colleges to address food insecurity: 1) educating faculty, staff, and students about the existence of food insecurity among college students and about the resources available for food insecure students; 2) providing food and emergency financial assistance; and 3) centralizing and coordinating student services and access to benefits. Educating faculty, staff, and students included providing information at student orientation, in written materials, through social media, by email, at faculty and staff trainings, in course syllabi, and through workshops and supplemental or for-credit courses. Food and emergency financial assistance was provided to students through food pantries, including those that also provide information about cooking, food budgeting, and SNAP eligibility; campus dining meal donations to students; learning kitchens that teach cooking skills; campus farmers' markets, including those that accept SNAP benefits; and providing gift cards, loans, or grants to students. It was also noted that free food is also often provided at campus sponsored events or even given to students by concerned individual faculty members. Efforts to centralize and coordinate student services and access to benefits included centrally locating most of student services around a central hub in the student center, establishing a coordinated screening and benefits program, hosting eligibility clinics, sending targeted information to potentially eligible students, and creating a portal for faculty and staff to report potential student needs and at-risk students.

Theoretical Model

Social Ecological Model. The Centers for Disease Control and Prevention (Frieden, 2010) has adopted the Social Ecological Model to better understand and explain many aspects of health, such as colorectal cancer, violence, health equity, and community engagement. The Social Ecological Model includes five levels of influence on health – individual (knowledge, attitude, beliefs, behaviors), interpersonal (family, peers, social networks, associations, health providers), organizational (rules, regulations, policies, informal structures, local health clinics, worksites), community (societal networks, norms, standards, media, research institutions, regional organizations), and policy (local, state, and federal policies and laws to regulate/support behaviors). The Dietary Guidelines of Americans, 2010 (U.S. Department of Agriculture and U.S. Department of Health and Human Services, 2010, December) also provided a description of how nutrition decisions fit within this framework. At the individual level, age,

gender, race/ethnicity, and disability can influence a person's food intake. At the environmental level, the policies and practices of schools, foodservice establishments, and places of work, worship, and recreation affect the food and nutrition decisions of individuals within these settings. Other sectors of influence, such as media, government, agriculture, and public health care systems also influence the health and access to food of communities and individuals. And lastly, social and cultural norms and values influence individuals' beliefs and behaviors towards food and nutrition.

Bruening and colleagues (2017) and other researchers (Alaimo, 2005; Brown et al., 2016; Coleman-Jensen & Nord, 2013; Coleman-Jensen et al., 2017; Gaines et al., 2014; GAO, 2018; Goldrick-Rab et al., 2015; Goldrick-Rab et al., 2019; Schure et al. 2106) identified factors related to food insecurity among college students across the levels of the Social Ecological Model. In this study, food insecurity among college students is explored within the context of the Social Ecological Model; see Figure 1. At the individual level, sociodemographic factors may be predictive of food insecurity, such as age (children and elderly), gender and sexual orientation (female and LGBTQ), ethnicity (people of color), disability, lack of prior military service, age (older), year of study in college (later years), enrollment status (part-time), residency status (U.S. resident), living arrangement (homeless or temporary), campus meal plan (limited number of meals), lack of transportation, employment, use of financial aid, use of assistance services, lack of self-efficacy to prepare a meal, lack of food and cooking skills and resources, use of food and/or financial educational programming, and lack of food related coping skills. At the interpersonal level, marital status (single, divorced, or widowed), increasing number of children, lack of parental education, increasing number of people in the household, limited household income, lack of parental support, and lack of peer mentoring and support may increase food insecurity. At the organizational level, the lack of affordable campus housing with appliances, expensive university meal plans, lack of a campus garden or food pantry, expensive campus retail stores, and lack of food and/or financial educational workshops or courses may predict food insecurity. Access to resources at the community level, such as soup kitchens, food pantries, food banks, farmers markets, community gardens, affordable grocery stores, and food and financial programs may be predictors of food security. At the

policy level, federal, state, and local policies, regulations, and programs, such as student financial aid, Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), SNAP, school meal programs, Child and Adult Daycare Food Program (CACFP), and The Emergency Food Assistance Program (TEFAP), as well as other financial support programs, may also predict food security status.

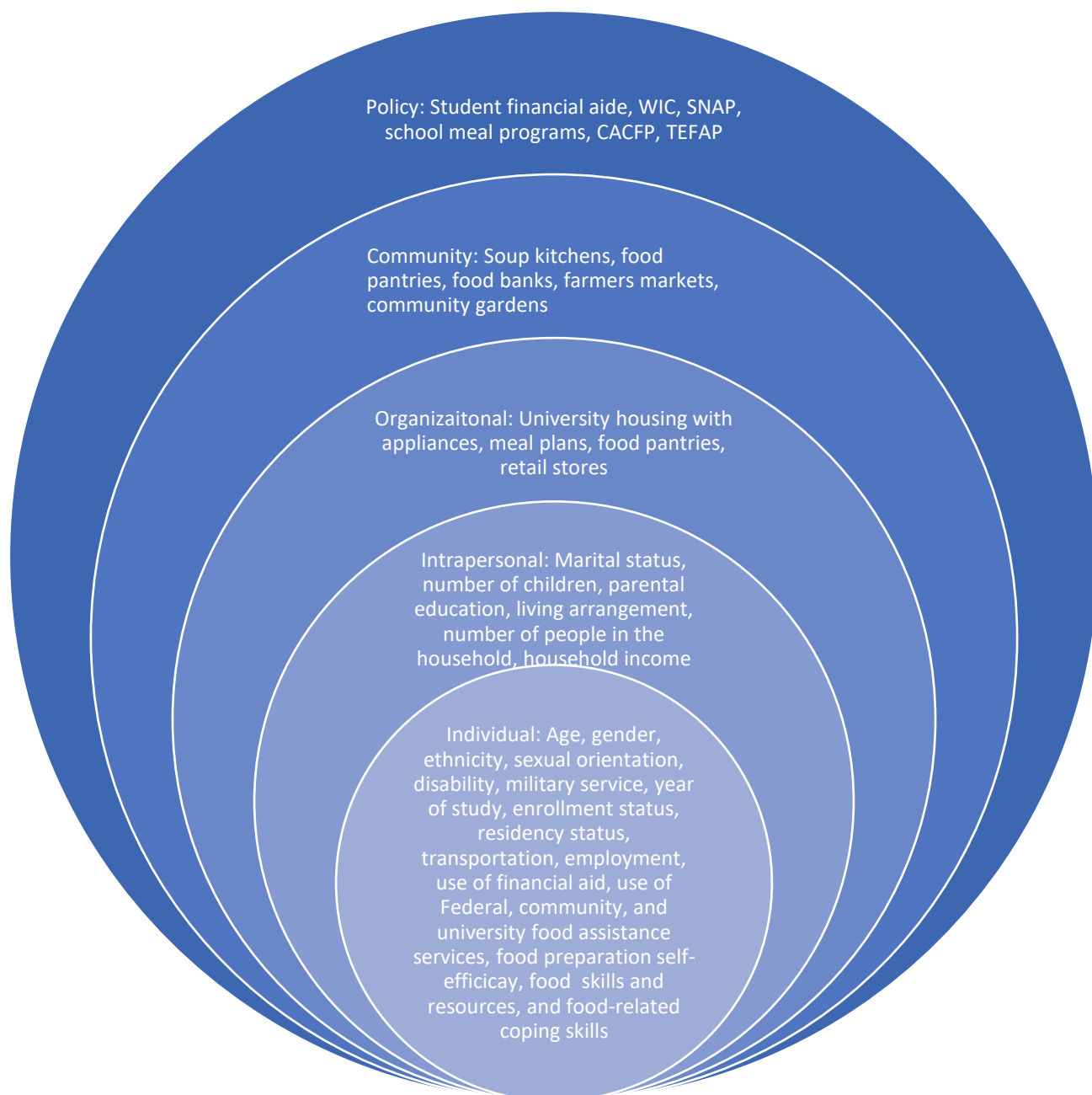


Figure 1. Theoretical model of food insecurity: Food insecurity described and predicted within the context of the Social Ecological Model

Social Support Concepts and Transactional Model of Stress and Coping Constructs. Within the Social Ecological Model, constructs from several health theories may be applicable to the study of food insecurity; however, because social support and coping are the most frequently discussed theoretical concepts and constructs in the literature regarding student food insecurity and because these concepts and constructs were most often incorporated in current university interventions to alleviate student food insecurity, this study focuses on the concepts of social support and constructs from the Transactional Model of Stress and Coping.

Several researchers have described the main concepts of social support (Glanz & Schwarz, 2008; Heaney & Israel, 2008; House, Umberson, & Landis, 1988; Shumaker & Brownell, 1984). While some authors refer to social support as a theory, Heaney & Israel (2008) stated that social support is not a theory per se but is a concept that is incorporated into many theories. Social support includes four different types of social support: 1) emotional support, which includes providing love, caring, trust, and empathy, 2) instrumental support, which includes providing material/tangible aid and services (money, food, transportation, etc.), 3) informational support, which includes providing information, suggestions, and advice (modeling of health behaviors, referrals, etc.), and 4) appraisal support, which includes constructive feedback and affirmation. This social support is always consciously provided with the intent of being helpful to the recipient. Provision of social support at the community and individual levels can provide a buffering effect to the individual that helps him or her cope with a stressor and reduce the short- and long-term health consequences from that stressor. Individual coping resources include problem-solving abilities, access to new contacts and information, and perceived control; organizational and community resources include community empowerment and community competence. Social support can reduce the frequency or the duration that the individual experiences the stressor. Social support can also influence health behaviors of the individual, such as help-seeking or coping behaviors. At the community level, enhancing social support increases community capacity and control, which can positively impact individuals receiving support from the community. Two challenges of social support are identifying those individuals or institutions who are committed to providing support and have the resources to do so

and providing supporting interventions that are within community norms. (Glanz & Schwarz, 2008; Heaney & Israel, 2008; House, Umberson, & Landis, 1988; Shumaker & Brownell, 1984)

Constructs of the Transactional Model of Stress and Coping include stressors, primary appraisal, secondary appraisal, problem-focused coping, emotion-focused coping, meaning-based coping/ reappraisal, and outcomes of coping (Glanz & Schwarz, 2008; Lazarus & Folkman, 1987; Sharma, 2017). Stressors include life events, chronic stressors, and nonevents. Primary appraisal includes determining the severity of the stressor and assessing its impact on the individual. Secondary appraisal is the individual's perception of the level of control the individual has over changing the stressor, managing one's emotions about the stressor, and/or coping effectively with the stressor. Problem-focused coping is a method of altering the environment or situation to deal with the stressor. Emotion-focused coping is a method of altering how an individual thinks or feels about the situation or event in order to deal with the stressor. Meaning-based coping or reappraisal is a reflection by the individual about whether the stressor has been effectively dealt with or an interpretation of the stressor in a personally meaningful way; this may include revising goals, acceptance, positive reinterpretation, and consideration of spiritual beliefs. Outcomes of coping include emotional health, functional status, and health behaviors. (Glanz & Schwarz, 2008; Lazarus & Folkman, 1987; Sharma, 2017).

Social support and coping have been found to be associated with lower risk of food insecurity in both rural and urban settings (Garasky, Morton, & Greder, 2006; King, 2017; Swanson, Olson, Miller, & Lawrence, 2008). Researchers, Ahluwalia, Dodds, and Baligh (1998) described the types of social support and coping skills that low-income individuals and families in both rural and urban North Carolina counties utilized to alleviate food insecurity. In their study (Ahluwalia et al., 1998), participants reported three different types of social support – emotional support, instrumental support, and informational support, provided by three different levels of social networks – extended family, friends, and neighbors and acquaintances, as well as formal support from federal or private programs, such as Food Stamps, WIC, and food pantries. Participants reported relying more often on their extended family than on neighbors or others for support; however, African American women more commonly reported relying on

formal assistance because they could not rely on their close network of family and friends as they too faced similar financial pressures. Participants reported receiving several kinds of social support from extended family, including instrumental support – food and meals, meals for children, money and loans, transportation, and child care; emotional support – care and reassurance; and informational support – education about shopping, meal preparation, managing food items to maximize resources, budgeting, and how to access and complete applications for food assistance programs, such as WIC, and other social services. Participants reported receiving food, childcare, and transportation, as well as information about programs and services, from friends. Participants infrequently relied on neighbors for social support, but occasionally received support in the form of food or favors. Women were more likely to report having wider social support networks than men in this study. Participants also reported several different coping strategies to alleviate food insecurity. These included planning menus, making shopping lists, budgeting, using coupons, buying food on sale, buying low cost food, buying store brand items, buying food in bulk, shopping for food a month at a time, shopping with others to reduce transportation costs, not purchasing unnecessary items, sending their children to eat or live with relatives, not eating meat or reducing the quality and variety of food eaten, not eating as much food or reducing the number of meals they ate to save food for their children, restricting their children's access to food at home, stealing food to provide for their children, and committing a petty crime to get arrested and sent to jail so that they could have food. (Ahluwalia et al., 1998).

Participants in the “Rural Families Speak” project, a multi-state study of low-income rural families (Swanson, Olson, Miller, & Lawrence, 2008), utilized similar forms of social support to alleviate food insecurity. Food insecure families frequently relied on formal support (Food Stamps, WIC, National School Breakfast and Lunch Programs, TANF, Medicaid, the Earned Income Tax Credit, and childcare, housing, transportation, and energy assistance programs) and also on informal instrumental, emotional, and informational support from family, friends, church, neighbors, and community organizations, such as receiving food from soup kitchens, food pantries, church cupboards, food banks, and the Salvation Army; sharing meals with family and friends; attending church suppers; having their children to eat with family

or friends; and receiving gifts of ingredients, meals, and money for food.

Social support for college students. Social support and coping skills specific to food insecurity among college students were reported by several researchers (Broton & Goldrick-Rab, 2018; Bruening et al., 2017; Bruening et al., 2018; Buch, 2016; Couch, et al., 2017; El Zein et al., 2017; GAO, 2018; Hagedorn & Olfert, 2018; Henry, 2017; Knol et al., 2017; McArthur, Ball, et al., 2018; McArthur, Fasczewski, et al., 2018; Miles et al. 2017; Payne-Sturges et al., 2018; Twill et al., 2016; Watson et al., 2017; Zollinger et al., 2018). Instrumental support commonly provided to students to help alleviate food insecurity includes free food from friends and family; free food or meals provided at university functions or from unused dining plans; free food from a university or community food pantry, food bank, or garden/farm; free food from a food assistance program, such as WIC or SNAP; reduced priced food from university or community retail outlets or dining plans; and financial support, either as gifts or loans, from family or friends (Broton & Goldrick-Rab, 2018; Bruening et al., 2017; Bruening et al., 2018; Buch, 2016; Couch et al., 2017; El Zein et al., 2017; GAO, 2018; Hagedorn & Olfert, 2018; Henry, 2017; Knol et al., 2017; McArthur, Ball, et al., 2018; Miles et al., 2017; Payne-Sturges et al., 2018; Twill et al., 2016; Watson et al., 2017; Zollinger et al., 2018). Informational support provided to students includes providing food, nutrition, and financial education through workshops, courses, or written materials; and providing information about available university, community, and government resources through orientation; in written materials (flyers, posters), social media, email, and course syllabi; through workshops and courses; and verbal assistance from university and organizational services personnel (Bruening et al., 2017; GAO, 2018; McArthur, Ball, et al., 2018; Payne-Sturges et al., 2018).

Coping strategies among college students. Coping strategies commonly employed and reported by students include skipping meals; stretching food to make it last longer; eating cheap food; eating processed foods; eating less healthy meals; eating less at restaurants to be able to bring home leftovers; eating more food when it was plentiful; eating at community functions with free food; sharing food and food duties with family or friends; planning meals before purchasing food; visiting family on the weekends to bring food back to school; taking food home from the campus dining hall; taking food home

from social gatherings; obtaining food from a dumpster or trash; bartering items for food; and selling items (textbooks, personal items, or blood/plasma/sperm/eggs) to obtain funds to purchase food (Hagedorn & Olfert, 2018; Martinez, Web, et al. 2018; McArthur, Ball, et al., 2018; McArthur, Fasczewski, et al. 2018; Miles et al., 2017;).

Conceptual Model

Alaimo (2005) developed a conceptual model of food insecurity and hunger in which several risk factors for food insecurity were identified, including sociodemographic factors (race/ethnicity, family composition), education and employment skills, past and present financial hardship, employment, health insurance, environment (including availability of affordable nutritious food), time, housing, health status, abuse, social support, and food preparation skills and/or capabilities; see Figure 2. Within the model, Alaimo (2005) also outlined coping strategies to help alleviate food insecurity; these included self-reliance, informal bartering, and formal institutions. Self-reliance was explained as food provisioning skills, such as stretching food to make it last longer. Informal bartering of services and food required relying on the social support of family and friends. Formal institutions included federal programs, such as WIC or the National School Lunch Program; charity food programs, such as food pantries; and employment, including gaining more education to obtain that employment. Alaimo (2005) also explained that a lack of coping strategies may result in disordered eating, distorted household dynamics, decreased nutritional quality of the diet, hunger, and psychological suffering (alienation, shame, guilt, powerlessness, etc.). These outcomes can further lead to poor physical and mental health, poor nutritional status, functional impairment, negative effects on psychosocial behaviors (such as negative parent child interactions), diminished work capacity, and impaired academic achievement. These consequences of food insecurity are linked back to the risk factors for food insecurity, highlighting the fact that the effects of food insecurity may contribute to the causes of food insecurity.

Gaines and colleagues (2014) built on the work of Alaimo (2005) and identified additional factors related to food insecurity specific to college students that should be included in a conceptual model of food insecurity that describes college students, including high costs of tuition and housing, limited

income, reliance on credit cards and loans, ineligibility for federal food assistance programs, and lack of financial and food management skills; see Figure 3.

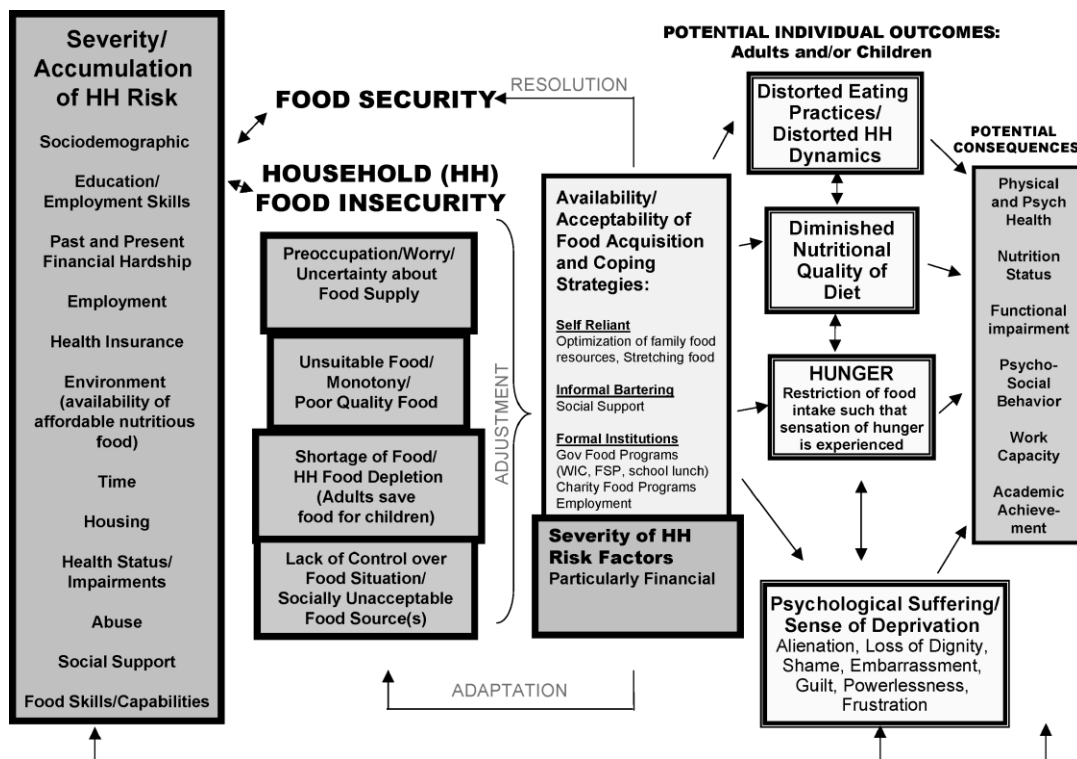


Figure 2. Conceptual model of food insecurity

From "Food insecurity in the United States: An overview" by K. Alaimo, 2005, *Topics in Clinical Nutrition*, 20(4), p. 285. Copyright 2005 by Lippincott Williams & Wilkins, Inc. Reprinted with permission.

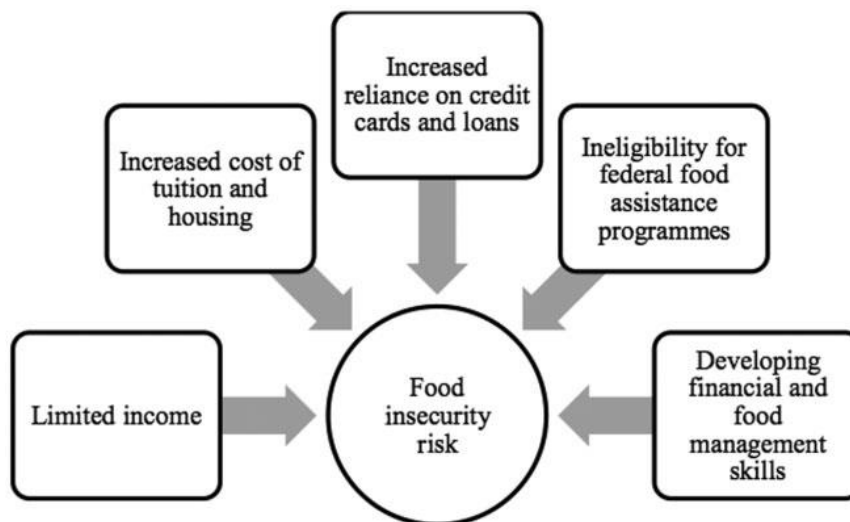


Figure 3. Conceptual model of food insecurity among college students

From "Examining the role of financial factors, resources and skills in predicting food security status among college students" by A. Gaines, C. A. Robb, L. L. Knol, & S. Sickler. *International Journal of Consumer Studies*, 38(4), p. 376. Copyright 2014 by John Wiley and Sons. Reprinted with permission.

Summary of the Literature

The research regarding food insecurity among college students reveals that the prevalence of food insecurity is high compared to U.S. households. Food insecurity among college students is frequently associated with several sociodemographic factors, including limited income, minority status, having children, and with limited resources, social support, and coping skills. Food insecurity among college students is associated with poor mental and physical health and poor academic outcomes. Researchers have provided several recommendations to alleviate student food insecurity and some universities are starting to implement policies and services to address the issue.

Gaps in the Literature

Early researchers (Bruening et al., 2016; Bruening et al., 2017; Chaparro et al., 2009; Gaines et al., 2014; Hanna, 2014; Lin et al., 2013; Maroto et al., 2015; Morris et al. 2016; Patton-Lopez et al., 2014) recognized that overall, there is too little research regarding food insecurity among college students; therefore, they recommended that more research be conducted to better understand the scope of food insecurity in this population. Researchers also identified that more research regarding food insecurity among college students is needed in small rural post-secondary education settings, in Hispanic-serving institutions, and in Historically Black Colleges and Universities, as well as in community colleges and for-profit colleges. The researchers also recommended more studies among several groups of students, including males and graduate, professional, nontraditional, and underserved students be conducted. Many researchers also recognized that more research was needed in larger, more representative samples of students, as is more rigorous analysis of the determinants and outcomes of food insecurity. Bruening and colleagues (2017) also identified that comparisons between much of the research on food insecurity among college students is limited because the researchers used different metrics to measure health and education outcomes. Many researchers also recognized that in addition to reporting GPA, including multiple measures of education outcomes would be helpful, such as the number of credits taken, dropping classes, and time to graduation; multiple health outcomes metrics are also needed. Many researchers recommended that future studies include research about the possible causes of food insecurity among

college students, such as previous food insecurity before coming to college, families' ability to financially assist college students, students' abilities to cope with transitioning to college with added stresses and additional responsibilities. Researchers also recommended that qualitative research about how students perceive and cope with food insecurity be conducted. Many researchers also identified that minimal research on the existence or effectiveness of interventions to alleviate food insecurity among college students was reported, nor is there any research on the long-term effects of food insecurity, including on how food insecurity may impact students' after graduation or how it may impact their careers.

As researchers identified several gaps in the research, the current study sought to address some of these in the design of the study, the population, the sampling method, and the data analysis process, which are outlined in Chapter 3.

CHAPTER 3

METHODOLOGY

Purpose of the Study

The purpose of this research study is to examine the prevalence of food insecurity among students at a Historically Black College & University, factors associated with food insecurity, the impact of food insecurity on students' education, and the influence of social support and coping skills on the relationship between food insecurity and academic outcomes.

The study investigated the following research questions:

- 1) What is the prevalence of food insecurity among students at Fort Valley State University?
 - a. How does the prevalence of food insecurity among FVSU students compare with the prevalence of food insecurity among students across the nation?
- 2) What factors are associated with or predict food insecurity among FVSU students?
 - a. How do these factors among FVSU students compare with those among students across the nation?
- 3) How does food insecurity impact academic outcomes of FVSU students?
 - a. How do academic outcomes related to food insecurity among FVSU students compare with academic outcomes among students across the nation?
- 4) How do social support and coping skills influence the relationship between food insecurity and academic outcomes?

Research Design

This study utilized a cross-sectional research design. This study employed a quantitative data collection method in the form of an online anonymous survey to assess the prevalence of food insecurity, factors associated with food insecurity, the impact of food insecurity on academic outcomes among college students, and the influence of social support and coping skills on the relationship between food insecurity and academic outcomes. This research design and data collection method were chosen because they were used by the majority of researchers studying student food insecurity; only

seven of the thirty-nine U.S. peer-reviewed studies employed some other research design. Additionally, this format works well when working with college students.

Institutional Review Board Approval

Fort Valley State University and Georgia Southern University Institutional Review Board approval was sought and obtained in the spring of 2019 before the study began; see Appendix A for the FVSU institutional review board approval and Appendix B for the Georgia Southern University institutional review board approval.

Population, Sampling, and Recruitment

The population in this study consisted of all FVSU undergraduate and graduate, full and part time students who were 18 years or older, enrolled during the 2019 spring semester. In the spring of 2019, 2,568 students were enrolled at FVSU; 615 were enrolled as freshmen, 625 as sophomores, 491 as juniors, 454 as seniors, 12 as post-baccalaureate degree students, 15 were enrolled in the graduate education specialist degree, and 356 as graduate students (C. Weaver, personal communication, March 1, 2019). The majority of students were full time (84.6%); Georgia residents (92.7%); female (62.3%); and African American (91.6%) (Board of Regents, University System of Georgia, 2019). Only 1.6% were Hispanic/Latino, 0.6% Asian, 0.1% American Indian or Alaskan Native, 2.5% two or more races, and 3.4% were White (Board of Regents, University System of Georgia, 2019). Additionally, the average age of undergraduate students was 22 years old and 6.3% of undergraduate students were considered non-traditional (older than 24 years old) students (Board of Regents, University System of Georgia, 2019). In the 2016-2017 school year, 98% of FVSU first time students received some form of financial aid, with the average grant or scholarship aid amount at \$7,570 and the average student loan amount at \$7,020 (National Center for Education Statistics, n.d.). In this same school year, 82% of all undergraduate students at FVSU received some form of grant or scholarship aid, with the average amount at \$6,266; 76% of students received a Pell grant; and 84% received a student loan (National Center for Education Statistics, n.d.). Additionally, 132 FVSU undergraduate and graduate students (4.9% of the student population) who were service members and veterans received an average of \$3,300

in GI Bill benefits, and \$2,915 and \$3,552 in undergraduate and graduate student Department of Defense Tuition Assistance, respectively (National Center for Education Statistics, n.d.).

A power analysis using the equation $n = Z^2P(1-P)/d^2$, recommended by Naing, Winn, and Rusli (2006) to determine the sample size of a prevalence study, was employed to calculate the sample size, 339, for this study. The proportion, 32.9%, was used in this calculation to determine sample size; this value was chosen because it was the average rate of food insecurity reported across the nine peer-reviewed U.S. studies included in the systematic review by Bruening et al. (2017). The outcome, 339, was then increased by ~30% to 450 to account for survey non-response.

The FVSU Chief Information Officer provided a complete list of students, stratified by class year, enrolled at FVSU in the spring of 2019 (C. Weaver, personal communication, March 1, 2019); this list came from the Banner enrollment system and included student emails and year of study. No institutional permission was needed from FVSU administration to access student emails, as no policy existed regarding the use of student email; however, permission was sought and granted from the FVSU IRB.

A stratified, by class year, random sample of 450 participants was generated from the enrollment list for recruitment in the first of three recruitment rounds of the study. Because the minimum sample size of 339 students was not met during the first round, an additional stratified random sample of 450 students was selected from the list of remaining students and asked to participate in a second round of recruitment. An additional 450 students were invited to participate in a third round of recruitment, for a total of 1,350 students. Participants were then contacted and recruited through the FVSU email system; see Appendix C for the recruitment email. Email distribution of the survey began on March 17, 2019. Follow-up emails were sent to participants weekly for two weeks, and once again on the last day of the third week, April 6, 2019. As participation in the study was voluntary, these emails were sent to remind and urge students to complete the survey to help increase participation in the survey. The second round of recruitment began on April 7, 2019 and the third round began on April 14, 2019. Invitations to participate were sent on April 7 and April 14, 2019, followed by weekly reminder emails for two weeks and again on the last day of the third week of each recruitment period. The final email reminder was sent

on May 4, 2019. Students were offered a nominal incentive to participate; students who completed the survey and agreed to provide an email (for the sole purpose of contacting students and awarding the incentive) were entered into a drawing for one of ten \$20.00 gift cards to help increase participation in the survey.

Data Collection Method

Data collection process. A single online anonymous survey, created in Qualtrics (2017), was used to collect information from students regarding the prevalence of food insecurity, student demographics, factors associated with food insecurity, the impact of food insecurity on academic outcomes, and the relationship between social support and coping skills with academic outcomes; see Appendix D for the student survey. A link to this Qualtrics (2017) survey was sent to the random sample of FVSU students using their FVSU email address. With IRB approval, email distribution of the survey began on March 17, 2019, to the 450 randomly selected participants and continued April 6, 2019. The survey was distributed to another 900 randomly selected participants in second and third rounds (450 each round) of recruitment from April 7, 2019 through May 4, 2019. The principal investigator did not have personal interaction with study participants other than to distribute incentives during May 2019 to the winners of the incentive drawing; all research correspondence with potential study participants was conducted via FVSU email. Prior to distribution of the survey, the survey was piloted with a small group of students (6) to confirm ease of survey use and time to completion; responses were deleted and not used in the final analysis.

Informed consent. Information about passive consent was included in the email inviting students to participate in the study; see Appendix E for the informed consent form. Information was provided to students about the researcher, the sponsoring institution (FVSU), the purpose of the study, the length of time to complete the survey, benefits for participating, risks to the participants, guarantee of anonymity and confidentiality, notification that participation is voluntary and that participants can decline to answer questions or withdraw from the study without any repercussions, and contact information of the researcher for participants to ask questions about the study if needed. In order to keep survey

participation and responses anonymous and confidential, and because the student survey was conducted online, consent did not include collecting student signatures, but passive consent was sought and the recruitment email included the following statement, “If you consent to participate in the survey and to the terms above, click on the link provided to start the survey.”

Risks to study participants. Risks to study participants was minimal as no or only slight discomfort to participants was expected from answering personal questions, such as questions regarding military status, sexual orientation, disability, living arrangements, income, race/ethnicity, use of assistance services, etc. However, anonymity of the survey mitigated this risk.

Anonymity and confidentiality. Students were recruited by the researchers through email. This email contained a link to the separate online anonymous Qualtrics survey. Survey responses from students were collected anonymously and had no identifying information. The researcher had no direct contact with study participants except to pilot test the survey with a small group of students and to distribute incentives to the winning students who participated in the drawing. Students who elected to participate in the drawing for the incentive after they completed the survey were directed away from the original survey through a link that took them to a separate survey that was not connected in any way to individual student responses. Here they entered their email address to participate in the drawing for the incentive. Email addresses were only used to notify winners of the incentive drawing. All email information was destroyed once the study was complete and incentives were distributed to the students; the survey was completed by May 4, 2019 and incentives were distributed and email addresses were destroyed in May 2019. Information collected from survey responses was downloaded from Qualtrics and housed on a secure password protected hard drive in the researchers’ office at Fort Valley State University (213 Myers Hall). Anonymous aggregate data may be shared with other researchers for further analysis.

Data collection instrument. A single online survey was used to collect information from students regarding the prevalence of food insecurity, student demographics, factors associated with food insecurity, the impact of food insecurity on academic outcomes, and the impact of social support and coping skills on

the relationship between food insecurity and academic outcomes; see the Appendix D for the student survey. Because social support and coping skills are the most frequently discussed theoretical concepts and constructs in the literature regarding student food insecurity and because these concepts and constructs were most often incorporated in current university interventions to alleviate student food insecurity, this study focuses on the concepts of social support and the constructs from the Transactional Model of Stress and Coping; see Table 1. The prevalence of food insecurity experienced over the past year was measured using the 10 item United States Department of Agriculture, Economic Research Service, U.S. Adult Food Security Survey Module (USDA, Economic Research Service, 2012); the two optional screener questions were not used in this study; see the Appendix F for the U.S. Adult Food Security Survey Module. Questions or questions modified from previous food insecurity research (Brown et al., 2016; Bruening et al., 2016; Chaparro et al., 2009; Coleman-Jensen & Nord, 2013; Dubik et al., 2016; Gaines et al., 2014; Hagedorn & Olfert, 2018; Hanna, 2014; Lin et al., 2013; Maroto et al., 2015; Morris et al., 2016; Patton-López et al., 2014; Schure et al., 2016; Silva et al., 2017) were used to measure student sociodemographics, academic outcomes, and resources, social support, and coping skills. Questions collected information on age, gender, race and ethnicity, marital status, number of children, sexual orientation, disability, military service, year of study, enrollment status, residency status, parental education, grade point average, other academic performance measures, as well as living arrangement, campus meal plan, transportation, number of people in the household, employment, household income, financial aid, use of federal, community, and university assistance services, parental/family assistance, friend/peer assistance, meal preparation self-efficacy, food and cooking skills and resources, and several food-related coping strategies, such as stretching food to make it last longer, using coupons, eating less healthy meals to eat more, etc.

Table 1

*Survey Questions Categorized by Social Support Concepts and Transactional Model of Stress & Coping**Constructs*

Construct	Description of construct	Survey questions to measure concepts and constructs
Emotional support	Providing love, caring, trust, and empathy	This construct is not addressed in this survey
Instrumental support	Providing material/tangible aid and services (money, food, transportation, etc.)	<ul style="list-style-type: none"> -Where do you live? -Are you enrolled in campus meal plan? If so, which describes your plan? -Do you have access to reliable transportation? -What is your annual household income? -What source(s) of financial aid do you receive? -Which of these assistance programs, if any, do you utilize? -Which of these community programs, if any, do you utilize? -Which of these university programs, if any, do you utilize?- Do your parents/guardians or other relatives provide you financial support for college? -Do your parents/guardians or other relatives typically purchase or send food for you? -Do your friends/peers typically purchase or send food for you?
Informational support	Providing information, suggestions, and advice (modeling of health behaviors, referrals, etc.)	This construct is not addressed in this survey
Appraisal support	Providing constructive feedback and affirmation	This construct is not addressed in this survey
Stressors	Demands from internal or external environment (life events, chronic stressors, and nonevents) that are perceived as harmful or threatening	<p>Food insecurity:</p> <ul style="list-style-type: none"> -The first statement is “(I/We) worried whether (my/our) food would run out before (I/we) got money to buy more.” Was that often true, sometimes true, or never true for (you/your household) in the last 12 months? -“The food that (I/we) bought just didn’t last, and (I/we) didn’t have money to get more.” Was that often, sometimes, or never true for (you/your household) in the last 12 months? -“(I/we) couldn’t afford to eat balanced meals.” Was that often, sometimes, or never true for (you/your household) in the last 12 months? -In the last 12 months, since last March, did (you/you or others in your household) ever cut the size of your meals or skip meals because there wasn't enough money for food? -How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?

Table 1 continued

*Survey Questions Categorized by Social Support Concepts and Transactional Model of Stress &**Coping Constructs*

Construct	Description of construct	Survey questions to measure concepts and constructs
Stressors continued		<ul style="list-style-type: none"> -In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money for food? -In the last 12 months, were you every hungry but didn't eat because there wasn't enough money for food? -In the last 12 months, did you lose weight because there wasn't enough money for food? -In the last 12 months, did (you/you or other adults in your household) ever not eat for a whole day because there wasn't enough money for food? -How often did this happen?
Primary appraisal	Determination of the severity of the stressor and assessment of impact on the individual	This construct is not addressed in this survey
Secondary appraisal	Determination of how much control the individual has over the stressor	<ul style="list-style-type: none"> -Describe your confidence: I can cook a nutritious meal. -Describe your confidence: I can cook a nutritious meal without spending a lot of money. -Rate your food skills or resources: Cooking skills -Rate your food skills or resources: Money to buy food -Rate your food skills or resources: Appliances for food preparation -Rate your food skills or resources: Food selection in local stores
Problem-focused coping	Method of dealing with the stressor by altering the environmental event or situation	<ul style="list-style-type: none"> -How often did you share food purchasing and preparation responsibilities with others? -How often did you stretch meals to make them last longer? -How often did you use coupons to purchase food? -How often did you borrow money from family or friends to purchase food? -How often did you attend functions with free food or where you "pay when you can"? -How often did you visit family on weekends to bring back food to school? -How often did you eat more than normal when food was plentiful? -How often did you take food home from on-campus dining hall? -How often did you purchase less expensive processed food? -How often did you eat less healthy meals to eat more food? -How often did you obtain food from a dumpster or trash? -How often did you barter services/items to buy food?

Table 1 continued

Survey Questions Categorized by Social Support Concepts and Transactional Model of Stress & Coping Constructs

Construct	Description of construct	Survey questions to measure concepts and constructs
Problem-focused coping continued		-How often did you sell textbooks, personal possessions, blood/ plasma, or sperm/eggs to obtain food?
Emotion-focused coping	Method of dealing with the stressor by altering the way the individual thinks or feels about it	This construct is not addressed in this survey
Meaning-based coping/ Reappraisal	Determination of whether the effects of the stressor have been effectively dealt with	This construct is not addressed in this survey
Outcomes of coping	Emotional well-being, functional status, health behaviors	Food insecurity: (questions listed above) Academic outcomes: -What is your Grade Point Average (GPA)? -How would you rate your class attendance? -How would you rate your attention span in class? -How would you rate your understanding the concepts taught in class? -How would you rate your progression towards graduating on time?

Instrument validity and reliability. Survey questions to assess the prevalence of food insecurity came from the United States Department of Agriculture, Economic Research Service, U.S. Adult Food Security Survey Module (USDA, Economic Research Service, 2012), which has been confirmed as a valid and reliable survey instrument by the USDA. A question to assess service in the military was modified slightly (to include the response choice of: prefer not to answer) from the 2012 Behavioral Risk Factor Surveillance Survey Questionnaire Social Context module question, as this was used by researchers Schure et al. (2016) in their study of food insecurity and military service. A question to assess sexual orientation was modified slightly (to include the answer choices of: I don't know the answer and prefer not to answer) from the 2014 National Health Interview Survey question, as this was used by researchers Brown et al. (2016) in a study of sexual orientation and food insecurity. A question to assess

disability status was asked using the definition provided from the 2010 Current Population Survey and used by researchers Coleman-Jensen and Nord (2013) in their study of disability and food insecurity. Questions to assess student demographics, other factors associated with food insecurity, the impact of food insecurity on academic outcomes, and the relationship between academic outcomes and social support and coping skills came from previously validated and reliable student food insecurity research (Bruening et al, 2016; Chaparro et al, 2009; Dubik et al., 2016; Gaines et al., 2014; Hanna, 2014; Hagedorn & Olfert, 2018; McArthur, Ball, et al., 2018; McArthur, Fasczewski, et al., 2018; Lin et al., 2013; Maroto et al., 2015; Morris et al., 2016; Patton-Lopez et al., 2014; Silva et al., 2017); see Appendix D for the student survey. To fit the current study, some questions were modified slightly; however, as much as possible, questions from previous studies were used without modification, so that the metrics used and the outcomes are comparable to other studies. All survey questions were piloted with a small group of students (6) to confirm readability and content understanding, to assist in supporting the validity and reliability of the survey instrument.

Data Analysis Process

Dependent variables. The dependent variable being assessed in research questions one and two of this study is food insecurity. The dependent variables being assessed in research questions three and four are the academic outcomes – GPA, class attendance, attention span in class, understanding of concepts taught in class, and progression towards graduation, and a total academic outcomes score, which is a sum of responses to the four individual variables.

Independent variables. Assessment of associations with and predictors of food insecurity in research question two includes the independent variables of age, gender, ethnicity, marital status, number of children, sexual orientation, disability status, military service, class year in school, enrollment status in school, residency status in school, educational attainment of parents, living arrangements, enrollment in a campus meal plan, access to transportation, number of people in the household, hours worked per week, household income, financial aid, use of federal food assistance programs, use of community food programs, use of university food programs, parental financial support, parental food support, peer food

support, a social support score, self-efficacy for cooking, self-efficacy for cooking on a budget, a cooking self-efficacy score, cooking skills, money to buy food, appliances for food preparation, food selection in local stores, a food skills and resources score, sharing food purchasing and preparation responsibilities, stretching meals, using coupons, borrowing money for food, attending functions with free food, visiting others to bring food back to campus, eating more than normal when food is plentiful, taking food home from campus dining, purchasing less expensive food, eating less healthy meals, obtaining food from the dumpster, bartering for food, selling items for food, and a coping skills score.

Assessment of the academic outcomes in research question three includes the independent variable of food insecurity.

Assessment of the relationship between social support and coping skills, food insecurity, and academic outcomes in research question four includes the independent variables of food insecurity, the social support score, and the coping skills score.

Questions and coding. Student food insecurity prevalence was calculated from answers provided to the 10 food security questions (the two screener optional screener questions were not used), following the procedure outlined by USDA, Economic Research Service (2012); see Appendix F for the U.S. Adult Food Security Survey Module. Answers to the ten questions were scored as 0 or 1 and summed to create a single score. A score of 0 indicates high food security; a score of 1 or 2 indicates marginal food security; a score of 3 – 5 indicates low food security, and a score of 6 – 10 indicates very low food security. Measurement of academic outcomes included GPA and four related questions previously used by Hagedorn and Olfert (2018), McArthur, Ball, et al. (2018), and McArthur, Fasczewski, et al. (2018). Answers to these four questions are rated from ‘poor’, ‘fair’, ‘good’, and ‘excellent’ and were coded from 1 for ‘poor’, 2 for ‘fair’, 3 for ‘good’, and 4 for ‘excellent’. Answers to these four academic outcomes questions were summed to create a single academic score, with possible scores ranging from 4 to 16. Measurement of social support included seven questions that asked which sources of social support were used; these included financial aid, federal food assistance programs, community food resources, university food resources, parent and family financial assistance, parent and family food assistance, and friend/peer

food assistance. The number of social support sources used were summed to create a social support score, with possible scores ranging from 0 to 19, similar to the process used to create a single coping skills score used by Hagedorn and Olfert (2018), McArthur, Ball, et al. (2018), and McArthur, Fasczewski, et al. (2018). Measurement of coping skills included 13 related questions previously used by Hagedorn and Olfert (2018), McArthur, Ball, et al. (2018), and McArthur, Fasczewski, et al. (2018). Answers to these questions are rated from 'never', 'sometimes', and 'often' and coded 1 for 'never', 2 for 'sometimes', and 3 for 'often'. Answers to the 13 coping skills questions were summed to create a single coping skills score, with possible scores ranging from 3 to 39. Two questions, previously used by Gaines et al. (2014), measured self-efficacy for cooking. Answers to these questions are rated from 'not at all confident', 'not very confident', 'moderately confident', 'very confident', and 'extremely confident' and coded from 1 to 5. These answers were summed to create a single self-efficacy score, ranging from 2 to 10. Four questions related to personal food skills and resources, previously used by Gaines et al. (2014), were asked. Responses to these questions include 'very inadequate', 'inadequate', 'adequate', and 'very adequate'; these were scored from 1 to 4 and summed to create a single score that ranges from 4 to 16.

Statistical analysis and reporting. Student demographics and other characteristics are reported descriptively (n and %) and by food security status. Responses were collapsed to create larger groups to compare for some variables, including ethnicity, marital status, sexual orientation, parental level of education, campus meal plan, and annual household income. Univariate logistic regression analysis was computed to determine associations between participant characteristics and food insecurity. Lasso regression analysis was computed to predict food insecurity based on student characteristics. Linear regression analysis was computed to determine if food insecurity predicted GPA and the academic outcomes score. Multiple regression analysis was computed to ascertain how social support and coping skills influenced the relationship between food insecurity and academic outcomes. Outcomes were considered significant at $p < .05$. Data analysis was conducted using SAS software, version 9.4, copyright © [2013] SAS Institute Inc. (SAS, n.d.) and IBM SPSS Statistics 25 (IBM, 2017).

CHAPTER 4

RESULTS

Participant Demographics

Of the 1,350 students recruited to participate in the survey, 245 students began the survey, but only the 226 students completed all the questions to assess food security status. These 226 students were included in this study, resulting in a response rate of 16.7% (8.8% of the FVSU student population); see Table 2. The majority of respondents were younger than 25 years old (86.7%; mean 21.95 years old), female (76.9%), Black or African American (93.3%), single, never married (93.3%), straight, not lesbian or gay (85.6%), sophomores (28.2%), enrolled full-time (96.9%), in-state residents (93.2%), and had a parent with some college education (44.8%). Additionally, the majority of students reported having no children (90.5%), no disability (96.4%), no history of or current service in the military (97.3%), and an annual household income of less than \$5,000.

The survey respondents were similar to the FVSU student population in relation to race, average age, and residency status, but a higher percentage of female students were represented in the survey compared to the FVSU student body (76.9% and 62.3%, respectively), as were undergraduate students (94.1% and 85.6%, respectively), and full-time students (96.9% and 84.6%, respectively).

Table 2

Survey Participant Demographics

Student Characteristic	n (%) by Characteristic
Age	
18	19 (9.4)
19 - 20	95 (46.8)
21 - 22	48 (23.6)
23 - 24	14 (6.9)
25 and older	27 (13.3)
Mean	21.95 (SD 6.007)
Missing (n = 23, 10.2%)	
Gender	
Male	52 (23.1)
Female	173 (76.9)
Missing (n = 1, 0.4%)	

Table 2 continued

Survey Participant Demographics

Student Characteristic	n (%) by Characteristic
Ethnicity	
Non-Hispanic White	4 (1.8)
Black or African American	208 (93.3)
Other ethnicities	11 (4.9)
Missing (n = 3, 1.3%)	
Marital Status	
Married or domestic partnership	9 (4.0)
Single, never married	208 (93.3)
Other	6 (2.7)
Missing (n = 3, 1.3%)	
Number of Children	
0	191 (90.5)
1	10 (4.7)
2 - 6	10 (4.7)
Mean	0.20 (SD 0.780)
Missing (n = 15, 6.6%)	
Sexual Orientation	
Straight, that is, not lesbian or gay	190 (85.6)
Lesbian or gay	16 (7.2)
Other	16 (7.2)
Missing (n = 4, 1.8%)	
Disability	
No	214 (96.4)
Yes	8 (3.6)
Missing (n = 4, 1.8%)	
Military Service	
No	219 (97.3)
Yes	6 (2.7)
Missing (n = 1, 0.4%)	
Hours Worked per Week	
0	86 (47.8)
1 - 9	6 (3.3)
10 - 19	35 (19.4)
20 - 29	27 (15.0)
30 - 39	12 (6.7)
40	14 (7.8)
Mean	11.46 (SD 13.430)
Missing (n = 46, 20.3%)	
Number of People Living With	
0	6 (2.9)
1 - 2	73 (35.6)
3 - 4	121 (59.0)
5 - 6	5 (2.4)
Mean	2.56 (SD 1.143)
Missing (n = 21, 9.3%)	

Table 2 continued

Survey Participant Demographics

Student Characteristic	n (%) by Characteristic
Class Year	
1 st year	53 (24.1)
2 nd year	62 (28.2)
3 rd year	49 (22.3)
4 th year	43 (19.5)
Graduate master's student	13 (5.9)
Missing (n = 6, 2.7%)	
Enrollment Status	
Full time student	216 (96.9)
Part time student	7 (3.1)
Missing (n = 3, 1.3%)	
Residency Status	
In-state student	205 (93.2)
Out-of-state student	14 (6.4)
International student	1 (0.5)
Missing (n = 6, 2.7%)	
Parental Level of Education	
Graduate degree (e.g. master's, PhD)	32 (15.1)
Bachelor's degree (four year)	39 (18.4)
Some college	95 (44.8)
High school or less	46 (21.7)
Missing (n = 14, 6.2%)	
Annual Household Income	
\$50,000 or more	24 (14.9)
\$25,000 - \$49,999	33 (20.5)
\$15,000 - \$24,999	24 (14.9)
\$5,000 - \$14,999	30 (18.6)
Less than \$5,000	50 (31.1)
Missing (n = 65, 28.8%)	
Living Arrangements	
On campus dorm with roommates	104 (47.5)
On campus suite with kitchen with roommates	39 (17.8)
Off campus alone	18 (8.2)
Off campus with roommates	37 (16.9)
With parents or family	20 (9.1)
Temporary housing with friend or relative	1 (0.5)
Missing (n = 7, 3.1%)	

Note: n = number of participants; % = percentage of participants

Results by Research Question**Research Question 1: What is the prevalence of food insecurity among students at Fort**

Valley State University? Students were classified as either food secure or food insecure based on their

responses to the 10 questions in the USDA U.S. Adult Food Security Survey Module (USDA, Economic Research Service, 2012); see Table 3. The two most common food security challenges experienced by students were being worried about running out of food and not being able to afford to eat balanced meals. Responses were summed and coded per USDA protocol; in this study, students who were coded as either high or marginally food secure were classified as food secure, and students who were coded as either low or very low food secure were classified as food insecure. Among respondents, 47.3% (n = 107) students were classified as food insecure and 52.7% (n = 119) students were classified as food secure; see Table 4.

Table 3

Student Responses to the USDA U.S. Adult Food Security Survey Module

Questions & Responses	Food Secure n (%)	Food Insecure n (%)	Total n (%)
(I/We) worried whether (my/our) food would run out before I/we got money to buy food.			
Often true	3 (7.9)	35 (92.1)	38 (16.8)
Sometimes true	24 (27.9)	62 (72.1)	86 (38.1)
Never true	86 (90.5)	9 (9.5)	95 (42.0)
Don't know	6 (85.7)	1 (14.3)	7 (3.1)
The food that (I/we) bought just didn't last, and (I/we) didn't have money to get more.			
Often true	1 (4.0)	24 (96.0)	25 (11.1)
Sometimes true	15 (18.5)	66 (82.5)	81 (35.8)
Never true	98 (86.7)	15 (13.3.)	113 (50.0)
Don't know	5 (71.4)	2 (28.6)	7 (3.1)
(I/we) couldn't afford to eat balanced meals." Was that often, sometimes, or never true for (you/your household) in the last 12 months.			
Often true	3 (8.8)	31 (91.2)	34 (15.0)
Sometimes true	19 (22.9)	64 (77.1)	83 (36.7)
Never true	93 (88.6)	12 (11.4)	105 (46.5)
Don't know	4 (100.0)	0 (0.0)	4 (1.8)
In the last 12 months, since last March, did (you/you or others in your household) ever cut the size of your meals or skip meals because there wasn't enough money for food?			
Yes	5 (7.0)	66 (93.0)	71 (31.4)
No	111 (74.5)	38 (25.5)	149 (65.9)
Don't know	3 (50.0)	3 (50.0)	6 (2.7)
How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?			
Almost every month	0 (0.0)	15 (100.0)	15 (21.1)
Some months but not every month	0 (0.0)	33 (100.0)	33 (46.5)
Only 1 or 2 months	3 (15.8)	16 (84.2)	19 (26.8)
Don't know	2 (50.0)	2 (50.0)	4 (5.6)

Table 3 continued

Student Responses to the USDA U.S. Adult Food Security Survey Module

Questions & Responses	Food Secure n (%)	Food Insecure n (%)	Total n (%)
In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money for food?			
Yes	8 (9.3)	78 (90.7)	86 (38.1)
No	107 (79.3)	28 (20.7)	135 (59.7)
Don't know	4 (80.0)	1 (20.0)	5 (2.2)
In the last 12 months, were you every hungry but didn't eat because there wasn't enough money for food?			
Yes	4 (5.4)	70 (94.6)	74 (32.7)
No	114 (76.5)	35 (23.5)	149 (65.9)
Don't know	1 (33.3)	2 (66.7)	3 (1.3)
In the last 12 months, did you lose weight because there wasn't enough money for food?			
Yes	1 (2.4)	40 (97.6)	41 (18.1)
No	112 (67.9)	53 (32.1)	165 (73.0)
Don't know	6 (30.0)	14 (70.0)	20 (8.8)
In the last 12 months, did (you/you or other adults in your household) ever not eat for a whole day because there wasn't enough money for food?			
Yes	1 (3.1)	31 (96.9)	32 (14.2)
No	115 (60.8)	74 (39.2)	189 (83.6)
Don't know	3 (60.0)	2 (40.0)	5 (2.2)
How often did this happen?			
Almost every month	0 (0.0)	8 (100.0)	8 (25.8)
Some months but not every month	0 (0.0)	20 (100.0)	20 (64.5)
Only 1 or 2 months	1 (33.3)	2 (66.7)	3 (9.7)

Note: n = number of participants; % = percentage of participants

Table 4

Student Classification by Food Security Status

Food Security Status	Food Secure n (%)	Food Insecure n (%)	Total n (%)
Food Secure			119 (52.7)
Food secure	63 (52.9)		63 (27.9)
Marginal food security	56 (47.1)		56 (24.8)
Food Insecure			107 (47.3)
Low food security		53 (49.5)	53 (23.5)
Very low food security		54 (50.5)	54 (23.9)

Note: n = number of participants; % = percentage of participants

The rate of food insecurity among female students was 48.0% (n = 83) and 46.2% (n = 24) among males; see Appendix G for the full list of frequencies of student characteristics classified by food security status. The rate of food insecurity among African American or Black students was 47.1% (n = 98),

50.0% (n = 2) among White students, and 54.5% (n = 6) among students of other ethnicities. The rate of food insecurity among single, never married students was 46.6% (n = 97), 44.4% (n = 4) among married students or those with a domestic partnership, and 66.7% (n = 4) among students of other marital status. The rate of food insecurity among students with no children was 46.6% (n = 89), 60.0% (n = 6) with one child, and 50.0% (n = 5) with two to six children. Food insecurity was higher among lesbian or gay students, 68.8% (n = 11), compared to straight students, 45.8% (n = 87), or students who classify themselves as something else, 50.0% (n = 8). The rate of food insecurity among those who reported no disability was 47.7% (n = 102) and 50.0% (n = 4) among those with a disability. The rate of food insecurity was 47.5% (n = 104) among students with no history of or current military service and 33.3% (n = 2) among those with military service. The rate of food insecurity was higher for upper division students (sophomores: 50.0%, n = 31; juniors: 53.1%, n = 26; seniors: 55.8%, n = 24) than for freshmen (37.7%, n = 20) or graduate students (30.8%, n = 4).

Research Question 2: What factors are associated with or predict food insecurity among FVSU students? Univariate logistic regression analysis was conducted to determine associations between several sociodemographic, resources, coping skills, academic variables and food insecurity. Statistically significant associations were found for several of these variables; see Table 5. Only one sociodemographic factor, parental level of education, was associated with food insecurity; those students with a parent having a high school degree or less were 3.257 times more likely to be food insecure than those with a graduate degree (OR = 3.257, 95% CI [1.267, 8.368], p = .014). The following sociodemographic variables were not associated with food insecurity: age, gender, ethnicity, marital status, number of children, sexual orientation, disability, military service, hours worked per week, number of people living with, class year (although this trended towards significance for fourth year students (OR = 2.084, p < 0.079) compared to first year students), enrollment status, or residency status; see Appendix H for the full list of univariate logistic regression results of student characteristics and food insecurity.

Table 5

Student Characteristics Statistically Significantly Associated with Food Insecurity

Student Characteristic	OR	95% CI	<i>p</i> value
Parental Level of Education			
Graduate degree (e.g. master's, PhD)	Ref	--	--
Bachelor's degree (four year)	2.010	0.768, 5.262	.155
Some college	1.579	0.686, 3.634	.283
High school or less	3.257	1.267, 8.368	.014
Annual Household Income			
\$50,000 or more	Ref	--	--
\$25,000 - \$49,999	3.187	1.011, 10.055	.048
\$15,000 - \$24,999	5.000	1.448, 17.271	.011
\$5,000 - \$14,999	3.429	1.064, 11.043	.039
Less than \$5,000	4.895	1.652, 14.503	.004
Campus Meal Plan			
Campus meal plan (unlimited access + cash)	Ref	--	--
Campus meal plan (2 meals/day + cash)	2.789	1.387, 5.605	.004
Commuter meals: 25 - 75	1.552	0.326, 7.393	.581
Not enrolled in a campus meal plan	2.956	1.534, 5.693	.001
Parents/Guardians or Relatives Provide Financial Support for College			
Yes (1 pt)	Ref	--	--
No	2.009	1.128, 3.578	.018
Parents/Guardians or Relatives Purchase or Send Food			
Yes (1 pt)	Ref	--	--
No	2.484	1.402, 4.402	.002
Adequacy of Money to Buy Food			
Mean (range 1 – 4)	0.325	0.208, 0.508	.000
Adequacy of Food Selection in Local Stores			
Mean (range 1 – 4)	0.620	0.412, 0.931	.021
Food Skills & Resources Score			
Mean (range 1 – 16)	0.867	0.763, 0.984	.027
Frequency of Sharing Food Purchasing and Preparation Responsibilities with Others			
Mean (range 1 – 3)	1.490	1.023, 2.168	.037
Frequency of Stretching Meals to Make them Last Longer			
Mean (range 1 – 3)	3.605	2.238, 5.807	.000
Frequency of Using Coupons to Purchase Food			
Mean (range 1 – 3)	1.778	1.226, 2.579	.002
Frequency of Borrowing Money from Family and Friends to Purchase Food			
Mean (range 1 – 3)	2.057	1.405, 3.012	.000
Frequency of Attending Functions with Free Food or Where You "Pay When You Can"			
Mean (range 1 – 3)	2.088	1.421, 3.069	.000

Table 5 continued

Student Characteristics Statistically Significantly Associated with Food Insecurity

Student Characteristic	OR	95% CI	<i>p</i> value
Frequency of Eating More than Normal when Food was Plentiful			
Mean (range 1 – 3)	1.491	1.033, 2.152	.033
Frequency of Taking Food Home from On-Campus Dining Hall			
Mean (range 1 – 3)	1.745	1.193, 2.553	.004
Frequency of Purchasing Less Expensive Processed Food			
Mean (range 1 – 3)	2.379	1.563, 3.621	.000
Frequency of Eating Less Healthy Meals to Eat More Food			
Mean (range 1 – 3)	2.326	1.556, 3.478	.000
Frequency of Obtaining Food from a Dumpster or Trash			
Mean (range 1 – 3)	3.050	1.065, 8.737	.038
Frequency of Bartering Services/Items to Buy Food			
Mean (range 1 – 3)	3.404	1.584, 7.316	.002
Frequency of Selling Textbooks, Personal Possessions, Blood/Plasma, or Sperm/Eggs to Obtain Food			
Mean (range 1 – 3)	2.511	1.413, 4.461	.002
Coping Skills Score			
Mean (range 13 – 39)	1.197	1.114, 1.297	.000
Rating of Class Attendance			
Mean (range 1 – 4)	0.602	0.397, 0.912	.017

Note: OR = odds ratio, CI = confidence interval, Ref = reference variable

Students reported using several social supports; see Table 6. The majority of students, 83.6% (n = 189) reported receiving student loans; 49.6% (n = 112) of students reported receiving grants, 44.2% (n = 100) received scholarships, and only 4.4 (n = 10) reported receiving no financial aid. Fewer students reported utilizing federal food assistance programs; 10.2% (n = 23) of students used SNAP, 2.2% (n = 5) used WIC, 4.0% (n = 9) used the NSLP, 2.2% (n = 5) used the NSBP, less than 1.0% used the SFSP, CACFP, or TEFAP, and 73.0% (n = 165) of students reported using no federal food assistance programs. Few students reported using community food programs; 77% reported using none (n = 174), while 4.0% (n = 9) used a church or community garden, 5.8% (n = 13) used a church or community soup kitchen, food pantry, or food bank, and 2.2% (n = 5) used a church or community farmers market. Additionally few students reported used university food programs; less than 1.0% of students reported using a campus

garden (n = 1), 2.7% (n = 6) used a campus food pantry, and 10.2% (n= 23) used a campus retail store.

Families provided financial support for 63.6% (n = 131) of students and provided food assistance for

61.1% (n = 127) of students. Friends provided food assistance for 29.4% (n = 62) of students.

Table 6

Sources of Student Social Support

Sources of Social Support	Food Secure n (%) by Response	Food Insecure n (%) by Response	Total n (%) by Response
Financial Aid Utilized			
Student loans	93 (49.2)	96 (50.8)	189 (83.6)
Grants	51 (45.5)	61 (54.5)	112 (49.6)
Scholarships	58 (58.0)	42 (42.0)	100 (44.2)
No financial aid	6 (60.0)	4 (40.0)	10 (4.4)
Missing (n = 8, 3.5%)			
Federal Food Assistance Programs Utilized			
SNAP (food stamps)	11 (47.8)	12 (52.2)	23 (10.2)
WIC (nutritional assistance for pregnant women and children)	1 (20.0)	4 (80.0)	5 (2.2)
Free or reduced-priced National School Lunch Program	5 (55.6)	4 (44.4)	9 (4.0)
Free or reduced-priced National School Breakfast Program	3 (60.0)	2 (40.0)	5 (2.2)
Free or reduced-priced Summer Foodservice Program	1 (100.0)	0 (0.0)	1 (0.4)
Free or reduced-priced Child and Adult Daycare Program	1 (100.0)	0 (0.0)	1 (0.4)
The Emergency Food Assistance Program	0 (0.0)	1 (100.0)	1 (0.4)
None of these programs	91 (55.2)	74 (44.8)	165 (73.0)
Missing (n = 19, 8.4%)			
Community Food Programs Utilized			
Church or community garden	4 (44.4)	5 (55.6)	9 (4.0)
Church or community soup kitchen, food pantry, or food bank	6 (46.2)	7 (53.8)	13 (5.8)
Church or community farmers market	2 (40.0)	3 (60.0)	5 (2.2)
None of these programs	91 (52.3)	83 (47.7)	174 (77.0)
Missing (n = 18, 8.0%)			
University Food Programs Utilized			
Campus garden	0 (0.0)	1 (100.0)	1 (0.4)
Campus food pantry	4 (66.7)	2 (33.3)	6 (2.7)
Campus retail store	13 (56.5)	10 (43.5)	23 (10.2)
None of these programs	91 (51.4)	86 (48.6)	177 (78.3)
Missing (n = 11, 4.9%)			

Table 6 continued

Sources of Student Social Support

Sources of Social Support	Food Secure n (%) by Response	Food Insecure n (%) by Response	Total n (%) by Response
Parents/Guardians or Relatives Provide Financial Support for College			
Yes	75 (57.3)	56 (42.7)	131 (63.6)
No	30 (40.0)	45 (60.0)	75 (36.4)
Missing (n = 20, 8.8%)			
Parents/Guardians or Relatives Purchase or Send Food			
Yes	77 (60.6)	50 (39.4)	127 (61.1)
No	31 (38.3)	50 (61.7)	81 (38.9)
Missing (n = 18, 8.0%)			
Friends/Peers Purchase or Send Food			
Yes	28 (45.2)	34 (54.8)	62 (29.4)
No	81 (54.4)	68 (45.6)	149 (70.6)
Missing (n = 15, 6.6%)			

Note: n = number, % = percentage

Several resources and social support sources were associated with food insecurity; see Table 5. Compared to having an annual income of \$50,000 or more, students with an annual income of \$25,000 - \$49,999 were more likely to experience food insecurity (OR = 3.187, 95% CI [1.011, 10.005], $p = .048$), as were those with incomes of \$15,000 - \$24,999 (OR = 5.000, 95% CI [1.448, 17.271], $p = .011$), \$5,000 - \$14,999 (OR = 3.429, 95% CI [1.064, 11.043], $p = .039$), and less than \$5,000 (OR = 4.895, 95% CI [1.652, 14.503], $p = .004$). Compared to having a campus meal plan with unlimited meals, students with a campus meal plan with only 2 meals per day plus cash more likely to experience food insecurity (OR = 2.798, 95% CI [1.387, 5.605], $p = .004$), as were students with no campus meal plan (OR = 2.956, 95% CI [1.534, 5.693], $p = .004$). Students receiving no financial assistance from parents/guardians and relatives were 2.009 more likely to experience food insecurity compared to receiving parental financial assistance (OR = 2.009, 95% CI [1.128, 3.578], $p = .018$). Students also receiving no food assistance from parents/guardians or relatives were more likely to experience food insecurity compared to receiving food assistance (OR = 2.484, 95% CI [1.402, 4.402], $p = .002$). When rating the adequacy of money to buy food, an increasing score was associated with a decreased likelihood of food insecurity (OR = 0.325, 95% CI [0.208, 0.508], $p = .000$). An increased score when rating the adequacy of food selection in local

stores was also associated with a decreased likelihood of food insecurity (OR = 0.620, 95% CI [0.412, 0.931], $p = .021$). An increasing total food skills and resources score (which included cooking skills, money to buy food, appliances for food preparation, and food selection in local stores) was also associated with a decreased likelihood of food insecurity (OR = 0.867, 95% CI [0.763, 0.984], $p = .027$).

Several resources and social supports were not associated with food insecurity: living arrangements, access to reliable transportation, financial aid score, federal food assistance programs score, campus and university programs score, parent support score, food purchased or sent by friends/peers, parent and friend support score, total social support score, self-efficacy of ability to cook a meal, self-efficacy of ability to cook a meal without spending a lot of money, total self-efficacy cooking score, adequacy of cooking skills score, and adequacy of appliances for food preparation score.

Students reported using several coping strategies; see Table 7. The five most frequently used coping strategies included stretching meals to make them last longer, 87.7% ($n = 186$) of students reported using this strategy, while 83.2% ($n = 173$) of students reported purchasing less expensive processed food, 79.0% ($n = 166$) ate less healthy meals to eat more food, 74.2% ($n = 155$) shared food purchasing and preparation responsibilities with others, and 73.4% ($n = 154$) borrowed money from family and friends to purchase food.

Table 7

Student Coping Skills

Student Characteristic	Food Secure n (%) by Response	Food Insecure n (%) by Response	Total n (%) by Response
Frequency of Sharing Food Purchasing and Preparation Responsibilities with Others			
Often (3 pts)	28 (46.7)	32 (53.3)	60 (28.7)
Sometimes (2 pts)	46 (48.4)	49 (51.6)	95 (45.5)
Never (1 pt)	36 (66.7)	18 (33.3)	54 (25.8)
Mean			2.029 (SD 0.740)
Missing ($n = 17$, 7.5%)			
Frequency of Stretching Meals to Make them Last Longer			
Often (3 pts)	33 (35.1)	61 (64.9)	94 (44.3)
Sometimes (2 pts)	53 (57.6)	39 (42.4)	92 (43.4)
Never (1 pt)	25 (96.2)	1 (3.8)	26 (12.3)
Mean			2.321 (SD 0.682)
Missing ($n = 14$, 6.2%)			

Table 7 continued

Student Coping Skills

Student Characteristic	Food Secure n (%) by Response	Food Insecure n (%) by Response	Total n (%) by Response
Frequency of Using Coupons to Purchase Food			
Often (3 pts)	15 (34.1)	29 (65.9)	44 (20.6)
Sometimes (2 pts)	45 (52.3)	41 (47.7)	86 (40.2)
Never (1 pt)	53 (63.1)	31 (36.9)	84 (39.3)
Mean			1.813 (SD 0.752)
Missing (n = 12, 5.3%)			
Frequency of Borrowing Money from Family and Friends to Purchase Food			
Often (3 pts)	22 (33.8)	43 (66.2)	65 (31.0)
Sometimes (2 pts)	51 (57.3)	38 (42.7)	89 (42.4)
Never (1 pt)	38 (67.9)	18 (32.1)	56 (26.7)
Mean			2.043 (SD 0.760)
Missing (n = 16, 7.1%)			
Frequency of Attending Functions with Free Food or Where You “Pay When You Can”			
Often (3 pts)	10 (24.4)	31 (75.6)	41 (19.4)
Sometimes (2 pts)	46 (55.4)	37 (44.6)	83 (39.3)
Never (1 pt)	55 (63.2)	32 (36.8)	87 (41.2)
Mean			1.782 (SD 0.750)
Missing (n = 15, 6.6%)			
Frequency of Visiting Family on Weekends to Bring Back Food to School			
Often (3 pts)	24 (54.5)	20 (45.5)	44 (21.2)
Sometimes (2 pts)	44 (51.2)	42 (48.8)	86 (41.3)
Never (1 pt)	41 (52.6)	37 (47.4)	78 (37.5)
Mean			1.837 (SD 0.750)
Missing (n = 18, 8.0%)			
Frequency of Eating More than Normal when Food was Plentiful			
Often (3 pts)	23 (44.2)	29 (55.8)	52 (25.2)
Sometimes (2 pts)	41 (47.7)	45 (52.3)	86 (41.7)
Never (1 pt)	43 (63.2)	25 (36.8)	68 (33.0)
Mean			1.922 (SD 0.761)
Missing (n = 20, 8.8%)			
Frequency of Taking Food Home from On-Campus Dining Hall			
Often (3 pts)	10 (31.3)	22 (68.8)	32 (15.3)
Sometimes (2 pts)	27 (49.1)	28 (50.9)	55 (26.3)
Never (1 pt)	73 (59.8)	49 (40.2)	122 (58.4)
Mean			1.569 (SD 0.744)
Missing (n = 17, 7.5%)			
Frequency of Purchasing Less Expensive Processed Food			
Often (3 pts)	28 (35.0)	52 (65.0)	80 (38.5)
Sometimes (2 pts)	54 (58.1)	39 (41.9)	93 (44.7)
Never (1 pt)	26 (74.3)	9 (25.7)	35 (16.8)
Mean			2.216 (SD 0.713)
Missing (n = 18, 8.0%)			

Table 7 continued

Student Coping Skills

Student Characteristic	Food Secure n (%) by Response	Food Insecure n (%) by Response	Total n (%) by Response
Frequency of Eating Less Healthy Meals to Eat More Food			
Often (3 pts)	25 (33.8)	49 (66.2)	74 (35.2)
Sometimes (2 pts)	52 (56.5)	40 (43.5)	92 (43.8)
Never (1 pt)	32 (72.7)	12 (27.3)	44 (21.0)
Mean			2.143 (SD 0.738)
Missing (n = 16, 7.1%)			
Frequency of Obtaining Food from a Dumpster or Trash			
Often (3 pts)	1 (16.7)	5 (83.3)	6 (2.9)
Sometimes (2 pts)	1 (16.7)	5 (83.3)	6 (2.9)
Never (1 pt)	107 (54.0)	91 (46.0)	198 (94.3)
Mean			1.086 (SD 0.369)
Missing (n = 16, 7.1%)			
Frequency of Bartering Services/Items to Buy Food			
Often (3 pts)	1 (14.3)	6 (85.7)	7 (3.4)
Sometimes (2 pts)	6 (26.1)	17 (73.9)	23 (11.1)
Never (1 pt)	102 (57.6)	75 (42.4)	177 (85.5)
Mean			1.179 (SD 0.464)
Missing (n = 19, 8.4%)			
Frequency of Selling Textbooks, Personal Possessions, Blood/Plasma, or Sperm/Eggs to Obtain Food			
Often (3 pts)	3 (21.4)	11 (78.6)	14 (6.7)
Sometimes (2 pts)	7 (30.4)	16 (69.6)	23 (11.0)
Never (1 pt)	100 (57.8)	73 (42.2)	173 (82.4)
Mean			1.243 (SD 0.565)
Missing (n = 16, 7.1%)			

Note: n = number, % = percentage, SD = standard deviation

An increasing score on several coping skills was associated with an increased likelihood of experiencing food insecurity; see Table 5. Students who shared food purchasing and preparation responsibilities with others were more likely to be food insecure (OR = 1.490, 95% CI [1.023, 2.168], $p = .037$). Stretching meals to make them last longer was also associated with food insecurity (OR = 3.605, 95% CI [2.238, 5.807], $p = .000$), as were using coupons to purchase food (OR = 1.778, 95% CI [1.226, 2.579], $p = .002$), borrowing money from family and friends to purchase (OR = 2.057, 95% CI [1.405, 3.012], $p = .000$), attending functions with free food or where you “pay when you (OR = 2.088, 95% CI [1.421, 3.069], $p = .000$), eating more than normal when food was plentiful (OR = 1.491, 95% CI [1.033,

2.152], $p = .033$), taking food home from on-campus dining hall (OR = 1.745, 95% CI [1.193, 2.553], $p = .004$), purchasing less expensive processed food (OR = 2.379, 95% CI [1.563, 3.621], $p = .000$), eating less healthy meals to eat more food (OR = 2.326, 95% CI [1.556, 3.478], $p = .000$), obtaining food from a dumpster or trash (OR = 3.050, 95% CI [1.065, 8.737], $p = .038$), bartering services/items to buy food (OR = 3.404, 95% CI [1.584, 7.316], $p = .002$), and selling textbooks, personal possessions, blood/plasma, or sperm/eggs to obtain food (OR = 2.511, 95% CI [1.413, 4.461], $p = .002$). An increasing total coping skills score, that included all the previous coping skills, plus the coping skill of visiting family on weekends to bring back food to school, was associated with an increased likelihood of experiencing food insecurity (OR = 1.197, 95% CI [1.114, 1.297], $p = .000$). The coping strategy of visiting family on weekends to bring back food to school was not associated with food insecurity.

Food insecurity was associated with only one academic outcome. An increasing class attendance score was associated with a reduction in the likelihood of food insecurity (OR = 0.602, 95% CI [0.397, 0.912], $p = .017$). GPA, attention span in class score, understanding the concepts in class score, progression towards graduating on time score, and a total academic outcomes score were not associated with food insecurity.

Lasso regression analysis was performed to identify the significant predictors of food insecurity. All student characteristics were entered into the model, but only two, the total coping skills score and hours worked per week, were identified as predictors of food insecurity. An increasing coping skills score was positively associated with and predicted food insecurity (parameter estimate = 0.724389), while an increasing number of hours worked per week was negatively associated with food insecurity and predicted a decreased likelihood of food insecurity (parameter estimate = -0.007540).

Research Question 3: How does food insecurity impact academic outcomes of FVSU students? Linear regression analysis was performed to identify whether food insecurity would predict an increasing GPA and other academic outcomes scores. Food insecurity was not found to be a statistically significant predictor of GPA ($R^2 = .010$, SE = 0.439, $F = 1.883$, $p = .172$), nor was it a statistically significant predictor of the class attendance score ($R^2 = .016$, SE = 0.652, $F = 3.491$, $p = .063$), attention

span in class score ($R^2 = .003$, $SE = 0.704$, $F = 0.561$, $p = .455$), understanding of concepts in class score ($R^2 = .001$, $SE = 0.745$, $F = 0.210$, $p = .647$), progression towards graduating score ($R^2 = .000$, $SE = 0.685$, $F = 0.062$, $p = .804$), or total academic outcomes score ($R^2 = .003$, $SE = 1.967$, $F = 0.715$, $p = .399$).

Research Question 4: How do social support and coping skills influence the relationship between food insecurity and academic outcomes? Multiple regression analysis was performed to determine the influence of social support and coping skills on the relationship between food insecurity and academic outcomes. Food insecurity, social support, and coping skills were not found to be statistically significant predictors of GPA ($R^2 = .024$, $SE = 0.436$, $F = 1.083$, $p = .359$), nor were they statistically significant predictors of the total academic outcomes score ($R^2 = .001$, $SE = 1.867$, $F = 0.050$, $p = .985$).

CHAPTER 5

DISCUSSION

The purpose of this research study was to examine the prevalence of food insecurity among students at a Historically Black College & University, factors associated with food insecurity, the impact of food insecurity on students' education, and the influence of social support and coping skills on the relationship between food insecurity and academic outcomes. This study utilized an online anonymous survey of a stratified random sample of students at FVSU to collect data regarding student sociodemographic factors, food security status, academic outcomes, resources, social supports, and coping strategies. This chapter includes a discussion of the results of the current study, in order by study question, and compares them to the existing research. This chapter also includes a review of the study's strengths and limitations, implications of the study, public health implications, recommendations to address food insecurity on campuses across the U.S., as well future research needs, and conclusions.

Prevalence of Food Insecurity

Nationally, the rate of food insecurity among U.S. households is 11.8% and the rate of very low food security is 4.5% (Coleman-Jensen et al., 2018). Researchers conducted systematic reviews to determine the prevalence of food insecurity among college students and discovered that the rate was much higher than the household national average – 32.9% (ranging from 14.1% - 58.8%) among the nine peer-reviewed studies reported by Bruening et al. (2017) and 43.5% (ranging from 21% - 58.8%) among the eight U.S. studies reported by Nazmi et al. (2018). In 2017, the Hope Center for College, Community, and Justice (2018) also conducted research among 11 Georgia 4-year colleges and universities and discovered that 37% of respondents were food insecure (23% low food security and 14% very low food security). As there was limited research on the prevalence of food insecurity among African American and Black students, the current study sought to determine the prevalence of food insecurity at a small rural HBCU. The rate of food insecurity, 47.3% (23.5% low food security and 23.9% very low food security), among FVSU students, was much higher than the rate of food insecurity and very low food security experienced by U.S. households. The FVSU rate of food insecurity was also

higher than the rates reported by Bruening et al. (2017), Nazmi et al. (2018), and the Hope Center for College, Community, and Justice (2018).

Factors Associated with Food Insecurity

Individual SEM level – sociodemographic factors related to food insecurity. This study measured several sociodemographic, resources, coping skills, and academic variables, but only one sociodemographic factor, parental level of education, was associated with food insecurity. Students in this study with a parent having a high school degree or less were 3.257 times more likely to be food insecure than those with a parent holding a graduate degree. This finding is consistent with the research of Davidson and Morrell (2016), Miles et al. (2017), Phillips et al. (2018), and Forman et al. (2018) who reported that students who were first-generation students were more likely to be food insecure. These results are not surprising as those with advanced degrees consistently earn significantly more (Torpey, 2018) and students coming from these households likely have access to additional financial and food resources.

Several sociodemographic variables were not statistically significantly associated with food insecurity in the current study: age, gender, ethnicity, marital status, number of children, sexual orientation, disability, military service, hours worked per week, number of people living with, class year, enrollment status, or residency status. However, four of these – ethnicity, sexual orientation, disability, and military service – deserve more discussion.

While ethnicity was not found to be associated with food insecurity in the current study, this was not the case in several other studies; several researchers have reported that African American or Black students are more likely than White students to experience food insecurity (El Zein et al., 2018; Maroto et al., 2015; Martinez, Web et al., 2018; Miles et al., 2017; Morris et al., 2016; Payne-Sturges et al., 2018; Phillips et al., 2018; Soldavini et al., 2019; Wood & Harris, 2018). Of note, Payne-Sturges et al. (2018) discovered that African American students were 4.0 times more likely than White students to be food insecure, and Soldavini et al. (2019) found that African American undergraduate students were 3.0 times more likely and graduate students were 3.77 times more likely to experience food insecurity than White

students. These researchers' findings reflect the rate of food insecurity in the general U.S. population. Coleman-Jensen et al. (2018) identified that while 11.8% of U.S. households were food insecure, Black households experienced food insecurity at a much higher rate, 21.8%. The lack of significant statistical association between ethnicity and food insecurity in the current study is most likely explained by the very high percentage of African or Black students in the study, 93.3%, and the small percentage of students who classified themselves as some other ethnicity, thereby making comparisons by ethnicity difficult. The high rate of food insecurity experienced by FVSU African American or Black students, 47.1%, was similar to the rate of 45.4% experienced by other African American and Black students in study of food insecurity among students at 11 Georgia colleges and universities, as reported by Hope Center for College, Community, and Justice (2018), and similar to the average rate of 46.5% (range 16% to 61.7%) among the African American or Blacks students in the peer-reviewed U.S. studies, included in the literature review of the current study, that reported student food insecurity by race/ethnicity. The FVSU rate of food insecurity was similar to the rate of 44.7% reported in the study by Soldavini et al. (2019), 50% reported by McArthur, Ball, et al. (2018) and Couch et al. (2017), 51.5% reported by Martinez, Frongillo, et al. (2018), and 52.6% by Hagedorn and Olfert (2018), but higher than the rate of 16% reported by Wood and Harris (2018), 21.4% reported by Payne-Sturges et al. (2017), 26.0% - 45.9% reported by Bruening et al. (2018), 29.6% reported by McArthur, Fasczewski, et al. (2018), and 31.4% reported by Forman et al. (2018), and lower than the rate of 59.2% reported Martinez, Web, et al. (2018), 60.7% reported by Phillips et al. (2018), 61.0% reported by Maroto et al. (2015), 61.5% reported by Bruening et al. (2016), and 61.7% reported by El Zein et al. (2018). It should be noted that among these studies, several had very few African American or Black students included in the sample.

Sexual orientation also was not associated with food insecurity in the current study; however, this was likely due to the small sample size as only 16 students identified themselves as lesbian or gay. A higher percentage of lesbian or gay students in the current study did report being food insecure (68.8%) compared to straight students (45.8%) and this finding trended towards significance ($p = .087$). This finding is similar to the results of the food security study conducted in the 11 Georgia colleges and

universities (Hope Center for College, Community, & Justice, 2018); among these students, a higher percentage of homosexual compared to heterosexual students were food insecure (43.9% and 34.8%, respectively). The increased prevalence of food insecurity among lesbian and gay students in the current study finding is also similar to the most recent Hope Center food security study (Goldrick-Rab et al., 2019) that reported that gay or lesbian students experienced food insecurity at a higher rate than heterosexual or straight students (52% and 44%, respectively).

Disability was not associated with food insecurity in the current study, again likely due to the small sample size; only eight students reported having a disability. This finding does differ, however, from Goldrick-Rab et al. (2019) who reported that students with a disability had higher rates of food insecurity (49-58% depending on the disability) compared to those with no disability (40%).

As Fort Valley State University is near an Air Force base and several students have military service, hence investigating food insecurity among this population was important. However, only six students participating in this study reported having military service. Two of these students, or 33.3%, were classified as food insecure, compared to 47.5% of students without military service who classified as were food insecure. This rate of food insecurity among FVSU students with military service is similar to the results of the Georgia food security study (Hope Center for College, Community, & Justice, 2018) which found that 36.5% of students with military service were food insecure, but the FVSU rate is somewhat lower than the rate of 46% among students with military service in the recent Hope Center study (Goldrick-Rab et al., 2019).

Although statistically significant associations between many demographic variables and food insecurity did not emerge in the current study, likely due to the small sample size, many other researchers did document these; therefore, more research among African American and Black students and at HBCUs is needed.

Individual and interpersonal SEM levels – resources, social support, and coping skills related to food insecurity. Several researchers have documented the resources, social support, and coping skills used by college students to alleviate food insecurity. The current study also sought to define

these factors among students attending an HBCU. Annual income, type of campus meal plan, financial and food assistance from parents/guardians or relatives, food skills and resources, and several coping skills were statistically significantly associated with food insecurity in the current study.

Students in the current study who reported a lower annual income were more likely to experience food insecurity. Compared to having an annual income of \$50,000 or more, students with an annual income of \$25,000 - \$49,999 were 3.187 times more likely to experience food insecurity; likewise, students with incomes of \$15,000 – \$24,999 were 5.000 times more likely, students with incomes of \$5,000 - \$14,999 were 3.429 times more likely and students with incomes less than \$5,000 were 4.895 times more likely to experience food insecurity compared to students with annual incomes greater than \$50,000. These results are consistent with those of other researchers. Patton-Lopez and colleagues (2014) discovered that students in their study with a low income, those who reported an annual income of less than \$15,000 per year, were more 2.23 times more likely to be food insecure, compared to those with incomes higher than \$15,000 per year. Wood and Harris (2018) reported similar results; White and Asian (but not Black) students who were low income (defined as having an income below \$30,000) were 1.82 and 2.58 times, respectively, more likely to be food insecure. Zollinger et al. (2018) also found a correlation between students with a lower household income and food insecurity. As educational expenses, including tuition, textbooks, housing, food, etc., continue to increase (College Board, 2018; U.S. Department of Education, National Center for Education Statistics, 2018), students who struggle to earn a living wage to cover educational costs will continue to be at risk of food insecurity.

The current study revealed that students with a campus meal plan with unlimited meals were less likely to be food insecure; students with a campus meal plan with only 2 meals per day plus cash were 2.798 more likely to experience food insecurity, as were students with no campus meal plan (OR = 2.956), compared to having a campus meal plan with unlimited meals. The current study also discovered that a higher percentage of freshmen students, who were required to have a campus meal plan, were more food secure. These results are similar to those of researchers Davidson and Morrell (2016) and Soldavini et al. (2019) who reported that students with a campus meal plan were less likely to be food insecure

compared to students with no meal plan (OR = 0.36; OR = 0.68, respectively). However, Martinez, Web et al. (2018) found that a higher proportion of food insecure students than food secure students reported commonly getting food from had a campus meal plan ($p < .01$), although the authors did not differentiate between different levels of dining plans, which may partially explain their results. Certainly, having an unlimited number of meals increases access to food for students and decreases their risk for food insecurity, while those students who have fewer meals on their dining plan, combined with a limited number of dining facilities to choose from and limited hours of operation, may be at risk for food insecurity.

In the current study, an increasing total food skills and resources score was associated with a decreased likelihood of food insecurity (OR = 0.867). This score was modeled after the resource adequacy scale developed by Gaines and colleagues (2016) and included the individual variables of adequacy of cooking skills, money to buy food, appliances for food preparation, and food selection in local stores, and summed to create a single score. The finding in the current study was similar to that of Gaines et al. (2016) who discovered that students with a higher score on this scale – i.e. a higher perception of adequacy of resources – were less likely to be food insecure. When looking at the variables individually, students in the current study who rated the adequacy of money to buy food higher had a decreased likelihood of food insecurity (OR = 0.325); likewise, those students with an increased score when rating the adequacy of food selection in local stores were also less likely to experience food insecurity (OR = 0.620). Gaines et al. (2016) did not report results on individual variables within the scale and so comparison with the current study is not possible. As mentioned previously, sufficient income to cover educational and living expenses helps to alleviate food insecurity. Additionally, as FVSU is located in a rural town with a high rate of food insecurity (Feeding America, 2017) and a limited number of grocery outlets and no major grocery chain stores (U.S. Department of Agriculture, Economic Research Service, 2017), students experiencing food insecurity would most likely be impacted by low income and limited access to food.

All previous research regarding the impact of family financial assistance on students consistently

revealed a decreased likelihood of food insecurity; the same results emerged in the current study. FVSU students that received no financial assistance from parents/guardians and relatives were 2.009 more likely than those who received assistance to experience food insecurity. Phillips et al. (2018) discovered that students who were financially independent of their parents were 2.18 more likely to be food insecure. Both Payne-Sturges et al. (2018) and Nikolaus et al. (2019) reported that students who received family financial support were less likely be food insecure (Adjusted OR = 0.28; OR = 0.32, respectively). Gaines et al. (2016), Broton & Goldrick-Rab (2018), and Forman et al. (2018) had similar results. This family assistance may be extremely helpful as students transition to college and take on more responsibilities, including learning how to budget and paying for their own expenses for the first time.

In addition to receiving family financial assistance, receiving no food assistance from family was also associated with food insecurity in the current study. Students who received no food assistance from parents/guardians or relatives were 2.484 more likely to experience food insecurity compared to those students who received food assistance. This result is similar to those of Bruening et al. (2016) but not with Martinez, Web et al. (2018) or Broton and Goldrick-Rab (2018). Bruening et al. (2016) reported that students who were food insecure were less likely to receive food from parents (OR = 0.51), while Martinez, Web et al. (2018) and Broton and Goldrick-Rab (2018) reported that a higher proportion of students who were food insecure than food secure received free food from family or friends. While these opposite results seem contradictory, reasonable explanations exist for both of these outcomes: those students who are food insecure have a greater need and may receive assistance from family and friends to help alleviate food insecurity; likewise, not receiving any assistance from family and friends limits students access to food and may place them at greater risk of food insecurity.

The current study did not find statistically significant associations between food insecurity and several resources and social supports, including living arrangements, access to reliable transportation (although, this trended towards significance, OR = 0.055), self-efficacy for cooking a nutritious meal score, self-efficacy for cooking a nutritious meal without spending a lot of money score, total cooking self-efficacy score, adequacy of cooking skills score, and adequacy of appliances for food preparation

score, financial aid score, federal food assistance programs score, community and university food programs score, family assistance score, friend assistance score, family and friend assistance score, and the total social support score. These findings may accurately reflect no association between food insecurity and resources or social supports, or they may be indicative of the small sample size of the study.

While no association between food insecurity and the total social support score emerged in this study, more discussion is appropriate here. The social support score was developed by summing the number (not the frequency) of social supports used by students, including financial aid, federal food assistance programs, community food programs, university food programs, family financial aid, family food assistance, and friend food assistance. Of note, a very high percentage of all FVSU students reported receiving some form of financial aid; 83.6% reported receiving a student loan, 49.6% received a scholarship, and 44.2% received a grant, while just 4.4% of students reported receiving no financial aid. The percentage of FVSU students receiving a grant was somewhat lower than the percentage (49%) of students in the Georgia food insecurity study (Hope Center for College, Community, and Justice, 2018) who reported receiving a Pell grant and lower than the percentage (54%) of students who reported receiving this benefit in the recent national food insecurity study by Goldrick-Rab et al. (2019). A high percentage of students in the current study also reported receiving financial assistance from family (63.6%) and food assistance from family (61.1%), and food assistance from friends (29.6%). However, very few students reported using federal, community, or university social supports – 73% of students reported not using any federal food assistance programs, 77% reported not using any community food programs, and 78.3% of student reported not using any university food programs. Only 10.2% of students used SNAP, 2.2% used WIC, 4.0% used the NSLP, 2.2% used the NSBP, and less than 1.0% used the SFSP, CACFP, or TEFAP. These rates were similar to those reported in the Georgia food insecurity study (Hope Center for College, Community, and Justice, 2018), which reported that 12% of food insecure Georgia students used SNAP, 3.2% used WIC, and 0.47% used TANF; but the rate of SNAP use among FVSU students was lower than the rate of SNAP use (21%)

reported by Broton & Goldrick-Rab (2018) and higher than the rate (0%) reported by McArthur, Fasczewski, et al. (2018). It is important to note here that several researchers (Alaimo, 2013; Broton & Goldrick-Rab, 2018; Bruening et al, 2017; Dubik et al., 2016; Gaines et al., 2014; Goldrick-Rab et al., 2019; Hope Center for College, Community, and Justice, 2018) and the GAO (2018) have described the difficulty that college students have qualifying for SNAP (as most are required to work at least 20 hours per week to be eligible for the program) or even simply accessing information about SNAP program eligibility (GAO, 2018). Therefore, it is likely that some of the students participating in this study who did not report using SNAP would in fact, qualify for it, and could use the program to help alleviate food insecurity. It is possible that the social support score is an accurate portrayal of student social support, but it is also possible that if the social support score had included frequency of social support usage, similar to the coping skills score, different results may have emerged. Regardless, like other resources, these financial and food assistance programs and social supports are intended to be used by those that need them to help alleviate food insecurity; therefore, it is logical that usage of these supports can be associated with both an increased likelihood and a decreased likelihood of food insecurity, as those who are food insecure and need these social supports, use them, and in turn, these social supports then help alleviate food insecurity (Alaimo, 2013; GAO, 2018).

The current study discovered that the five most frequently used food related coping strategies used by FVSU students were stretching meals to make them last longer, purchasing less expensive processed food, eating less healthy meals to eat more food, sharing food purchasing and preparation responsibilities with others, and borrowing money from family and friends to purchase food. These strategies were similar to the findings of McArthur, Ball, et al. (2018) and McArthur, Fasczewski, et al. (2018). McArthur, Ball, et al. (2018) reported that students in their study frequently purchased cheap processed food, planned menus before buying food, stretched food to last longer, ate less healthy meals to eat more food, and shared groceries/meals with roommates. McArthur, Fasczewski, et al., (2018) similarly reported that the most common food related strategies used by students in their study included eating cheap food, stretching food, sharing groceries/meals with relatives and friends, planning meals, and

eating less healthy meals.

Several researchers (Broton & Goldrick-Rab, 2018; Bruening et al., 2016; Couch et al., 2017; Hagedorn & Olfert, 2018; Knol et al., 2019; Martinez, Web et al., 2018; McArthur, Ball, et al., 2018; McArthur, Fasczewski, et al., 2018; Miles et al., 2017; Zollinger et al., 2018) have documented an association between coping skills and food insecurity. A coping skills score was developed based on the work of Hagedorn & Olfert (2018), McArthur, Ball, et al. (2018), and McArthur, Fasczewski, et al. (2018) and included 13 questions to assess different coping strategies; these questions were also then summed to create a coping skills score, indicative of using more coping skills more often. The current study found that students who rated higher on the coping skills score were 1.197 times more likely to experience food insecurity. This outcome was similar to Hagedorn and Olfert (2018) who discovered that students who scored higher on their coping strategies scale were 1.20 times more likely to be food insecure; both McArthur, Ball, et al. (2018) and McArthur, Fasczewski, et al. (2018) also saw similar results in their studies. This finding supports the conceptual model of food insecurity among college students described by Gaines et al. (2014) who reported that developing food management skills was an important factor in limiting the risk for food insecurity.

The current study also assessed the individual variables that were included in the coping skills score; all but one (visiting family on weekends to bring back food to school) were associated with an increased likelihood of food insecurity. Hagedorn and Olfert (2018), McArthur, Ball, et al. (2018) and McArthur, Fasczewski, et al. (2018) did not report on associations between food insecurity and the individual variables in their coping scales; therefore, comparison to their work is not possible. However, other researchers did report somewhat similar variables. The current study found that students who reported more often attending functions with free food or where you “pay when you can” were 2.088 times more likely to be food insecure, similar to Martinez, Web et al. (2018) who reported that a higher proportion of students who were food insecure than food secure students received free food at on and off campus events. Couch et al. (2017) also discovered that students who were food insecure were more likely than food secure students to receive free food or meals as a coping strategy. Miles et al. (2017) and

Martinez, Web et al. (2018) also found that a higher proportion of food insecure students than food secure students received food from federal food assistance programs or another free food program, a food pantry, or a garden; Zollinger et al. (2018) too reported a correlation between student food insecurity and an increased use of a campus food pantry or campus or community garden. In the current study, students who more often purchased less expensive processed food were 2.379 times more likely to be food insecure and students who more often ate less healthy meals to eat more food were also 2.326 times more likely to be food insecure. Miles et al. (2017) and Martinez, Web et al. (2018) found similar results; in their studies, a higher proportion of students who were food insecure than food secure students bought cheap unhealthy food. The current study also discovered that students who more often shared food purchasing and preparation responsibilities with others were 1.490 times more likely to be food insecure. Similarly, Miles et al. (2017) also discovered that a higher percentage of food insecure students shared food. The current study also discovered that students employed several coping skills that were not investigated by other researchers. Students in the current study who more often stretched meals to make them last longer were 3.605 times more likely to experience food insecurity and students who reported more often borrowing money from family and friends to purchase food were 2.057 more likely to experience food insecurity. Likewise, students who more often used coupons to purchase food were 1.778 more likely to be food insecure and students who more often ate more than normal when food was plentiful were 1.491 times more likely to be food insecure. Taking food home from an on-campus dining hall was another coping strategy used by FVSU students; students who more often used this strategy were 1.745 times more likely to be food insecure. Additionally, students who more often obtained food from a dumpster or trash were 3.050 times more likely to be food insecure, as were those who more often bartered services/items to buy food (OR = 3.404) and sold textbooks, personal possessions, blood/plasma, or sperm/eggs to obtain food (OR = 2.511). The one coping skill that was not statistically significantly associated with food insecurity in the current study – visiting family on weekends to bring back food to school – is not surprising, as this behavior is likely typical of most students and the college experience.

As a whole, these findings lend support for the use of social support concepts (Glanz & Schwarz,

2008; Heaney & Israel, 2008; House, Umberson, & Landis, 1988; Shumaker & Brownell, 1984), the Transactional Model of Stress and Coping (Glanz & Schwarz, 2008; Lazarus & Folkman, 1987; Sharma, 2017), and the conceptual model of student food insecurity outlined by Gaines et al. (2014) to help explain food insecurity among students. As expected, students who are food insecure utilize several different resources, social support, and coping skills to help alleviate the stressor of food insecurity.

Academic factors related with food insecurity. Food insecurity was associated with only one academic outcome in the current study. An increasing class attendance score (rated from poor to excellent) was associated with a reduction in the likelihood of food insecurity (OR = 0.602). This finding is consistent with those of McArthur, Ball, et al. (2018) who reported that a lower proportion of food insecure students rated their class attendance as excellent or good, and similar to the results of Silva et al. (2017) who discovered that more students who were food insecure reported being very or somewhat affected in their ability to attend class. This finding may be explained if students who are hungry do not come to class; additionally, students may have to make decisions about balancing their time coming to class and working to help cover their educational and living expenses.

The current study did not find statistically significant associations between food insecurity and GPA (although, this trended towards significance, OR = 0.548, $p < 0.075$), improved attention span in class, improved understanding of concepts taught in class, improved progression towards graduating on time, or an increasing total academic outcomes score. The current study finding of no statistically significant association between GPA and food insecurity was similar to the findings of Davidson and Morrell (2018) who also discovered no association between GPA and food insecurity. However, several other researchers (Hagedorn & Olfert, 2018; Maroto et al., 2015; Martinez, Frongillo et al., 2018; McArthur, Ball, et al., 2018; Morris et al., 2016; Patton-Lopez et al., 2014; Phillips et al., 2018) reported an association between food insecurity and lower GPAs. The current study academic outcomes findings may accurately reflect no association between food insecurity and academic outcomes, or more likely, they may be indicative of the small sample size of the study.

Predictors of food insecurity. The current study employed Lasso regression analysis to define

predictors and help provide a more thorough picture of food insecurity. Two significant predictors of food insecurity emerged in this study: hours worked per week and the total coping skills score. An increasing coping skills score was positively associated with and predicted food insecurity, while an increasing number of hours worked per week was negatively associated with food insecurity and predicted a decreased likelihood of food insecurity. This indicates that as the number of coping strategies utilized increased, food insecurity increased, and as the hours of work increased, food security decreased.

The current study finding of an increased coping skills score being a predictor of food insecurity was similar to that of Hagedorn and Olfert (2018) who found that scoring higher on a coping strategies scale was a significant predictor of food insecurity; those that scored higher, using more coping strategies, were 1.2 times more likely to experience food insecurity. The same coping strategies score was also a predictor of food insecurity in the study by McArthur, Ball, et al. (2018) and a similar coping strategy scales was used by McArthur, Fasczewski, et al. (2018) who also found that a higher score was significantly correlated to food insecurity. As mentioned previously, the use of coping skills is a logical strategy for students to deal with food insecurity, but it is also important that students learn and use several different coping strategies to alleviate food insecurity (Bruening et al., 2017; GAO, 2018).

An increasing number of hours worked per week predicted a decreased likelihood of food insecurity in the current study; however, other researchers reported opposite results. Soldavini et al. (2019) found that undergraduate students with a part-time job were 1.66 times more likely or a full-time job were 2.23 times more likely to experience food insecurity than those students who were unemployed; graduate students with a part-time job were also 1.51 time more likely than unemployed graduate students to be insecure. Nikolaus et al. (2019) also reported that students who received financial support through employment had 1.63 higher odds of experiencing food insecurity. Forman et al. (2018) also reported that a higher percentage of students who worked for pay experienced food insecurity compared to those that did not work. Both of these opposite results could logically predict food insecurity, depending on an individual's situation. If students work, they earn more income and may be better able to afford food; however, students who must work during school still may not earn enough to pay for both food and the

rising costs of education.

Impact of Food Insecurity on Academic Outcomes

Food insecurity has the potential to impact academic outcomes – GPA, class attendance, attention span in class, understanding of concepts taught in class, course load/number of credits taken per semester, and ultimately, graduation rates.

In the current study, food insecurity was not found to be a statistically significant predictor of GPA. These results were inconsistent compared to other researchers. Maroto and colleagues (2015) discovered that students who were food secure were less likely (OR 0.390) to have a lower GPA. Phillips et al. (2018) also found that food insecure students had lower GPAs than food secure students, as did Martinez, Frongillo et al. (2018). McArthur, Ball, et al. (2018) also found a correlation between food secure status and GPA, with food insecure students performing more poorly. Other researchers (Hagedorn & Olfert, 2018; Martinez, Webb, et al., 2018; Morris et al., 2016; Patton-Lopez et al., 2014) also found significant associations between food insecurity and lower GPAs. However, McArthur, Fasczewski, et al. (2018) reported no correlation between food insecurity and GPA. Likewise, Payne-Sturges et al. (2018) reported no statistically significant differences in GPA by food security status.

The current study also assessed the impact of food insecurity on four individual academic outcomes – perception of class attendance, attention span in class, understanding of concepts taught in class, and progression towards graduation – and a total academic outcomes score that consisted of the sum of the four individual outcomes. Food insecurity did not statistically significantly predict the total academic outcomes score in this study, nor any of the individual variables, although class attendance trended towards significance ($p < .063$). These findings differ from those of other researchers. Hagedorn and Olfert (2018) reported that a higher academic progress score, the same score used in the current study, was inversely related to food insecurity (OR = 0.079). McArthur, Ball, et al. (2018) also discovered a correlation between food insecurity and a lower academic score; additionally, a lower proportion of food insecure students scored higher (excellent) on all of the individual academic variables in the academic score: class attendance, attention span in class, understanding of concepts taught in class,

and progression towards graduating. McArthur, Fasczewski, et al. (2018) also found a correlation between food insecurity and a lower academic progress score. Phillips et al. (2018), who measured slightly different academic outcomes, discovered that food insecure students were 3.422 more likely than food secure students to report neglecting their studies, 3.584 times more likely to reduce their course load, and 3.49 times more likely to consider dropping out of college due to money owed. Silva and colleagues (2017) also reported that there were significant differences between food secure and insecure students' ability to attend classes and perform in class; more students who were food insecure reported being very or somewhat affected in their ability to attend class or perform in class.

The lack of impact of food insecurity on academic outcomes is most likely explained by the small sample size. However, it is possible that these findings may be explained by factors that were not measured in the current study. Several researchers (Cunningham & Swanson, 2010; Warde, 2008; Williams & Bryan, 2013; Williams & Portman, 2014) have described significant contributors to African Americans' success in academics: parental involvement, extended family networks, social support networks, supportive school relationships, having access to resources to attend and persist in higher education, personal stores of hardship, and developing resilience when faced with obstacles. Other researchers (Garibaldi, 1991; Minor, 2008) have described the characteristics of HBCUs that help facilitate resilience among African American students; these include small class size, regular academic advising, tutoring by peers and instructors, faculty and alumni as role models, and remediation assistance for basic skills. FVSU was established as an 1890 land grant historically black college and university with the goal to equip students with knowledge and skills to become leaders and to provide research and outreach to improve the surrounding community (Fort Valley State University, n.d.-d). FVSU continues to meet this goal, while also striving to be 'family' for students, so this atmosphere may help improve academic outcomes among many of its students. FVSU has several programs that support students, such as a professional mentoring program, peer advisors, first year experience, second year experience, a tutoring program, regular advising and academic alerts, and Trio student support services (Fort Valley State University, n.d.-c). Additionally, small class size in many courses and faculty who provide

individual assistance to students struggling academically both help to improve academic outcomes. Although many students in the current study reported several sociodemographic characteristics, as well as lack of resources and social supports that put them at risk for food insecurity, it is possible that these students who have experienced hardships have developed other coping skills and resilience that help mitigate the effect of food insecurity on academic outcomes. As grades and progression towards graduation are important to students, faculty, and university administration, further research about the impact of food insecurity on academic outcomes is needed.

Social Support and Coping Skills Influence on the Relationship Between Food Insecurity and Academic Outcomes

To this researcher's knowledge, no researchers have previously investigated the direct influence of social support and coping skills on the relationship between food insecurity and academic outcomes. Multiple regression analysis was performed in the current study to determine the influence of social support and coping skills on the relationship between food insecurity and academic outcomes. Food insecurity, social support score, and coping skills score were all entered into the model; however, none were found to be statistically significant predictors of GPA, nor were they statistically significant predictors of the total academic outcomes score. As this study and other researchers (Broton & Goldrick-Rab, 2018; Bruening et al., 2016; Bruening et al., 2018; Chaparro et al., 2009; Couch et al., 2017; Davidson & Morrell, 2016; El Zein et al., 2018; Forman et al., 2018; Gaines et al., 2016; Hagedorn & Olfert, 2018; Hanna, 2014; Knol et al., 2019; Maroto et al., 2015; Martinez, Webb et al., 2018; McArthur, Ball, et al., 2018; McArthur, Fasczewski, et al., 2018; Miles et al., 2017; Morris et al., 2016; Nikolaus et al., 2019; Patton-Lopez et al., 2014; Payne-Sturges et al., 2018; Phillips et al., 2018; Soldavini et al., 2019; Wood & Harris, 2018; Zollinger et al., 2018) have documented a relationship between social support and coping skills and food insecurity, and several researchers (Hagedorn & Olfert, 2018; Maroto et al., 2015; Martinez, Webb, et al., 2018; Martinez, Frongillo et al., 2018; McArthur, Ball, et al., 2018; McArthur, Fasczewski, et al., 2018; Morris et al., 2016; Patton-Lopez et al., 2014; Phillips et al., 2018; Silva et al., 2017) have reported a relationship between food insecurity and academic outcomes, it is

likely that with a larger sample size, the influence of social support and coping skills on the relationship between food insecurity and academic outcomes may be revealed. Certainly, further research is warranted.

Study Strengths

A strength of this study is that it utilized a stratified random sample during recruitment, rather than a convenience sample or a sample of a few classes; therefore, it is more representative of the FVSU population and may be generalizable to other similar academic institutions. Another strength of this study is that it included the same metrics to measure the prevalence of food insecurity, student characteristics, social support and coping skills, and academic outcomes as those used in other research, making comparisons to other student populations easier. An additional strength of this research is that it included assessment of other factors not addressed in much of the other college student food insecurity research – history of military service, disability, and sexual orientation. This study also employed a rigorous analysis of the data, utilizing univariate logistic, linear, Lasso, and multivariable regression, in addition to descriptive or basic statistical procedures, which helped to provide a clearer picture of food insecurity among this study population.

Study Limitations

This study had some limitations which affect the generalizability of the results to other colleges and universities. This study was cross-sectional in design and therefore is limited in its ability to draw conclusions about causality; additionally, it cannot address food insecurity over time or in the long-term. This study was conducted in a small, rural, public university, and so likely is not reflective large, urban colleges and universities, or of community or for-profit colleges. As this study was conducted at an HBCU it likely is not reflective of other universities with more diverse student bodies. This study had a small sample size and response rate which limits the ability to draw more thorough associations and predictions about student food insecurity or academic outcomes. In an effort to limit the time it would take for students to complete the survey, this study did not include several factors related to food insecurity investigated in other studies, such as food insecurity experienced before college, student debt,

students' ability to cope with transition to college, being raised in the foster system, prior criminal conviction, physical or mental health outcomes associated with food insecurity, the use of emotional or informational social support to alleviate food insecurity, the use of emotion-focused or meaning-based-coping strategies to alleviate food insecurity, or the effectiveness of any interventions to alleviate food insecurity among college students, or students' perceptions about food insecurity. Additionally, the format of four questions and answers related to social support limited the ability to draw more thorough conclusions about social support and food insecurity. And lastly, this study relied on student reported data and so may be subject to desirability and recall bias.

Public Health Implications

Food insecurity has the potential to significantly negatively impact physical and mental health of students, as well as academic outcomes. There are multiple levels of influence across the Social Ecological Model that significantly impact food security. African American students experience many simultaneous risk factors that result in higher rates of food insecurity than students of other ethnicities. Many students do not, and more often, cannot access social supports, such as SNAP or other food assistance programs, either due to structural barriers or due to stigma. While some universities are beginning to implement campus interventions, limited peer-reviewed research exists documenting intervention development processes and outcomes, which limits our ability to develop or adapt, implement, and assess effective and sustainable interventions. Ultimately, however, student food insecurity cannot be solved through temporary food assistance programs or charity; root causes of inequity – racism, lack of access to education and employment, and poverty must also be addressed. The current study and others demonstrate the variability in results, i.e. prevalence and associated and predictive factors of food insecurity, which leaves a persistent gap in the research.

Recommendations to Address Food Insecurity on Campuses Across the U.S.

Universities that aim to address student food insecurity must implement interventions across the Social Ecological Model to effectively reduce student food insecurity (Alaimo, 2013; GAO, 2018 Goldrick-Rab, et al., 2019). Universities must embrace a systems approach to address the simultaneous

risk factors that students face to alleviate food insecurity. Building on several years of student food insecurity research, Hope Center researchers Goldrick-Rab, Baker-Smith, Coca, Looker, and Williams stated, “It is especially important for colleges and universities to move beyond food pantries as they respond to basic needs insecurity on campus” (2019, p. 23). These researchers (Goldrick-Rab et al., 2019) provided five recommendations for colleges to better address hunger among their students: 1) appoint a director of student wellness and basic needs, 2) embrace a culture of caring across the entire university, 3) be proactive, rather than reactive, in creating partnerships and engaging community organizations, 4) develop and expand an emergency aid program, and 5) advocate for change at all levels of government. Universities should also develop an interdisciplinary campus food policy council; conduct a needs and strengths assessment of the campus food, housing, and financial environment, taking in account actual and perceived barriers and facilitators; screen for at-risk students; and develop, implement, and assess *multiple simultaneous* interventions to better accommodate food insecure students (Bruening et al., 2017; GAO, 2018; McArthur et al., 2018).

Interventions fall into four general categories: providing information about resources, providing food and financial management education, providing food and financial aid, and advocating for policy change. Universities must provide more clear information about housing, transportation, health insurance, health services, employment, daycare, financial aid, and food resources, such as SNAP, WIC, and TEFAP. Educational strategies could include developing a peer-to-peer mentoring program and hosting workshops and classes related to food planning/preparation, financial management, and coping skills; specifically, these could teach students the difference in costs between eating out and cooking at home, and how to plan a monthly budget, plan menus, share food preparation duties, create shopping lists, purchase affordable foods, use coupons, prepare low-cost meals, and eat healthy (Buch et al., 2016; El Zein et al., 2017; Knol et al., 2017; McArthur, Ball, et al., 2018; McArthur, Fasczewski, et al., 2018; Payne-Sturges, et al., 2018). Examples of food aid that help alleviate food insecurity include developing a food pantry or soup kitchen, such as those in the College & University Food Bank Alliance; developing a campus garden and/or farm; providing a campus farmers market that accepts SNAP and WIC benefits;

planting edible landscaping that allows students to freely pick fruits and vegetables; reducing the prices of campus dining meals and meal plans for low-income students, similar to the National School Lunch Program; increasing the number of healthy retailers in and around campus that accept SNAP; reducing the price of foods in on-campus retail outlets; allowing students to share unused meals on their meal plan; implementing a campus dining food recovery program, such as the Food Recovery Network; allowing leftover food from campus catered events to be shared with students and using an app to notify students of campus events with food and leftovers; sponsoring department, club, sorority, or fraternity food drives; encouraging all campus members to share food and food responsibilities during the semester; sponsoring end of semester dorm move-out food donation drives; and providing transportation to university and community grocery shopping areas (Bruening et al., 2017; Dubik et al., 2016; GAO, 2018). Universities should also provide more opportunities for student employment; provide other financial resources (scholarships, grants, and loans) for tuition and fees, housing, health care, transportation, and daycare that free up students' funds to purchase food; collaborate with community partners to encourage them to provide food and financial services for students. Additionally, universities should advocate for changes in federal, state, and local policies that would provide better food and financial aid to students, such as changing the eligibility criteria for SNAP or the work study requirements for students (Broton & Goldrick-Rab, 2018; Bruening et al., 2017; Buch et al., 2016; El Zein et al., 2017; GAO, 2018; McArthur, Ball, et al., 2018). Regardless of the type of intervention, universities should encourage student-driven and interdisciplinary team approaches that allow all campus members to be part of the solution (Bruening et al., 2017; McArthur, Ball, et al., 2018).

An important issue to consider when working with food insecure students is stigma. This issue is important to students, as they may feel uncomfortable admitting being food insecure, but it is also a concern for college administrators, as some may not want to admit that their campus has an issue with food insecurity. Different campuses have addressed this using opposite approaches. For example, when choosing a location for a food pantry, some universities have located it in a very public and central location, preferring to bring it out in the open to help students realize that food insecurity is normal and

they are not alone, while others have chosen to locate it away from busy areas, making it less noticeable in an attempt to maintain student privacy. (El Zein et al., 2018; GAO, 2018; Goldrick-Rab, Cady, & Coca, 2018)

The Food and Agriculture Organization of the United Nations (2001) definition of food security is “when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.” As researchers (Bazerghi, McKay, & Dunn, 2016; Martinez, Web, et al., 2018; Simmet, Depa, Tinneman, & Stroebele-Benshop, 2017; Trinidad, Camden, & Coleman, 2015) have reported that food at food banks and food pantries is often unhealthy or not culturally appropriate, this highlights another issue related to food insecurity – the need to move beyond focusing on quantity and consider quality. As we work to alleviate food insecurity among college students, we also need to advocate for students’ rights to access healthy culturally appropriate food.

Several authors have documented the historical factors that have contributed to inequities in the food system that lead to higher rates of food insecurity among African Americans and other people of color (Alaimo, 2013; Alkon & Norgaard, 2009; Allen, 2008; Allen, 2010; Constance, 2008; Horst, McClintock, & Hoey, 2017; Rameriz, 2015; White, 2011): structural racism, classism, and sexism; historical and intergenerational trauma; and longstanding federal, state, local, and institutional policies that exclude access to land, loans, housing, education, employment, and fair wages, thereby creating a cycle of oppression, poverty, and health disparities. The Institute for Agriculture and Trade Policy (2012) defines food justice as “the right of communities everywhere to produce, process, distribute, access, and eat good food regardless of race, class, gender, ethnicity, citizenship, ability, religion, or community.” Individuals, universities, communities, and public health professionals must address food insecurity as a food justice issue, a social justice issue. Ultimately, in order to alleviate student food insecurity, we must advocate for policies, programs, and funding that reduce or eliminate poverty, and importantly, those that address access to equitable education and employment opportunities for all community members.

FVSU Food Environment and Recommendations to Address Food Insecurity

Students who are younger than 21 years of age and have earned less than 60 credit hours are required to live on campus and purchase a meal plan at FVSU (Fort Valley State University, 2017). Meal plans for lower division undergraduate students include 19 meals per week and 3 levels of Wildcat cash; meal plans for upper division students living on campus include 2 meals per day and Wildcat cash (Sodexo, n.d.; Fort Valley State University, 2018). Campus apartments for freshmen come with or without a kitchenette, while campus apartments for upper division students come with full kitchens (Fort Valley State University, 2017). FVSU has six dining facilities: Resident Dining, The Georgia Room, Simply-to-Go, Slice of Life, Chick-fil-A, and Jazzman's Café and Bakery (Sodexo, n.d.). Resident Dining is open three times a day for 2 ½ - 3 hours per meal period, opening at 7:00 am and closing at 7:00 pm, on Monday through Friday, and twice a day on the weekends (Sodexo, n.d.). Retail dining operations open later than residential dining, but some also remain open later, from 10:00 pm – 12:00 am (Sodexo, n.d.). Only Resident Dining and Slice of Life are open on the weekends (Sodexo, n.d.). FVSU has a campus garden and a campus farm; however, students have limited access to these. FVSU does provide transportation on weekdays to the main grocery store in Fort Valley (Fort Valley State University. (n.d.-b)). FVSU provides several student support services, however information about resources to help alleviate food insecurity could be more prominent as they are not available on FVSU webpages (Fort Valley State University. (n.d.-c)). Fort Valley does provide food, nutrition, and financial management courses to students and free health and nutrition workshops are available occasionally to faculty and staff (Fort Valley State University, n.d.-a). Within the Fort Valley community, there are two small grocery stores; large chain grocery stores are not located in Fort Valley; the nearest is 11.3 miles away (Google Maps, 2019). Fort Valley also has a small farmers market that is open from 1:00 – 7:00 pm on Fridays (Fort Valley Main Street/DDA, n.d.).

Any of the recommendations and interventions listed in the previous section would be appropriate for FVSU, but some are more realistic and sustainable for FVSU. First, information about federal, university, and community resources to help alleviate food insecurity should be posted on multiple

university webpages, including Recruitment and Admissions, Financial Aid, Student Life, Residential Life and Housing, and Student Health and Counseling Services. Additionally, staff in these departments and programs should have print materials available to share with students. Second, information about food insecurity should also be included in the Orientation to the University course which is required of all undergraduate students. Free workshops should also be provided to students, staff, and faculty about food and financial management; these could be provided by human resources, Extension, and by individual academic departments. Third, several food aid interventions would be appropriate on campus, including providing free or low-cost meal plans for qualifying low-income students, allowing students to share unused meals on their meal plan with other students, implementing a dining food recovery program that shares leftover food with students, planting edible landscaping, expanding access to the university garden and farm to students, and developing a food pantry. And fourth, expanding work study to provide employment opportunities to more students and to allow students to work more hours would help them earn an income to help them better cover their tuition costs and living expenses.

Future Research

As the current study is only the second related to food insecurity to be conducted in an HBCU, more food security research is needed in minority serving institutions, as well as in small institutions, rural institutions, community colleges, and for-profit colleges, and among male students, underserved and at risk students (specifically those raised in the foster system, those with prior criminal convictions, and those with housing insecurity or homelessness), nontraditional students, graduate students, and international students (Bruening et al., 2017). More food security research is needed in using more rigorous study design and analysis (Bruening et al., 2017). More research is needed about the causes of food insecurity among college students, including food insecurity experienced before college and students' ability to cope with transitioning to college (Bruening et al., 2017). As the current study included only instrumental social support, future research is needed regarding the emotional or informational social support provided to college students, or the use of emotion-focused or meaning-based-coping strategies by college students to alleviate food insecurity. More research is needed about

the physical and mental health and academic outcomes associated with food insecurity among college students. The current study did not assess the effectiveness of campus interventions to alleviate food insecurity and only three studies exist that described a campus intervention in the U.S. Therefore, much more research is needed to assess what campus interventions and resources exist for college students and to what extent they are effectively preventing and alleviating food insecurity. As students also receive support from families and may be impacted by family food insecurity, both before they reach college and then again while enrolled in college, more research is needed to assess the effect on students of interventions aimed at helping families (Alaimo, 2013; McArthur, Fasczewski, et al. (2018)). This is also true at the community level; more research is needed to assess how students may benefit from interventions that help improve the food security of the whole community and interventions that increase community capacity building and a community's self-reliance and social capital (Alaimo, 2013; King, 2017). Importantly, much more research is needed that assesses food insecurity among college students over time and long-term, both during school but also after graduation, such as the impact of food insecurity on employment, income, and health (Bruening et al., 2017; Bruening et al., 2018). The current study did not include qualitative data from students and only three such studies among U.S. students exist. Therefore, additional qualitative research is needed to assess college students' perceptions about the impact of food insecurity and coping with food insecurity, and their suggestions for possible to interventions to alleviate student food insecurity (Bruening et al., 2017).

Conclusions

As there is limited research on food security among college students overall, this study adds to that body of work. While the proposed study did not fill all the gaps missing in the research regarding food insecurity among college students, it did address many of the early researchers' (Bruening et al., 2016; Bruening et al., 2017; Chaparro et al., 2009; Gaines et al., 2014; Hanna, 2014; Lin et al., 2013; Maroto et al., 2015; Morris et al. 2016; Patton-Lopez et al., 2014; Silva et al., 2017) recommendations for future research.

Students at a small rural HBCU experienced a high rate of food insecurity. Students used a

limited number of federal food assistance programs or community and university food programs to alleviate food insecurity; however they did utilize several coping skills to help alleviate the problem. Although food insecurity in this study did not impact academic outcomes, as seen in most other studies, food insecurity has the potential to hinder academic success among college students, which ultimately may affect universities through decreased student performance, decreased credit hours, and poor retention and graduation rates. Several interventions may be feasibly and successfully implemented at FVSU and on others campuses across the U.S., such as providing more information about federal, university, and community resources; providing financial management, food preparation skills, and coping strategies education; providing food aid, such as reduced priced campus dining meal plans, a campus dining meal sharing program, and a campus food pantry and garden; and providing more opportunities for student employment, scholarships, and grants.

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APPENDICES

APPENDIX A

FORT VALLEY STATE UNIVERSITY INSTITUTIONAL REVIEW BOARD APPROVAL



**Fort Valley State
University**

A State and Land-Grant University
University System of Georgia

Department of Veterinary Science

1005 State University Drive · Fort Valley, Georgia 31030-4313

22 Jan 2019

Fort Valley State University IRB #1
US-OHRP (DHHS) #: IRB00006368
FWA #: 00018566

Dear Professor Larson:

Having made all necessary modifications and having clarified for the Human Subjects Committee all concerns, your proposal submission designated HSC-S-19-01.Larson is complete. On behalf of the Human Subjects Committee, it is my pleasure to notify you that this proposal has received final acceptance from our IRB. An electronic copy, with required signatures, will be forwarded to your office for your records. If the project has not been completed by 27 April 2020, you must request renewed approval for continuation of this project. It has been a sincere pleasure for us to serve you. God's blessings on your study. If we may be of further assistance to you, please do not hesitate to ask.

A handwritten signature in blue ink, appearing to read "Clarence E. Riley, Jr.".

Clarence E. Riley, Jr., Ph.D.
Chair, Human Subjects Committee
Fort Valley State University
825-6898

APPENDIX B

GEORGIA SOUTHERN UNIVERSITY INSTITUTIONAL REVIEW BOARD APPROVAL

Georgia Southern University Office of Research Services & Sponsored Programs Institutional Review Board (IRB)		
Phone: 912-478-5465		Veazey Hall 3000
		PO Box 8005
Fax: 912-478-0719	IRB@GeorgiaSouthern.edu	Statesboro, GA 30460

To: Larson, Rebecca; Hansen, Andrew; Rochani, Haresh; Smallwood, Stacy

From: Office of Research Services and Sponsored Programs
Administrative Support Office for Research Oversight Committees (IACUC/IBC/IRB)

Approval Date: 2/21/2019

Subject: Institutional Review Board Exemption Determination - Limited Review

After a review of your proposed research project numbered H19322, titled "Food Insecurity Among College Students at a Historically Black College & University: Prevalence, Social Support & Coping Skills, and Academic Outcomes," it appears that your research involves activities that do not require full approval by the Institutional Review Board (IRB) according to federal guidelines.

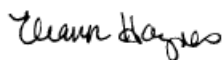
There is a human subjects incentive in this project in the amount of ten \$20 gift cards through a drawing. This project has been approved as an anonymous data collection. If University or sponsored funds are used to pay incentives please refer to the Human Subjects Incentive Policy and Human Subjects Incentive Disbursement and Reconciliation Form.

According to the Code of Federal Regulations Title 45 Part 46, your research protocol is determined to be exempt from full review under the following exemption category(s):

Exemption 2 Research involving only the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, if: Information obtained is recorded in such a manner that human participants cannot be identified, directly or through identifiers linked to them. Please visit our FAQ's for more information on anonymous survey platforms: Any disclosure of the human participant's responses outside the research could not reasonably place the participant at risk of criminal or civil liability or be damaging to the participant's financial standing, employ-ability or reputation; Survey or interview research does not involve children; The research project does not include any form of intervention.

Any alteration in the terms or conditions of your involvement may alter this approval. *Therefore, as authorized in the Federal Policy for the Protection of Human Subjects, I am pleased to notify you that your research, as submitted, is exempt from IRB approval. You will be asked to notify the IRB upon project completion. If you alter the project, it is your responsibility to notify the IRB and acquire a new determination of exemption.*

Sincerely,



Eleanor Haynes
Research Integrity Officer

APPENDIX C

RECRUITMENT EMAIL

First email

Dear Students,

I am an Assistant Professor of Food & Nutrition here at Fort Valley State University and a Public Health doctoral student at Georgia Southern University. I am conducting a survey regarding food insecurity on our campus. I would very much appreciate if you would participate in the survey! Your participation will play an important role in solving this issue on our campus. Below is a link to this short survey. Your responses will be anonymous.

By completing the survey, you have the chance to win one of ten \$20 gift cards.

The survey will be available March 17 through April 6, 11:59 pm. Thank you in advance for your participation!

*Note you must be at least 18 years of age and currently enrolled at Fort Valley State University to participate in this survey.

To start the survey, click on the link:

https://georgiasouthern.co1.qualtrics.com/jfe/form/SV_2iAiBD2sgoOjh41

Becky Larson, MS, RD
Assistant Professor of Food & Nutrition
Director of Food & Nutrition Didactic Program
Fort Valley State University
College of Agriculture, Family Sciences, and Technology
Department of Family & Consumer Sciences
1005 State University Drive
213 Myers Hall
478.822.1008
larsnr@fvsu.edu

Follow-up email

Dear Students,

This is a reminder about participating in a survey regarding food insecurity on campus and a chance to win a \$20 gift card. As an Assistant Professor of Food & Nutrition and a Public Health doctoral student at Georgia Southern University, I am conducting a survey regarding food insecurity on our campus. I would very much appreciate if you would participate in the survey. Your participation plays an important role in solving this issue on our campus. Below is a link to this short survey. Your responses will be anonymous.

By completing the survey, you have the chance to win one of ten \$20 gift cards.

The survey will be available until 11:59 PM on April 6. Thank you in advance for your participation!

*Note you must be at least 18 years of age and currently enrolled at Fort Valley State University to participate in this survey.

To start the survey, click on the link:

https://georgiasouthern.co1.qualtrics.com/jfe/form/SV_2iAiBD2sgoOjh41

Becky Larson, MS, RD
Assistant Professor of Food & Nutrition
Director of Food & Nutrition Didactic Program
Fort Valley State University
College of Agriculture, Family Sciences, and Technology
Department of Family & Consumer Sciences
1005 State University Drive
213 Myers Hall
478.822.1008
larsonr@fvsu.edu

Second and Third Round Recruitment

First email

Dear Students,

I am an Assistant Professor of Food & Nutrition here at Fort Valley State University and a Public Health doctoral student at Georgia Southern University. I am conducting a survey regarding food insecurity on our campus. I would very much appreciate if you would participate in the survey! Your participation will play an important role in solving this issue on our campus. Below is a link to this short survey. Your responses will be anonymous.

By completing the survey, you have the chance to win one of ten \$20 gift cards.

The survey will be available April 7 through April 27, 11:59 pm. Thank you in advance for your participation!

*Note you must be at least 18 years of age and currently enrolled at Fort Valley State University to participate in this survey.

To start the survey, click on the link:

https://georgiasouthern.co1.qualtrics.com/jfe/form/SV_2iAiBD2sgoOjh41

Becky Larson, MS, RD

Assistant Professor of Food & Nutrition
Director of Food & Nutrition Didactic Program
Fort Valley State University
College of Agriculture, Family Sciences, and Technology
Department of Family & Consumer Sciences
1005 State University Drive
213 Myers Hall
478.822.1008
larsnr@fvsu.edu

Follow-up email

Dear Students,

This is a reminder about participating in a survey regarding food insecurity on campus and a chance to win a \$20 gift card. As an Assistant Professor of Food & Nutrition and a Public Health doctoral student at Georgia Southern University, I am conducting a survey regarding food insecurity on our campus. I would very much appreciate if you would participate in the survey. Your participation plays an important role in solving this issue on our campus. Below is a link to this short survey. Your responses will be anonymous.

By completing the survey, you have the chance to win one of ten \$20 gift cards.

The survey will be available until 11:59 PM on April 27. Thank you in advance for your participation!

*Note you must be at least 18 years of age and currently enrolled at Fort Valley State University to participate in this survey.

To start the survey, click on the link:

https://georgiasouthern.co1.qualtrics.com/jfe/form/SV_2iAiBD2sgoOjh41

Becky Larson, MS, RD
Assistant Professor of Food & Nutrition
Director of Food & Nutrition Didactic Program
Fort Valley State University
College of Agriculture, Family Sciences, and Technology
Department of Family & Consumer Sciences
1005 State University Drive
213 Myers Hall
478.822.1008
larsnr@fvsu.edu

APPENDIX D

STUDENT SURVEY

Hello, you have been invited to participate in research to better understand students' experiences with food and food security. The survey will take approximately 20-30 minutes. At the end of the survey, you will have the opportunity to enter to win 1 of 10 \$20 gift card. By clicking the arrow button to continue to the survey, you consent to the terms provided in the e-mail and you understand the minimal risks associated with participating in the study. You must be 18 years or older to participate.

Q1 What is your age?

Under 18

18 or over, please specify your age: _____

Condition: Under 18 Is Selected. Skip To: End of Survey.

Q2 What is your gender?

Male

Female

Transgender

Prefer not to answer

Q3 What is your ethnicity?

Black or African American

Non-Hispanic White

Asian

Hispanic or Latino

American Indian or Alaskan Native

Native Hawaiian or Other Pacific Islander

Two or more races

Prefer not to answer

Q4 What is your marital status?

Single, never married

Married or domestic partnership

Widowed

Divorced

Separated

Prefer not to answer

Q5 How many children do you have?

Please specify the number of children you have: _____

Prefer not to answer

Q6 Which of the following best represents how you think of yourself?

Lesbian or gay

Straight, that is, not lesbian or gay

Bisexual

Something else

I don't know the answer

Prefer not to answer

Q7 Do you have a physical, mental, or emotional condition that causes serious difficulty with your daily activities (deaf or have serious difficulty hearing; blind or serious difficulty seeing even when wearing glasses; serious difficulty concentrating, remembering, or making decisions; serious difficulty walking or climbing stairs; difficulty dressing or bathing; have difficulty doing errands alone such as visiting a doctor's office or shopping)?

Yes

No

Prefer not to answer

Q8 Have you ever served on active duty in the United States Armed Forces, either in the regular military or in a National Guard or military reserve unit?

Yes

No

I don't know the answer

Prefer not to answer

These next questions are about the food eaten in your household in the last 12 months, since March of last year and whether you were able to afford the food you need.

Following are several statements that people have made about their food situation. For these statements, please tell us whether the statement was often true, sometimes true, or never true for (you/your household) in the last 12 months—that is, since last March.

Q9 The first statement is "(I/We) worried whether (my/our) food would run out before (I/we) got money to buy more." Was that often true, sometimes true, or never true for (you/your household) in the last 12 months?

Often True

Sometimes True

Never True

Don't know

Q10 "The food that (I/we) bought just didn't last, and (I/we) didn't have money to get more." Was that often, sometimes, or never true for (you/your household) in the last 12 months?

Often True

Sometimes True

Never True

Don't know

Q11 "(I/we) couldn't afford to eat balanced meals." Was that often, sometimes, or never true for (you/your household) in the last 12 months?

Often True

Sometimes True

Never True

Don't know

Q12 In the last 12 months, since last March, did (you/you or others in your household) ever cut the size of your meals or skip meals because there wasn't enough money for food?

Yes

No

Don't know

Condition: No or Do not know Is Selected. Skip To: In the last 12 months, did you ever e....

Q13 How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?

Almost every month

Some months but not every month

Only 1 or 2 months

Don't know

Q14 In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money for food?

Yes

No

Don't know

Q15 In the last 12 months, were you every hungry but didn't eat because there wasn't enough money for food?

Yes

No

Don't know

Q16 In the last 12 months, did you lose weight because there wasn't enough money for food?

Yes

No

Don't know

Q17 In the last 12 months, did (you/you or other adults in your household) ever not eat for a whole day because there wasn't enough money for food?

Yes

No

Don't know

Condition: No or Don't Know Is Selected. Skip To: End of Block

Q18 How often did this happen?

Almost every month

Some months but not every month

Only 1 or 2 months

This set of questions asks about your academic performance and status in school.

Q19 What is your Grade Point Average (GPA)?

Please specify your GPA: _____

Prefer not to answer

Q20 How would you rate your class attendance?

Excellent

Good

Fair

Poor

Prefer not to answer

Q21 How would you rate your attention span in class?

Excellent

Good

Fair

Poor

Prefer not to answer

Q22 How would you rate your understanding the concepts taught in class?

Excellent

Good

Fair

Poor

Prefer not to answer

Q23 How would you rate your progression towards graduating on time?

Excellent

Good

Fair

Poor

Prefer not to answer

Q24 What is your class year?

1st year

2nd year

3rd year

4th year

Graduate master's student

Prefer not to answer

Q25 What is your enrollment status?

Full time student

Part time student

Prefer not to answer

Q26 What is your student residency status?

In-state student

Out-of-state student

International student

Prefer not to answer

Q27 What is the highest level of education that your parent(s) have achieved?

High school or less

Some college

Professional certificate (one year or less)

Associate degree (two year)

Bachelor's degree (four year)

Graduate degree (e.g., master's, PhD)

Prefer not to answer

The next set of questions ask about your living and working arrangements.

Q28 Where do you live?

On campus dorm with roommates

On campus suite with kitchen with roommates

Off campus alone

Off campus with roommates

With parents or family

With foster parents

Temporary housing with friend or relative

Group home

Shelter

Homeless

Prefer not to answer

Q29 Are you enrolled in campus meal plan? If so, which describes your plan?

I am not enrolled in a campus meal plan

Wildcat Blue (2 meals per day and \$100 in Wildcat Cash per semester.)

Wildcat Silver, Gold, or Platinum (Unlimited access to the all-you-care-to-eat dining in the Food Service Center during operating hours, seven days a week and Wildcat Cash)

Commuter Meals: Any 75 Meals

Commuter Meals: Any 50 Meals

Commuter Meals: Any 25 Meals

Prefer not to answer

Q30 Do you have access to reliable transportation?

Yes

No

Prefer not to answer

Q31 How many people do you live with?

Please specify the number of people you live with: _____

Prefer not to answer

Q32 How many hours do you work per week?

Please specify the number of hours you work per week: _____

Prefer not to answer

The next set of questions ask about your resources.

Q33 What is your annual household income?

Less than \$5,000

\$5,000-\$14,999

\$15,000-\$24,999

\$25,000-\$49,999

\$50,000-\$74,999

\$75,000-\$99,999

\$100,000 or more

Prefer not to answer

Q34 What source(s) of financial aid do you receive? Choose all that apply.

- Student Loans
- Grants
- Scholarships
- No financial aid
- Prefer not to answer

Q35 Which of these assistance programs, if any, do you utilize? Choose all that apply.

- SNAP (food stamps)
- WIC (nutritional assistance for pregnant women and children)
- Free or reduced-price National School Lunch Program
- Free or reduced-price National School Breakfast Program
- Free or reduced-price Summer Food Service Program
- Free or reduced-price Child and Adult Daycare Food Program
- The Emergency Food Assistance Program
- None of these programs
- Prefer not to answer

Q36 Which of these community programs, if any, do you utilize? Choose all that apply.

- Church or community garden
- Church or community soup kitchen, food pantry, or food bank
- Church or community farmers market
- None of these programs
- Prefer not to answer

Q37 Which of these university programs, if any, do you utilize? Choose all that apply.

- Campus garden
- Campus food pantry
- Campus retail store
- None of these programs
- Prefer not to answer

Q38 Do your parents/guardians or other relatives provide you financial support for college?

- Yes
- No
- Prefer not to answer

Q39 Do your parents/guardians or other relatives typically purchase or send food for you?

- Yes
- No
- Prefer not to answer

Q40 Do your friends/peers typically purchase or send food for you?

- Yes
- No
- Prefer not to answer

Which best describes your confidence in completing each of the tasks listed?

Q41 I can cook a nutritious meal.

- Extremely confident
- Very confident
- Moderately confident
- Not very confident
- Not at all confident
- Prefer not to answer

Q42 I can cook a nutritious meal without spending a lot of money.

- Extremely confident
- Very confident
- Moderately confident
- Not very confident
- Not at all confident
- Prefer not to answer

Rate your food skills or resources.

Q43 Cooking skills

- Very adequate
- Adequate
- Inadequate
- Very inadequate
- Prefer not to answer

Q44 Money to buy food

- Very adequate
- Adequate
- Inadequate
- Very inadequate
- Prefer not to answer

Q45 Appliances for food preparation

- Very adequate
- Adequate
- Inadequate
- Very inadequate
- Prefer not to answer

Q46 Food selection in local stores

- Very adequate
- Adequate
- Inadequate
- Very inadequate
- Prefer not to answer

This last set of questions asks about food related strategies used in the last 12 months.

Q47 How often did you share food purchasing and preparation responsibilities with others?

Often

Sometimes

Never

Prefer not to answer

Q48 How often did you stretch meals to make them last longer?

Often

Sometimes

Never

Prefer not to answer

Q49 How often did you use coupons to purchase food?

Often

Sometimes

Never

Prefer not to answer

Q50 How often did you borrow money from family or friends to purchase food?

Often

Sometimes

Never

Prefer not to answer

Q51 How often did you attend functions with free food or where you “pay when you can”?

Often

Sometimes

Never

Prefer not to answer

Q52 How often did you visit family on weekends to bring back food to school?

Often

Sometimes

Never

Prefer not to answer

Q53 How often did you eat more than normal when food was plentiful?

Often

Sometimes

Never

Prefer not to answer

Q54 How often did you take food home from on-campus dining hall?

Often

Sometimes

Never

Prefer not to answer

Q55 How often did you purchase less expensive processed food?

Often

Sometimes

Never

Prefer not to answer

Q56 How often did you eat less healthy meals to eat more food?

Often

Sometimes

Never

Prefer not to answer

Q57 How often did you obtain food from a dumpster or trash?

Often

Sometimes

Never

Prefer not to answer

Q58 How often did you barter services/items to buy food?

Often

Sometimes

Never

Prefer not to answer

Q59 How often did you sell textbooks, personal possessions, blood/plasma, or sperm/eggs to obtain food?

Often

Sometimes

Never

Prefer not to answer

Thank you for taking the time to complete this survey!

To enter the drawing for a chance to win 1 of 10 \$20 gift cards, go to:

https://georgiasouthern.co1.qualtrics.com/jfe/form/SV_c1aKSK18kbddNZP

Incentive Survey

Q1 Thank you for taking the time to complete the food security survey:

To enter the drawing for a chance to win 1 of 10 \$20 gift cards, please enter your Wildcat email address: _____

APPENDIX E

INFORMED CONSENT FORM

Dear Fort Valley State University student and prospective research participant:

I am Becky Larson, MS, RD, Assistant Professor of Food & Nutrition in the Department of Family & Consumer Sciences and the College of Agriculture, Family Sciences and Technology; I am also a Public Health doctoral student at Georgia Southern University. I am asking for your cooperation with a research project which will investigate food security/insecurity among students at Fort Valley State University.

The purpose of this research will be to determine answers to the following questions:

- 1) What is the prevalence of food insecurity among students at Fort Valley State University?
 - a. How does the prevalence of food insecurity among FVSU students compare with the prevalence of food insecurity among students across the nation?
- 2) What factors are associated with food insecurity among FVSU students?
 - a. How do these factors among FVSU students compare with those among students across the nation?
- 3) How does food insecurity impact education outcomes of FVSU students?
 - a. How do education outcomes related to food insecurity among FVSU students compare with education outcomes among students across the nation?
- 4) How does social support and coping skills influence the relationship between food insecurity and education outcomes?

Your participation in this study would involve completing an online survey, which is estimated to take approximately 15 minutes.

Risks to you as a study participant will be minimal as no or only slight discomfort is expected from answering personal questions, such as questions regarding military status, sexual orientation, disability, living arrangements, income, race/ethnicity, use of assistance services, etc. However, please note that all survey responses will be anonymous. Contact Student Health and Counseling Services at (478) 822-1035 if you wish to talk with someone about any concerns.

With your participation in this research survey, you will benefit from a better understanding of how food insecurity affects Fort Valley students. Your participation will provide information that may be used to better serve students who may be food-insecure. This information will provide societal benefits, such as identifying barriers college students face to cope with food insecurity.

As a student research participant, you will have the opportunity to enter a drawing to win a \$20 gift card upon submission of your online survey.

All responses will be completely anonymous--the research team will be unable to connect your individual responses to you in any way. You will not be identified by name within this data set, nor any reports that detail information obtained from this study. Your confidentiality as a participant in this study will remain secure. If you wish to participate in the drawing for the incentive, the \$20 gift card, you will be directed to a second survey to enter your email address. This email address will not be attached your original survey responses in any way. Email addresses will only be used to notify winners of the incentive drawing. Your email will be deleted within a month after the incentives have been

distributed to the winning students.

Anonymous data from this study may be placed in a publicly available repository for study validation and further research. You will not be identified by name in the data set or any reports using information obtained from this study, and your confidentiality as a participant in this study will remain secure. Subsequent uses of records and data will be subject to standard data use policies which protect the anonymity of individuals and institutions.

Participants maintain the right to ask questions pertaining to the research, and to have those questions answered. If you would like to inquire about this study, please contact Becky Larson, whose contact information is included at the conclusion of this informed consent form. For questions concerning your rights as a research participant, contact information for the Provost and the Human Subjects Committee Chair is listed below.

Your decision to participate in this study is completely voluntary. You are not required to participate. You may elect to not answer specific questions within the survey and you may end your participation at any time by not submitting the electronic survey, without penalty or retribution. Upon withdrawal, you will no longer be eligible to enter the drawing for the \$20 gift card. Completion of the survey implies that you agree to participate and that your data may be used in this research study.

You must be 18 years of age or older to consent to participate in this research study at the time you submit this survey.

This project has been reviewed and approved by the FVSU Institutional Review Board under tracking number [IRB0006368](#) and by the Georgia Southern Institutional Review Board under the tracking number [H19322](#). You are being given a copy of this consent form to keep for your records. If you consent to participate and to the terms above, click on the link provided to start the survey.

Title of Project: Prevalence and implications of food insecurity among students at an Historically Black College & University

Principal Investigator: Rebecca Larson, MS, RD, Assistant Professor of Food & Nutrition
Department of Family & Consumer Sciences, College of Agriculture, Family Sciences and Technology, 1005 State University Dr, 213 Myers Hall, Fort Valley, GA 31030, 478.825.1008, larsonr@fvsu.edu
Faculty Advisor: Andrew Hansen, Georgia Southern University, 2033 Hendricks Hall, Georgia Southern University, Statesboro, GA, 30460, 912.478.0261, ahansen@georgiasouthern.edu

Research involving Human Subjects at the Fort Valley State University is carried out under the oversight of the Institutional Human Subjects Committee. The Human Subjects Committee reports to the Provost and Vice President for Academic Affairs.

Contact information are as follows:

Dr. T. Ramon Stuart (Provost and Vice President for Academic Affairs)

Phone: (478) 825-6330; E-mail: stuartt@fvsu.edu

Dr. Clarence E. Riley, Jr. (Chair, Human Subjects Committee)

Phone: (478) 825-6898; E-mail: rileyc@fvsu.edu

Fort Valley State University is accredited by the Commission on Colleges of the Southern Association of Colleges and Schools to award baccalaureate, masters and educational specialist degrees. Contact the Commission on Colleges at 1866 Southern Lane, Decatur, Georgia 30033-4097 or call 404-679-4500 for questions about the accreditation of Fort Valley State University.

Fort Valley State University is an affirmative action, equal opportunity institution and does not discriminate against applicants, students, or employees on the basis of race gender, ethnicity, national origin, sexual orientation, religion, age, disability, marital or veteran status.

Georgia Southern University
Institutional Review Board
Phone: (912) 478-2359

APPENDIX F

U.S. ADULT FOOD SECURITY SURVEY MODULE: THREE-STAGE DESIGN, WITH
SCREENERS**Economic Research Service, USDA****September 2012**

Revision Notes: The food security questions in the U.S. Adult Food Security Survey Module are essentially unchanged from those in the original module first implemented in 1995.

September 2012:

- Corrected skip specifications in AD5
- Added coding specifications for “How many days” for 30-day version of AD1a and AD5a.

July 2008:

- Wording of resource constraint in AD2 was corrected to, “...because there wasn’t enough money for food” to be consistent with the intention of the September 2006 revision.

September 2006:

- Minor changes were introduced to standardize wording of the resource constraint in most questions to read, “...because there wasn't enough money for food.”
- Question numbers were changed to be consistent with those in the revised Household Food Security Survey Module.
- User notes following the questionnaire were revised to be consistent with current practice and with new labels for ranges of food security and food insecurity introduced by USDA in 2006.

Overview: The U.S. Adult Food Security Survey Module is the same set of questions that is administered as the U.S. Household Food Security Survey Module to households with no child present. For many measurement purposes, the adult module can be used both for households with and without children present.

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- Advantages (compared with the 18-item household module):
 - Less respondent burden.
 - Improves comparability of food security statistics between households with and without children and among households with children in different age ranges.
 - Avoids asking questions about children’s food security, which can be sensitive in some survey contexts.
- Limitations:
 - Does not provide specific information on food security of children.

Transition Into Module (administered to all households):

These next questions are about the food eaten in your household in the last 12 months, since (current month) of last year and whether you were able to afford the food you need.

Optional USDA Food Sufficiency Question/Screeners: Question HH1 (This question is optional. It is not used to calculate the Adult Food Security Scale. It may be used in conjunction with income as a preliminary screener to reduce respondent burden for high income households).

HH1. [IF ONE PERSON IN HOUSEHOLD, USE "I" IN PARENTHETICALS, OTHERWISE, USE "WE."]

Which of these statements best describes the food eaten in your household in the last 12 months: — enough of the kinds of food (I/we) want to eat; —enough, but not always the kinds of food (I/we) want; —sometimes not enough to eat; or, —often not enough to eat?

- [1] Enough of the kinds of food we want to eat
- [2] Enough but not always the kinds of food we want
- [3] Sometimes not enough to eat
- [4] Often not enough to eat
- [] DK or Refused

Household Stage 1: Questions HH2-HH4 (asked of all households; begin scale items).

[IF SINGLE ADULT IN HOUSEHOLD, USE "I," "MY," AND "YOU" IN PARENTHETICALS; OTHERWISE, USE "WE," "OUR," AND "YOUR HOUSEHOLD."]

HH2. Now I'm going to read you several statements that people have made about their food situation. For these statements, please tell me whether the statement was often true, sometimes true, or never true for (you/your household) in the last 12 months—that is, since last (name of current month).

The first statement is "(I/We) worried whether (my/our) food would run out before (I/we) got money to buy more." Was that often true, sometimes true, or never true for (you/your household) in the last 12 months?

- [] Often true
- [] Sometimes true
- [] Never true
- [] DK or Refused

HH3. "The food that (I/we) bought just didn't last, and (I/we) didn't have money to get more." Was that often, sometimes, or never true for (you/your household) in the last 12 months?

- [] Often true
- [] Sometimes true
- [] Never true
- [] DK or Refused

HH4. "(I/we) couldn't afford to eat balanced meals." Was that often, sometimes, or never true for (you/your household) in the last 12 months?

- Often true
- Sometimes true
- Never true
- DK or Refused

Screener for Stage 2 Adult-Referenced Questions: If affirmative response (i.e., "often true" or "sometimes true") to one or more of Questions HH2-HH4, OR, response [3] or [4] to question HH1 (if administered), then continue to *Adult Stage 2*; otherwise skip to *End of Adult Food Security Module*.

NOTE: In a sample similar to that of the general U.S. population, about 20 percent of households (45 percent of households with incomes less than 185 percent of poverty line) will pass this screen and continue to Adult Stage 2.

Adult Stage 2: Questions AD1-AD4 (asked of households passing the screener for Stage 2 adult-referenced questions).

AD1. In the last 12 months, since last (name of current month), did (you/you or other adults in your household) ever cut the size of your meals or skip meals because there wasn't enough money for food?

Yes

No (Skip AD1a)

DK (Skip AD1a)

AD1a. [IF YES ABOVE, ASK] How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?

Almost every month

Some months but not every month

Only 1 or 2 months

DK

AD2. In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money for food?

Yes

No

DK

AD3. In the last 12 months, were you every hungry but didn't eat because there wasn't enough money for food?

Yes

No

DK

AD4. In the last 12 months, did you lose weight because there wasn't enough money for food?

Yes

No

DK

Screener for Stage 3 Adult-Referenced Questions: If affirmative response to one or more of questions AD1 through AD4, then continue to *Adult Stage 3*; otherwise, skip to *End of Adult Food Security Module*.

NOTE: In a sample similar to that of the general U.S. population, about 8 percent of households (20 percent of households with incomes less than 185 percent of poverty line) will pass this screen and continue to Adult Stage 3.

Adult Stage 3: Questions AD5-AD5a (asked of households passing screener for Stage 3 adult-referenced questions).

AD5. In the last 12 months, did (you/you or other adults in your household) ever not eat for a whole day because there wasn't enough money for food?

Yes

No (Skip AD5a)

DK (Skip AD5a)

AD5a. [IF YES ABOVE, ASK] How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?

Almost every month

Some months but not every month

Only 1 or 2 months

DK

END OF ADULT FOOD SECURITY MODULE

User Notes

(1) Coding Responses and Assessing Household Adult Food Security Status:

Following is a brief overview of how to code responses and assess household food security status based on the Adult Food Security Scale. For detailed information on these procedures, refer to the *Guide to Measuring Household Food Security, Revised 2000*, available through the ERS Food Security in the United States Briefing Room.

Responses of “yes,” “often,” “sometimes,” “almost every month,” and “some months but not every month” are coded as affirmative. The sum of affirmative responses to the 10 questions in the Adult Food Security Scale is the household’s raw score on the scale.

Food security status is assigned as follows:

- Raw score zero—High food security among adults
- Raw score 1-2—Marginal food security among adults
- Raw score 3-5—Low food security among adults
- Raw score 6-10—Very low food security among adults

For some reporting purposes, the food security status of the first two categories in combination is described as food secure and the latter two as food insecure.

(2) Response Options: For interviewer-administered surveys, DK (“don’t know”) and “Refused” are blind responses—that is, they are not presented as response options but marked if volunteered. For self-administered surveys, “don’t know” is presented as a response option.

(3) Screening: The two levels of screening for adult-referenced questions are provided for surveys in which it is considered important to reduce respondent burden. In pilot surveys intended to validate the module in a new cultural, linguistic, or survey context, screening should be avoided if possible and all questions should be administered to all respondents.

To further reduce burden for higher income respondents, a preliminary screener may be constructed using question HH1 along with a household income measure. Households with income above twice the poverty threshold AND who respond <1> to question HH1 may be skipped to the end of the module and classified as food secure. Using this preliminary screener reduces total burden in a survey with many higher income households, and the cost, in terms of accuracy in identifying food-insecure households, is not great.

However, research has shown that a small proportion of the higher income households screened out by this procedure will register food insecurity if administered the full module. If question HH1 is not needed for research purposes, a preferred strategy is to omit HH1 and administer Adult Stage 1 of the module to all households.

(4) 30-Day Reference Period: The questionnaire items may be modified to a 30-day reference period by changing the “last 12-month” references to “last 30 days.” In this case, items AD1a and AD5a must be changed to read as follows:

AD1a/AD5a. [IF YES ABOVE, ASK] In the last 30 days, how many days did this happen?

_____ days

DK

Responses of 3 days or more are coded as “affirmative” responses.

APPENDIX G

FREQUENCIES OF STUDENT CHARACTERISTIC BY FOOD SECURITY STATUS

Student Characteristic	Food Secure n (%) by Response	Food Insecure n (%) by Response	Total n (%) by Response
Age			
18	11 (57.9)	8 (42.1)	19 (9.4)
19 - 20	47 (49.5)	48 (50.5)	95 (46.8)
21 - 22	27 (56.3)	21 (43.8)	48 (23.6)
23 - 24	4 (28.6)	10 (71.4)	14 (6.9)
25 and older	15 (55.6)	12 (44.4)	27 (13.3)
Mean			21.95 (SD 6.007)
Missing (n = 23, 10.2%)			
Gender			
Female	90 (52.0)	83 (48.0)	173 (76.9)
Male	28 (53.8)	24 (46.2)	52 (23.1)
Missing (n = 1, 0.4%)			
Ethnicity			
Non-Hispanic White	2 (50.0)	2 (50.0)	4 (1.8)
Black or African American	110 (52.9)	98 (47.1)	208 (93.3)
Other ethnicities	5 (45.5)	6 (54.5)	11 (4.9)
Missing (n = 3, 1.3%)			
Marital Status			
Married or domestic partnership	5 (55.6)	4 (44.4)	9 (4.0)
Single, never married	111 (53.4)	97 (46.6)	208 (93.3)
Other	2 (33.3)	4 (66.7)	6 (2.7)
Missing (n = 3, 1.3%)			
Number of Children			
0	102 (53.4)	89 (46.6)	191 (90.5)
1	4 (40.0)	6 (60.0)	10 (4.7)
2 - 6	5 (50.0)	5 (50.0)	10 (4.7)
Mean			0.20 (SD 0.780)
Missing (n = 15, 6.6%)			
Sexual Orientation			
Straight, that is, not lesbian or gay	103 (54.2)	87 (45.8)	190 (85.6)
Lesbian or gay	5 (31.3)	11 (68.8)	16 (7.2)
Other	8 (50.0)	8 (50.0)	16 (7.2)
Missing (n = 4, 1.8%)			
Disability			
No	112 (52.3)	102 (47.7)	214 (96.4)
Yes	4 (50.0)	4 (50.0)	8 (3.6)
Missing (n = 4, 1.8%)			
Military Service			
No	115 (52.5)	104 (47.5)	219 (97.3)
Yes	4 (66.7)	2 (33.3)	6 (2.7)
Missing (n = 1, 0.4%)			

FREQUENCIES OF STUDENT CHARACTERISTIC BY FOOD SECURITY STATUS

Student Characteristic	Food Secure n (%) by Response	Food Insecure n (%) by Response	Total n (%) by Response
Hours Worked per Week			
0	37 (43.0)	49 (57.0)	86 (47.8)
1 - 9	6 (100.0)	0 (0.0)	6 (3.3)
10 - 19	21 (60.0)	14 (40.0)	35 (19.4)
20 - 29	14 (51.9)	13 (48.1)	27 (15.0)
30 - 39	6 (50.0)	6 (50.0)	12 (6.7)
40	8 (57.1)	6 (42.9)	14 (7.8)
Mean			11.46 (SD 13.430)
Missing (n = 46, 20.3%)			
Number of People Living With			
0	2 (33.3)	4 (66.7)	6 (2.9)
1 - 2	38 (52.1)	35 (47.9)	73 (35.6)
3 - 4	64 (52.9)	57 (47.1)	121 (59.0)
5 - 6	4 (80.0)	1 (20.0)	5 (2.4)
Mean			2.560 (SD 1.143)
Missing (n = 21, 9.3%)			
Class Year			
1 st year	33 (62.3)	20 (37.7)	53 (24.1)
2 nd year	31 (50.0)	31 (50.0)	62 (28.2)
3 rd year	23 (46.9)	26 (53.1)	49 (22.3)
4 th year	19 (44.2)	24 (55.8)	43 (19.5)
Graduate master's student	9 (69.2)	4 (30.8)	13 (5.9)
Missing (n = 6, 2.7%)			
Enrollment Status			
Full time student	115 (53.2)	101 (46.8)	216 (96.9)
Part time student	2 (28.6)	5 (71.4)	7 (3.1)
Missing (n = 3, 1.3%)			
Residency Status			
In-state student	105 (51.2)	100 (48.8)	205 (93.2)
Out-of-state student	8 (57.1)	6 (42.9)	14 (6.4)
International student	1 (100.0)	0 (0.0)	1 (0.5)
Missing (n = 6, 2.7%)			
Parental Level of Education			
Graduate degree (e.g. master's, PhD)	21 (65.6)	11 (34.4)	32 (15.1)
Bachelor's degree (four year)	19 (48.7)	20 (51.3)	39 (18.4)
Some college	52 (54.7)	43 (45.3)	95 (44.8)
High school or less	17 (37.0)	29 (63.0)	46 (21.7)
Missing (n = 14, 6.2%)			

FREQUENCIES OF STUDENT CHARACTERISTIC BY FOOD SECURITY STATUS

Student Characteristic	Food Secure n (%) by Response	Food Insecure n (%) by Response	Total n (%) by Response
Annual Household Income			
\$50,000 or more	18 (75.0)	6 (25.0)	24 (14.9)
\$25,000 - \$49,999	16 (48.5)	17 (51.5)	33 (20.5)
\$15,000 - \$24,999	9 (37.5)	15 (62.5)	24 (14.9)
\$5,000 - \$14,999	14 (46.7)	16 (53.3)	30 (18.6)
Less than \$5,000	19 (38.0)	31 (62.0)	50 (31.1)
Missing (n = 65, 28.8%)			
Living Arrangements			
On campus suite with kitchen with roommates	19 (48.7)	20 (51.3)	39 (17.8)
On campus dorm with roommates	64 (61.5)	40 (38.5)	104 (47.5)
Off campus alone	6 (33.3)	12 (66.7)	18 (8.2)
Off campus with roommates	14 (37.8)	23 (62.2)	37 (16.9)
With parents or family	11 (55.0)	9 (45.0)	20 (9.1)
Temporary housing with friend or relative	0 (0.0)	1 (100.0)	1 (0.5)
Missing (n = 7, 3.1%)			
Campus Meal Plan			
Campus meal plan (unlimited access + cash)	60 (67.4)	29 (32.6)	89 (40.8)
Campus meal plan (2 meals/day + cash)	23 (42.6)	31 (57.4)	54 (24.8)
Commuter meals: 25 - 75	4 (57.1)	3 (42.9)	7 (3.2)
Not enrolled in a campus meal plan	28 (41.2)	40 (58.8)	68 (31.2)
Missing (n = 8, 3.5%)			
Access to Reliable Transportation			
Yes	87 (56.5)	67 (43.5)	154 (70.6)
No	27 (42.2)	37 (57.8)	64 (29.4)
Missing (n = 8, 3.5%)			
Self-efficacy to Cook a Nutritious Meal			
Extremely confident (5 pts)	41 (56.2)	32 (43.8)	73 (33.8)
Very confident (4 pts)	26 (55.3)	21 (44.7)	47 (21.8)
Moderately confident (3 pts)	30 (47.6)	33 (52.4)	63 (29.2)
Not very confident (2 pts)	11 (50.0)	11 (50.0)	22 (10.2)
Not at all confident (1 pt)	6 (54.5)	5 (45.5)	11 (5.1)
Mean			3.690 (SD 1.186)
Missing (n = 10, 4.4%)			

FREQUENCIES OF STUDENT CHARACTERISTIC BY FOOD SECURITY STATUS

Student Characteristic	Food Secure n (%) by Response	Food Insecure n (%) by Response	Total n (%) by Response
Self-efficacy to Cook a Nutritious Meal Without Spending a Lot of Money			
Extremely confident (5 pts)	27 (52.9)	24 (47.1)	51 (23.7)
Very confident (4 pts)	22 (48.9)	23 (51.1)	45 (20.9)
Moderately confident (3 pts)	35 (55.6)	28 (44.4)	63 (29.3)
Not very confident (2 pts)	16 (50.0)	16 (50.0)	32 (14.9)
Not at all confident (1 pt)	13 (54.2)	11 (45.8)	24 (11.2)
Mean			3.312 (SD 1.290)
Missing (n = 11, 4.9%)			
Cooking Self-efficacy Score			
Mean (range 2 – 10)			6.954 (SD 2.323)
Missing (n = 9, 4.0%)			
Adequacy of Cooking Skills			
Very adequate (4 pts)	38 (53.5)	33 (46.5)	71 (33.0)
Adequate (3 pts)	62 (51.2)	59 (48.8)	121 (56.3)
Inadequate (2 pts)	10 (52.6)	9 (47.4)	19 (8.8)
Very inadequate (1 pt)	3 (75.0)	1 (25.0)	4 (1.9)
Mean			3.205 (SD 0.673)
Missing (n = 11, 4.9%)			
Adequacy of Money to Buy Food			
Very adequate (4 pts)	16 (80.0)	4 (20.0)	20 (9.4)
Adequate (3 pts)	75 (63.0)	44 (37.0)	119 (56.1)
Inadequate (2 pts)	15 (26.3)	42 (73.7)	57 (26.9)
Very inadequate (1 pt)	4 (25.0)	12 (75.0)	16 (7.5)
Mean			2.675 (SD 0.750)
Missing (n = 14, 6.2%)			
Adequacy of Appliances for Food Preparation			
Very adequate (4 pts)	28 (57.1)	21 (42.9)	49 (22.8)
Adequate (3 pts)	53 (48.6)	56 (51.4)	109 (50.7)
Inadequate (2 pts)	23 (59.0)	16 (41.0)	39 (18.1)
Very inadequate (1 pt)	8 (44.4)	10 (55.6)	18 (8.4)
Mean			2.879 (SD 0.856)
Missing (n = 11, 4.9%)			
Adequacy of Food Selection in Stores			
Very adequate (4 pts)	26 (72.2)	10 (27.8)	36 (16.9)
Adequate (3 pts)	70 (51.1)	67 (48.9)	137 (64.3)
Inadequate (2 pts)	11 (35.5)	20 (64.5)	31 (14.6)
Very inadequate (1 pt)	5 (55.6)	4 (44.4)	9 (4.2)
Mean			2.939 (SD 0.694)
Missing (n = 13, 5.8%)			

FREQUENCIES OF STUDENT CHARACTERISTIC BY FOOD SECURITY STATUS

Student Characteristic	Food Secure n (%) by Response	Food Insecure n (%) by Response	Total n (%) by Response
Food Skills & Resources Score			
Mean (range 4 – 16)			11.525 (SD 2.194)
Missing (n = 9, 4.0%)			
Financial Aid Utilized			
Student loans	93 (49.2)	96 (50.8)	189 (83.6)
Grants	51 (45.5)	61 (54.5)	112 (49.6)
Scholarships	58 (58.0)	42 (42.0)	100 (44.2)
No financial aid	6 (60.0)	4 (40.0)	10 (4.4)
Missing (n = 8, 3.5%)			
Financial Aid Score			
Mean (range 0 – 3)			1.956 (SD 0.762)
Missing (n = 8, 3.5%)			
Federal Food Assistance Programs Utilized			
SNAP (food stamps)	11 (47.8)	12 (52.2)	23 (10.2)
WIC (nutritional assistance for pregnant women and children)	1 (20.0)	4 (80.0)	5 (2.2)
Free or reduced-priced National School Lunch Program	5 (55.6)	4 (44.4)	9 (4.0)
Free or reduced-priced National School Breakfast Program	3 (60.0)	2 (40.0)	5 (2.2)
Free or reduced-priced Summer Foodservice Program	1 (100.0)	0 (0.0)	1 (0.4)
Free or reduced-priced Child and Adult Daycare Program	1 (100.0)	0 (0.0)	1 (0.4)
The Emergency Food Assistance Program	0 (0.0)	1 (100.0)	1 (0.4)
None of these programs	91 (55.2)	74 (44.8)	165 (73.0)
Missing (n = 19, 8.4%)			
Federal Food Assistance Programs Score			
Mean (range 0 – 7)			1.552 (SD 1.121)
Missing (n = 19, 8.4%)			
Community Food Programs Utilized			
Church or community garden	4 (44.4)	5 (55.6)	9 (4.0)
Church or community soup kitchen, food pantry, or food bank	6 (46.2)	7 (53.8)	13 (5.8)
Church or community farmers market	2 (40.0)	3 (60.0)	5 (2.2)
None of these programs	91 (52.3)	83 (47.7)	174 (77.0)
Missing (n = 18, 8.0%)			
University Food Programs Utilized			
Campus garden	0 (0.0)	1 (100.0)	1 (0.4)
Campus food pantry	4 (66.7)	2 (33.3)	6 (2.7)
Campus retail store	13 (56.5)	10 (43.5)	23 (10.2)
None of these programs	91 (51.4)	86 (48.6)	177 (78.3)
Missing (n = 11, 4.9%)			

FREQUENCIES OF STUDENT CHARACTERISTIC BY FOOD SECURITY STATUS

Student Characteristic	Food Secure n (%) by Response	Food Insecure n (%) by Response	Total n (%) by Response
Community & University Programs Score			
Mean (range 0 – 6)			1.188 (SD 0.394)
Missing (n = 11, 4.9%)			
Parents/Guardians or Relatives Provide Financial Support for College			
Yes	75 (57.3)	56 (42.7)	131 (63.6)
No	30 (40.0)	45 (60.0)	75 (36.4)
Missing (n = 20, 8.8%)			
Parents/Guardians or Relatives Purchase or Send Food			
Yes	77 (60.6)	50 (39.4)	127 (61.1)
No	31 (38.3)	50 (61.7)	81 (38.9)
Missing (n = 18, 8.0%)			
Family Support Score			
Mean (range 0 – 2)			1.633 (SD 0.484)
Missing (n = 18, 8.0%)			
Friends/Peers Purchase or Send Food			
Yes	28 (45.2)	34 (54.8)	62 (29.4)
No	81 (54.4)	68 (45.6)	149 (70.6)
Missing (n = 15, 6.6%)			
Friend Support Score			
Mean (range 0 – 1)			0.294 (SD 0.457)
Missing (n = 11, 4.9%)			
Family & Friend Support Score			
Mean (range 0 – 3)			1.981 (SD 0.740)
Missing (n = 11, 4.9%)			
Social Support Score			
Mean			4.2342 (SD 1.464)
Missing (n = 9, 4.0%)			
Frequency of Sharing Food Purchasing and Preparation Responsibilities with Others			
Often (3 pts)	28 (46.7)	32 (53.3)	60 (28.7)
Sometimes (2 pts)	46 (48.4)	49 (51.6)	95 (45.5)
Never (1 pt)	36 (66.7)	18 (33.3)	54 (25.8)
Mean			2.029 (SD 0.740)
Missing (n = 17, 7.5%)			
Frequency of Stretching Meals to Make them Last Longer			
Often (3 pts)	33 (35.1)	61 (64.9)	94 (44.3)
Sometimes (2 pts)	53 (57.6)	39 (42.4)	92 (43.4)
Never (1 pt)	25 (96.2)	1 (3.8)	26 (12.3)
Mean			2.321 (SD 0.682)
Missing (n = 14, 6.2%)			
Frequency of Using Coupons to Purchase Food			
Often (3 pts)	15 (34.1)	29 (65.9)	44 (20.6)
Sometimes (2 pts)	45 (52.3)	41 (47.7)	86 (40.2)
Never (1 pt)	53 (63.1)	31 (36.9)	84 (39.3)
Mean			1.813 (SD 0.752)
Missing (n = 12, 5.3%)			

FREQUENCIES OF STUDENT CHARACTERISTIC BY FOOD SECURITY STATUS

Student Characteristic	Food Secure n (%) by Response	Food Insecure n (%) by Response	Total n (%) by Response
Frequency of Borrowing Money from Family and Friends to Purchase Food			
Often (3 pts)	22 (33.8)	43 (66.2)	65 (31.0)
Sometimes (2 pts)	51 (57.3)	38 (42.7)	89 (42.4)
Never (1 pt)	38 (67.9)	18 (32.1)	56 (26.7)
Mean			2.043 (SD 0.760)
Missing (n = 16, 7.1%)			
Frequency of Attending Functions with Free Food or Where You “Pay When You Can”			
Often (3 pts)	10 (24.4)	31 (75.6)	41 (19.4)
Sometimes (2 pts)	46 (55.4)	37 (44.6)	83 (39.3)
Never (1 pt)	55 (63.2)	32 (36.8)	87 (41.2)
Mean			1.782 (SD 0.750)
Missing (n = 15, 6.6%)			
Frequency of Visiting Family on Weekends to Bring Back Food to School			
Often (3 pts)	24 (54.5)	20 (45.5)	44 (21.2)
Sometimes (2 pts)	44 (51.2)	42 (48.8)	86 (41.3)
Never (1 pt)	41 (52.6)	37 (47.4)	78 (37.5)
Mean			1.837 (SD 0.750)
Missing (n = 18, 8.0%)			
Frequency of Eating More than Normal when Food was Plentiful			
Often (3 pts)	23 (44.2)	29 (55.8)	52 (25.2)
Sometimes (2 pts)	41 (47.7)	45 (52.3)	86 (41.7)
Never (1 pt)	43 (63.2)	25 (36.8)	68 (33.0)
Mean			1.922 (SD 0.761)
Missing (n = 20, 8.8%)			
Frequency of Taking Food Home from On-Campus Dining Hall			
Often (3 pts)	10 (31.3)	22 (68.8)	32 (15.3)
Sometimes (2 pts)	27 (49.1)	28 (50.9)	55 (26.3)
Never (1 pt)	73 (59.8)	49 (40.2)	122 (58.4)
Mean			1.569 (SD 0.744)
Missing (n = 17, 7.5%)			
Frequency of Purchasing Less Expensive Processed Food			
Often (3 pts)	28 (35.0)	52 (65.0)	80 (38.5)
Sometimes (2 pts)	54 (58.1)	39 (41.9)	93 (44.7)
Never (1 pt)	26 (74.3)	9 (25.7)	35 (16.8)
Mean			2.216 (SD 0.713)
Missing (n = 18, 8.0%)			
Frequency of Eating Less Healthy Meals to Eat More Food			
Often (3 pts)	25 (33.8)	49 (66.2)	74 (35.2)
Sometimes (2 pts)	52 (56.5)	40 (43.5)	92 (43.8)
Never (1 pt)	32 (72.7)	12 (27.3)	44 (21.0)
Mean			2.143 (SD 0.738)
Missing (n = 16, 7.1%)			

FREQUENCIES OF STUDENT CHARACTERISTIC BY FOOD SECURITY STATUS

Student Characteristic	Food Secure n (%) by Response	Food Insecure n (%) by Response	Total n (%) by Response
Frequency of Obtaining Food from a Dumpster or Trash			
Often (3 pts)	1 (16.7)	5 (83.3)	6 (2.9)
Sometimes (2 pts)	1 (16.7)	5 (83.3)	6 (2.9)
Never (1 pt)	107 (54.0)	91 (46.0)	198 (94.3)
Mean			1.086 (SD 0.369)
Missing (n = 16, 7.1%)			
Frequency of Bartering Services/Items to Buy Food			
Often (3 pts)	1 (14.3)	6 (85.7)	7 (3.4)
Sometimes (2 pts)	6 (26.1)	17 (73.9)	23 (11.1)
Never (1 pt)	102 (57.6)	75 (42.4)	177 (85.5)
Mean			1.179 (SD 0.464)
Missing (n = 19, 8.4%)			
Frequency of Selling Textbooks, Personal Possessions, Blood/Plasma, or Sperm/Eggs to Obtain Food			
Often (3 pts)	3 (21.4)	11 (78.6)	14 (6.7)
Sometimes (2 pts)	7 (30.4)	16 (69.6)	23 (11.0)
Never (1 pt)	100 (57.8)	73 (42.2)	173 (82.4)
Mean			1.243 (SD 0.565)
Missing (n = 16, 7.1%)			
Coping Skills Score			
Mean (range 13 – 39)			22.600 (SD 5.316)
Missing (n = 11, 4.9%)			
GPA			
≤2.00	2 (50.0)	2 (50.0)	4 (2.1)
2.11-2.50	3 (30.0)	7 (70.0)	10 (5.2)
2.51-3.00	25 (49.0)	26 (51.0)	51 (26.7)
3.01-3.50	44 (52.4)	40 (47.6)	84 (44.0)
3.51-4.00	24 (57.1)	18 (42.9)	42 (22.0)
Mean (range 1.84 – 4.0)			3.183 (SD 0.440)
Missing (n = 35, 15.5%)			
Rating of Class Attendance			
Excellent (4 pts)	54 (62.1)	33 (37.9)	87 (39.2)
Good (3 pts)	55 (49.1)	57 (50.9)	112 (50.5)
Fair (2 pts)	7 (31.8)	15 (68.2)	22 (9.9)
Poor (1 pt)	1 (100.0)	0 (0.0)	1 (0.5)
Mean			3.284 (SD 0.656)
Missing (n = 3, 1.3%)			
Rating of Attention Span in Class			
Excellent (4 pts)	26 (66.7)	13 (33.3)	39 (17.5)
Good (3 pts)	64 (49.6)	65 (50.4)	129 (57.8)
Fair (2 pts)	22 (44.9)	27 (55.1)	49 (22.0)
Poor (1 pt)	5 (83.3)	1 (16.7)	6 (2.7)
Mean			2.901 (SD 0.703)
Missing (n = 3, 1.3%)			

FREQUENCIES OF STUDENT CHARACTERISTIC BY FOOD SECURITY STATUS

Student Characteristic	Food Secure n (%) by Response	Food Insecure n (%) by Response	Total n (%) by Response
Rating of Understanding the Concepts in Class			
Excellent (4 pts)	27 (51.9)	25 (48.1)	52 (23.3)
Good (3 pts)	61 (53.0)	54 (47.0)	115 (51.6)
Fair (2 pts)	26 (51.0)	25 (49.0)	51 (22.9)
Poor (1 pt)	3 (60.0)	2 (40.0)	5 (2.2)
Mean			2.960 (SD 0.743)
Missing (n = 3, 1.3%)			
Rating of Progression Towards Graduating on Time			
Excellent (4 pts)	51 (52.0)	47 (48.0)	98 (44.5)
Good (3 pts)	51 (52.6)	46 (47.4)	97 (44.1)
Fair (2 pts)	14 (58.3)	10 (41.7)	24 (10.9)
Poor (1 pt)	0 (0.0)	1 (100.0)	1 (0.5)
Mean			3.327 (SD 0.684)
Missing (n = 6, 2.6%)			
Academic Outcomes Score			
Mean (range 4 – 16)			12.413 (SD 1.966)
Missing (n = 3, 1.3%)			

APPENDIX H

UNIVARIATE LOGISTIC REGRESSION OF STUDENT CHARACTERISTICS AND FOOD
INSECURITY

Student Characteristic	OR	95% CI	<i>p</i> value
Age			
Mean (range 18 – 62)	0.983	0.9371, 1.031	.471
Gender			
Female	Ref	--	--
Male	0.929	0.499, 1.730	.817
Ethnicity			
Non-Hispanic White	Ref	--	--
Black or African American	0.891	0.123, 6.445	.909
Other ethnicities	1.200	0.121, 11.865	.876
Marital Status			
Married or domestic partnership	Ref	--	--
Single, never married	1.092	0.285, 4.183	.897
Other	2.500	0.292, 21.399	.403
Number of Children			
Mean (range 0 – 6)	0.911	0.636, 1.304	.609
Sexual Orientation			
Straight, that is, not lesbian or gay	Ref	--	--
Lesbian or gay	2.605	0.871, 7.785	.087
Other	1.184	0.427, 3.285	.746
Disability			
No	Ref	--	--
Yes	1.098	0.268, 4.505	.897
Military Service			
No	Ref	--	--
Yes	0.563	0.099, 3.081	.499
Hours Worked per Week			
Mean (range 0 – 40)	0.990	0.969, 1.012	.373
Number of People Living With			
Mean (0 – 6)	0.979	0.770, 1.245	.862
Class Year			
1 st year	Ref	--	--
2 nd year	1.650	0.783, 3.479	.188
3 rd year	1.865	0.847, 4.108	.122
4 th year	2.084	0.919, 4.727	.079
Graduate master's student	0.733	0.199, 2.697	.641
Enrollment Status			
Full time student	Ref	--	--
Part time student	2.847	0.540, 14.993	.217
Residency Status			
In-state student	Ref	--	--
Out-of-state student	0.787	0.264, 2.350	.668
International student	0.000	0.000	1.000

UNIVARIATE LOGISTIC REGRESSION OF STUDENT CHARACTERISTICS AND FOOD

INSECURITY

Student Characteristic	OR	95% CI	<i>p</i> value
Parental Level of Education			
Graduate degree (e.g. master's, PhD)	Ref	--	--
Bachelor's degree (four year)	2.010	0.768, 5.262	.155
Some college	1.579	0.686, 3.634	.283
High school or less	3.257	1.267, 8.368	.014
Annual Household Income			
\$50,000 or more	Ref	--	--
\$25,000 - \$49,999	3.187	1.011, 10.055	.048
\$15,000 - \$24,999	5.000	1.448, 17.271	.011
\$5,000 - \$14,999	3.429	1.064, 11.043	.039
Less than \$5,000	4.895	1.652, 14.503	.004
Living Arrangements			
On campus suite with kitchen with roommates	Ref	--	--
On campus dorm with roommates	0.594	0.283, 1.247	.168
Off campus alone	1.900	0.593, 6.084	.280
Off campus with roommates	1.561	0.626, 3.893	.340
With parents or family	0.777	0.263, 2.293	.648
Temporary housing with friend or relative	xxx	0-xxx	1.000
Campus Meal Plan			
Campus meal plan (unlimited access + cash)	Ref	--	--
Campus meal plan (2 meals/day + cash)	2.789	1.387, 5.605	.004
Commuter meals: 25 - 75	1.552	0.326, 7.393	.581
Not enrolled in a campus meal plan	2.956	1.534, 5.693	.001
Access to Reliable Transportation			
Yes	Ref	--	--
No	1.779	0.987, 3.209	.055
Self-efficacy to Cook a Nutritious Meal			
Mean (range 1 - 5)	0.919	0.733, 1.152	.464
Self-efficacy to Cook a Nutritious Meal Without Spending a Lot of Money			
Mean (range 1 - 5)	1.014	0.823, 1.248	.897
Cooking Self-Efficacy Score			
Mean (range 2 - 10)	0.975	0.869, 1.094	.671
Adequacy of Cooking Skills			
Mean (range 1 - 4)	1.048	0.703, 1.561	.819
Adequacy of Money to Buy Food			
Mean (range 1 - 4)	0.325	0.208, 0.508	.000
Adequacy of Appliances for Food Preparation			
Mean	0.937	0.685, 1.282	.684
Adequacy of Food Selection in Local Stores			
Mean (range 1 - 4)	0.620	0.412, 0.931	.021
Food Skills & Resources Score			
Mean (range 1 - 16)	0.867	0.763, 0.984	.027
Financial Aid Score			
Mean (range 0 - 3)	1.121	0.782, 1.608	.534

UNIVARIATE LOGISTIC REGRESSION OF STUDENT CHARACTERISTICS AND FOOD

INSECURITY

Student Characteristic	OR	95% CI	<i>p</i> value
Federal Food Assistance Programs Score			
Mean (range 0 – 7)	0.656	0.303, 1.421	.285
Community & University Food Programs Score			
Mean (range 0 – 6)	1.458	0.339, 1.458	.612
Parents/Guardians or Relatives Provide Financial Support for College			
Yes (1 pt)	Ref	--	--
No	2.009	1.128, 3.578	.018
Parents/Guardians or Relatives Purchase or Send Food			
Yes (1 pt)	Ref	--	--
No	2.484	1.402, 4.402	.002
Family Support Score			
Mean (range 0 – 2)	0.984	0.510, 1.899	.963
Friends/Peers Purchase or Send Food			
Yes (1 pt)	Ref	--	--
No	0.691	0.381, 1.254	.224
Friend Support Score			
Mean (range 0 – 1)	1.446	0.798, 2.623	.224
Family & Friend Support Score			
Mean (range 0 – 3)	1.229	0.797, 1.897	.350
Social Support Score			
Mean (range 0 – 19)	1.087	0.874, 1.352	.454
Frequency of Sharing Food Purchasing and Preparation Responsibilities with Others			
Mean (range 1 – 3)	1.490	1.023, 2.168	.037
Frequency of Stretching Meals to Make them Last Longer			
Mean (range 1 – 3)	3.605	2.238, 5.807	.000
Frequency of Using Coupons to Purchase Food			
Mean (range 1 – 3)	1.778	1.226, 2.579	.002
Frequency of Borrowing Money from Family and Friends to Purchase Food			
Mean (range 1 – 3)	2.057	1.405, 3.012	.000
Frequency of Attending Functions with Free Food or Where You “Pay When You Can”			
Mean (range 1 – 3)	2.088	1.421, 3.069	.000
Frequency of Visiting Family on Weekends to Bring Back Food to School			
Mean (range 1 – 3)	0.972	0.676, 1.399	.879
Frequency of Eating More than Normal when Food was Plentiful			
Mean (range 1 – 3)	1.491	1.033, 2.152	.033
Frequency of Taking Food Home from On-Campus Dining Hall			
Mean (range 1 – 3)	1.745	1.193, 2.553	.004

UNIVARIATE LOGISTIC REGRESSION OF STUDENT CHARACTERISTICS AND FOOD
INSECURITY

Student Characteristic	OR	95% CI	<i>p</i> value
Frequency of Purchasing Less Expensive Processed Food			
Mean (range 1 – 3)	2.379	1.563, 3.621	.000
Frequency of Eating Less Healthy Meals to Eat More Food			
Mean (range 1 – 3)	2.326	1.556, 3.478	.000
Frequency of Obtaining Food from a Dumpster or Trash			
Mean (range 1 – 3)	3.050	1.065, 8.737	.038
Frequency of Bartering Services/Items to Buy Food			
Mean (range 1 – 3)	3.404	1.584, 7.316	.002
Frequency of Selling Textbooks, Personal Possessions, Blood/Plasma, or Sperm/Eggs to Obtain Food			
Mean (range 1 – 3)	2.511	1.413, 4.461	.002
Coping Skills Score			
Mean (range 13 – 39)	1.197	1.114, 1.297	.000
GPA			
Mean (1.84 – 4.0)	0.548	0.282, 1.063	.075
Rating of Class Attendance			
Mean (range 1 – 4)	0.602	0.397, 0.912	.017
Rating of Attention Span in Class			
Mean (range 1 – 4)	0.816	0.560, 1.190	.291
Rating of Understanding the Concepts in Class			
Mean (range 1 – 4)	1.009	0.708, 1.438	.960
Rating of Progression Towards Graduating on Time			
Mean (range 1 – 4)	1.038	0.704, 1.531	.849
Academic Outcomes Score			
Mean (range 4 – 16)	0.911	0.796, 1.044	.179

Note: OR = odds ratio, CI = confidence interval, Ref = reference variable