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DIET QUALITY AND FOOD INSECURITY AMONG UNIVERSITY STUDENTS: THE  
ROLE OF FOOD PREPARATION ABILITY

A Thesis  
presented in partial fulfillment of requirements  
for the degree of Master of Science  
in the Department of Nutrition and Hospitality Management  
The University of Mississippi

by

KATHARINE L. HALFACRE

May 2017

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## ABSTRACT

Previous research identified poor diet, financial strain, and an elevated prevalence of food insecurity among post-secondary students in the United States. Observed associations among other populations suggested food preparation ability could improve diet quality and reduce food insecurity, even in the presence of financial strain. This study aimed to analyze how food preparation ability and financial strain determine food insecurity and fruit and vegetable consumption, a component of diet quality among U.S. university students. A representative sample of University of Mississippi undergraduate students ( $N=2,000$ ) were invited to participate in an online survey. The final sample ( $n=89$ ) yielded a response rate of 4.45%. Responses were analyzed using t-tests, correlations, and regression analyses, identifying differences by gender, correlations, and associations of financial strain and food preparation ability to outcome variables. The results indicated nearly half (46.1%) of the sample experienced food insecurity, and approximately one quarter (24.7%) of the sample experienced very low food security. Daily servings of fruit and vegetables consumed (2.19 servings) was approximately half the *Dietary Guidelines' for Americans* recommendation. Compared to male students ( $n=29$ ), female students ( $n=60$ ) reported better food preparation ability. Loan borrowing was a positive determinant of food insecurity ( $p=0.025$ ) and very low food security ( $p=0.033$ ) among female students. Among components of food preparation ability, procurement was a negative determinant of food insecurity ( $p=0.032$ ), while cooking skills had a significant positive correlation with fruit and

vegetable consumption ( $p=0.021$ ) among female students only. Further research could elucidate a better understanding of the roles that food preparation ability and financial strain play in determining food insecurity and diet quality among university students, potentially contributing to the design and implementation of effective intervention strategies aimed at improving nutrition and health of this population.

## DEDICATION

I dedicate this thesis to Mykel Cunningham. Thank you for being my partner in every adventure we have been through and all of those that are yet to come. I could not have done this without you.

I also dedicate this thesis to my parents, Marvin and Robin Halfacre. Thank you both for inspiring and pushing me to follow my dreams.

## LIST OF ABBREVIATIONS AND SYMBOLS

AFSSM	Adult Food Security Survey Module
BMI	Body Mass Index
FPA	Food preparation ability
GPA	Grade point average
IRB	Institutional Review Board
M	Mean
NHS	National Health Service
OLS	Ordinary least squares
OR	Odds ratio
SD	Standard deviation
SE	Standard error
USDA	United States Department of Agriculture

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## CHAPTER 1

### INTRODUCTION

Studies have suggested that many university students struggle to maintain food security (Freudenberg et al., 2011; Gaines, Robb, Knol, & Sickler, 2014; Goldrick-Rab, Broton, & Eisenberg, 2015; Hughes, Serebryanikova, Donaldson, & Leveritt, 2011; Twill, Bergdahl, & Fensler, 2016) and good quality of diet (Brown, Dresen, & Eggett, 2005) during their education. Food insecurity has been defined by the U.S. Department of Agriculture (USDA) as a “limited or uncertain access to nutritious, safe foods necessary to lead a healthy lifestyle” (Coleman-Jensen, Rabbitt, Gregory, & Singh, 2015). Research has suggested that some college campuses have a measured food insecurity prevalence almost five times as high as the food insecurity prevalence in the general U.S. population (Patton-Lopez, Lopez-Cevallos, Cancel-Tirado, & Vazquez, 2014). Various studies have tied food insecurity to decreased academic performance among post-secondary students (Freudenberg et al., 2011; Maroto et al., Snelling, & Linck, 2014; Morris, Smith, Davis, & Null, 2016; Patton-Lopez et al., 2014). Food insecurity has been identified as a significant threat to the diet quality of university students and has an observed association with increased consumption of highly palatable, energy-dense, less healthful foods (Hughes et al., 2011; Leung, Epel, Ritchie, Crawford, & Laraia, 2014). Quality of diet during young adulthood has been said to be a key determinant of overweight and obesity among university students (Izaga, Pablo, Apalauza, Beti, & Ochoa, 2006) as well as increased risk for conditions such as heart disease, stroke, diabetes, and cancer (Krinke, 2002). Poor diet quality and

overweight/obesity were found to hinder academic performance and success (Deliens, Clarys, Bourdeaudhuij, & Deforche, 2013; George, Dixon, Stansal, Gelb, & Pheri, 2008). This risk for food insecurity and poor diet quality warranted further investigation into determining factors of ability and the design of intervention strategies.

Research has identified that an increasing number of young adults from low socioeconomic backgrounds are attending post-secondary school (Hussar & Bailey, 2014; Colarusso, 2015). Food insecurity prevalence among college students has been attributed to financial challenges, such as exponentially increasing tuition rates and insufficient financial resources for students and their parents (Ehrenberg, 2007). While the inadequate ability to prepare their own meals has been found to increase poor diet quality among young adults (Larson, Perry, Story, & Neumark-Sztainer, 2006), literature on the importance of food preparation ability as a determinant of food insecurity among university students with financial difficulty is scarce.

Research has identified that gender is associated with fruit and vegetable consumption (Tam, Yassa, Parker, O'Connor, & Allman-Farinelli, 2016), nutrition knowledge, and eating attitudes (Clifford, Keeler, Gray, Steingrube, & Morris, 2010; Jasti & Kovacs, 2010). Food insecurity has not been associated with gender among university students; however, related factors such as weight gain, body satisfaction, and dietary behaviors have been attributed to differences in gender among university students (Sira & White, 2010). Although women have reported better food preparation behaviors (Larson et al., 2006), ability to prepare food has not been measured, in respect to gender. Gender differences could explain how university students cope with food insecurity and poor food preparation ability, but the literature is limited to mostly to dietary measures and demographic differences between male and female university students.

The associations between diet quality, food insecurity, financial strain, and food preparation ability among U.S. university students indicated a need for further research. The potential benefits of studying these factors relate to improving outcomes in health, wellness, and success of this population. This study aimed to gain an understanding of the role food preparation ability and financial strain have in determining food insecurity and diet quality among U.S. university students. In this study, food preparation ability was defined as a multi-faced concept including cooking and food preparation skills, ability related to procurement of meals, and the ability to access food preparation equipment and space. It was hypothesized that financial resources and food preparation ability were both significant determinants of food security and diet quality and that adequate ability could attenuate the negative effect of financial strain on food insecurity and diet quality.

### **Research Objectives and Specific Questions**

The goal of this study was to analyze the roles of food preparation ability and financial strain in determining food insecurity, very low food security, and diet quality among full-time undergraduate university students in the United States. Specifically, the following research questions were answered:

1. What is the status of food insecurity, very low food security, and fruit and vegetable consumption among full-time undergraduate university students, and do they differ by gender?

2. What are the correlations between fruit and vegetable consumption, food insecurity, very low food security, financial strain, and food preparation ability among full-time undergraduate male and female university students?
3. How are fruit and vegetable consumption, food insecurity, and very low food security determined by financial strain and food preparation ability among full-time undergraduate male and female university students?

## CHAPTER 2

### REVIEW OF LITERATURE

This chapter discusses existing studies on diet quality, food security, financial strain, and food preparation ability among U.S. university students, identifying gaps in literature and motivating current research.

#### **Food Insecurity**

Food insecurity has been defined as having “limited access to adequate food due to a lack of money and/or other resources” (Coleman-Jensen et al., 2015). Food insecurity was found to determine diet quality (Hughes et al., 2011; Leung et al., 2014). Compared to food-secure adults, food-insecure adults were said to be more likely to consume highly palatable foods and possess lower scores for diet quality (Leung, et al., 2014). This association suggested food insecurity may pose a threat to the future health of U.S. university students (Cady, 2014; Goldrick-Rab et al., 2015; Maroto et al., 2014).

Research has also indicated that food-insecure students may sacrifice grades and experience difficulties related to physical and mental health (Hughes et al., 2011). Multiple studies have identified an association between food insecurity and decreased academic performance among university students (Freudenberg et al., 2011; Maroto et al., 2014; Morris et al., 2016; Patton-Lopez et al., 2014). This association with decreased GPA was not surprising given the association between food insecurity and diet quality, another determinant of academic success. The stress of food insecurity has observed effects on self-esteem, anxiety, and

symptoms of depression among some adult populations (Laraia, Siega-Riz, Gunderson, & Cole, 2006); however, this association has not been observed among U.S. university students. This evidence suggested that food insecurity may have mental health implications for this population. The potential risks to health, wellness, and success due to food insecurity indicated a need for further research into these associations and investigation into potential intervention strategies.

Growing concern over food insecurity among U.S. university students has prompted research efforts aimed at assessing the food security status at college campuses across the country. Multiple studies have estimated food insecurity prevalence among university students in the United States with results that ranged from 14% to 59%. The University of Alabama study was the only study that found food insecurity rates among students to be similar (14%) to those among the general population (14.9%) (Gaines et al., 2014). The present findings that risk of food insecurity among university students is more than twice of the risk among general population in the same state are consistent with previous findings (Chaparro et al., 2009; Freudenberg et al., 2011; Gorman, 2014; Morris et al., 2016; Patton-Lopez et al., 2014). A student body at University of Hawaii Manoa expressed a food insecurity prevalence of 21% which was higher than state (7.8%) or national (10.9%) food insecurity rates at the time of the study (Chaparro et al., 2009). Furthermore, a large sample of almost 2,000 University of Illinois students, from four separate campuses, expressed a high prevalence of food insecurity (35%) compared to national rate (14.3%) of food insecurity (Morris et al., 2016). At the urban university CUNY, 39.2% of students were classified as food insecure, a much higher rate than the national rate of 20% at the time of the study (Freudenberg et al., 2011). Kent State University, which lies in a county classified as a food desert, displayed a food insecurity prevalence of 49.7%, over three times the national rate (16.1%) of food insecurity at the time of



the study (Gorman, 2014). The highest prevalence of food insecurity among university students was observed at Western Oregon University; 59% of students were food insecure compared to the national rate of 14.9% (Patton-Lopez et al., 2014). Although it was unclear why there was such substantial variation among university student food insecurity findings, these varied estimates could be attributed to sample size, measurement tool, and socioeconomic background of participants.

### **Diet Quality**

Numerous chronic conditions such as cardiovascular disease, hypertension, diabetes, and obesity are recognized as diet-sensitive diseases, associated with the poor diet quality (Seligman, Laraia, & Kushel, 2009). Some forms of cancer have also been linked to diet (De Stefani et al., 2006; Fung et al., 2005). The diet quality of young adults has an observed impact on future risk of heart disease, cancer, diabetes, and stroke (Krinke, 2002). Diet quality has been associated with overweight and obesity among university students (Izaga et al., 2006). Poor dietary habits such as low fruit and vegetable consumption and elevated fast-food consumption have an observed association with overweight and obese status among U.S. university students (Kobayashi, 2007), findings which were concurrent with prevalence of 21.9% and 9.5% in regards to overweight and obesity status, indicated by Body Mass Index (BMI) (American College Health Association, 2007).

Weight gain, higher BMI, and dietary patterns such as consumption of French fries and soda intake have been observed as predictors for poor academic performance among university students, measured by grade point average (GPA) (Deliens et al., 2013). There was also empirical evidence linking university students' diet to GPA and "Total Success", a variable comprised of academic success and progress towards personal goal attainment (George et al.,

2008). This evidence suggested diet quality could be a vital component of academic success, a particularly important association among university student populations.

Laska, Larson, Neumark-Sztainer, & Story (2010) identified young adults in the United States as a population at risk for poor diet due to low consumption of vegetables and whole grains and increased consumption of fast food. Other research suggested young adults fail to meet several dietary benchmarks for fruit and vegetable intake (Larson et al., 2006), while also possessing tastes and beliefs which promote the consumption of convenience meals that are often dense in energy, fat, and sugar (Van der Horst, Brunner, & Siegrist, 2010). Young adults transitioning to college in the United States may be exposed to poor diet quality, with one study having indicated that almost one quarter of students gain at least 5% body weight during the first semester of college (Wengreen & Moncur, 2009). A recent study suggested that meal plan participation is not without risks and may increase consumption of calorically dense fast-food meals due to increased financial access through flex plans (Dingman, Schulz, Wyrick, Bibeau, & Gupta, 2014). Research suggested university students without on-campus meal plans may suffer from worse diet quality than previously measured (Laska et al., 2010). Findings from a recent study suggested campus dining halls offer better eating options than most off-campus options, yet these dining halls offer significant barriers in the form of all-you-can-eat food access and inclusion of unhealthful food options (Horacek et al., 2012). On-campus meal plan participation had an association with improved consumption of foods from the fruit, vegetable, and meat groups compared to non-participants (Brown et al., 2005). One study found that while the diet of university students is poor overall due to high fat and low fruit and vegetable consumption, meal plan participation of two or more meals a day is associated with better nutritional intake compared to those who do not participate in meal plans as often (Merkle, 1998).

## **Gender Differences among University Students**

Student gender has been associated with poor dietary behaviors such as greater convenience food consumption among male students than female students (Van der Horst et al., 2010). Female university students were found to be at greater risk for poor body image and are more likely to skip meals or reduce meal size to restrict caloric intake than male students (Sira & White, 2010; Tam et al., 2016). Per observations by Laska *et al.* (2010), female university students have more home availability of unhealthy foods during college. Male students have less knowledge of nutrition fact labels and do not practice reading them when purchasing food according to previous observations (Jasti & Kovacs, 2010).

Gender differences could help explain characteristic differences found throughout this population. Male students are likely to make food purchasing according to costs and tastes; whereas, female university students have indicated that their food purchasing is driven by taste for healthful foods and efforts to avoid fat (Boek et al., 2012). Furthermore, among young adults in the United States, male respondents have displayed lesser food preparation behaviors than female respondents (Larson et al., 2006). A large study of young adults observed lower food preparation behaviors by male respondents than female respondents which was accompanied with lower consumption of fruits and vegetables (Larson et al., 2006). Perception of cooking skills, which has been reported lower among male respondents, significantly predicts aspects of diet quality such as the consumption of fast-food and meeting *Dietary Guidelines* (Larson et al., 2006; Van der Horst et al., 2010).

Gender differences have a variety of impacts on the university-student population according to research. Although there is no significant difference between male and female university students in regards to food insecurity, female students have displayed a strong

association between food insecurity and increased weight gain during college education (Butler, Black, Blue, & Gretebeck, 2004; Sira & White, 2010). The findings of Butler *et al.* (2014) indicated that female students may eat less and even abstain from meals; however, they still experience a significant increase in weight during college due to a decrease in physical activity. While there is an understanding of what causes these issues regarding gender and diet quality, food insecurity, and food preparation ability, little research has been done to identify why male and female university students experience eating during college so differently.

### **Financial Strain in College Students**

More young adults in the United States with low socioeconomic backgrounds have been seeking post-secondary education than ever before (Colarusso, 2015; Gaines et al., 2014). This trend has occurred in conjunction with college tuition increasing 2% to 3.5% faster than the rate of inflation (Ehrenberg, 2007). The resulting financial strain among many university students has led to inadequate financial resources to meet day-to-day living expenses, such as remaining food secure (Gaines et al., 2014). Students with limited financial resources were likely to receive financial support in the form of grants or loans, which had an observed association with food insecurity (Morris et al., 2016). A lack of financial resources has been described as one of the main barriers to food security among university students (Nugent, 2011).

The financial hardship university students faced may have limited their access to healthful foods (Johnson, 2015). Evidence pointed to almost one quarter of university students skipping meals frequently due to not being able to afford food (Goldrick-Rab, Broton, & Eisenberg, 2015). Among U.S. adults, low-income was associated with poor diet quality, far from meeting recommendations for many food groups (Leung, et al., 2014). Leung et al. (2014)

found that low-income adults were not likely to meet any dietary recommendations and consumed more sweets and bakery desserts than higher income individuals.

Financial aid in the form of grants, scholarships, and student loans stands as a potential answer to financial hardship for university students. Despite rising college tuition rates and an increasing number of students from low socioeconomic backgrounds, federal funds designed to assist low-income students afford college such as the Pell Grant have remained stagnant, resulting in an overall decrease in the buying power of the Pell Grant in regards to total cost of attendance, down to 60% for community colleges (Goldrick-Rab et al., 2015) and 34% for public universities (Twill et al., 2016). Studies have identified that student loans are a popular coping mechanism for university students seeking funding for education and living expenses while in college (Darolia, 2014; Farahbakhsh, Ball, Farmer, Maximova, Hanbazaza, Willows, 2015; Gaines et al., 2014). However, student loan use has not been found to be effective in preventing food insecurity (Morris et al., 2016). The potential burden of loan repayment has been identified as a potential determinant of food insecurity beyond college attendance, potentially threatening future health, wellness, and professional success for U.S. university students (Gaines et al., 2014).

### **Food Preparation Ability**

Another observed and modifiable barrier to healthful eating was food preparation ability (Larson et al., 2006; Levy & Auld, 2004; Reicks, Trofholz, Stang, & Laska, 2014; Van der Horst et al., 2010). Besides providing financial assistance, enabling improvements in food preparation ability and eating competence may have offered potential solutions to the problems of diet quality and food insecurity among university students.

Food preparation ability describes the aptitude and skills needed to prepare healthful meals, and has been found to be positively associated with diet quality among young adults (Larson et al., 2006). A lack of food preparation ability has been identified as a determinant of reliance on ready-to-eat meals and fast-food consumption (Leung et al., 2014; Nelson, Story, Larson, Neumark-Sztainer, & Lytle, 2008). Eating competence, a related concept comprised of perceived diet quality, attitudes, food acceptance, internal regulation, and skills, has been shown to be associated with lower BMI and diet quality in college students (Clifford et al., 2010; Lohse, Bailey, Krall, Wall, & Mitchell, 2011).

These skills may be necessary for students to practice food preparation, a behavioral predictor of fruit and vegetable consumption among young adults (Larson et al., 2006; Reicks et al., 2014). U.S. university students face barriers to developing food preparation ability, including time, facilities, and equipment for cooking (Larson et al., 2006). Van der Horst *et al.* (2010) cited time as a limited resource that cripples the development and practice of food preparation skills, leading to increased consumption of convenience foods. Beyond time constraints, other barriers to food preparation ability have been identified as finances, food access, and equipment (Betts, Amos, Keim, Peters, & Stewart, 1997).

Empirical evidence strongly suggested a positive association between food preparation ability and diet quality, and that the constraints of time, finances, and independence significantly inhibited the development of necessary food preparation ability among university students. However, little is known regarding how food preparation ability is related with food insecurity in this population. Further, there was a lack of understanding of the complex interconnections between barriers to food preparation, financial strain during college, food insecurity, and quality of diet in the population of university students.

## Summary

Upon completion of a review of literature related to food insecurity, diet quality, financial strain, and food preparation ability among university students, it became apparent there were gaps in our understanding of the topic. Research of food insecurity among this population suggested there was a higher risk for food insecurity among university students compared to the general population. Whereas the consequences of food insecurity among U.S. university students is a significant threat to the lifelong health, wellness, and success of U.S., there was a scarcity of evidence that identified the determinants and consequences of food insecurity among university students. It was clear that understanding the contributing factors of food insecurity beyond socioeconomic background could aid in the development and application of future policy and interventions. Many current studies suggested that university students could suffer from poor diet quality, an association that threatens the future health of U.S. university students. The associations between poor diet quality and academic performance and success indicated a need for further policy and intervention strategies. These observations indicated a need to gain a better understanding of the contributing factors of diet quality among this population. Based on the literature, the effects of financial hardship on food insecurity likely contributed to other dietary outcomes among U.S. university students. In regards to gender, food insecurity, food preparation ability, and diet quality vary greatly between male and female students; however, there is little evidence to date offering explanations for these findings or their implications on the development of policy and intervention strategies. This issue called for search for intervention strategies that could benefit the diet quality and food security status of a population that is so limited by financial strain. The risk of poor diet quality and food insecurity associated with this financial hardship demanded further investigation into practical intervention strategies. Food

preparation ability offered some merit as a potential determinant of food insecurity and diet quality among university students. Primarily cooking skills had been investigated for this association according to the body of knowledge. Other components of food preparation ability such as access to equipment or the ability to properly procure food items, particularly among students in food deserts such as those who participated in Gorman (2014), could be significant determinants of food insecurity and diet quality. Further investigation into the role of food preparation ability is warranted, given the findings of previous research; however, the current models assessing food preparation ability remain limited with a limited scope of cooking skills, primarily. More comprehensive analysis of food preparation ability would demand improved measurement instruments yet to be developed and applied according to the current literature.

This review of literature indicated several gaps in our knowledge, as stated; however, it provided direction for future research into the complex associations between food insecurity, diet quality, financial strain, and food preparation ability among university students in the United States. Further understanding the role of financial strain and food preparation ability among university students could offer insight into alternative intervention strategies to improving food security status and diet quality among the population, particularly without the expansion of financial assistance programs. This thesis research attempted to investigate how food security and diet quality could be improved by better understanding the roles of financial strain and food preparation ability among this population. Additionally, this research sought to identify gender differences in respect to food security status, diet quality, financial strain, and food preparation ability among university students.

Based on the literature, financial strain was hypothesized to have a negative correlation with fruit and vegetable consumption and a positively correlation with the likelihood of food



insecurity and very low food security. Also, it was hypothesized that food preparation ability is positively correlated with fruit and vegetable consumption and negatively correlated with the likelihood of food insecurity. It was hypothesized that significant gender differences would exist in regards to the status of fruit and vegetable consumption and food preparation ability. Henceforth, it was hypothesized that differences would exist between genders in the way financial strain and food preparation ability predict the likelihood of fruit and vegetable consumption, food insecurity, and very low food security.

## **CHAPTER 3**

### **METHODS**

This chapter describes the study design and data collection procedures. Definitions of the variables and their measurement as well as statistical analysis in regards to each research question are also included in this chapter.

#### **Study Design**

This was a cross-sectional, survey-based study. The questionnaire and the survey protocol were reviewed and approved as exempt by the University of Mississippi Institutional Review Board (IRB) before distribution. The survey was placed on the Qualtrics platform [Appendix A]. The survey participants were prompted with informed consent and email contact of the investigator prior to advancing to the questionnaire [Appendix B]. The questionnaire included screening questions, survey questions to assess diet quality, food security, food preparation ability, and questions regarding demographic and socioeconomic information about the respondent.

#### **Data Collection Procedures**

Surveys were distributed to a representative sample of 2,000 undergraduate students at multiple campuses of the University of Mississippi in early December, 2016, via email invitation with a web link to the online questionnaire. The Survey Panel Group of the University of Mississippi Office of Institutional Research, Effectiveness, and Planning distributed the survey. Two follow-up emails were sent at four days and at one week after the original invitation

to remind and encourage participation. Completed survey data were protected and made available only to the investigators for this study. The screening questions asked whether the participants were 18 years and older and were enrolled and attending either the main campus or one of the five regional campuses of the University of Mississippi as full-time undergraduate students during the Fall, 2016, semester. Participants who did not meet the screening criteria were thanked for their time and excluded from further participation. The sample provided 124 respondents, an initial response rate of 6.2%. All respondents proceeded through screening, but 35 were filtered out due to incomplete survey responses, yielding the final sample of 89 responses for analysis (4.45% final response rate).

## **Variables**

This section describes how food insecurity, fruit and vegetable consumption, food preparation ability, and financial resource were measured.

### *Food Security*

Student food security status was assessed using the USDA's U.S. Adult Food Security Survey Module (AFSSM), a 10-item survey with questions designed to assess household adult food security status. To limit the scope to the students' experience in college, the Fall, 2016, semester was used as the reference period instead of the standard 12-month reference [Appendix C]. Following the USDA scoring procedures [Appendix C] (USDA Economic Research Service, 2012), affirmative response totals were counted accordingly to AFSSM guidelines and categorized as follows: 0 = high food security, 1-2 = marginal food security, 3-5 = low food security, 6-10 = very low food security. Responses of "3 or more" to questions 5a and 9a were considered affirmative (USDA Economic Research Service, 2012). This study used a dichotomous variable of *Food Insecurity*, which equaled 1 if the respondent was assessed to have

either low food security or very low food security, and 0 if the respondent displayed either high or marginal food security. Another dichotomous variable of *Very Low Food Security*, which equaled 1 if the respondent had very low food security, and 0 otherwise, was also created to represent a more severe level of food insecurity.

### *Fruit and Vegetable Consumption*

The measurement used in the study's questionnaire was a 17-item Multifactor Screener developed by the National Cancer Institute [Appendix A]. This instrument has been validated as an accurate measure of dietary factors such as fruit and vegetable consumption, percentage of energy from fat, and dietary fiber. This instrument was used because of its relatively short length. Questions pertained to frequency of consumption of foods from 16 categories. The last item assessed which type of milk is usually consumed. Response options were provided on an 8-point Likert scale ranging from "Never" to "2 or more times per day." Scoring was conducted following the procedures originally developed for the instrument [Appendix C] (National Cancer Institute Division of Cancer Control & Population Sciences, 2000). The parameters relevant to age and gender of the participants were chosen for the scoring formulae. The indicated frequency of consumption of fruit and vegetable items, including 100% fruit juice, other fruit, green leafy salads, white potatoes, beans, and other vegetables, was utilized along with median portion sizes, according to age and gender responses, to estimate the daily servings of fruits and vegetables consumed (United States Department of Agriculture, Center for Nutrition Policy and Promotion, 1992) by respondents. Although the 1992 Food Guide Pyramid has been replaced, the definition of the outcome measure, servings of fruits and vegetables, has remained the same in the *Dietary Guidelines for Americans* (U.S. Department of Health and Human Services and USDA, 2015).

### *Food Preparation Ability*

The food preparation questions used in this study were obtained from various validated instruments designed to assess food preparation ability among young adults. A total of 11 questions were asked to represent three components of food preparation ability: cooking skills; ability to procure food for meals; and ability to access food preparation equipment [Appendix A]. Five questions (Larson et al., 2006; National Health Service [NHS] Middlesbrough, 2010) were used to assess cooking skills, which addresses self-efficacy and skills regarding meal preparation, vegetable preparation, and ability to cook meat products. Procurement ability, or the ability to shop for groceries, was assessed through three questions. Two procurement questions were adopted from Larson *et al.* (2006) while the third question was adopted from NHS Middlesbrough (2010). The final three questions (Larson et al., 2006) assessed access to food preparation equipment and space such as oven, stove, pots, utensils, and food storage. Respondents were asked to rate each of these items on a five-point Likert scale ranging from 1 = very poor skills or no accessibility to 5 = very good skills or high accessibility. Responses were averaged and scored as three variables of food preparation ability: *Cooking Skills*; *Procurement*; and *Equipment Access*.

### *Financial Strain*

Financial strain was assessed by asking how they were paid for their college education. Respondents were allowed to indicate multiple answers from choices including student borrowing, parent borrowing, student income and savings, parent income and savings, scholarships and grants, and other relative/friend support. Based on the responses, two dummy variables were created to represent financial strain: *Borrowing for College*; and *No Financial Assistance from Parents*. *Borrowing for College* was scored as 1 if the respondent had an

affirmative response to “student borrowing” or “parent borrowing,” or both, and 0 otherwise. The variable No Financial Assistance from Parents was scored as 1 if the respondent did not indicate the “parent income & savings” option as a means for paying for college, and 0 otherwise.

### *Demographics*

Participants were asked demographic and other general questions: gender, years of university attendance, marital status, race/ethnicity, employment, living situation, physical activity, height, weight, transportation, meal plan participation, and parental education level. The institutional identification available from the screening questions was also retained.

### **Analysis**

All statistical tests used a two-tailed 95% confidence interval or a significance level of  $\alpha=.05$ . Statistical analysis was conducted using IBM SPSS 22.0.0.0.

To answer the first research question, “What is the status of food insecurity, very low food security, and fruit and vegetable consumption among university students?” descriptive statistics were reported. Frequencies were reported for food security variables, and means and standard deviations were reported for *Fruit and Vegetable Consumption*. These statistics were reported for each gender grouping as well as for the entire sample. Differences between male and female respondents were tested using a two-tailed independent samples t-test. Cronbach’s alpha was estimated to test the reliability of FPA instruments.

For the second research question, “What are the correlations between fruit and vegetable consumption, food insecurity, very low food security, financial strain, and food preparation ability among university students?” Pearson correlation coefficients were obtained.

Regression models were used for the third research question, “How are fruit and vegetable consumption, food insecurity, and very low food security determined by financial strain and food preparation ability?”. The equation for the probabilities of food insecurity and very low food security were assessed using logistic regression models, and the fruit and vegetable consumption equation was assessed using an ordinary least square (OLS) regression. Regression coefficients were to reveal the associations between each determinant and the dependent variable, holding other potential determinants constant. R-square changes associated with the addition of food preparation ability variables were also reported.

The following tables summarize the variables used and methods for statistical analysis. Table 1 summarizes definitions and measurements of the variables used in analysis. Table 2 outlines the research questions, hypotheses, and analysis plans.

Table 1  
*Variable Definitions and Measurements*

Variables	Definition	Coding
Gender	The respondent identifies their sex as male or female.	1 = Male 2 = Female
Food Insecurity	The respondent is food insecure.	0 = $\leq 3$ affirmative responses to U.S. Adult Food Security Survey Module 1 = $\geq 3$ affirmative responses to U.S. Adult Food Security Survey Module
Very Low Food Security	The respondent has very low food security.	0 = $\leq 6$ affirmative responses to U.S. Adult Food Security Module 1 = $\geq 6$ affirmative responses to U.S. Adult Food Security Module
Fruit and Vegetable Consumption	The estimated number of servings of fruits and vegetables consumed per day, excluding French fries, based on survey responses to the 17-item Multifactor Screener.	Numerical value in servings
Financial Strain – Borrowing for College	The respondent uses student borrowing, parent borrowing, or both to pay for college.	0 = No borrowing 1 = Borrowing
Financial Strain – No Financial Assistance from Parents	The respondent lacks support from parent income & savings as a means to pay for college.	0 = Does not lack parental support 1 = Lacks parental support
FPA - Cooking Skills	Average of the self-rated scores for quality of meals, abilities to prepare healthful meals, follow a recipe, prepare vegetables, and properly cook meat.	Numerical value ranging 1-5, with 5 being the highest skills.
FPA - Procurement	Average of the self-rated scores for shopping with a list, shopping on a budget, and access to convenient grocery shopping.	Numerical value of ranging 1-5, with 5 being the highest ability.
FPA - Equipment Access	Average of the self-rated scores for access to food preparation appliances, tools, and food storage equipment.	Numerical value of ranging 1-5, with 5 being the highest accessibility.



Table 2  
*Hypotheses and Statistical Analysis*

Research Question	Hypothesis	Analysis
What is the status of food insecurity, very low food security, and fruit and vegetable consumption among university students? Do they differ by gender?	N/A	Frequencies for food security variables  M and SD for <i>Fruit and Vegetable Consumption</i>  Independent sample t-tests
What are the correlations between fruit and vegetable consumption, food insecurity, very low food security, financial strain, and food preparation ability among male and female university students?	Financial strain is negatively correlated with fruit and vegetable consumption and positively correlated with food insecurity and very low food security.  Food preparation ability is positively correlated with fruit and vegetable consumption and negatively correlated with food insecurity and very low food security.	Pearson correlation coefficients.
How are fruit and vegetable consumption, food insecurity, and very low food security determined by financial strain and food preparation ability among male and female university students?	Financial strain is a negative predictor of fruit and vegetable consumption and a positive predictor of the likelihood of food insecurity and very low food security.  Food preparation ability is a positive predictor of fruit and vegetable consumption and a negative predictor of the likelihood of food insecurity and very low food security.	Logistic regression models for <i>Food Insecurity</i> and <i>Very Low Food Security</i>  OLS regression for <i>Fruit and Vegetable Consumption</i>

Note. Italicized text used for dependent variables in Analysis column.

## CHAPTER 4

### RESULTS

This chapter describes the statistical findings. The information in this chapter includes sample characteristics, correlations, and regression analysis.

#### **Sample Characteristics**

The sample for analysis consisted of 89 participants who provided valid responses to all survey questions. A description of the sample is in Table 3. Of the respondents, 60 were female (67.4%), and 29 were male (32.6%). Students were classified by years attending university as Freshman ( $n=37$ , 41.6%), Sophomore ( $n=12$ , 13.5%), Junior ( $n=25$ , 28.1%), and Senior ( $n=15$ , 16.8%). Forty of the respondents reported that both parents had at least a Bachelor's degree, representing 45.0% of the sample. Others identified that only one parent had a Bachelor's degree ( $n=31$ , 34.8%) or that neither parent had attained a Bachelor's degree ( $n=18$ , 20.2%). Students were given the opportunity to identify multiple methods of funding for the cost of college which included student borrowing ( $n=34$ , 38.2%), parent borrowing ( $n=20$ , 22.5%), student income and savings ( $n=25$ , 28.1%), parent income and savings ( $n=45$ , 50.6%), scholarships and/or grants ( $n=67$ , 75.3%) and relatives/friends support ( $n=11$ , 12.4%). About a half of the students lived off-campus ( $n=47$ , 52.8%). Most students had purchased a meal plan through the university ( $n=49$ , 55.1%), Most respondents identified their primary transportation as a personal vehicle ( $n=69$ , 77.5%). Other forms of primary transportation were public transit ( $n=18$ , 20.3%) and biking ( $n=2$ , 2.2%). Body Mass Index was calculated based on self-reported

height and weight items in the survey. Respondents had a mean BMI of 23.3;  $SD=4.5$  and were classified as underweight ( $n=10$ , 11.2%), normal weight ( $n=52$ , 58.4%), overweight ( $n=21$ , 23.6%) and obese ( $n=6$ , 6.8%).

Table 3  
*Sample Characteristics (N=89)*

		Characteristics	Frequency (%)
Gender	Male		29 (32.6)
	Female		60 (67.4)
Race/Ethnicity	White		72 (81.0)
	African American		9 (10.1)
	Hispanic, Latino, or Spanish origin		5 (5.6)
	Asian		2 (2.2)
	Other		1 (1.1)
Classification	Freshman		37 (41.6)
	Sophomore		12 (13.5)
	Junior		25 (28.1)
	Senior		15 (16.8)
Parental Education	Neither has bachelor's degree		18 (20.2)
	At least one has bachelor's degree		31 (34.8)
	Both have at least a bachelor's degree		40 (45.0)
Paying for College <sup>a</sup>	Student borrowing		34 (38.2)
	Parent borrowing		20 (22.5)
	Student income & savings		25 (28.1)
	Parent income & savings		45 (50.6)
	Scholarships and/or grants		67 (75.3)
	Relatives/friends support		11 (12.4)
Living Situation	On-campus		42 (47.2)
	Off-campus		47 (52.8)
Campus Meal Plan	Yes		49 (55.1)
	No		40 (44.9)
Primary Transportation	Personal vehicle		69 (77.5)
	Public transit		18 (20.3)
	Bike		2 (2.2)
Body Mass Index <sup>b</sup>	Underweight		10 (11.2)
	Normal weight		52 (58.4)
	Overweight		21 (23.6)
	Obese		6 (6.8)

<sup>a</sup> Respondents were permitted to provide multiple responses for Paying for College.

<sup>b</sup> For respondent Body Mass Index, Mean (SD) = 23.3 (4.5)

## Food Security and Fruit and Vegetable Consumption

Descriptive statistics were tabulated for food security variables and fruit and vegetable consumption for the entire student sample and by gender (Table 4). The occurrence of food insecurity in the sample was 46.10% ( $n=41$ ), of which 22 students (24.70% of the entire sample) were experiencing very low food security. Male and female participants displayed similar food insecurity occurrence ( $t=-0.161$ ), 44.80% and 46.70%, respectively. Very low food security was more prevalent among female students ( $n=16$ , 26.70%) than male students ( $n=6$ , 20.70%), but the difference was not statistically significant ( $t=-0.607$ ).

The sample displayed a mean fruit and vegetable consumption of 2.19 ( $SD=0.39$ ) servings per day. In regards to mean fruit and vegetable consumption, male students ( $M=2.29$   $SD=0.44$ ) and female students ( $M=2.15$   $SD=0.36$ ) were similar ( $t=1.463$ ).

Table 4  
*Descriptive Statistics of Food Security and Fruit and Vegetable Consumption*

	Frequency (%)			T-test ( $p$ value)
	All ( $N=89$ )	Male ( $n=29$ )	Female ( $n=60$ )	
Food security	48 (53.90)	16 (55.20)	32 (53.30)	0.161 (0.872)
Food insecurity	41 (46.10)	13 (44.80)	28 (46.70)	-0.161 (0.872)
Very low food security	22 (24.70)	6 (20.70)	16 (26.70)	-0.607 (0.545)
	Mean ( $SD$ )			T-test ( $p$ value)
	All ( $N=89$ )	Male ( $n=29$ )	Female ( $n=60$ )	
Fruit and vegetable consumption	2.19 (0.39)	2.29 (0.44)	2.15 (0.36)	1.463 (0.147)

## Self-Reported Food Preparation Ability

Descriptive statistics data for food preparation ability is displayed in Table 5. The mean score is reported for each item from the food preparation ability section of the survey. Responses were used to assess three components of food preparation ability including cooking skills,

procurement, and equipment access. The variable *Cooking Skills* assessed skills regarding meal preparation, vegetable preparation, and ability to cook meat products, and was measured as the average of five items: the quality of meals made ( $M=3.20$ ,  $SD=0.92$ ), ability to prepare a healthful meal ( $M=3.47$ ,  $SD=1.09$ ), ability to follow a dinner recipe for two ( $M=4.12$ ,  $SD=1.10$ ), ability to prepare fresh vegetables ( $M=3.88$ ,  $SD=1.18$ ), and ability to properly cook meat ( $M=3.89$ ,  $SD=1.11$ ). Upon averaging relevant responses, the mean cooking skills response was assessed 3.71 ( $SD=0.83$ ), slightly above what the respondents considered “average.” Cronbach’s alpha for the five *Cooking Skills* items was assessed as 0.828, indicative of good reliability. The variable *Procurement* assesses the ability to shop for groceries, and was measured as the average of three items: ability to shop with a list ( $M=4.42$ ,  $SD=0.84$ ), ability to shop on a budget ( $M=3.78$ ,  $SD=1.07$ ), and access to convenient grocery shopping ( $M=3.89$ ,  $SD=1.05$ ). The mean procurement response was assessed as “good” at 4.03 ( $SD=0.79$ ). Cronbach’s alpha for *Procurement* items indicated good reliability ( $\alpha=0.702$ ). The variable *Equipment Access* assesses the ability to access food preparation equipment and space, and was measured as the average of three items: access to food preparation appliances ( $M=3.53$ ,  $SD=1.37$ ), access to food preparation tools ( $M=3.36$ ,  $SD=1.45$ ), and access to food storage equipment ( $M=3.82$ ,  $SD=1.11$ ). The mean equipment access response was assessed as between “average” and “good” at 3.57 ( $SD=1.22$ ). Cronbach’s alpha for *Equipment Access* was 0.913, indicating good reliability among equipment access items.

Table 5

*Descriptive Statistics of Self-Reported Food Preparation Ability (FPA) (N=89)*

Cooking Skills		
Items	Mean (SD)	Cronbach's alpha
1. Self-rated quality of prepared meals	3.20 (0.92)	
2. Ability to prepare healthful meal	3.47 (1.09)	
3. Ability to follow dinner recipe for two	4.12 (1.10)	
4. Ability to prepare fresh vegetables	3.88 (1.18)	
5. Ability to properly cook meat	3.89 (1.11)	
Average of the five items: <sup>a</sup>	3.71 (0.83)	.828
Procurement		
Items	Mean (SD)	Cronbach's alpha
6. Ability to shop with a list	4.42 (0.84)	
7. Ability to shop on a budget	3.78 (1.07)	
8. Access to convenient grocery shopping	3.89 (1.05)	
Average of the three items: <sup>b</sup>	4.03 (0.79)	.702
Equipment Access		
Items	Mean (SD)	Cronbach's alpha
9. Access to food preparation appliances (e.g., oven, stove, etc.)	3.53 (1.37)	
10. Access to food preparation tools (e.g., pots, pans, utensils, etc.)	3.36 (1.45)	
11. Access to food storage equipment (e.g., cooler, freezer, etc.)	3.82 (1.11)	
Average of the three items: <sup>c</sup>	3.57 (1.22)	.913

Note. Each item was self-reported on a 5-point Likert scale, with 1 = Very Poor/No Accessibility and 5 = Very Good/High Accessibility

<sup>a</sup> This row indicates mean Cooking Skills and Cronbach's alpha for Cooking Skills items.

<sup>b</sup> This row indicates mean Procurement and Cronbach's alpha for Procurement items.

<sup>c</sup> This row indicates mean Equipment Access and Cronbach's alpha for Equipment Access items.

### Financial Strain and Food Preparation Ability

Displayed in Table 6, descriptive statistics for financial strain and food preparation ability variables are provided for the entire sample and by gender. *Financial Strain* was indicated by two variables, *Borrowing for College* and *No Financial Assistance from Parents*. Among the entire sample 42 respondents borrowed for college (47.20%), and 44 received no financial assistance from parents (49.40%). Among male respondents, 12 borrowed for college (41.40%)

and 16 received no financial assistance from parents (55.20%). Among female respondents, 30 borrowed for college (50.00%) and 28 received no financial assistance from parents (46.70%). An independent samples T-test was performed to compare financial strain between male and female respondents. The t-statistic for borrowing for college ( $t=-0.76$ ), and no financial assistance from parents ( $t=0.75$ ) indicated no significant difference in financial strain among genders.

In regards to FPA, the sample's mean scores were reported for *Cooking Skills* (3.71,  $SD=0.83$ ), *Procurement* (4.03,  $SD=0.79$ ), and *Equipment Access* (3.57,  $SD=0.83$ ). In general, female respondents showed higher average abilities of food preparation than male respondents in all three categories, with means for *Cooking Skills* (3.89,  $SD=0.74$  and 3.34,  $SD=0.90$ ), *Procurement* (4.18,  $SD=0.71$  and 3.70,  $SD=0.84$ ), and *Equipment Access* (3.76,  $SD=1.19$  and 3.17,  $SD=1.19$ ), respectively. Independent samples T-tests were used to assess the significance of the difference by gender. T-statistics were significant for all three categories of FPA, with *Cooking Skills* ( $t=-3.09$ ,  $p<0.01$ ), *Procurement* ( $t=-2.82$ ,  $p<0.01$ ), and *Equipment Access* ( $t=-2.19$ ,  $p<0.05$ ).



Table 6  
*Descriptive Statistics of Financial Strain and FPA*

	Frequency (%)			T-test ( <i>p</i> value)
	All ( <i>N</i> =89)	Male ( <i>n</i> =29)	Female ( <i>n</i> =60)	
Borrowing for college	42 (47.20)	12 (41.40)	30 (50.00)	-0.76 (0.451)
No financial assistance from parents	44 (49.40)	16 (55.20)	28 (46.70)	0.75 (0.458)
	Mean ( <i>SD</i> )			T-test ( <i>p</i> value)
	All ( <i>N</i> =89)	Male ( <i>n</i> =29)	Female ( <i>n</i> =60)	
Cooking skills	3.71 (0.83)	3.34 (0.90)	3.89 (0.74)	-3.09 (0.003)**
Procurement	4.03 (0.79)	3.70 (0.84)	4.18 (0.71)	-2.82 (0.006)**
Equipment access	3.57 (1.22)	3.17 (1.19)	3.76 (1.19)	-2.19 (0.031)*

\*Significant at the 0.05 level (2-tailed)

\*\*Significant at the 0.01 level (2-tailed)

### **Pearson Correlation Coefficients between Financial Strain, Food Insecurity, and Very Low Food Security**

As seen in Table 7, Pearson correlation coefficients were obtained to assess the pairwise correlations between the financial strain variables (*Borrowing for College* and *No Financial Assistance from Parents*) and the indicators food insecurity (*Food Insecurity* and *Very Low Food Security*). Among all respondents *Borrowing for College* was not significantly correlated with *Food Insecurity*, but *Borrowing for College* had a significant positive Pearson correlation coefficient with *Very Low Food Security* ( $r=0.241, p<0.05$ ). Receiving no financial assistance from parents was not significantly correlated with *Food Insecurity* or *Very Low Food Security*.

When Pearson correlation coefficients were assessed for each gender separately, *Borrowing for College* was not significantly correlated with *Food Insecurity* or *Very Low Food Security* for male respondents, whereas it was positively correlated with *Food Insecurity* ( $r=0.267, p<0.05$ ) and *Very Low Food Security* ( $r=0.302, p<0.05$ ) among female respondents. Receiving no financial assistance from parents was not significantly correlated with *Food Insecurity* or *Very Low Food Security* for both male and female respondents.

Table 7

*Pearson Correlation Coefficients: Financial Strain, Food Insecurity, and Very Low Food Security (N=89)*

	All	
	Food insecurity	Very low food security
Borrowing for college	0.165 (0.123)	0.241 (0.023)*
No financial assistance from parents	0.033 (0.759)	0.059 (0.586)
	Male (n=29)	
	Food insecurity	Very low food security
Borrowing for college	-0.053 (0.783)	0.089 (0.645)
No financial assistance from parents	0.255 (0.645)	0.289 (0.128)
	Female (n=60)	
	Food insecurity	Very low food security
Borrowing for college	0.267 (0.039)*	0.302 (0.019)*
No financial assistance from parents	-0.071 (0.588)	-0.035 (0.789)

Note. Pearson correlation coefficients are reported, *p* values in parentheses.

\*Significant at the 0.05 level (2-tailed)

\*\*Significant at the 0.01 level (2-tailed)

### **Pearson Correlation Coefficients between Financial Strain and Fruit and Vegetable**

#### **Consumption**

Pearson correlation coefficients were obtained to assess how financial strain variables (*Borrowing for College* and *No Financial Assistance from Parents*) and *Fruit and Vegetable Consumption* are reported for the entire sample, as well as by gender, in Table 8. Among the entire sample, there was no significant correlation between *Borrowing for College* and *Fruit and Vegetable Consumption*. There was no significant correlation between receiving no financial assistance from parents and *Fruit and Vegetable Consumption*.

Among male respondents *Borrowing for College* was not significantly correlated *Fruit and Vegetable Consumption*. *No Financial Assistance from Parents* was not significantly correlated with *Fruit and Vegetable Consumption* among male students. Among female

respondents *Borrowing for College* was not significantly correlated with *Fruit and Vegetable Consumption*. Similarly, *No Financial Assistance from Parents* was not correlated with *Fruit and Vegetable Consumption* among female students.

Table 8  
*Pearson Correlation Coefficients: Financial Strain and Fruit and Vegetable Consumption*

All (N=89)	
	Fruit and vegetable consumption
Borrowing for college	0.036 (0.739)
No financial assistance from parents	-0.136 (0.203)
Male (n=29)	
	Fruit and vegetable consumption
Borrowing for college	0.080 (0.680)
No financial assistance from parents	-0.064 (0.742)
Female (n=60)	
	Fruit and vegetable consumption
Borrowing for college	0.032 (0.808)
No financial assistance from parents	-0.202 (0.122)

Note. Pearson correlation coefficients are reported, *p* values in parentheses.

### **Pearson Correlation Coefficients between FPA, Food Insecurity, and Very Low Food Security**

Reported in Table 9 are the Pearson correlation coefficients to assess correlations between FPA variables (*Cooking Skills*, *Procurement*, and *Equipment Access*), and indicators of food insecurity (*Food Insecurity*, and *Very Low Food Security*). Among the entire sample, *Cooking Skills* was significantly correlated with *Procurement* ( $r=0.386$ ,  $p<0.01$ ) and *Equipment Access* ( $r=0.361$ ,  $p<0.01$ ) but not with *Food Insecurity* and *Very Low Food Security*. *Procurement* was significantly correlated with *Equipment Access* ( $r=0.386$ ,  $p<0.01$ ) but was not correlated with *Food Insecurity* or *Very Low Food Security*. *Equipment Access* was not significantly correlated with *Food Insecurity* or *Very Low Food Security*. Among male

respondents *Cooking Skills* was significantly correlated with *Procurement* ( $r=0.513, p<0.01$ ) but not with *Equipment Access*, *Food Insecurity*, or *Very Low Food Security*. *Procurement* and *Equipment Access* were significantly correlated ( $r=0.385, p<0.05$ ) among male students. *Procurement* was not significantly correlated with *Food Insecurity* or *Very Low Food Security*. *Equipment Access* among male students did not have significant correlations with *Food Insecurity* and *Very Low Food Security*. Among female respondents *Cooking Skills* was significantly correlated with *Equipment Access* ( $r=0.290, p<0.05$ ) but not *Procurement*, *Food Insecurity*, or *Very Low Food Security*. *Procurement* among female students was significantly correlated with *Equipment Access* ( $r=0.322, p<0.05$ ) and *Food Insecurity* ( $r=-0.259, p<0.05$ ) but not *Very Low Food Security*. *Equipment Access* among female students was not significantly correlated with *Food Insecurity* or *Very Low Food Security*.

Table 9  
*Pearson Correlation Coefficients: FPA, Food Insecurity, and Very Low Food Security*

	All (N=89)	
	Food insecurity	Very low food security
Cooking skills	-0.071 (0.508)	-0.046 (0.666)
Procurement	-0.175 (0.100)	-0.097 (0.366)
Equipment access	-0.087 (0.417)	-0.162 (0.129)
	Male (n=29)	
	Food insecurity	Very low food security
Cooking skills	0.001 (0.998)	-0.003 (0.989)
Procurement	-0.065 (0.736)	-0.158 (0.412)
Equipment access	-0.113 (0.560)	-0.172 (0.373)
	Female (n=60)	
	Food insecurity	Very low food security
Cooking skills	-0.128 (0.330)	-0.107 (0.414)
Procurement	-0.259 (0.046)*	-0.103 (0.432)
Equipment access	-0.084 (0.521)	-0.187 (0.153)

Note. Pearson correlation coefficients are reported,  $p$  values in parentheses.

\*Significant at the 0.05 level (2-tailed)

## Pearson Correlation Coefficients between FPA and Fruit and Vegetable Consumption

Pearson correlation coefficients were calculated for food preparation variables and *Fruit and Vegetable Consumption* and can be found in Table 10. *Cooking Skills, Procurement, or Equipment Access* were not significantly correlated with *Fruit and Vegetable Consumption*. Among male respondents, *Cooking Skills, Procurement, or Equipment Access* were not significantly correlated with *Fruit and Vegetable Consumption*. Among female respondents, *Cooking Skills* was significantly correlated with *Fruit and Vegetable Consumption* ( $r=0.298$ ,  $p<0.05$ ). Neither *Procurement* nor *Equipment Access* were significantly correlated with *Fruit and Vegetable Consumption* among female students.

Table 10  
*Pearson Correlation Coefficients: FPA and Fruit and Vegetable Consumption*

All (N=89)	
	Fruit and vegetable consumption
Cooking skills	0.078 (0.469)
Procurement	0.058 (0.592)
Equipment access	0.051 (0.636)
Male (n=29)	
	Fruit and vegetable consumption
Cooking skills	-0.102 (0.598)
Procurement	0.137 (0.479)
Equipment access	0.027 (0.888)
Female (n=60)	
	Fruit and vegetable consumption
Cooking skills	0.298 (0.021)*
Procurement	0.089 (0.499)
Equipment access	0.126 (0.338)

Note. Pearson correlation coefficients are reported,  $p$  values in parentheses.

\*Significant at the 0.05 level (2-tailed)

## **Pearson Correlation Coefficients between Financial Strain and FPA**

Pearson correlation coefficients were obtained to assess correlations between financial strain variables (*Borrowing for College* and *No Financial Assistance from Parents*) and FPA variables (*Cooking Skills*, *Procurement*, and *Equipment Access*) among the entire sample, as well as for each gender. Among all respondents, there were no significant correlations between *Borrowing for College* and *Cooking Skills*, *Procurement*, or *Equipment Access*. Among all respondents, *No Financial Assistance from Parents*, had no significant correlation with *Cooking Skills*, *Procurement*, or *Equipment Access*. Among male respondents, there were no significant correlations between *Borrowing for College* and *Cooking Skills*, *Procurement*, or *Equipment Access*. Among male respondents, *No Financial Assistance from Parents* had no significant correlation with *Cooking Skills*, *Procurement*, or *Equipment Access*. Among female respondents, there was no significant correlation between *Borrowing for College* and *Cooking Skills*, *Procurement*, or *Equipment Access*. Among female respondents *No Financial Assistance from Parents*, had no significant correlation with *Cooking Skills*, *Procurement*, or *Equipment Access*.

Table 11  
*Pearson Correlation Coefficients – Financial Strain and FPA*

All (N=89)					
	Borrowing for college	No financial assistance from parents	FPA cooking skills	FPA procurement	FPA equipment access
Borrowing for college	1.000	0.101 (0.348)	-0.025 (0.816)	0.045 (0.675)	0.008 (0.942)
No financial assistance from parents	--	1.000	-0.129 (0.229)	-0.024 (0.826)	0.049 (0.651)
FPA cooking skills	--	--	1.000	0.386 ( $<0.001$ )**	0.361 (0.001)**
FPA procurement	--	--	--	1.000	0.386 ( $<0.001$ )**
FPA equipment access	--	--	--	--	1.000
Male (n=29)					
	Borrowing for college	No financial assistance from parents	FPA cooking skills	FPA procurement	FPA equipment access
Borrowing for college	1.000	0.335 (0.076)	0.154 (0.424)	-0.063 (0.745)	0.254 (0.183)
No financial assistance from parents	--	1.000	0.015 (0.938)	0.010 (0.960)	-0.124 (0.523)
FPA cooking skills	--	--	1.000	0.513 (0.004)**	0.355 (0.059)
FPA procurement	--	--	--	1.000	0.385 (0.039)*
FPA equipment access	--	--	--	--	1.000

Female (n=60)					
	Borrowing for college	No financial assistance from parents	FPA cooking skills	FPA procurement	FPA equipment access
Borrowing for college	1.000	0.000 (1.000)	-0.172 (0.188)	0.071 (0.591)	-0.137 (0.298)
No financial assistance from parents	--	1.000	-0.183 (0.163)	-0.006 (0.962)	0.161 (0.218)
FPA cooking skills	--	--	1.000	0.196 (0.133)	0.290 (0.024)*
FPA procurement	--	--	--	1.000	0.322 (0.012)*
FPA equipment access	--	--	--	--	1.000

Note. Pearson correlation coefficients are reported, *p* values in parentheses.

\*Significant at the 0.05 level (2-tailed)

\*\*Significant at the 0.01 level (2-tailed)

### Logistic Regression Analysis: Food Insecurity

Because Pearson correlation coefficients showed that FPA variables were closely correlated with one another, a logistic regression analysis was conducted to estimate the independent association of these variables to the likelihood of food insecurity (Table 12). The dependent variable was the dichotomous variable of *Food Insecurity*. The logistic regression coefficients and odds ratios were estimated in two different model specifications: Model 1 only included *Borrowing for College* and *No Financial Assistance from Parents* variables, and Model 2 included variables representing FPA as well as the financial strain variables. The R-square differences between the first and second model shows the variance additionally explained by food preparation abilities.



Upon analyzing all respondents, Model 1 displayed a Cox & Snell R-Square of 0.027 and Model 2 displayed 0.061, suggesting financial strain and FPA explain only small percentages of the variability of the likelihood of food insecurity. Examining the logistic coefficients, the two financial strain variables showed positive signs in both Model 1 and 2 as hypothesized. Two of the FPA variables showed negative signs in Model 2 also as hypothesized, but none were statistically significant in either of the models.

The same regression analyses were conducted separately for male and female respondents. Among male respondents Model 1 displayed a Cox & Snell R-Square of 0.086 and Model 2 displayed a Cox & Snell R-Square of 0.097, suggesting very little explanation is added by the FPA variables. Interestingly, among male respondents, the coefficient for *Borrowing for College* was negative ( $\beta=-0.782$ ), and the coefficient for *Cooking Skills* was positive ( $\beta=0.204$ ), both of which are contrary to what was expected. Coefficients for *No Financial Assistance from Parents* ( $\beta=1.348$ ), *Procurement* ( $\beta=-0.312$ ), and *Equipment Access* ( $\beta=-0.023$ ) showed hypothesized signs; however, none of these variables showed any statistically significant coefficients with the likelihood of food insecurity. Among female respondents, the Cox & Snell R-Square increased from 0.075 of Model 1 to 0.162 of Model 2, suggesting that FPA explains the additional 8.7% of the variability of the likelihood of food insecurity, while financial strain alone can only explain 7.5%. In Model 1, the coefficient for *Borrowing for College* was significantly positive ( $\beta=1.105, p<0.05$ ), suggesting that the presence of college loans was associated with three times of the odds of being food insecure among female students (*Odds Ratio*=3.019). *No Financial Assistance from Parents* was not significant in Model 1 for female students ( $\beta=-0.310$ ). Model 2 displayed significant positive coefficients for *Borrowing for College* ( $\beta=1.368, p<0.05$ ) and *Procurement* ( $\beta=-1.030, p<0.05$ ) among female respondents.

That is, controlling for the lack of financial assistance from parents and the students' abilities to prepare own meals, borrowing for college is associated with four times of the odds of food insecurity (*Odds Ratio*=3.927). Also, controlling for financial strain and other components of food preparation ability, the ability related to shopping for groceries reduces the odds of food insecurity to almost one third (*Odds Ratio*=0.357). This Model 2 analysis did not yield significant coefficients for *No Financial Assistance from Parents* ( $\beta$ =-0.532), *Cooking Skills* ( $\beta$ =-0.220), and *Equipment Access* ( $\beta$ =0.192).

Table 12  
*Logistic Regression: Food Insecurity*

All (N=89)								
Variables	Model 1				Model 2			
	$\beta$	<i>S.E.</i>	<i>Odds ratio</i>	<i>p-value</i>	$\beta$	<i>S.E.</i>	<i>Odds ratio</i>	<i>p-value</i>
Borrowing for college	0.661	0.433	1.937	0.127	0.723	0.444	2.061	0.104
No financial assistance from parents	0.068	0.433	1.070	0.875	0.061	0.448	1.063	0.891
Cooking skills	--	--	--	--	0.033	0.298	1.034	0.911
Procurement	--	--	--	--	-0.481	0.324	0.618	0.137
Equipment access	--	--	--	--	-0.045	0.204	0.956	0.826
Constant	-0.507	0.358	0.602	0.156	1.439	1.345	4.218	0.285
Male (n=29)								
Variables	Model 1				Model 2			
	$\beta$	<i>S.E.</i>	<i>Odds ratio</i>	<i>p-value</i>	$\beta$	<i>S.E.</i>	<i>Odds ratio</i>	<i>p-value</i>
Borrowing for college	-0.703	0.869	0.495	0.418	-0.782	0.949	0.457	0.409
No financial assistance from parents	1.322	0.869	3.752	0.128	1.348	0.906	3.848	0.137
Cooking skills	--	--	--	--	0.204	0.533	1.226	0.702
Procurement	--	--	--	--	-0.312	0.593	0.732	0.599
Equipment access	--	--	--	--	-0.023	0.398	0.977	0.953
Constant	-0.667	0.625	0.513	0.286	-0.099	1.991	0.906	0.960

Female (n=60)

Variables	Model 1				Model 2			
	$\beta$	<i>S.E.</i>	<i>Odds ratio</i>	<i>p</i> -value	$\beta$	<i>S.E.</i>	<i>Odds ratio</i>	<i>p</i> -value
Borrowing for college	1.105	0.539	3.019	0.041*	1.368	0.612	3.927	0.025*
No financial assistance from parents	-0.310	0.541	0.733	0.566	-0.532	0.380	0.587	0.382
Cooking skills	--	--	--	--	-0.220	0.417	0.803	0.599
Procurement	--	--	--	--	-1.030	0.480	0.357	0.032*
Equipment access	--	--	--	--	0.192	0.273	1.212	0.482
Constant	-0.552	0.456	0.576	0.225	3.88	2.306	47.389	0.094

Note. Dashes represent values not reported through regression analysis.

\*Significant at the .05 level (two-tailed)

### **Logistic Regression Analysis: Very Low Food Security**

A logistic regression analysis was conducted to estimate the independent association of financial strain and FPA to the likelihood of very low food security (Table 13). The dependent variable is a dichotomous variable of *Very Low Food Security*.

For all respondents, Model 1 displayed a Cox & Snell R-Square of 0.058, and Model 2 displayed 0.089, suggesting little explanation (3.1%) of the variability of the likelihood of very low food security is provided by the addition of FPA variables. *Borrowing for College* had significantly positive coefficients in Model 1 ( $\beta=1.139, p<0.05$ ) and Model 2 ( $\beta=1.195, p<0.05$ ), suggesting that the presence of college loans was associated with slightly above three times of the odds of having very low food security among students in both models (*Odds Ratio*=3.125 and *Odds Ratio*=3.305, respectively). The second financial strain variable, *No Financial Assistance from Parents*, showed positive coefficients in both Model 1 and 2, as hypothesized, but these were not significant. Two of the FPA variables showed negative signs in Model 2, as hypothesized, but none was significant in either of the models.

The same regression analysis was conducted separately for male and female respondents. Among male respondents, Model 1 displayed a Cox & Snell R-Square of 0.087. Model 2, with a Cox & Snell R-Square of 0.123, suggesting modest explanation (3.6%) of the variability of the likelihood of very low food security is added by the FPA variables. Among male respondents, the coefficient for *Borrowing for College* was negative in Model 1 ( $\beta=-0.043$ ) and Model 2 ( $\beta=-0.060$ , N.S) but not statistically significant. The coefficient for *Cooking Skills* was positive ( $\beta=0.312$ ), contrary to the hypothesis, but this was not statistically significant. Coefficients for *No Financial Assistance from Parents* ( $\beta=1.668$ ), *Procurement* ( $\beta=-0.543$ ), and *Equipment Access* ( $\beta=-0.023$ ) displayed hypothesized signs, but none were not statistically significant.

Among female respondents, Cox & Snell R-Square increased from 0.091 of Model 1 to 0.117 of Model 2, suggesting that FPA explains only a small part (2.6%) of the variability of the likelihood of very low food security. The coefficient for *Borrowing for College* was significantly positive in Model 1 ( $\beta=1.468, p<0.05$ ) and Model 2 ( $\beta=1.451, p<0.05$ ), suggesting that the presence of college loans was associated with more than four times of the odds of very low food security among female students (*Odds Ratio*=4.342 and *Odds Ratio*=4.269). The coefficients for *No Financial Assistance from Parents* ( $\beta=-0.176$  and  $\beta=-0.057$ ) were negative in Model 1 and Model 2 among female students, contrary to the hypothesis. Coefficients for *Cooking Skills* ( $\beta=-0.063$ ), *Procurement* ( $\beta=-0.306$ ) and *Equipment Access* ( $\beta=-0.222$ ) were not significant, but they were negative as hypothesized.

Table 13  
*Logistic Regression: Very Low Food Security*

All (N=89)								
Variables	Model 1				Model 2			
	$\beta$	<i>S.E.</i>	<i>Odds ratio</i>	<i>p</i> -value	$\beta$	<i>S.E.</i>	<i>Odds ratio</i>	<i>p</i> -value
Borrowing for college	1.139	0.523	3.125	0.029*	1.195	0.534	3.305	0.025*
No financial assistance from parents	0.170	0.509	1.186	0.738	0.251	0.526	1.285	0.633
Cooking skills	--	--	--	--	0.108	0.344	1.114	0.753
Procurement	--	--	--	--	-0.178	0.354	0.837	0.614
Equipment access	--	--	--	--	-0.319	0.234	0.727	0.173
Constant	-1.822	0.476	0.162	<0.001**	-0.480	1.583	0.619	0.762
Male (n=29)								
Variables	Model 1				Model 2			
	$\beta$	<i>S.E.</i>	<i>Odds ratio</i>	<i>p</i> -value	$\beta$	<i>S.E.</i>	<i>Odds ratio</i>	<i>p</i> -value
Borrowing for college	-0.043	0.996	0.958	0.966	-0.060	1.128	0.942	0.958
No financial assistance from parents	1.711	1.219	5.533	0.160	1.668	1.276	5.299	0.191
Cooking skills	--	--	--	--	0.312	0.656	1.366	0.634
Procurement	--	--	--	--	-0.543	0.744	0.581	0.465
Equipment access	--	--	--	--	-0.188	0.498	0.829	0.706
Constant	-2.475	1.065	0.084	0.020*	-0.932	2.551	0.394	0.715

Female (n=60)

Variables	Model 1				Model 2			
	$\beta$	<i>S.E.</i>	<i>Odds ratio</i>	<i>p</i> -value	$\beta$	<i>S.E.</i>	<i>Odds ratio</i>	<i>p</i> -value
Borrowing for college	1.468	0.3654	4.342	0.025*	1.451	0.679	4.269	0.033*
No financial assistance from parents	-0.176	0.616	0.838	0.775	-0.057	0.655	0.945	0.931
Cooking skills	--	--	--	--	-0.063	0.447	0.939	0.887
Procurement	--	--	--	--	-0.306	0.450	0.736	0.496
Equipment access	--	--	--	--	-0.222	0.282	0.801	0.430
Constant	-1.792	0.476	0.162	<0.001**	0.488	2.357	1.629	0.836

Note. Dashes represent values not reported through regression analysis.

\*Significant at the .05 level (two-tailed)

\*\*Significant at the .001 level (two-tailed)



## OLS Regression Analysis: Fruit and Vegetable Consumption

A regression analysis was conducted to estimate the independent association of these variables on the number of servings of fruits and vegetables consumed daily (Table 14). OLS regression coefficients ( $b$ ) as well as standardized coefficients ( $Beta$ ) were estimated.

Among all respondents, Model 1 displayed a R-Square of 0.021, with Model 2 displaying R-Square of 0.027, suggesting a modest (0.6%) explanation of variability in the likelihood of fruit and vegetable consumption from FPA variables. A positive coefficient was found for *Borrowing for College* in Model 1 ( $b=0.039$ ,  $Beta=0.50$ ) and Model 2 ( $b=0.039$ ,  $Beta=0.49$ ), contrary to the hypothesis, but these were not statistically significant. As hypothesized, *No Financial Assistance from Parents* in Model 1 ( $b=-0.110$ ,  $Beta=-0.141$ ) and Model 2 ( $b=-0.107$ ,  $Beta=-0.137$ ) had a negative coefficient with *Fruit and Vegetable Consumption*, but these were not significant in either of the two models. As hypothesized, *Cooking Skills* ( $b=0.019$ ,  $Beta=0.040$ ), *Procurement* ( $b=0.012$ ,  $Beta=0.024$ ), and *Equipment Access* ( $b=0.011$ ,  $Beta=0.034$ ) had positive coefficients with *Fruit and Vegetable Consumption*, but these were not significant.

The same regression analysis was conducted separately for male and female respondents. Among male respondents Model 1 displayed a R-Square of 0.016, while Model 2 displayed a R-Square of 0.094, suggesting a small explanation (7.8%) of the variability of the likelihood of fruit and vegetable consumption was provided with the addition of FPA variables. A positive coefficient was found for *Borrowing for College* in Model 1 ( $b=0.099$ ,  $Beta=0.114$ ) and Model 2 ( $b=0.180$ ,  $Beta=0.206$ ), contrary to the hypothesis. As hypothesized, *No Financial Assistance from Parents* in Model 1 ( $b=-0.088$ ,  $Beta=-0.102$ ) and Model 2 ( $b=-0.121$ ,  $Beta=-0.140$ ) had a negative coefficient with *Fruit and Vegetable Consumption*, as hypothesized, but this was not significant in either of the two models. *Cooking Skills* ( $b=-0.131$ ,  $Beta=-0.270$ ) and *Equipment*

*Access* ( $b=-0.025$ ,  $Beta=-0.068$ ) had negative coefficients with *Fruit and Vegetable Consumption*, as hypothesized, although they were not significant. *Procurement* ( $b=0.164$ ,  $Beta=0.316$ ) had a positive coefficient as hypothesized; however, it was not a significant. Among female respondents, Model 1 displayed a R-Square of 0.042, with Model 2 displaying R-Square of 0.125, suggesting some additional explanation (8.3%) of the variability in the likelihood of fruit and vegetable consumption from the addition of FPA variables. A positive coefficient was found for *Borrowing for College* in Model 1 ( $b=0.023$ ,  $Beta=0.32$ ) and Model 2 ( $b=0.064$ ,  $Beta=0.88$ ), contrary to the hypothesis, but these were not significant. As hypothesized, *No Financial Assistance from Parents* in Model 1 ( $b=-0.146$ ,  $Beta=-0.202$ ) and Model 2 ( $b=-0.123$ ,  $Beta=-0.169$ ) had negative coefficients with *Fruit and Vegetable Consumption*, but these were not significant in either of the two models. As hypothesized, *Cooking Skills* ( $b=0.126$ ,  $Beta=0.256$ ), *Procurement* ( $b=0.001$ ,  $Beta=0.002$ ), and *Equipment Access* ( $b=0.028$ ,  $Beta=0.090$ ) had positive coefficients with *Fruit and Vegetable Consumption*, but these were not significant, contrary to the hypothesis.

Table 14  
*OLS Regression: Fruit and Vegetable Consumption*

All (N=89)								
Variables	Model 1				Model 2			
	<i>b</i>	<i>S.E.</i>	$\beta$	<i>p</i> -value	<i>b</i>	<i>S.E.</i>	$\beta$	<i>p</i> -value
Borrowing for college	0.039	0.084	0.050	0.642	0.039	0.085	0.049	0.652
No financial assistance from parents	-0.110	0.084	-0.141	0.191	-0.107	0.086	-0.137	0.217
Cooking skills	--	--	--	--	0.019	0.058	0.040	0.745
Procurement	--	--	--	--	0.012	0.061	0.024	0.848
Equipment access	--	--	--	--	0.011	0.039	0.034	0.784
Constant	2.228	0.068	--	<0.001**	2.070	0.259	--	<0.001**
Male (n=29)								
Variables	Model 1				Model 2			
	<i>b</i>	<i>S.E.</i>	$\beta$	<i>p</i> -value	<i>b</i>	<i>S.E.</i>	$\beta$	<i>p</i> -value
Borrowing for college	0.099	0.180	0.114	0.586	0.180	0.201	0.206	0.382
No financial assistance from parents	-0.088	0.178	-0.102	0.626	-0.121	0.189	-0.140	0.528
Cooking skills	--	--	--	--	-0.131	0.117	-0.270	0.271
Procurement	--	--	--	--	0.164	0.129	0.316	0.216
Equipment access	--	--	--	--	-0.025	0.086	-0.068	0.775
Constant	2.286	0.132	--	<0.001**	2.182	0.434	--	<0.001**

Female ( $n=60$ )

Variables	Model 1				Model 2			
	<i>b</i>	<i>S.E.</i>	$\beta$	<i>p</i> -value	<i>b</i>	<i>S.E.</i>	$\beta$	<i>p</i> -value
Borrowing for college	0.023	0.094	0.032	0.805	0.064	0.095	0.088	0.503
No financial assistance from parents	-0.146	0.094	-0.202	0.125	-0.123	0.096	-0.169	0.208
Cooking skills	--	--	--	--	0.126	0.069	0.256	0.072
Procurement	--	--	--	--	0.001	0.070	0.002	0.987
Equipment access	--	--	--	--	0.028	0.044	0.090	0.533
Constant	2.206	0.790	--	<0.001**	1.575	0.354	--	<0.001**

Note. Dashes represent values not reported through regression analysis.

\*Significant at the .05 level (two-tailed)

\*\*Significant at the .001 level (two-tailed)

## CHAPTER 5

### DISCUSSION

This chapter summarizes main findings of the study, presents conclusions, and discusses implications of the research. It also addresses limitations of the study.

#### **Discussion of Findings**

##### *Food Insecurity*

Food insecurity and very low food security were prevalent, affecting 46.1% and 24.7% of University of Mississippi students, respectively. These rates are much higher than the U.S. household food insecurity prevalence of 12.7% and very low food security prevalence of 5.0% (USDA Economic Research Service, 2016). Similarly, the results of this study indicate a higher prevalence of food insecurity and very low food security in our sample, compared to 2013-2015 Mississippi data indicating estimates of 20.8% and 7.9%, respectively (USDA Economic Research Service, 2016). However, the findings from the present study are more comparable to other studies of university students that identified food insecurity rates between 14% and 59% (Chaparro et al., 2009; Freudenberg et al., 2011; Gaines et al., 2014; Gorman, 2014; Morris et al., 2016; Patton-Lopez et al., 2014).

The elevated prevalence of food insecurity among university students sampled may be attributed to several factors. The sample displayed characteristics associated with higher food insecurity rates including a large representation of females living in a rural town in the southern

region of the United States (USDA Economic Research Division, 2016). Similar studies also took place at rural college campuses (Chaparro et al., 2009; Gorman, 2014; Patton-Lopez et al., 2014), but City University of New York, an urban university in New York City, displayed an elevated prevalence of food insecurity as well (Freudenberg et al., 2011). These studies did not seek to measure the relationship of food preparation ability to food insecurity that was observed in the present study. Research has suggested that the presence of food preparation ability, which includes skills as well as procurement and equipment access, and financial management skills such as budgeting and reducing expenses may be more important than cooking skills and coping behaviors, such as skipping meals and purchasing competitive foods, in predicting food insecurity among this population (Alaimo, 2005).

Research has identified several factors indicating that university students may be at high risk for food insecurity. One such factor is the association between food insecurity and financially independent students, those who do not receive financial assistance from their parents (Chaparro et al., 2009; Gaines et al., 2014). Studies have indicated that emerging adults, such as U.S. university students, begin developing characteristics needed for healthful living, which includes food security, during this stage of life (Schwartz, Cote, & Arnett, 2005). This characteristic of emerging adults coupled with food insecurity findings among university students indicates that students are entering their college education with underdeveloped skills, such as financial management skills, cooking skills, food procurement skills, and nutrition knowledge, which may be necessary to maintain food security away from their parents' home. The lack of developed self-efficacy in regards to food preparation and coping with financial strain could help explain the elevated prevalence of food insecurity among university students.

This is worth further investigation due to the positive association between college education and better food security later in life (Coleman-Jensen, Nord, Andrews, & Carlson, 2012).

### *Diet Quality*

In the present study, the mean fruit and vegetable consumption for university students was observed at 2.19 servings per day. This finding is much lower than the 2015-2020 *Dietary Guidelines for Americans* daily recommendations of 2.5 servings of vegetables and 2 servings of fruit (U.S. Department of Health and Human Services and USDA, 2015). Fruit and vegetable consumption among the sample of university students was comparable to NHANES data regarding low-income ( $\leq 300\%$  of federal poverty level) young adults (Leung et al., 2014). Although the present study did not determine significant predictors of fruit and vegetable consumption, previous research has suggested that trends such as less-frequent family meals and food preparation may leave university students without the skills needed to eat a healthy diet (Jabs & Devine, 2006). Findings from the present study add to the body of evidence of unhealthy diet among young adults, including higher consumption of fast food (Paeratakul, Ferdinand, Champagne, Ryan, & Bray, 2003) and higher soda consumption (Nielsen & Popkin, 2004) by this age group than any other age group. These findings are supported by studies citing taste, convenience, and low costs as the driving forces behind the food purchasing behaviors of university students (Boek et al., 2012). The poor diet of university students may be explained by factors such as family-life, food tastes, and purchasing behaviors, which were not measured in this study, suggesting a need for the identification of contributing factors of university student diet quality. In regards to university students, analysis of dietary factors beyond fruit and vegetable consumption could also provide additional insight into the role of each predictor of diet quality for both male and female university students.

In the present study, students self-reported BMI measurements that were lower than the reported average of U.S. adults aged 20-29, for both male and female students (U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, 2012). Other studies measuring BMI of U.S. post-secondary students had similar findings (Clifford et al., 2010; Kobayashi, 2007; Larson et al., 2006; Wengreen & Moncur, 2009). Freshmen were overrepresented in this sample, and research has indicated that post-secondary students usually gain more weight as they progress through their education (Butler et al., 2004; Sira & White, 2010). The combination of poor diet quality and a high prevalence of food insecurity suggests that although university students do not report high BMI measurements, they may be at a high risk for higher BMI measurements later in life, a threat to their health.

### *Gender*

Findings from the present study suggest that gender is associated with differences among the determinants of food insecurity and very low food security rates. In regards to food preparation ability, female students self-reported higher scores for all three components including cooking skills, procurement ability, and access to food preparation equipment compared to male students, consistent with findings from Larson *et al.* (2006). The present study's findings supported the hypothesis that food preparation ability had a role in determining food insecurity; however, this association was only observed among female students. Financial strain, specifically loan borrowing, was a positive predictor of food insecurity among female students, but not among male students. This finding suggests that male students may cope with financial strain better than female students, which may be explain in part by a prioritization of low cost foods when purchasing meals (Boek et al., 2012) and lower levels of stress during



financial strain (Kettley, Whitehead, & Raffan, 2008). Compared to male students, female students have also expressed higher levels of stress regarding healthy living (Boek et al., 2012) and debt (Kettley, 2008) throughout their lifecycle. The existing literature on how male and female students cope with financial stress may help explain the findings of the present study; however, this study did not analyze factors related to food-purchasing motivations, financial coping mechanisms, or perceived financial stress.

Research should aim to identify the impact of stressors during college education on the development of predictors of food insecurity and diet quality. The absence of a significant association between food preparation ability and food insecurity among male students in this study may possibly be due to male students' complacency with financial strain (Kettley et al., 2008). Male students may not develop the food preparation abilities needed to mitigate the effect of financial strain on food insecurity. It may be warranted to develop further studies that seek to observe this association and others relevant to the food insecurity and diet quality of both male and female university students.

Gender was not significantly associated with fruit and vegetable consumption. Despite existing evidence suggesting female students consume more fruit and vegetable servings compared to male students (Leung et al., 2014), the present study did not find this association.

#### *The Role of Financial Strain*

Loan borrowing was positively correlated with both food insecurity and very low food security, but only among female students, as hypothesized. Parent loan borrowing in the present study was comparable to national rates of university students from households that borrow Parent PLUS loans during their education (U.S. Department of Education, National Center for Education Statistics, 2015). However, it is important to note that student-loan borrowing in the

present study was low compared to national data (U.S. Department of Education, National Center for Education Statistics, 2015). Despite a relatively low presence of loan borrowing among the sample, the prevalence of food insecurity and very low food security were elevated, a potential indication of unknown determinants of food insecurity among this population that were not studied in the present research. The low presence of loan borrowing could be attributed to many students receiving scholarships and/or grants. Additionally, evidence suggests student loan debt increases with each semester students continue their college education (Harrast, 2004). The high presence of college Freshmen, known to have lower financial knowledge than upperclassmen (Chen & Volpe, 1998) could have exacerbated the effects of new-found financial independence on the sample, potentially inflating the prevalence of food insecurity. Further analysis of the significance of demographic and socioeconomic factors is necessary to fully understand this unexpected finding.

While financial strain appears to impact diet quality, resulting in food insecurity, the present study failed to identify a component of financial strain that significantly predicted fruit and vegetable consumption among university students. This is not consistent with findings from Leung *et al.* (2014), who found that low-income young adults, aged 18-24, consumed fewer fruits and vegetables than young adults who were not low-income. Research had previously suggested that student diet quality could be poor due to the limiting effect of financial strain on the access of food (Johnson, 2015). These food choices may be the result of students choosing “competitive foods,” such as fast-food, soda, and vending machine items sold outside the student meal plan, which are lower in price (Yeh et al., 2010). Other constraints to healthful eating such as time (Yeh et al., 2010) could be associated with academic, social, and work pressures affecting low-income students. However, the present study suggests that there is a correlation

with food insecurity but not procurement, indicating that university students may feel they have adequate access to the procurement of food despite limited financial resources, a contradiction of Johnson (2015). Financial strain could hinder the maintenance of food security and healthful eating; however, all socioeconomic factors were not analyzed in the present study due to study limitations, warranting larger studies aimed at observing these associations.

### *The Role of Food Preparation Ability*

Procurement was a significant negative predictor of food insecurity, among female students, supporting the hypothesis that better food procurement ability improved food security among university students in the United States. This finding suggests that better food procurement ability can improve food security, even in the presence of financial struggle. Gaines *et al.* (2014) measured the association between self-efficacy, in cooking skills, and food insecurity with similar results. This study found that better self-reported cooking skills were correlated with fruit and vegetable consumption among female students. However, food preparation ability was not a significant predictor of fruit and vegetable consumption when financial strain was controlled for. These findings fail to identify food preparation ability as a significant determinant of fruit and vegetable consumption when students' financial situation is considered, rejecting the hypotheses.

### **Limitations**

The small sample size (N=89) and low response rate (4.45%) presented a limitation to the research. With a larger, and more demographically diverse sample, this analysis may have resulted in observations similar to previous findings regarding self-reported food preparation ability (Larson *et al.*, 2006; NHS Middlesbrough, 2010) or fruit and vegetable consumption (Leung *et al.*, 2014). The elevated prevalence of food insecurity among the sample may be

underestimated because of the underrepresentation of minority races who may suffer from a higher prevalence of food insecurity and poor diet quality. Another limitation is that female students were overrepresented in the present sample compared to recent data indicating female and male student enrollment at public 4-year institutions of 54.61% and 45.39%, respectively (U.S. Department of Education, National Center for Education Statistics, 2016).

The reliance on self-reported data to assess food preparation ability may have introduced a subjectivity bias. Although the literature on self-efficacy suggests that perceived ability may be important (Alaimo, 2005), the perceived ability may not accurately represent the true food preparation ability of individuals. Nutrition knowledge was not measured in the present study; additionally, knowledge is a component of eating competency which includes feelings and skills relevant to food and eating (Clifford et al., 2016) and may be a more comprehensive measure of ability to eat healthfully than the food preparation ability measured in the present study.

The presence of loans or lack of parental support may not always be definitive markers of financial distress among university students; however, preliminary explorative of the sample data suggested these two variables were significantly correlated with parents' socioeconomic status, suggesting these two variables may be reasonable representations of financial strain.

### **Conclusions and Implications**

This and future studies give way for opportunities to improve the lifelong health, wellness, and success of U.S. university students. Policy has primarily combatted the threats of food insecurity and diet quality among this population through financial aid such as the Pell Grant (Twill et al., 2010) and the implementation of university food banks, known as the “food bank movement” (Powers, 2012). This study aimed at finding alternative solutions to food insecurity and poor diet quality among university students. Based on the literature (Larson et al.,

2006; Levy & Auld, 2004; Reicks et al., 2014; Van der Horst et al., 2010) food preparation ability is a determinant of diet quality. However, the present study suggests that food preparation ability, specifically procurement ability, is also a determinant of food insecurity among financially strained university students in the United States. This study did not observe the hypothesized association between food preparation ability and diet quality either among male or female students, indicating a need for further research aimed at gaining a better understanding of the driving forces behind the dietary choices of all university students.

The high rates of both food insecurity and very low food security among University of Mississippi students, as well as those at other university campuses in the United States, suggest that U.S. university students may be in dire need of intervention strategies aimed at improving food security status. Previous research identified an association between food insecurity and poor dietary behaviors among this population (Hughes et al., 2011; Leung et al., 2014). Financial strain among university students has been identified as a barrier to food security in this and other studies (Johnson, 2015; Nugent, 2011).

The findings from this study contribute to the body of knowledge suggesting that financial strain and food preparation ability both have a role in determining food insecurity among university students in the United States; however, further analysis of demographic, socioeconomic, behavioral, and other determinants of food insecurity among U.S. university students is warranted. The findings from this study warrant further analysis of the associations between the quantitative components of diet quality such as the Healthy Eating Index and potential predictors such as eating competence, food preparation behaviors, and food preparation ability. Furthermore, there is an opportunity to analyze the barriers of diet quality and its determinants among the university student population. Constraints, including financial, physical,

time, or those relevant to knowledge or ability, could hinder the development of adequate food preparation ability. This gap in knowledge indicates the need to gain a better understanding of these barriers and how they may relate to the status of food security and diet quality among the U.S. university student population.

The growing body of evidence suggests that opportunities exist for policy makers and university administrators to mitigate the threat of financial strain among the university student population. Interventions aimed at improving university students' ability to cope with financial struggles are warranted. Furthermore, such interventions could offer an opportunity to improve food procurement ability, a predictor of food insecurity in this study. Personal financial management classes could be offered to aid in educating students on ways to cope with limited financial resources. Additionally, money management classes could be offered at the secondary and post-secondary levels to educate students on basic skills needed for sustaining a healthy life after leaving their parents' homes. These skills should include shopping for groceries on a budget and shopping with a list. Increased public transit opportunities for students could increase access to convenient grocery shopping. The combination of financial education and improved procurement skills and food access could be beneficial in reducing food insecurity among university students in the United States.

A significant contribution of this study is the food preparation ability instrument which was designed using items from previously validated instruments. The current measurement instrument included additional items that measured procurement and equipment access rather than cooking skills, the primary emphasis of previous instruments. Opportunity remains to further analyze the determinants of fruit and vegetable consumption among university students. Inclusion of the measurement of eating competency, including knowledge, feelings, and skills

relevant to food and eating, could contribute to a more comprehensive instrument and provide additional understanding of the status of food security and diet quality among this population.

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## LIST OF APPENDICES

## APPENDIX A: QUESTIONNAIRE

## College-Student Food Consumption Survey

**Informed Consent** Welcome to the college-student food consumption survey. Thank you for agreeing to participate in this survey measuring college students' diet and food access. Your responses will be a critical part of my Master's thesis research assessing the determinants of diet quality and food security among college students. Your response will remain anonymous and will not be used for purposes other than the proposed study. Participation is voluntary. The survey will take approximately 8-10 minutes. This study has been reviewed by The University of Mississippi's Institutional Review Board (IRB). If you have any questions, concerns, or reports regarding your rights as a participant of research, please contact the IRB at (662) 915-7482 or [irb@olemiss.edu](mailto:irb@olemiss.edu). Any questions about the survey can be directed to [klhalfac@go.olemiss.edu](mailto:klhalfac@go.olemiss.edu)

**Screen Age** Are you 18 years or older in age?

- Yes (1)
- No (2)

If No Is Selected, Then Skip To End of Survey

**Screen Enrollment** At which campus of the University of Mississippi were you enrolled during the Fall 2016 semester?

- Oxford campus (1)
- Tupelo campus (2)
- Grenada campus (3)
- DeSoto campus (4)
- Booneville campus (5)
- Other (6) \_\_\_\_\_
- Not enrolled (7)

If Not enrolled Is Selected, Then Skip To End of Survey

**Screen FT Undergrad** Were you a full-time undergraduate student during the Fall 2016 semester?

- Yes (1)
- No (2)

If No Is Selected, Then Skip To End of Survey

**DQ1** Please think about what you usually ate or drank during the Fall 2016 semester. Please read each question carefully and:

- Report how many times per day, week, or month you eat each food
- Choose the best response for each question.

	Never (1)	Less than once a month (2)	1-3 times per month (3)	1-2 times per week (4)	3-4 times per week (5)	5-6 times per week (6)	1 time per day (7)	2 or more times per day (8)
Cold Cereal (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Milk, to drink or on cereal (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bacon or sausage, do not include low-fat, light, or turkey varieties (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hot Dogs, beef or pork (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Whole grain bread (whole wheat, rye, oatmeal, and pumpernickel) (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
100% fruit juice (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fruit (fresh, frozen, or canned), do not include juice (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Regular fat dressing or mayonnaise (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lettuce or green leafy salad (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

French fries, home fries, or hash browns (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
White potatoes (baked, boiled, mashed, or potato salad) (11)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cooked dried beans (refried, baked, soup, etc.) (12)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other vegetables (raw, cooked, frozen, or canned) (13)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pasta (14)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Peanuts, walnuts, seeds, & other nuts (15)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Regular fat potato chips, tortilla chips, or corn chips (16)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

DQ2 What kind of milk did you usually use?

- Did not drink milk in the past month (1)
- Whole Milk (2)
- 2% Fat Milk (3)
- 1% Fat Milk (4)
- 1/2% Fat Milk (5)
- Skim or Non-Fat Milk (6)



FS1 For the following statements, please tell us whether the statement was often true, sometimes true, or never true for you during the Fall 2016 semester.

FS2 “I worried whether my food would run out before I got money to buy more.”

- Often True (1)
- Sometimes True (2)
- Never True (3)
- Don't Know or Refuse to Answer (4)

FS3 “The food that I bought just didn't last, and I didn't have money to get more.”

- Often True (1)
- Sometimes True (2)
- Never True (3)
- Don't Know or Refuse to Answer (4)

FS4 I couldn't afford to eat balanced meals.”

- Often True (1)
- Sometimes True (2)
- Never True (3)
- Don't Know or Refuse to Answer (4)

FS5 During the Fall 2016 semester, did you ever cut the size of your meals or skip meals because there wasn't enough money for food?

- Yes (1)
- No (2)
- Don't Know or Refuse to Answer (3)

Display This Question:

If In the last 30 days, 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 Is Selected

FS5a During the Fall 2016 semester, how many days did you cut the size of your meals or skip meals because there wasn't enough money for food?

Number of Days (1)

FS6 During the Fall 2016 semester, did you ever eat less than you felt you should because there wasn't enough money for food?

- Yes (1)
- No (2)
- Don't Know or Refuse to Answer (3)

FS7 During the Fall 2016 semester, were you every hungry but didn't eat because there wasn't enough money for food?

- Yes (1)
- No (2)
- Don't Know or Refuse to Answer (3)

FS8 During the Fall 2016 semester, did you lose weight because there wasn't enough money for food?

- Yes (1)
- No (2)
- Don't Know or Refuse to Answer (3)

FS9 During the Fall 2016 semester, did you ever not eat for a whole day because there wasn't enough money for food?

- Yes (1)
- No (2)
- Don't Know or Refuse to Answer (3)

Display This Question:

If In the last 30 days, 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 Is Selected

FS9a During the Fall 2016 semester, how many days did you ever not eat for a whole day because there wasn't enough money for food?

Number of Days (1)

FPA1 How would you rate the meals you prepare for yourself?

- Very Poor (1)
- Poor (2)
- Average (3)
- Good (4)
- Very Good (5)

FPA2 How confident are you in your ability to prepare healthful meals for yourself?

- Very Unconfident (1)
- Unconfident (2)
- Somewhat Confident (3)
- Confident (4)
- Very Confident (5)

FPA3 How would you rate your ability to follow a recipe and prepare a dinner for two or more people?

- Very Poor (1)
- Poor (2)
- Average (3)
- Good (4)
- Very Good (5)

FPA4 How would you rate your ability to prepare fresh vegetables for use in a salad or recipe?

- Very Poor (1)
- Poor (2)
- Average (3)
- Good (4)
- Very Good (5)

FPA5 How would you rate your ability to properly cook chicken, beef, pork, and fish so that they are safe for consumption?

- Very Poor (1)
- Poor (2)
- Average (3)
- Good (4)
- Very Good (5)

FPA6 How would you rate your ability to successfully shop for groceries using a shopping list?

- Very Poor (1)
- Poor (2)
- Average (3)
- Good (4)
- Very Good (5)

FPA7 How would you rate your ability to successfully shop for groceries following a budget?

- Very Poor (1)
- Poor (2)
- Average (3)
- Good (4)
- Very Good (5)

FPA8 How would you rate your access to convenient grocery shopping?

- Very Poor (1)
- Poor (2)
- Average (3)
- Good (4)
- Very Good (5)

FPA9 How would you rate your accessibility to food preparation appliances such as a stove or oven?

- No Accessibility (1)
- Low Accessibility (2)
- Average Accessibility (3)
- Above-Average Accessibility (4)
- High Accessibility (5)

FPA10 How would you rate your accessibility to food preparation tools such as pots, skillets, and utensils?

- No Accessibility (1)
- Low Accessibility (2)
- Average Accessibility (3)
- Above-Average Accessibility (4)
- High Accessibility (5)

FPA11 How would you rate your accessibility to adequate food storage such as refrigerator and freezer?

- No Accessibility (1)
- Low Accessibility (2)
- Average Accessibility (3)
- Above-Average Accessibility (4)
- High Accessibility (5)

Gender Are you?

- Male (1)
- Female (2)
- Other (3) \_\_\_\_\_

RACE Which category best describes you?

- White (1)
- Black or African American (2)
- Hispanic, Latino, or Spanish origin (3)
- Asian (4)
- Other (5) \_\_\_\_\_

LIVING Which best describes your living arrangements during Fall 2016 semester?

- On-Campus dorm (1)
- On-Campus Greek housing (2)
- Off-Campus with roommates (3)
- Off-Campus without roommates (4)
- Off-Campus with family (5)
- Other (6) \_\_\_\_\_

MEAL PLAN Did you have a campus meal plan during the Fall 2016 semester?

- Yes (1)
- No (2)

MARITAL Define your marital status.

- Single (1)
- Married (2)
- Divorced (3)
- Widowed (4)
- Other (5) \_\_\_\_\_

PAY FOR SCHOOL How did you pay for college during the Fall 2016 semester? (Check all that apply)

- Student borrowing (1)
- Parent borrowing (2)
- Student income & savings (3)
- Parent income & savings (4)
- Scholarships and/or grants (5)
- Relatives/friends support (6)
- Other (7) \_\_\_\_\_

TRANSPORTATION Did you have access to the following transportation options during the Fall 2016 semester? (Check all that apply.)

- Personal vehicle (1)
- Bike (2)
- Public transit (3)
- Other (4) \_\_\_\_\_
- None of the above (5)

ACTIVITY Which of the following best describes your physical activity level?

- Inactive, never or rarely include physical activity in your day (1)
- Somewhat active, include light or moderate physical activity 2 - 3 times per week (2)
- Active, include at least 30 minutes of moderate activity most days of the week, or 20 minutes of vigorous activity at least 3 days per week (3)
- Very active, include large amounts of moderate or vigorous activity most days of the week (4)

WORK What is your employment status, whether you are paid or unpaid for your work during the Fall 2016 semester?

- Not employed (1)
- Employed, (2)
- Employed, 18 - 30 hours per week (3)
- Employed, > 30 hours per week (4)
- Other (5) \_\_\_\_\_

EDU START In what year did you begin your college education?

- 2016 (1)
- 2015 (2)
- 2014 (3)
- 2013 (4)
- 2012 (5)
- 2011 or earlier (6)

MOM EDU What is your mother's education level?

- No high school diploma or GED (1)
- High School diploma or GED (2)
- Some college (3)
- 2 year college degree (4)
- Bachelor's degree (5)
- Graduate degree (6)
- Don't know; prefer not to answer (7)

DAD EDU What is your father's education level

- No high school diploma or GED (1)
- High school diploma or GED (2)
- Some college (3)
- 2 year college degree (4)
- Bachelor's degree (5)
- Graduate degree (6)
- Don't know, prefer not to answer (7)

HEIGHT What is your height?

- Shorter than 5' 0" (1)
- 5' 0" (2)
- 5' 1" (3)
- 5' 2" (4)
- 5' 3" (5)
- 5' 4" (6)
- 5' 5" (7)
- 5' 6" (8)
- 5' 7" (9)
- 5' 8" (10)
- 5' 9" (11)
- 5' 10" (12)
- 5' 11" (13)
- 6' 0" (14)
- 6' 1" (15)
- 6' 2" (16)
- 6' 3" (17)
- 6' 4" (18)
- 6' 5" (19)
- 6' 6" (20)
- 6' 7" (21)
- 6' 8" (22)
- 6' 9" (23)
- 6' 10" (24)
- 6' 11" (25)
- 7' 0" (26)
- Taller than 7' 0" (27)

WEIGHT What is your weight?

Weight in pounds (1)



APPENDIX B: INFORMED CONSENT

Welcome to the college-student food consumption survey. Thank you for agreeing to participate in this survey measuring college students' diet and food access. Your responses will be a critical part of my Master's thesis research assessing the determinants of diet quality and food security among college students. Your response will remain anonymous and will not be used for purposes other than the proposed study. Participation is voluntary. The survey will take approximately 8-10 minutes. This research is approved by the University of Mississippi Institutional Review Board. Any questions about the survey can be directed to [klhalfac@go.olemiss.edu](mailto:klhalfac@go.olemiss.edu)

APPENDIX C: SCORING PROCEDURES: AFSSM & MULTIFACTOR SCREENER

## 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.

### **Multifactor Screener: Scoring Procedures**

For Pyramid servings of **fruits and vegetables consumed** (defined by USDA in the 1992

Dietary Guidelines Food Guide Pyramid:

$$E(\text{Fruits and Veg}^{1/2}) = b_0 + b_1 (N_{FG1}P_1 + N_{FG2}P_2 + \dots + N_{FG7}P_7)^{1/2}$$

Information regarding Multifactor Screener scoring procedures can be found at

<https://epi.grants.cancer.gov/nhis/multifactor/scoring.html#scoring>

## VITA

### EDUCATION

Bachelor of Science in Kinesiology with a concentration in Health Fitness Studies

Mississippi State University, December, 2014, *magna cum laude*

### EMPLOYMENT

Graduate Assistant, Institute of Child Nutrition, University of Mississippi, Fall, 2015 –  
Spring, 2016

Graduate Assistant, Department of Nutrition and Hospitality Management, University of  
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Instructor of Record, Department of Nutrition and Hospitality Management, University of  
Mississippi, January, 2017