

FOOD INSECURITY AND RELATED CORRELATES AMONG STUDENTS
ATTENDING APPALACHIAN STATE UNIVERSITY

A Thesis
by
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Abstract

FOOD INSECURITY AND RELATED CORRELATES AMONG STUDENTS ATTENDING APPALACHIAN STATE UNIVERSITY

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Objective: This study measured the prevalence and related correlates of food insecurity among students attending Appalachian State University. Design: A cross-sectional, online-administered questionnaire. Methods: A randomized sample of 6,000 students were invited to complete an online questionnaire during the 2015-2016 academic year. The questionnaire measured food security using the USDA Adult Food Security Survey Module (AFSSM), coping strategies, money expenditure, academic progress scales, use of social support, and sociodemographics of the student sample. Correlation, chi-square, and regression analyses assessed relationships between variables and identified predictor variables for food insecurity. Results: Completed questionnaires were submitted by 1,217 students (20%), while 1,093 was used for analysis. Based on the scores of the AFSSM, 46.2% (n = 505) experienced some degree of food insecurity, with 21.9% (n = 239) experiencing low food security and 24.3% (n = 266) experiencing very low food security. Regression analysis showed the following variables to be predictive of food insecurity: female gender, higher money expenditure and coping strategy scores, lower grade point

average, students receiving financial aid, students who did not own a car, perceived fair/poor health status, and lower frequency of cooking for self or others. Most frequently reported coping strategies by food insecure students were purchasing cheap, processed foods (n = 282, 57.4%), stretching food (n = 100, 40.5%), and eating less healthy foods to eat more (n = 174, 35.4%). Regarding social support, 64% of food insecure students reported needing more assistance with food. Conclusions: The present sample showed an immediate need for food resource assistance.

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Chapter One

Introduction

1.1 Definitions. The term "food security," as defined by the U.S. Department of Agriculture/Economic Research Service (USDA/ERS), refers to access by all people at all times to a safe and adequate diet for an active and healthy life (USDA, 2016a). According to data collected from the 2015 USDA Household Food Security Survey Module (HFSSM), an estimated 12.7% of U.S. households (17.4 million households) were food insecure at some point during 2015, and 5% of those households experienced very low food security (Coleman-Jensen, Rabbitt, Gregory, & Singh, 2016). This prevalence of food insecure households represents a decline from 14% of affected households in 2014 and from 14.7% in 2009 (Coleman-Jensen, Rabbitt, Gregory, & Singh, 2015). In terms of regional prevalence, food insecurity is highest in the South (15.7%) and lowest in the Northeast (12.4%). In North Carolina, the prevalence of food insecurity in 2013 was 17.3% (Coleman-Jensen, Gregory, & Singh, 2014).

The concept of food security commonly includes both physical and economic access to food that meets people's dietary needs and takes into account their food preferences. Household food security is often measured using the 18-item Household Food Security Survey Module (HFSSM) or the 10-item Adult Food Security Survey Module (AFSSM) published by the USDA/ERS. These tools classify households/individuals on a four-point food security scale ranging from high food security to very low food security. Accordingly, households/individuals assigned to the high food security category are those that experience no problems or anxiety about consistently accessing adequate food, those assigned to the marginal food security category experience anxiety about accessing adequate food at times,

but the quality, variety, and quantity of foods consumed are not reduced, low food secure households are those where the quality, variety and desirability of diets are reduced, but the quantity of food consumed and eating patterns are not disrupted, and very low food secure households are those where the eating patterns are disrupted and food consumption is reduced due to lack of money and other resources for accessing food (USDA, 2016b). Monitoring food security in the United States assists in measuring the need for Federal Food Assistance programs, private food assistance programs, and other agencies devoted to reducing food insecurity (Coleman-Jensen et al., 2015).

1.2 Research objectives and justification. The objectives of this cross-sectional survey study were to: 1) measure the prevalence of food insecurity (i.e., low and very low food security) among a random sample of undergraduate and graduate students attending Appalachian State University (ASU) during the 2015-2016 academic year; 2) identify the academic progress, coping strategies, money expenditure behaviors, perceived health status, dietary and cooking practices, and sources of social support of food insecure students; 3) identify predictive variables for food insecurity among affected students; and 4) compare food insecure and food secure students based on correlates of food insecurity. There are currently no published data concerning the prevalence of food insecurity and related psychosocial correlates among college students in North Carolina, and there are few data concerning food insecurity among this population in the Southeastern United States, with only one study examining these topics at a University in Alabama (Gaines, Robb, Knol, & Sickler, 2014). Therefore, this study will contribute to the literature concerning the scope of the college student food insecurity problem in the State and in the Southeastern region. Additionally, the findings will inform University administrators about the need to expand

food resource assistance for food insecure students enrolled at ASU. Various types of interventions are suggested that, if implemented, could help alleviate the student hunger problem on the ASU campus.

1.3 Study hypotheses. Five sets of hypotheses were tested in this study to identify relationships between the students' food security status and selected demographic, academic, and health variables, coping strategies, and sources of social support. The students' food security status was determined by their scores on the U.S. Department of Agriculture (USDA) Adult Food Security Survey Module (AFSSM). This module measures food security status over the previous 12 months.

1.3.1 Food insecurity and demographic variables. 1) More than 50% of the sample will have experienced some level of food insecurity, i.e., low, or very low food security. 2) A significantly greater proportion of males, third/fourth year students, and off-campus residents will report having experienced some level of food insecurity. 3) There will be a significant inverse correlation between the students' personal average monthly income and their food security status.

1.3.2 Food insecurity and academic variables. 1) There will be a significant inverse correlation between the students' grade point average (GPA) and their food security status. 2) There will be a significant inverse correlation between the students' scores on the Academic Progress Scale (APS) and their food security status.

1.3.3 Food security and health status. 1) Significantly greater proportions of food secure than food insecure students will rate their perceived health status as "excellent/good."

1.3.4 Food security and coping strategies. 1) Males and third/fourth year students will use a significantly greater number of coping strategies than females and sophomores. 2) The two most frequently used coping strategies will be to purchase cheap, processed food and to attend on-campus or community functions where there is free food.

1.3.5 Food security and food resource support. 1) More than 50% of food insecure students will report needing more support for accessing food than they currently receive.

Chapter Two

Review of the Literature

2.1 Global food insecurity. According to the Food and Agriculture Organization of the United Nations (FAO) (FAO, 2015) undernourishment is characterized by the inability of individuals to acquire enough food to meet their daily minimum energy requirements over a one-year period. Based on most recent estimates, 795 million people around the world are undernourished. Although this number is down by 167 million from the previous decade, just over one in every nine people in the world are currently unable to access enough food to live an active and healthy life (Food and Agriculture Organization [FAO], International Fund for Agriculture Development [IFAD], & World Food Programme [WFP], 2015). While this number has steadily decreased from 1,011 million in 1990-92—progress toward improved food security continues to be uneven across regions. While some regions (Eastern and Central Asia, Latin America, and Northern Africa) have made rapid progress in reducing hunger, substantial pockets of food insecurity remain prevalent in a number of countries. In Southern Asia and sub-Saharan Africa, progress has been slow overall. A study performed in the Eastern Cape Province of South Africa found that 67.7% of surveyed households were severely food insecure in 2015 (Musemwa, Muchenje, Mushunje, Aghdasi, & Zhou, 2015). The number one cause of food insecurity was the abandonment of family food production due to lack of resources. According to the WFP (2016), other major causes of food insecurity around the world include poverty, lack of agricultural resources, adverse climate and weather conditions, natural disasters including wars and displacement, unstable markets, and food wastage.

Key strategies that have been successful in improving levels of food security and achieving nutrition goals include increases in economic growth and agricultural productivity, enhancement of markets including international trade, and increases in social protection (FAO, IFAD, & WFP, 2015). Although some countries—southern Asia, Oceania, the Caribbean, and southern and eastern Africa—report some success in reducing the prevalence of hunger, undernourishment and other forms of malnutrition remain at high levels in these regions.

In many countries, health problems related to dietary inadequacies are an ever increasing threat (WHO, 2015). According to the FAO, mortality caused by food insecurity related to conflict and famine can far exceed deaths directly caused by violence (FAO, IFAD, & WFP, 2015). Malnutrition is linked to almost half of all childhood deaths, and those children who survive malnutrition are smaller, more likely to develop infections, and more likely to experience restricted brain development (United Nations International Children’s Fund [UNICEF], 2017). Results from a study performed on 311 children with severe acute malnutrition (SAM) from Niger identified the three most common infections related to SAM as gastroenteritis, respiratory infections, and malaria (Page et al., 2013).

2.2 Food Insecurity Among Selected Population Groups in the United States

2.2.1 Race/ethnic minorities. In the United States, previous studies have shown that food insecurity is more prevalent among non-Hispanic blacks, Hispanics, and other ethnicities compared to non-Hispanic whites (Lui, Naija, Greenlund, Chapman, & Croft, 2014; Leung, Epel, Ritchie, Crawford, & Laraia, 2014). In 2013, 26.1% of households

headed by black, non-Hispanics and 23.7% of households headed by Hispanics were food insecure compared to 10.6% of white households (Coleman-Jensen et al., 2014). Kaiser et al. (2003) studied the association between food insecurity and food supplies in Latino households by interviewing 256 families with preschool aged children in six different California counties. The interviews took place at the participant's homes, the local WIC office, or local health care clinics, and measured food insecurity and household food inventory during the past 3 months. Results revealed that greater food insecurity during the past 3 months was associated with lower household food inventory scores for grains ($r = -.27$, $p < 0.001$), dairy ($r = -.18$, $p < 0.01$), meats ($r = -.22$, $p < 0.001$), vegetables ($r = -.29$, $p < 0.001$), fruit ($r = -.36$, $p < 0.001$), and snack foods ($r = -.23$, $p < 0.001$). It was also found that past food insufficiency during the mother's childhood was negatively associated with food insecurity during the past 3 months ($r = -.37$, $p < 0.001$), and that maternal education and household per capita income (below 130% of the poverty level) were inversely correlated with food insecurity ($r = -.34$, $p < 0.001$; $r = -.20$, $p < 0.001$). Food insecurity was also associated with a lower variety of nutrient-dense foods after controlling for mother's education. Forty-five percent of families interviewed were classified as food insecure without hunger and 15% of families classified as food insecure with hunger. These numbers may be higher than average due to data collection taking place after the winter months where seasonal work is limited for many Latino families.

2.2.2 Women and children. Research suggests that food insecurity is associated with psychological distress, anxiety, and depression among low-income women and children. Siefert, Heflin, Corcoran, and Williams (2001) examined the relationship between food insufficiency and women's physical and mental health using data from the first wave of the

Women's Employment Study. This study included 724 mothers who were receiving cash assistance in an urban county in Michigan in 1997. The four dependent variables used to measure the women's physical and mental health were self-rated health, physical limitations, major depression, and generalized anxiety disorder. Food insufficiency was found to be a significant predictor of fair or poor self-rated health (OR: 2.02, 95% CI; 1.4-2.92, $p < 0.01$), physical limitations (OR: 1.92, 95% CI; 1.36-2.71, $p < 0.01$), and major depression (OR: 2.82, 95% CI; 1.96-4.07, $p < 0.01$).

In regards to children, Alaimo, Olson, and Frongillo (2001) analyzed data from the Third National Health and Nutrition Examination Survey (NHANES III) to investigate associations between food insufficiency and cognitive, academic, and psychosocial outcomes for U.S. children ages 6 to 11, and U.S. teenagers ages 12 to 16. Findings revealed that those children ages 6 to 11 who were identified by their families as "sometimes" or "often" not having enough food to eat had significantly lower arithmetic scores (1.3 to 2.5 points lower out of a scale of 20), were more than twice as likely to have repeated a grade, were more likely to have seen a psychologist, and were more likely to have difficulty getting along with other children when compared to their food sufficient peers. Food insufficient teenagers were almost twice as likely to have seen a psychologist, were more likely to have been suspended from school, and had a hard time getting along with other children compared to their food sufficient peers.

2.2.3 Low income families. Food insecurity is more prevalent in low income households. For instance, 42.1% of households with annual incomes below the official poverty level were food insecure in 2013 compared to 6.7% of households with incomes above 185 percent of the poverty level (Coleman-Jenson et al., 2014). Several researchers

have suggested that food insecurity in low income households is associated with some, but not all, characteristics of a nutrient-poor diet. Leung et al. (2014) analyzed data from the 1999-2008 National Health and Nutrition Examination Survey (NHANES) to examine the association between household food security and food and nutrient intakes and overall diet quality among low income adults. The findings revealed that 4,952 (67.1%) reported their households were fully food secure, 1,046 (11.1%) reported experiencing marginal food security, 1,401 (13.7%) reported experiencing low food security, and 730 (8.1%) reported experiencing very low food security during the previous 12 months. Very low food security was significantly associated with the following dietary behaviors: an 8% increase in consumption of high-fat dairy foods (95% CI; 3-13%), a 4% increase in consumption of salty snacks (95% CI; 0-9%), a 12% increase in consumption of sugar sweetened beverages (95% CI; 3-21%; $p < 0.003$), a 12% decrease in vegetable consumption (95% CI; -15 to -9%; $p < 0.001$), and a 5% increase in consumption of red and processed meat (95% CI; 1-9%; $p < 0.005$) when compared to food secure adults. Additionally, zero percent of adults met the federal recommendation for vegetable intake (five daily servings or more) and only 2% met the federal recommendation for fruit intake (four daily servings or more). Overall, lower food security was associated with diets that increase the risk for chronic diseases.

2.2.4 Other special population groups. In addition to the previously identified associations between food insecurity, malnutrition, and mental health disorders, there are documented associations between food insecurity and chronic diseases, including infectious, non-communicable, and mental illnesses (Anema, Vogenthaler, Frongillo, Kadiyala, & Weiser, 2009). In collaboration with Project Open Hand (POH), a non-profit organization dedicated to providing food assistance to individuals suffering from chronic or debilitating

diseases in the San Francisco Bay Area, Whittle et al. (2015) conducted semi structured, in depth interviews with 34 POH clients. The majority of the participants (82%) were males between the ages of 45 and 65, who were well educated, and never married or divorced. Half of the participants were considered “mildly ill” by POH while the other half were considered “severely ill”. The interview guide included topics such as housing, finances, food security, and health status, with the interviews lasting an average of 90 minutes. After transcribing and double coding the interviews, the researchers found three highly salient themes related to living with food insecurity, i.e., insufficient quantity of food, poor quality of food, and strategies for procuring food. Regarding insufficient quantity of food, “roughly half” of the participants described periods of time in their life where they did not have enough to eat due to financial issues. Some reported “long stretches of financial hardship” while others reported “short stretches at the end of every month.” One man relied solely on the POH for his food and discussed how it is “never enough food... Especially with this [virus], the body deteriorates in so many ways.”

Consumption of poor quality diets also emerged as an issue associated with food insecurity in this population. Most clients reported knowledge of healthy eating but reported eating “junk foods” based primarily on cost. The authors found that food quality was almost always compromised to acquire enough food to avoid hunger. Strategies for procuring food, i.e., coping strategies used by the participants included: stockpiling food in times of plenty, relying on friends or family for food or money to buy food, sharing food with others, skipping meals, relying on soup kitchens and other food assistance programs, participating in studies for vouchers or cash, dumpster diving, recycling bottles for cash, and selling local street newspapers. Other coping strategies included stealing food, checking into homeless

shelters only to eat free meals, sneaking into buffet events at a local university, exchanging sexual activities for food, and selling prescription drugs to obtain money to buy food.

2.3 Health Problems Associated with Food Insecurity

2.3.1 Malnutrition. Obesity—a condition featuring excess adiposity—is often assessed using Body Mass Index (BMI) scores. Obesity is characterized by a BMI ≥ 30 and is calculated by dividing an individual's weight (kg) by the square of the individual's height in meters (m^2). Currently, obesity affects more than one third (34.9%) of American adults and has been found to be more prevalent among those with lower socioeconomic status (Centers for Disease Control and Prevention [CDC], 2016). Cheung et al. (2015) used demographic data along with focus group themes to determine the longitudinal relationship between food insecurity and BMI. Recruiting subjects from an ethnically diverse community health center in Chelsea, Massachusetts, the authors measured the food security status, BMI at baseline, age, sex, race/ethnicity, education, insurance, and primary language. The subjects were also invited to attend focus group discussions to help identify barriers to healthy eating among the food insecure and successful strategies to avoid obesity despite financial constraints. The findings indicated that although food insecure subjects did not have a significantly higher BMI at baseline, they had significantly greater BMI gains over time compared to those who were food secure. Analysis of focus group data revealed that regardless of BMI, participants endorsed the importance of eating produce and avoiding highly processed and “junk foods” for maintaining health, but acknowledged that healthier foods were expensive. Other themes that emerged from the focus group discussions included inadequate resources and difficulty with food access—including transportation—and the concept that food practices and choices

were different among obese versus non obese subjects. Subjects who were not obese identified skills to cope with high prices which included budgeting, portion control, and healthier cooking techniques. In contrast, obese participants admitted that they were unable to budget sufficiently, and often resorted to convenience meals they perceived as “unhealthy” because they believed they had “no other options to cope with their time and resource constraints.”

Food insecurity has not only been linked to over nutrition, but to undernutrition as well. A study performed by Park and Eicher-Miller (2014) analyzed the relationship between food insecurity and iron deficiency during pregnancy among subjects from the U.S. Using 1999-2010 NHANES data, the study population included 1,045 pregnant females between the ages of 13 to 54 years who had completed a 24-hour recall and a 30-day dietary supplement questionnaire. Total iron intake was calculated as the sum of the 24-hour dietary iron intake and mean daily supplemental iron intake. Among the participants, 15.7% were food insecure, and the average intake of dietary iron was 15 ± 1 mg/day (the Estimated Average Requirement [EAR] for iron is 22-23 mg/day for pregnant females). Dietary iron intake was not associated with food security status, however, supplemental iron intake was 10 mg/day higher among the food secure than among the food insecure participants, resulting in a higher mean total daily iron intake among the food secure pregnant females. Since these participants were not meeting their EAR for iron, public health policy should continue to focus on improving access to iron-rich foods and iron supplements for food insecure pregnant females, since the need for this nutrient increases during pregnancy.

2.3.2 Mental health, cognition, and behavioral problems. A cohort study using data from the Early Childhood Longitudinal Study, Birth Cohort (ECLS-B) examined the

influence of maternal depression on future household food insecurity in low-income families (Garg, Toy, Tripodis, Cook, & Cordella, 2015). Interviews with 2917 mothers were recorded when their children were 9 months of age and 24 months of age. Findings revealed that significantly more depressed mothers at baseline reported household food insecurity at follow-up (14.4% vs 10%, OR 1.51, 95% CI 1.06-2.14). There was also a significant effect of Women, Infants, and Children Supplemental Nutrition Program (WIC) participation on the relationship, such that depressed mothers who received WIC assistance at baseline were significantly more likely to be food insecure at follow up compared to depressed mothers who did not receive such assistance. Depression may also impair a mother's decision-making skills, her ability to access social assistance programs, and her motivation to shop or cook, which may all lead to increased risk for food insecurity.

Food insecurity, an important social determinant of health, has also been associated with insufficient sleep. In a random dial telephone survey study conducted in 12 states, Liu et al. (2014) examined the relationship between food and housing insecurity, frequent mental distress, and insufficient sleep among 68,111 U.S. adults. The survey consisted of a core set of questions on public health issues and included questions concerning housing and food insecurity. Analysis revealed that frequent insufficient sleep was significantly more prevalent among those who reported housing insecurity (37.7% vs 21.6%) and food insecurity (41.1% vs 22.9%) when compared to those who did not. Those who reported food insecurity were three times more likely to report frequent mental distress than those who reported being food secure. The authors speculated that stress caused by housing or food insecurity could also lead to prolonged psychological distress or depressive symptoms. However, hunger may also affect the ability to sleep well.

2.4 Food Insecurity Among International and U.S. College Students

2.4.1 Food insecurity among international college students. Little research has been undertaken concerning food insecurity among college students worldwide. Gallegos, Ramsey and Ong (2014) investigated the extent and severity of food insecurity among students attending a metropolitan university in Brisbane, Australia, and examined the sociodemographic, dietary and health factors associated with food insecurity in this sample. This cross sectional study used a web based survey that was emailed to 14,439 Health and Business students at the university, and yielded a 6.7% response rate (n = 810). The survey included the USDA 18-item HFSSM, sociodemographic questions, questions concerning consumption of “take away” foods, fruits, and vegetables, and items concerning self-assessed health. Findings revealed that 25.5% of the students experienced household food insecurity, and that students who were food insecure were 35% less likely to consume more than 2 fruits a day, 55% less likely to consume over 4 vegetables a day, twice as likely to self-report fair or poor health, and three times as likely to defer their studies due to financial difficulties. Only 24% of students experiencing very low food security sought food relief, and the most popular form of assistance was the university sponsored food bank. These findings suggest that developing strategies aimed at decreasing food insecurity on-campus could play a role in improving student retention rates.

Another study that measured food insecurity among university students in South Africa found a similar prevalence rate to that reported by Gallegos et al. (2014). Munro, Quayle, Simpson, & Barnsley (2013) focused on the vulnerability to food insecurity, the experience of food insecurity in the university population, and the likely impact of food insecurity on the well-being and academic experiences of students attending the University of KwaZulu-Natal

(UKZN). Data were collected from 1,083 students using a revised, validated version of the USDA HFSSM, along with questions pertaining to demographics, eating habits, spending habits, and strategies to address food insecurity. Analysis revealed that 20.8% of the sample experienced some level of vulnerability to food insecurity, with 16.1% reporting serious levels of vulnerability and 4.7% reporting critical levels of vulnerability. Regarding ability to concentrate while hungry, 11.3% reported deficit in concentration as a result of hunger “often” or “almost always,” and 21.5% responded with “sometimes.” The students also reported that hunger affected levels of fatigue and worry about personal access to food/meals, and a paired t test revealed that students were significantly more likely to go hungry at the end of the semester rather than the beginning ($p < 0.001$). Since academic demands are usually highest towards the end of a semester, the authors stated that these findings might provide information related to performance on final examinations and subsequent graduation. Other variables that were associated with vulnerability to food insecurity included collecting financial aid ($t = 7.955$; $df = 1027$; $p < 0.001$) and being a part of the Centre for Science Access (CSA) program ($t = 9.708$; $df = 1034$; $p < 0.001$), which is a program that accepts students from disadvantaged schools who do not meet entrance requirements for the mainstream science degrees. The authors speculated that students from previously disadvantaged backgrounds may not have the nutritional resources to effectively meet the required academic demands. The authors proposed six specific recommendations for alleviating the problem of food insecurity on college campuses: create awareness across institutes of higher education (HEIs), provide ethically and responsibly managed food vouchers funded by HEIs or other external organizations, investigate the viability of on-campus food banks or reduced fee meals, promote on-campus student employment

opportunities, provide life-skills training in money management and budgeting, and reassess financial aid meal allowances to address personal circumstances.

2.4.2 Food insecurity among college students in the United States. Researchers who have measured the prevalence of food insecurity among college students in the United States have reported high percentages of affected students. Chaparro, Zaghoul, Holck, & Dobbs (2009) assessed the prevalence and possible predictors of food insecurity among 441 college students in Manoa, Hawaii and found that 45% of the participants reported some degree of food insecurity. Instructors from 31 randomly selected classes gave permission to have their students participate. The investigators used the six-item USDA Six-Item Short Form Food Security Survey Module—a subset of the USDA HFSSM—to measure the participants' experience with food insecurity during the previous 12 months. The students were also asked to provide demographic information and information concerning their spending patterns. The results revealed that 24% (n = 105) of students classified as marginally food insecure and 21% (n = 85) classified as food insecure, with 15% (n = 61) having low food security and 6% (n = 24) having very low food security. These rates are nearly three times as high as the prevalence rate of 7.8% reported for Hawaii from 2004-2006, according to USDA data (Nord, Andrews, & Carlson, 2007). Analysis of student monthly spending patterns indicated that the amount of money spent on housing, groceries, cell phone and one time large expenses did not differ significantly between food secure and food insecure students. However, the probability of food insecurity significantly increased as transportation, eating out, entertainment, and shopping increased. It was also found that students who lived on-campus, off-campus, and off-campus with roommates were significantly more likely to be food insecure than those living with their parents or relatives.

Students who reported two or more ethnic affiliations were also significantly more likely to be food insecure.

A study among students attending two community colleges in Maryland also found a high prevalence of food insecurity (Maroto, 2013). The participants were 150 students attending a low income urban community college and 151 attending an affluent suburban community college. The students were asked to complete the USDA HFSSM along with questions regarding their GPA, demographic information, and living situation. The author found that 59% of students at the urban community college and 53% of students at the suburban community college were affected by food insecurity. Food insecurity was significantly associated with a lower GPA in the overall sample and at the suburban community college, but not at the urban community college.

Gaines et al. (2014) examined the role of financial factors, resources, and skills in predicting food security status among college students at the University of Alabama. The concept that individuals between the ages of 18 to 25 are transitioning to adulthood, leading to greater instability in relationships, emotions, cognitive development, and finances served as the basis for identifying potential risk factors for food insecurity. Sophomore, junior, and senior students were invited to participate in an on-campus survey that measured food insecurity, self-efficacy concerning cooking skills, and perceived food resources and skill adequacy. Out of 557 participants, 20.2% experienced anxiety about food security (marginal), 8.91% experienced low food security, and 5.15% experienced very low food security. This prevalence of food insecurity was lower than the state average of 18% (Coleman-Jensen et al., 2014) and lower than that reported in other studies (Chaparro et al., 2009; Maroto, 2013). High levels of food security were associated with greater cooking self-

efficacy ($p = 0.029$), and food insecurity was associated with students who received financial aid ($p = 0.011$) or food assistance ($p = 0.003$), were financially independent ($p = 0.001$), and reported budgeting behaviors or tracking expenses ($p < 0.01$).

Lin et al. (2013) surveyed 112 African American females attending a Historically Black University in Texas to determine whether behavioral and psychosocial differences existed among female students with and without food security. The survey measured the following six dependent variables: future orientation, family connectedness, self-esteem, partner conflicts, personal conflict resolution, and substance abuse. A large percentage of the females surveyed were seniors (46%) under the age of 24 (97%) who generally earned grades of A's and B's (82%). The results revealed that females who reported experiencing food insecurity were significantly more likely to report drug use in the last month (2.25 vs. 1.53, $p < 0.05$), conflict with partners (4.19 vs. 1.02, $p < 0.05$), lower future orientation (33.18 vs. 35.24, $p < 0.05$), and lower self-esteem beliefs (11.62 vs. 13.14, $p < 0.01$). The limitations of this study included measuring food insecurity with only one question, i.e., "In the last month, have you experienced problems with food insecurity?" and the fact that the female students were recruited from the Department of Health and Human Performance, restricting the generalizability of the findings to other student groups at the University. Additionally, the authors failed to report the prevalence of food insecurity in their student sample.

Patton-Lopez, Lopez-Cevallos, Cancel-Tirado, & Vazquez (2014) examined the prevalence and correlates of food insecurity at a midsize rural university in Oregon, as part of a broader effort to increase access to food among students on-campus. The entire student population ($n = 5,438$) was emailed an invitation to participate in the study. The protocol included the administration of an online 40-item survey. The survey measured food

insecurity by using the USDA's Six-Item Short Form Food Security Survey Module, and included questions regarding credit card debt, employment, financial aid, and other relevant factors associated with food insecurity which were not stated. The students had two weeks to complete the survey and were reminded weekly. Results revealed a response rate of 7% (n = 354) and analysis revealed a 59% prevalence of food insecurity and a 27% participation rate in food assistance programs. The strongest correlate of food insecurity was a reported income of <\$15,000 per year (odds ratio (OR) 2.23; 95% confidence interval (CI), 1.07-4.63), followed by self-report of fair or poor health (OR, 1.73, 95% CI, 1.07-4.63). Students who were also more likely to be food insecure included employed students (OR, 1.73, 95% CI, 1.04-2.88) and students who participated in food assistance programs (OR, 1.91, 95% CI, 1.05-3.45). It was also found that students who reported a GPA ≥ 3.1 were 60% less likely to be food insecure (OR, 0.40, 95% CI, 0.22-0.69). There were no significant associations between food insecurity and living arrangement, health insurance status, physical activity level, enrollment status, or other demographic factors.

Most recently published, Morris, Smith, Davis, & Null (2016) surveyed students from four Illinois universities for food security status and sociodemographics including gender, age, race, academic standing, living situation, employment, GPA, financial support and hometown region. Analysis of 1,882 collected surveys (3.87% response rate) established a food insecurity rate of 35.0% with significant associations between food insecurity and African American race ($\chi^2 = 49.989$; $p < .001$), low GPA ($\chi^2 = 84.466$; $p < .001$), off-campus residence without parents or guardians ($\chi^2 = 42.064$; $p < .001$), and financial aid assistance ($\chi^2 = 70.033$; $p < .001$). The authors of the study recommend future studies to include

qualitative data to gather more insight regarding the underlying and basic causes of food insecurity in college students.

2.5 The Cumulative Risk Theory

Much of the research on food insecurity focuses on identifying the determinants and consequences of being food insecure versus being food secure. To establish the connection between economic hardship and food insecurity, it is appropriate to evaluate multiple risk factors that impact an individual's or family's well-being (Hernandez, 2015). The Cumulative Risk Theory proposes that it is the accumulation of risk factors that influence a particular outcome, rather than any one risk factor individually (Rutter, Kent, & Rolf, 1979).

Hernandez (2015) used this theory to examine four types of cumulative family risk indices (financial strain, maternal poor health and risky health behaviors, family disruption and conflict, and parenting disruption) to assess various levels of food insecurity among households with children. Using data from the longitudinal study Fragile Families and Child Well-being (FFCW), the author examined the following factors: economic hardship, employment, health problems, self-reported health, indicators of depression and anxiety, drug use, single parenting, incarceration, relationship conflict and violence, women with children from multiple men, partner support, and parental strain. These factors made up the four family risk indices and were scored on a scale from 0-16 (the higher the score the more cumulative risk). Results of this study revealed that particular family indices are related to distinguishing between different levels of food insecurity (i.e., marginally food secure, low food secure, and very low food secure). Specifically, financial strain is a predictor of marginal food security for non-poor families, and poor maternal health/risky health behaviors is a predictor for families experiencing very low food security.

Chapter Three

Description of the Research

3.1 Participants and recruitment. Students enrolled at Appalachian State University (ASU) during the 2015-2016 academic year were recruited using two sets of 3,000 email addresses obtained from the Office of Institutional Research, Assessment and Planning in November of 2015 and February of 2016. Inclusion criteria were: 1) an enrolled sophomore, junior, senior, or graduate student, 2) over the age of 18, 3) on or off-campus resident, 4) any gender, and 5) any race/ethnicity. Freshmen students were excluded from the study since a primary objective was to measure the proportion of students who had experienced food insecurity at some time during the previous 12 months; during the 2014-2015 academic year freshmen students would not have begun their college career.

The first email blast of 3,000 recruitment letters was sent to students in mid-November, 2015, followed by a reminder email one week later. Data collection was suspended the day before Thanksgiving and was not resumed until the first week in February, 2016 to minimize the possibility of collecting biased food security data over the holiday period when food may have been more accessible. The second blast of 3,000 email recruitment letters was sent out the first week in February, 2016 followed by a reminder email one week later. These recruitment procedures followed the recommendations made by Dillman, Smyth, and Christian (2009). Data collection concluded on March 31, 2016.

Those students who were interested in learning more about this study after reading the electronic recruitment letter clicked a link that took them to a letter of informed consent. This consent letter explained the purpose of the study, identified the sponsors of the study, and included the elements of informed consent (Appendix A). Those students who wished to

continue in the study indicated their agreement with the study conditions by clicking an "accept" button which took them to the first questionnaire item. The students who completed the questionnaire were offered the opportunity to enter a drawing to win one of two \$100 gift cards to Amazon.com. Interested students clicked a link that was presented after the final questionnaire item and typed their name and email address. This link was detached from the questionnaire link to insure confidentiality of responses. Approval to conduct this research was granted by the Office of Research Protections at ASU on October 30th, 2015.

3.2 Survey instrument. Data were collected using an anonymous, three-part, online questionnaire consisting of 73 items designed to measure prevalence of food insecurity (11 items), identify coping strategies used by food insecure students, (30 items), and to elicit demographic, academic, economic, health, food preparation, and social support information (32 items). The prevalence of food insecurity over the past 12 months was measured using the 11-item USDA Adult Food Security Survey Module (AFSSM) available at http://www.ers.usda.gov/datafiles/Food_Security_in_the_United_States/Food_Security_Survey_Modules/ad2012.pdf. This module consists of a general screening question designed to assess overall household food security over the past 12 months and ten more specific questions that assess the quantity and quality of food available to the individual, and experiences with hunger and weight loss over this time period (Appendix C). The students next completed an eight-item Money Expenditure Scale (MES) to measure how often, during the previous 12 months, i.e., "often," "sometimes," or "never" they had spent money on the following nonfood items instead of buying food: alcohol, cigarettes, recreational drugs, car repairs, gasoline, public transportation to school/work, pet care, and tattoos.

Part two of the questionnaire included a Coping Strategies Scale (CSS) comprised of 29 behaviors used by food insecure individuals to access food, compiled with guidance from pertinent literature (Kempson, Kennan, Sadani, & Adler, 2003; Pinard et al., 2016; Knight, Probst, Liese, Sercy, & Jones, 2016; Dharmasena, Bessler, & Capps, 2016). The students were asked to indicate the frequency, i.e., "often," "sometimes," or "never" with which they had used each strategy during the previous 12 months (Table 3). These strategies were assigned to four subscales based on their focus (Table 4), and Cronbach alpha reliability coefficients were calculated as follows: saving (9 items, $\alpha = .74$), support system/self-support (10 items, $\alpha = .65$), food intake/access (6 items, $\alpha = .64$), and selling (4 items, $\alpha = .55$). Although both the food insecure and food secure students could have completed these items, only data from the food insecure students, as determined by their AFSSM scores, were included in the analysis. The students next completed a four-item Academic Progress Scale (APS) where they rated their perceived performance on the following academic variables: overall progress in school including graduating on time, class attendance, attention span in class, and understanding of concepts taught in class. Each item was followed by "excellent," "good," "fair," and "poor," and the Cronbach alpha reliability coefficient for the APS was 0.70.

The questionnaire concluded with items eliciting information concerning demographics, health, cooking skills and food preparation, food group consumption, and social support. The demographic variables were: gender, age, marital status, international vs domestic student status, presence of children in the household, height and weight (for calculating BMI), and race/ethnic affiliation. The economic variables were: employment status, average personal monthly income, car ownership, use of public transportation, and

participation in an on-campus meal plan or food assistance program. Health-related variables were a self-assessment of health status and access to health insurance. Information concerning food preparation included a self-assessment of cooking skills and an estimate of how often the students prepared food for themselves and for others. Lastly, two items addressed the topic of food resource support. The first item asked the students to identify, from a list of 13 resources, those that the food insecure students would find most helpful in improving their access to food. The resources listed were: part-time/full-time job, better transportation to the store, learn to grow food, get a roommate, financial aid from others, more financial aid at school, learn how to shop for food, learn how to eat healthy, learn how to make a budget, food pantry on/near campus, garden on/near campus, sign up for school meal plan, and learn how to cook. These resources were followed by an "other" option to offer the students the opportunity to identify a resource not included. The second item asked whether the students could have used more support in accessing food during the previous 12 months, followed by "yes," "no," and "don't need help".

3.3 Pilot testing. The online questionnaire was pilot tested with 41 students enrolled in a community nutrition class at ASU. An electronic recruitment letter with a link to the questionnaire was emailed to the students. The responses to questionnaire items, along with their feedback concerning clarification of wording and inclusion/deletion of items were collected over a seven-day period. No incentive was offered for participating in the pilot test, and these students did not participate in the final study. The two changes made to the questionnaire based on student feedback were adding an “other” option to the question regarding gender, and changing the wording of two items for greater clarity in the coping strategies section (part 2).

3.4 Statistical analyses. Data were analyzed using SAS statistical software (SAS Institute Inc., SAS 9.1.3 Help and Documentation, Cary, NC: SAS Institute Inc., 2008). Frequency distributions, percentages, means (SD), and ranges were obtained on demographic variables, food security status, scores on the Academic Progress, Coping Strategies, and Money Expenditure scales, and on items addressing food resource support. The students' food security status was determined based on their scores on the USDA AFSSM (http://www.ers.usda.gov/datafiles/Food_Security_in_the_United_States/Food_Security_Survey_Modules/hh2012.pdf). Students with a score of zero were classified as high food secure, those with scores of 1-2 as marginally food secure, those with scores of 3-5 as low food secure, and students with scores of 6-10 were classified as very low food secure. In accordance with USDA definitions, students who scored in the low food secure or very low food secure categories comprised the food insecure group, while those who scored in the high food secure or marginally food secure categories comprised the food secure group for data analysis.

When scoring the eight-item Money Expenditure Scale (MES) 1 point was allotted to the "never" 2 points to the "sometimes," and 3 points to the "often" responses, with possible scores ranging from 8 to 24 points. Therefore, the maximum score would be 24 points if a student "often" spent money on all eight items rather than on food, and eight points if a student "never" spent money on any of the eight items instead of buying food. The four-item Academic Progress Scale (APS) was scored by allotting 4 points to the "excellent" response, 3 points to the "good" response, 2 points to the "fair" response, and 1 point to the "poor" response. Therefore, scores could range from 16 points if students selected the "excellent" response for all items to 4 points if students selected the "poor" option for all items. The 29-

item Coping Strategies Scale (CSS) was scored by allotting 3 points for every “often” response, 2 points for every “sometimes” response, and 1 point for every “never” response, with a minimum score of 29 points earned by students who "never" used any of the coping strategies and a maximum score of 87 points earned by students who "often" used all of the strategies. Correlation analyses assessed relationships between the students' AFSSM scores and GPA, scores on the APS, MES, and CSS scales, BMI, and personal monthly income. Chi-square analyses compared proportions of food insecure with food secure students on demographic and health characteristics, APS and MES scores, items concerning self-rated cooking skills and frequency of food preparation, and food group consumption patterns. A regression model was created to identify predictor variables for food insecurity. Statistical significance was $p < 0.05$.

Chapter Four

Results

4.1 Participant characteristics. A total of 1217 students submitted responses to the on-line questionnaire (20% return rate). However, 128 questionnaires were disqualified because they provided insufficient data to determine the students' level of food security, leaving a final sample of 1093 students. The students' mean age was 21.7 ± 3.8 , range 18 to 56 years and their mean BMI was 24.5 ± 5.5 , range 15.0 to 46.2.

Table 1 shows the frequency distributions and percentages of other demographic and lifestyle characteristics for the food insecure and food secure students, and for the entire sample. In summary, approximately 30% of the entire sample was male, two-thirds was female, and 1.5% selected the "other" gender response option. The majority (91.7%) of the students self-classified as white, not of Hispanic origin, and less than 1% were international students. Approximately one-third of the students were sophomores, one-half were junior/seniors, and 15% were graduate students. The large majority of the students were enrolled full time at ASU, three-fourths lived off-campus, and two-thirds received financial aid. The students' mean grade point average (GPA) was 3.38 ± 0.6 . Regarding their financial status, about three-fourths of the students reported a personal monthly income of below \$500, and over half held one or more part time jobs. Additionally, a large majority of the students had health insurance, perceived their health as "excellent/good," and reported "often/sometimes" cooking for themselves or others.

Table 1

Characteristics of Food Insecure Students (n =505), Food Secure Students (n =588), and Entire Sample (n =1093)

Variable	Food Insecure Students		Food Secure Students		All Students		p-value
	n	%	n	%	n	%	
Gender							<0.001
Male	171	34.9	146	25.8	317	30.1	
Female	303	61.8	419	74.2	723	68.4	
Other	16	3.3	0	0.0	16	1.5	
Race/Ethnicity							ns
White, non-Hispanic	431	89.4	526	93.6	957	91.7	
Hispanic	21	4.4	17	3.0	38	3.6	
Asian	12	2.5	5	0.9	17	1.6	
African American	7	1.5	7	1.3	14	1.3	
American Indian	3	0.6	3	0.5	6	0.6	
Other	8	1.7	4	0.7	12	1.2	
Marital Status							ns
Not Married	468	95.7	534	94.7	1002	95.2	
Married	21	4.3	30	5.3	51	4.8	
Year in School							0.046
Sophomore	140	28.9	174	30.8	314	29.9	
Junior	136	28.1	132	23.4	268	25.6	
Senior	146	30.2	160	28.3	306	29.2	
Graduate	57	16.8	91	16.1	148	14.1	
Other	5	1.0	8	1.4	13	1.2	
Enrollment Status							ns
Part-time student	20	4.2	26	4.6	46	4.4	
Full-time student	462	95.8	536	95.4	999	95.6	
Residency							ns
On-campus	109	23.6	135	24.8	244	24.3	
Off-campus	352	76.4	409	75.2	761	75.7	
Employment Status							ns
Unemployed	155	33.6	208	39.4	363	36.7	
One or more part-time jobs	281	61.0	292	55.3	573	57.9	
Full-time job	25	5.4	28	5.3	53	5.4	

Table 1 (continued)

Variable	Food Insecure Students		Food Secure Students		All Students		p-value
	n	%	n	%	n	%	
Personal Monthly Income							ns
< \$500	382	75.9	450	77.2	832	76.6	
\$501-\$1000	91	18.1	89	15.3	180	16.6	
\$1001-\$1500	12	2.4	12	2.0	24	2.2	
\$1501-\$2000	6	1.2	6	1.0	12	1.1	
>\$2000	12	2.4	26	4.5	38	3.5	
Receive Financial Aid							<0.001
Yes	341	70.8	324	58.2	665	64.0	
No	141	29.2	233	41.8	374	36.0	
Purchased Meal Plan							ns
Yes	126	26.2	171	30.9	297	28.7	
No	355	73.8	382	69.1	737	71.3	
Perceived Health Status							<0.001
Excellent/good	319	72.5	460	91.5	779	82.6	
Fair/poor	121	27.5	43	8.5	164	17.4	
Body Mass Index							0.011
Underweight	24	5.2	20	3.8	44	4.5	
Normal weight	260	56.7	345	65.6	605	61.4	
Overweight	108	23.5	113	21.5	221	22.4	
Obese	67	14.6	48	9.1	115	11.7	
Cook for self and others							0.005
Often	256	53.1	350	62.8	606	58.3	
Sometimes	181	37.6	172	30.9	353	34.0	
Never	45	9.4	35	6.3	80	7.7	
Perceived Cooking Skills							ns
Excellent/good	391	80.8	439	78.8	830	79.7	
Fair/poor	93	19.2	118	21.2	211	20.3	

Note: Counts will not always sum to 1093 because of missing data.

ns= analysis of food secure vs. food insecure students was non-significant

4.2 Prevalence of food insecurity and characteristics of the food insecure

students. Based on the students' AFSSM scores, 588 (53.8%) of the sample was food secure over the past 12 months, while 505 (46.2%) had experienced some level of food insecurity. Frequency distributions of the four USDA categories of food security revealed that 337 (30.8%) were food secure, 251 (22.9%) were marginally food secure, 239 (21.9%) were low food secure, and 266 (24.3%) were very low food secure. Regarding the demographic characteristics of the food insecure students, a greater proportion of males than females were food insecure ($n = 171, 53.9\%$ vs. $n = 303, 41.9\%$). Overall, the majority of food insecure students self-classified as white, non-Hispanic, and were not married. Approximately one third of food insecure students were seniors, over 95% were enrolled as full-time students, and approximately three quarters were living off campus with a reported income of less than \$500 per month. Furthermore, approximately two thirds of the food insecure students in this sample held one or more part time jobs and reported receiving financial aid.

Table 2 presents the findings from the regression model that identifies predictive variables for food insecurity among the present sample. The quantitative variables were scores on the Money Expenditure Scale (MES) and Coping Strategies Scale (CSS) and GPA, while the qualitative variables were male gender, not owning a car, receiving financial aid, "fair/poor" perceived health status, and "never" cooking for themselves or for others.

Table 2

Predictor variables for food insecurity with fitted coefficients (quantitative variables) and additive effects relative to reference level (qualitative variables)

Explanatory Variable	Estimate±StdError	p-value
Money Expenditure Score	0.34 ± 0.04	<0.001
Coping Strategies Score	0.13 ± 0.01	<0.001
GPA	-0.41 ± 0.12	<0.001
Gender		
Male	0.52 ± 0.14	<0.001
Female (ref)	0.00	
Car Ownership		
Yes	-0.77 ± 0.17	<0.001
No (ref)	0.00	
Financial Aid		
Yes	0.28 ± 0.13	0.032
No (ref)	0.00	
Current Health Status		
Excellent/good	-0.44 ± 0.18	0.015
Fair/poor (ref)	0.00	
Cook for Self/Others		
Often	-0.58 ± 0.23	0.013
Sometimes	-0.24 ± 0.24	0.309
Never (ref)	0.00	

Note: Multiple R-square for fitted model was 48.1%.

4.3 Coping strategies used by food insecure students. The mean score on the 29-item Coping Strategies Scale (CSS) earned by the 505 food insecure students was 48.2 (± 7.4, range 32 to 84) points out of a possible 87 points, with higher scores reflecting more frequent use of coping strategies. Accordingly, higher CSS scores were positively associated with higher scores on the AFSSM scale ($r = 0.42$, $p < 0.001$).

Table 3 shows the frequency distributions and percentages for the 29 coping strategies used by the food insecure students in descending order, ranked according to the number of students who selected the "often" response option. The three coping strategies receiving the greatest number of "often" responses were: "purchasing cheap, processed foods, e.g., ramen noodles, frozen pizza, candy" (n = 282, 57.0%), "holding one or more part time or full time jobs," (n = 223, 45.6%), and "planning menus before buying food" (n = 205, 41.8%). These were followed by "stretching food to make it last longer" (n = 199, 40.5%) and "eating less healthy meals in order to eat more" (n = 174, 35.4%). The three coping strategies that received the greatest number of "never" responses were: "selling sperm/eggs for money to buy food" (n = 471, 96.3%), "participating in food assistance programs, e.g., the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) and the Supplemental Nutrition Assistance Program (SNAP)" (n = 450, 92.0%), and "selling blood/plasma for money to buy food" (n = 446, 91.4%).

Analysis of the food insecure students' CCS scores based on demographic variables revealed that sophomores earned significantly lower mean scores than juniors/seniors (difference between means -1.74) or graduate students (difference between means -2.47), in all cases $p = 0.04$. Students living off-campus had significantly higher mean CSS scores compared to those living on-campus (difference between means 1.8, $p = 0.04$). Students having one full time job had significantly higher mean CSS scores than those having one or more part-time jobs (difference between means -3.61, $p = 0.002$). Students with one or more part-time jobs had significantly higher mean CSS scores than students who were unemployed (difference between means -2.29, $p = 0.002$). Students who rated their current health as "fair/poor" had significantly higher mean CSS scores than students who rated their health as

"excellent/good" (difference between means 2.7, $p = 0.009$). There was a small but significant positive correlation between the students' CSS scores and their BMIs ($r = 0.13$, $p = 0.005$), suggesting that the food insecure students with higher BMIs reported using more coping strategies. No significant differences were found between the mean CSS scores based on the following variables: gender, international vs. domestic student status, marital status, self-rated cooking skills, car ownership, or academic progress scale (APS) score.

Table 3

Coping strategies used by food insecure students (n = 505) ranked in descending order according to the "often" response option

Coping Strategy	Often		Sometimes		Never	
	n	%	n	%	n	%
Purchased cheap/processed foods	282	57.4	168	34.2	41	8.4
Held one or more part/full time	223	45.6	164	33.5	102	20.9
Planned menus before buying food	205	41.8	183	37.3	103	21.0
Stretched food to make it last longer	199	40.5	235	47.9	57	11.6
Ate less healthy in order to eat more	174	35.4	234	47.7	83	16.9
Shared rent with others	157	32.2	79	16.2	252	51.6
Shared groceries with roommates	145	29.7	227	46.4	117	23.9
Attended functions with free food	138	28.1	250	50.9	103	21.0
Used a credit card to buy food	133	27.1	108	22.0	249	50.8
Used food coupons	126	25.7	214	43.7	150	30.6
Ate more when food was plentiful	122	24.9	258	52.7	110	22.5

Table 3 (continued)

Coping Strategy	Often		Sometimes		Never	
	n	%	n	%	n	%
Used less utilities	119	24.4	161	33.1	207	42.5
Obtained food from family	115	23.4	246	50.1	130	26.5
Borrowed money from family/friends	108	22.0	261	53.2	122	24.9
Took food home from campus dining	71	14.5	174	35.4	246	50.1
Saved supply of food for emergency	71	14.5	172	35.1	247	50.4
Sold personal possessions	53	10.9	175	35.9	259	53.2
Sold textbooks	36	7.5	118	24.7	324	67.8
Ate at a pay-what-you-can facility	34	7.0	96	19.6	359	73.4
Avoided medical visits/medications	30	6.1	70	14.3	391	79.6
Joined organization with free food	29	5.9	86	17.5	376	76.6
Obtained food from dumpster/trash	24	4.9	37	7.5	430	87.6
Obtained food from pantry/bank	23	4.7	31	6.3	437	89.0
Bartered for food	22	4.5	93	18.9	376	76.6
Took fewer classes to save on tuition	18	3.7	48	9.8	422	86.5
Participated in food assistance	18	3.7	21	4.3	450	92.0
Sold blood/plasma	16	3.3	26	5.3	446	91.4
Participated as a research subject	10	2.1	66	13.6	411	84.4
Sold sperm/eggs	8	1.6	10	2.0	471	96.3

The 29 coping strategies shown in Table 3 were assigned to four subscales based on their focus, and Table 4 shows the mean scores (SD) and ranges earned by the 505 food insecure students on these four subscales. The students earned the highest mean score on the savings subscale (16.2 points) and the lowest on the selling subscale (5.1 points).

Table 4

Mean Scores on Coping Strategies Combined Scale and Subscales for Food Insecure Students (n =505)

	mean±sd	range
Combined Coping Strategies Scale (29 items, possible range 29-87)	48.2±7.4	32-84
Subscale		
Saving (9 items, possible range 9-27)	16.2±3.4	9-27
Took fewer classes		
Used less utilities (electricity, water)		
Shared rent with others		
Planned menus before buying food		
Cut out food coupons		
Saved money on meds or med appointments		
Stretched food to last longer		
Shared groceries/meals with roommates		
Save food for emergencies		
Support system/self-support (10 items, possible range 10-30)	16.1±2.8	10-27
Participated in paid research study to buy food		
Borrowed money from family/friends		
Attended functions where there was free food		
Obtained food from food bank or pantry		
Participated in food assistance program		
Ate meals at "pay what you can" places		
Joined a group where free meals are provided		

Table 4 (continued)
Support system/self-support (continued)

	mean±sd	range
Visited family on weekends to bring food back		
Used a credit card to buy food		
Held one or more part/full-time jobs		
Food intake/access		
(6 items, possible range 6-18)		
Ate more when food was plentiful	10.8±2.1	6-18
Took food home from on-campus dining hall		
Obtained food from a dumpster or trash		
Purchased cheap, processed food		
Ate less healthy in order to eat more		
Bartered services/items to buy food		
Selling (4 items, possible range 4-12)		
Sold textbooks	5.1±1.2	4-12
Sold personal possessions		
Sold blood/plasma to buy food		
Sold sperm/eggs to buy food		

4.4 Sources of food resource support. The five types of support selected most frequently by the food insecure students as those they would find most helpful in improving their food access were: "getting a part-time/full-time job" (n = 222, 44.0%), "receiving more financial aid from the University" (n = 192, 38.0%), "learning how to make a budget" (n = 160, 31.7%), "learning how to eat healthy" (n = 140, 27.7%), and "learning how to shop for food" (n = 110, 21.8%). In response to the question: "Can you count on anyone to provide you with support in accessing food, such as driving you to the store or helping you prepare meals?", 201 (48.3%) chose the "yes" response, 74 (17.8%) chose "no," and 141 (33.9%)

chose “don’t need help.” When asked: “In the last 12 months, could you have used more support with accessing food than you received?” 190 students (64.4%) answered “yes.” Among these 190 students, 64 (33.7%) indicated they could have used “a lot more” support and 115 (60.1%) indicated they could have used “some” support in the last 12 months.

4.5 Comparisons of food insecure and food secure students. As shown in Table 1, there were 171 males (34.9%) and 303 females (61.8%) in the food insecure group, while in the food secure group there were 146 males (25.8%) and 419 females (74.2%). Comparisons of the food insecure and food secure students based on year in school indicated that there were similar proportions of sophomores in the food insecure and food secure groups ($n = 140, 28.9\%$ vs. $n = 174, 30.8\%$), a significantly higher proportion of juniors and seniors in the food insecure group than in the food secure group ($n = 282, 58.3\%$ vs $n = 292, 51.7\%$), and a significantly lower proportion of graduate students in the food insecure than in the food secure group ($n = 62, 12.8\%$ vs $n = 99, 17.5\%$)(in all cases $p = 0.046$). The food insecure students also had a significantly higher mean BMI than the food secure students (25.04 vs 24.0, $p = 0.003$). A small positive association was found between the students' score on the AFSSM and their BMI ($r = 0.1, p = 0.005$), suggesting that the more food insecure students tended to have higher BMIs. No significant differences emerged between the food insecure and food secure students based on the following demographic variables: age, on/off-campus residence, part/full-time student, race/ethnicity, marital status, having dependent children, and international/domestic student status.

Several significant differences were found between proportions of food insecure and food secure students based on academic variables. Data from the Academic Progress Scale

(APS) revealed that a significantly lower proportion of food insecure than food secure students rated their overall progress in school as "excellent/good" ($n = 373, 80.0\%$ vs $n = 501, 91.4\%$). Likewise, a significantly lower proportion of food insecure than food secure students chose the "excellent/good" response when asked to rate their class attendance ($n = 427, 89.7\%$ vs $n = 536, 95.5\%$), their attention span in class ($n = 337, 69.8\%$ vs $n = 462, 82.1\%$), and their understanding of concepts taught in class ($n = 414, 85.5\%$ vs $n = 532, 94.3\%$) (in all cases $p < 0.001$). Additional analysis of the APS variable revealed that the food insecure students scored an average of 1 point lower on this scale than their food secure peers (12.5 ± 2.1 , range 5 to 16 vs. 13.5 ± 1.8 , range 6 to 16) out of a possible 16 points. Higher APS scores also showed a small but significant negative correlation with the students' AFSSM scores ($r = -.28, p < 0.001$), suggesting, as indicated above, that the more food secure students rated themselves higher on the four variables comprising this scale. The students' food security status was also significantly negatively correlated, although to a small degree, with their GPA ($r = -.26, p < 0.001$), indicating that the more food secure students perform better academically overall.

Comparisons of food insecure and food secure students based on economic variables revealed that a significantly greater proportion of food insecure than food secure students did not own a car ($n = 114, 23.9\%$ vs $n = 76, 13.6\%$, $p < 0.001$), and a significantly greater proportion of food insecure than food secure students used public transportation ($n = 334, 69.4\%$ vs $n = 324, 57.9\%$, $p < 0.001$). A significantly greater proportion of food insecure than food secure students also received some amount of financial aid ($n = 341, 70.8\%$ vs $n = 324, 58.2\%$, $p < 0.001$). Analysis of data from the Money Expenditure Scale (MES) revealed that food insecure students scored an average of 1.5 points higher than the food secure students

(10.1 ± 2.0 points, range 8 to 22 points vs. 8.6 ± 1.1 points, range 8 to 16 points) out of a possible 24 points, indicating that the food insecure students more often spent money on non-food items rather than on food compared to the food secure students. Higher MES scores were also positively correlated with higher AFSSM scores ($r = 0.5$, $p < 0.001$), reinforcing the finding that students who spent more money on nonfood items were more food insecure. No significant differences were found between the proportions of food insecure and food secure students based on the following economic variables: employment status, personal average monthly income, and participation in an on-campus meal plan.

Findings comparing food insecure and food secure students on their perceived health status indicated that a significantly higher proportion of food insecure students rated their health as "fair/poor" ($n = 121$, 27.5% vs $n = 43$, 8.6%, $p < 0.001$). There was no significant difference in the proportions of food insecure and food secure students who had health insurance coverage. The findings concerning the students' typical eating patterns revealed that the two food groups identified by the food insecure students as those they consumed most often were grains/cereals ($n = 408$, 80.8%) and dairy foods ($n = 312$, 61.8%), while the food secure students most often identified grains/cereals ($n = 462$, 78.6%) and vegetables/juice ($n = 407$, 69.2%). When asked which food groups they would consume more often if they had greater access to these foods, both the food insecure and food secure students identified fruits/juice ($n = 390$, 77.2% vs. $n = 344$, 58.5%) and vegetables/juice ($n = 359$, 71.1% vs. $n = 330$, 56.1%). Regarding frequency of food preparation, a significantly lower proportion of food insecure than food secure students selected "often" ($n = 256$, 53.1% vs $n = 350$, 62.8%) when asked how frequently they cooked for themselves or for others ($p = 0.005$). Lastly, when asked to describe how they generally felt about their current food

situation, the terms most often selected by the food insecure students were "fine/ok" (n = 271, 53.7%), "satisfied" (n = 99, 19.6%), and "frustrated" (n = 98, 19.4%). In contrast, the food secure students most often selected "secure" (n = 346, 58.8%) and "satisfied" (n = 345, 58.7%).

Chapter Five

Discussion

5.1 Hypothesis testing and interpretation of results. The prevalence of food insecurity (46.2%) among the sample of students attending ASU during the 2015-2016 academic year was considerably higher than the national average of 12.7% during 2015 (Coleman-Jensen et al., 2016) and higher than the 2013 average for North Carolina of 17.3% (Coleman-Jensen et al., 2014). This prevalence was also comparable to those reported for other college student populations (Coleman-Jensen et al., 2014; Chaparro et al., 2009; Maroto, 2013).

Although the finding concerning the prevalence of food insecurity among the student sample did not support the hypothesis that more than 50% of the students had experienced some level of food insecurity during the previous 12 months, it does provide evidence that a considerable percentage of the participants lacked sufficient access to nutrient dense, affordable foods that support physical and mental well-being. As Gaines et al. (2014) have suggested, individuals between the ages of 18 to 25 are transitioning to adulthood—often from the care of their parents—and tend to have greater instability in relationships, emotions, cognitive development, and finances. This instability in finances and new onset of independence from parental assistance may support the idea that college students lack some ability to budget wisely and prioritize and/or distinguish their social wants from their physical needs i.e. spending money on social activities and events versus planning and shopping for weekly groceries.

Regression analysis showed the following variables to be predictive of food insecurity among the student sample: male gender, “fair/poor” perceived health status, lower grade point average (GPA), higher scores on the Coping Strategies Scale (CSS), higher scores on the Money Expenditure Scale (MES), receiving financial aid, not owning a car, and “never” cooking for self or others. Variables that were not predictors of food insecurity, but that were nevertheless more common among food insecure than among food secure students were use of public transportation, junior/senior academic classification, and off-campus residency. These predictor and nonpredictor variables are discussed below in the context of the study hypotheses and with emphasis on how these variables might contribute to food insecurity among affected students.

Food insecurity was more prevalent among males than among females, as hypothesized. The common lifestyle of college men, associated with sporting events, binge drinking, gambling, and video games—paired with an absence of cooking and shopping skills—may account for this gender difference, considering that women tend to acquire greater cooking and shopping skills in their middle and high school years. Another demographic characteristic that was more common among the food insecure students was off-campus residence, in support of the study hypothesis. At ASU, most juniors and seniors live off-campus, involving increased living and parking expenses and lower participation in on-campus meal plans. These living costs, along with the high proportion of participants residing off-campus (approximately three-fourths), may have contributed to the high rate of food insecurity among this subgroup. Concerning the students’ race/ethnic affiliations, although 91.0% of the sample identified as white, non-Hispanic, 51 of the 87 (57.0%) students who identified as belonging to another race/ethnic group reported experiencing

some level of food insecurity during the previous 12 months. This may be related to previous research on ethnic minorities and the association between lower education, lower income/financial status, and food insecurity (Kaiser et al., 2013). Students coming from low income households may have a lower monthly spending budget for food than those coming from higher income households.

Regarding the associations between income variables and food insecurity, a majority (70.0%) of the food insecure students reported receiving some amount of financial aid, and 61.0% reported having one or more part time or full time jobs. Nevertheless, these students continued to face financial challenges due, in part, to increased tuition rates and living expenses. Although a significant inverse association was not found between average personal monthly income and scores on the AFFSM as hypothesized, with over three-fourths of the food insecure students reporting a personal monthly income below \$500, it is not surprising that income restrictions are leading to compromised access to living essentials including a regular and adequate food supply. Additionally, as students begin to cope with the stress of inadequate access to food, their overall health status may be compromised (Morris, Smith, Davis, & Null, 2016).

These income challenges are reflected in the coping strategies most often used by the food insecure students, i.e., purchasing cheap, processed foods, stretching food to make it last longer, and eating less healthy in order to eat more. These dietary practices are associated with consumption of energy-dense foods which could compromise the students' nutrient reserves in the long-term. These findings supported the hypothesis that the food insecure students would often resort to purchasing cheap, processed food, but did not support the hypothesis that they also would often attend on-campus or community functions where there

is free food. The coping strategies used most often, along with the findings that most of the foods consumed by the food insecure students were from the grain/cereal and dairy groups, and that these students would have liked greater access to fruit/juices and vegetables/juices, suggest that the food insecure students may not meet the daily recommended amounts of fruits or vegetable recommended by the 2015 Dietary Guidelines for Americans (USDA, 2015) and by the ChooseMyPlate website (USDA, 2017). Consuming low amounts of fruits and vegetables may increase the students' risk for inadequate fiber intakes and for low body reserves of the micronutrients, while consuming high amounts of cheap, processed foods, and eating less healthy in order to eat more may increase their risk for unhealthy weight gain and chronic disease in the long-term (Dhurandhar, 2016).

Several health-related variables also revealed differences between the food insecure and food secure students. Although not statistically significant, the food insecure students in the present study had a higher mean BMI compared to the food secure students; 38.0% of the food insecure students were overweight or obese by BMI compared to 30.6% of food secure students. This supports the previously determined relationship between food insecurity and health implications and is supported by the reported coping strategies of purchasing cheap, processed foods, and eating less healthy in order to eat more. Additionally, similar to results reported by Patton-Lopez et al. (2014) and Gallegos et al. (2014), a smaller percentage of food insecure students (73.0%) than food secure students (91.5%) rated their health status as "excellent/good," supporting the study hypothesis. This may be due to poor intake of nutrient dense foods, for cheap, processed, caloric dense foods often lack the vitamins and minerals needed to support a healthy immune system.

Regarding the association between food security status and academic variables, a significant inverse correlation was found between the students' AFSSM scores and their grade point average (GPA), and between their AFSSM scores and their scores on the Academic Progress Scale (APS), as hypothesized. Thus, the food insecure students reported significantly lower GPAs than their food secure peers, and were more likely to give themselves ratings of "fair" and "poor" on items concerning overall progress in school, class attendance, attention span in class, and understanding of concepts taught in class. Similar findings were reported by Munro et al., (2013), Maroto (2013), Patton-Lopez et al. (2014) and Morris, Smith, Davis, and Null (2016). These unfavorable consequences of food insecurity were summarized by Patton-Lopez et al. (2014) who noted that the combination of working to meet financial demands and lack of regular access to an adequate diet can adversely impact the academic performance of college students.

Findings revealed similar mean scores on the Coping Strategies Scale (CSS) for food insecure males and females, indicating that gender had little impact on the number of coping strategies used. This finding failed to support the study hypothesis that males would report using a significantly higher amount of coping strategies. This could imply that females use coping strategies that are more effective at alleviating food insecurity than males, possibly related to budgeting or meal planning in the household. Although similar scores were established in regards to gender, significant differences in mean CSS scores emerged based on year in school, such that third/fourth year students used more coping strategies compared to sophomores, supporting the study hypothesis. This finding may suggest that as students get older, they begin to utilize more effective coping strategies and increase their budgeting or planning habits compared to younger students.

While some students transition into adulthood with excellent time management, budgeting, and cooking skills, other students are limited in these vital skills or struggle to excel at prioritizing. Concerning the students' spending habits, the food insecure students scored significantly higher on the Money Expenditure Scale (MES) than the food secure students, suggesting that the former group more often spend money on such non-food items as cigarettes, alcohol, and tattoos. This finding suggests that food insecure students are contributing to their own food insecurity by choosing to purchase these non-food items as priority over food items.

Regarding cooking behavior, students who “never” cooked for themselves or others were significantly more likely to be food insecure compared to students who more frequently cooked for themselves or for others. This can be interpreted in two different ways. One is that the food insecure students lack vital cooking skills, leading to the purchasing of higher priced, ready-made convenience foods versus an abundance of fresh produce and whole foods where preparation is needed. Secondly, the food insecure students are cooking less for themselves and others due to the fact that they do not have an availability of food to begin with. Regarding the students' access to food resource assistance, the hypothesis stating that a majority of the food insecure students would report needing more support for accessing food than they received was supported by the finding that 64.0% of these students reported needing more assistance with food in the past 12 months.

These findings suggest the immediate need for food assistance programs made available to ASU students on-campus and in the surrounding Boone community. Accessing food assistance programs is made more challenging in North Carolina, where students are classified as dependent on their parents until the age of 24. This prevents the majority of

college students from being eligible for existing food assistance programs in the state. One suggestion for increasing food access on-campus would be to establish more food pantries run by student and staff volunteers with donations from local grocery stores and other food outlets. Additionally, to supply continuous inventory for these food pantries, student groups could host campus and community wide food drives, encourage donation of food items during admissions to sporting and arts events, and partner with on-campus food vendors to supply left over food items from catering events and dining halls. Other universities that have implemented on-campus food pantries have reported that this type of intervention has produced considerable success at helping to reduce the prevalence of food insecurity on their campuses (Anderson, 2016; Twill, Bergdahl, & Fensler, 2016).

College and University Food Bank Alliance (CUFBA) is an organization with 400 members that provides support, training, and resources for campus food banks/pantries (CUFBA, 2017). Joining this program would assist ASU in the development of additional food resources on campus and aid in alleviating the food insecurity at ASU. Other suggestions to alleviate the food insecurity problem at ASU include offering reduced-price lunches to low-income students, giving out cafeteria food coupons at on-campus events, setting up budgeting skills classes to be given during orientation week, offering free cooking demonstrations and grocery store tours provided by nutrition and health promotion students, and inviting local farmers to sell their produce at on-campus farmers markets. Another is to allow eligible students to share the unused cash left on student meal plan cards at the end of each semester.

In terms of community involvement, owners of local restaurants could be approached by student leaders about offering discounts with student IDs, and staff of community

organizations such as churches could be asked to invite students to attend free congregate meals. Another community possibility is to involve students in community gardening and to approach local business leaders about offering more part-time employment to students year-round. On the state level, the possibility of implementing policies that give students a certain amount of money each semester to be used at on-campus meal settings could be explored with policy-makers. The students in the present study also reported using several safe and acceptable coping strategies to increase their access to food i.e., attending on-campus or community functions where there was free food, obtaining food from a food pantry, eating at restaurants where you pay what you can, cutting out food coupons, and planning menus before buying food. These findings suggest that students would be receptive to receiving these types of on-campus and community food resource assistance.

5.2 Study limitations and strengths. The present study had several limitations that prevent the generalizability of the findings to the nation-wide population of college students. Among these were the study design, i.e., this was a cross sectional study that relied on self-reporting of all data. Also, a low response rate of 20% may have increased the probability of sampling error and non-response bias (Singleton and Straits, 1991). Other study limitations included use of a nonprobability sample, data collection on a single campus, overrepresentation of female students, and limited race/ethnic diversity. Nevertheless, one strength of this study is that it contributes prevalence data to the limited literature concerning college student food insecurity in North Carolina and in the Southeastern United States. Another strength is that several predictor variables for food insecurity were identified that can serve as the focus of interventions tailored to specific student characteristics designed to

assist food insecure students on multiple levels to improve their access to food resources. Such activities could, for example, be targeted specifically at male college students or at students experiencing academic difficulties, and teach skill-building in the areas of financial budgeting, and purchasing and preparing affordable, palatable, nutrient-dense foods.

5.3 Areas for future research. Nutrition and health educators at ASU would benefit from research that determines which type of food resource assistance interventions would be most beneficial for food insecure students. Research is also needed that measures the prevalence of family and on-campus food insecurity among freshmen and first-generation college students to determine whether, and how, specific family economic, psychological, or sociocultural factors may subsequently have an unfavorable impact on the food security status of these young students after enrolling at ASU. Other studies are needed that measure the prevalence of food insecurity and identify related correlates among married students with or without dependent children, students with cognitive or physical challenges, and international students.

5.4 Conclusions. The ASU students who participated in the present study showed a high prevalence of food insecurity. This adverse health problem could possibly be attributable, in part, to economic challenges such as high tuition and living expenses, and to inadequate student experiences with budgeting, food purchasing, and food preparation, as evidenced by their requests for these types of assistance. Among the consequences of the present food deficit problem is that a considerable proportion of the affected students coped by substituting nutrient-dense foods with energy-dense foods, which may increase their long-term risk for unhealthy weight gain and chronic disease. These students were also

experiencing academic difficulties, as reflected in lower GPAs. Therefore, regardless of the causes of food insecurity among ASU students, and in light of the potential adverse health and academic consequences, a key conclusion from this research is that there is an immediate need for various types of on-campus and community-based food resource assistance programs to alleviate the present hunger problem on the ASU campus.

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Appendix A

Recruitment Invitation Letter

Hello from Dr. Ball in the Nutrition Department!

I am writing you to invite you to participate in a study about food insecurity and food access among college students. Your participation is valuable because it will help us design programs to improve student access to nutritious food at App State. By completing the survey, you have the chance to win a \$100 Amazon gift card. Please click the link below to take the survey:

https://appstate.az1.qualtrics.com/SE/?SID=SV_81fKQXsj6kHJulf

Thank you for your help and please write me with any questions. Have a wonderful break!

Lanae Ball, PhD
Assistant Professor
Department of Nutrition and Health Care Management
LS Dougherty 204, 261 Locust Street
Appalachian State University
Boone, NC 28608

Appendix B

Letter of Informed Consent

Greetings!

You are invited to take part in a research study about your usual access to food. This study is being conducted by Dr. Laura McArthur and Dr. Lanae Ball, two professors in the Department of Nutrition and Health Care Management at Appalachian State University. If you agree to participate, we will ask for about 10 to 15 minutes of your time to complete a self-administered, questionnaire that you are asked to complete in a private setting.

Your participation in this study is strictly voluntary, and you are free to stop answering questions at any time. We do not anticipate that you will experience any inconvenience from completing this questionnaire other than the time it takes to answer the questions. Please understand that no compensation or academic credit is being offered for your participation; however, you may enter your email address to enter a drawing for a \$100 Amazon Gift Card by clicking a new link on the last page of the survey. Your participation would be very valuable to us since the answers you provide will help us to design activities about how to enhance student access to nutritious food.

We assure you that the answers you give will not be connected to your email address and that only group answers, not individual answers, will be reported in the article that we write about this research.

Thank you for considering this invitation. If you have any questions about this study, please contact Dr. Laura McArthur or Dr. Lanae Ball at the telephone numbers or e-mail addresses listed below.

Respectfully,

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This research project has been approved on October 30th, 2015 by the Institutional Review Board (IRB) at Appalachian State University. This approval will expire on October 29th, 2016 unless the IRB renews the approval of this research.

- Yes, I'd like to participate
- No thank you
- I have already taken this survey

Appendix C

Food Security Questionnaire

Which school do you currently attend?

- A. Appalachian State University
- B. East Carolina University
- C. Mississippi State University
- D. University of North Carolina at Greensboro
- E. University of Southern Mississippi
- F. West Virginia University

Part One

Please choose the answer choice that BEST applies to you. All questions concern your access to food within the past 12 months.

1. Which statement best describes the food available to you in the past 12 months? Check your answer.

- A. Enough of the kinds of food I want to eat
- B. Enough, but not always the kinds of food I want to eat
- C. Sometimes not enough to eat
- D. Often not enough to eat

For questions 2 through 5 please choose the answer choice that BEST applies to you.

2. In the past 12 months, I worried whether my food would run out before I got money to buy more.

Often Sometimes Never

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

Often Sometimes Never

4. I couldn't afford to eat balanced meals.

Often Sometimes Never

5. In the last 12 months, did you ever cut the size of your meals or skip meals because there wasn't enough money for food?

Yes No

If you answered "Yes" to question 5, please complete the rest of this question. Otherwise, skip to question 7.

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

- _____ A. Almost every month
- _____ B. Some months, but not every month
- _____ C. In only one or two months

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

Yes No

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

Yes No

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

Yes No

10. In the last 12 months, did you ever not eat for a whole day because there wasn't enough money for food?

Yes No

If you answered "Yes" to question 10, please complete question 11. Otherwise, skip to question 12.

11. How often did this happen? Check your answer.

- _____ A. Almost every month
- _____ B. Some months, but not every month
- _____ C. In only one or two months

12. During the past 12 months, about how often did you spent money on the following instead of using the money to buy food?

A. Purchased alcohol instead of using money to buy food

Often Sometimes Never

B. Purchased cigarettes instead of using money to buy food

Often Sometimes Never

C. Purchased recreational drugs instead of using money to buy food

Often Sometimes Never

D. Spent money on car repairs instead of using money to buy food.

Often Sometimes Never

E. Spent money on gasoline instead of using money to buy food.

Often Sometimes Never

F. Spent money on public transportation to school/work instead of using money to buy food.

Often Sometimes Never

G. Spent money on pet care instead of using money to buy food.

Often Sometimes Never

H. Spent money on tattoos instead of using money to buy food.

Often Sometimes Never

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

Part Two

Below is a list of strategies that some people use to get food when their own food is low or when they have run out of food. Please choose how often you have used any of these strategies in the past 12 months to get food. Choose all that apply to you.

13. Sold textbooks or other personal possessions

Often Sometimes Never

14. Sold personal possessions

Often Sometimes Never

15. Taken fewer classes to save tuition money

Often Sometimes Never

16. Used less utilities (e.g. electricity, water)

Often Sometimes Never

17. Shared the rent with other people

Often Sometimes Never

18. Held one or more part-time or full-time jobs

Often Sometimes Never

19. Used a credit card to buy food

Often Sometimes Never

20. Planned menus before buying food

- | | Often | Sometimes | Never |
|---|-------|-----------|-------|
| 21. Cut out food coupons | Often | Sometimes | Never |
| 22. Sold your blood/plasma to buy food | Often | Sometimes | Never |
| 23. Sold your sperm/eggs to buy food | Often | Sometimes | Never |
| 24. Participated in a research study/clinical trial to buy food | Often | Sometimes | Never |
| 25. Borrowed money from family or friends | Often | Sometimes | Never |
| 26. Attended on-campus or community functions where there was free food | Often | Sometimes | Never |
| 27. Obtained food from a food bank or food pantry | Often | Sometimes | Never |
| 28. Bartered (traded) services or items to get food | Often | Sometimes | Never |
| 29. Participated in a federal or state food assistance program (e.g. SNAP, WIC, etc.) | Often | Sometimes | Never |

30. Taken food home from on-campus dining hall

Often Sometimes Never

31. Saved money on medications or medical appointments to buy food

Often Sometimes Never

32. Stretched food to make it last longer

Often Sometimes Never

33. Shared groceries and/or meals with roommates

Often Sometimes Never

34. Obtained food from a dumpster or trash

Often Sometimes Never

35. Saved a supply of food in case of emergency

Often Sometimes Never

36. Ate more than normal when food was plentiful

Often Sometimes Never

37. Eaten meals at places where you can “pay what you can” (e.g. FARM Café)

Often Sometimes Never

38. Joined a church or other organizational group where free meals are provided

Often Sometimes Never

39. Ate less healthy meals so you could eat more food

Often Sometimes Never

40. Purchased cheap, processed food (e.g. ramen noodles, frozen pizza, candy, etc.)

Often Sometimes Never

41. Visited family on the weekend in order to bring back food to school

Often Sometimes Never

Part Three

These final questions ask for information about you and your lifestyle. All of your answers will be kept confidential. Please choose the answers that best apply to you, or type in your answer in the space provided.

42. Your gender is: Male Female Other

43. How old are you? _____years

44. Which term best describes your marital status?

A. Not married

B. Married

45. A. Do you have any dependent children living with you? Yes No

If you answered "Yes" to question 45A, please complete the rest of this question. Otherwise, skip to question 46.

B. How many children currently live with you? _____

46. A. About how much do you currently weigh? _____ pounds

B. About how tall are you? _____ feet, _____ inches

47. What year are you in school?

Freshman Sophomore Junior Senior Graduate Student
Other: please indicate _____

48. A. Are you an international student? Yes No

If you answered "Yes" to question 48A, please complete the rest of this question. Otherwise, skip to question 49.

B. How long have you been in the United States? _____

49. Are you a:

- A. Part-time student
- B. Full-time student

50. What is your major? _____

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

Excellent Good Fair Poor

52. How would you rate your class attendance?

Excellent Good Fair Poor

53. How would you rate your attention span in class?

Excellent Good Fair Poor

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

Excellent Good Fair Poor

55. What is your current grade point average (GPA)? _____

56. What is your race/ethnic background?

- A. African-American, not of Hispanic origin
- B. American Indian
- C. Asian
- D. Hispanic
- E. White, not of Hispanic origin
- F. Other: please indicate _____

57. Which term best describes your employment status?

- A. Unemployed
- B. One or more part-time jobs
- C. One full-time job
- D. Other: please indicate _____

58. Do you live:

- A. On-campus
- B. Off-campus

59. Do you have a car? Yes No

60. Do you take public transportation such as the bus? Yes No

61. Do you currently receive income from some type of financial aid like a scholarship, grant, private or federal loan? Yes No

62. What is your personal (not family) average monthly income? \$ _____

63. How would you rate your current health?

Excellent Good Fair Poor

64. Do you currently participate in an on-campus meal plan? Yes No

65. Do you currently have health insurance? Yes No

66. How often do you cook for yourself or for others?

Often Sometimes Never

67. How would you rate your cooking skills?

Excellent Good Fair Poor

68. A. Please identify the food group(s) where most of the foods come from that you *currently eat*.

- Grains/cereals (e.g. breakfast cereals, breads, crackers, noodles, other pastas, rice, sweet pastries/cookies/cake, etc.)
- Vegetables/juices (e.g. potatoes, carrot, green leafy vegetables, corn, broccoli, etc.)
- Fruits/juices (e.g. apples, oranges, tomatoes, peaches, grapes, etc.)
- Meat/fish/poultry (e.g. beef, pork, chicken, fish, shellfish, etc.)
- Other protein foods (e.g. peanut butter, nuts, seeds, soy foods, different beans other than green beans, etc.)
- Dairy foods (e.g. fat-free or regular milk, block cheese, cottage cheese, ice cream, yogurt, etc.)
- Sweets (e.g. hard/gummy candy, candy bars, regular soft drinks, jams/jellies, honey, table sugar, etc.)

B. Please identify the food group(s) that you would eat more foods from if you had access to these foods or access to the resources that would allow you to eat more of these foods.

- Grains/cereals (e.g. breakfast cereals, breads, crackers, noodles, other pastas, rice, sweet pastries/cookies/cake, etc.)
- Vegetables/juices (e.g. potatoes, carrot, green leafy vegetables, corn, broccoli, etc.)
- Fruits/juices (e.g. apples, oranges, tomatoes, peaches, grapes, etc.)
- Meat/fish/poultry (e.g. beef, pork, chicken, fish, shellfish, etc.)
- Other protein foods (e.g. peanut butter, nuts, seeds, soy foods, different beans other than green beans, etc.)
- Dairy foods (e.g. fat-free or regular milk, block cheese, cottage cheese, ice cream, yogurt, etc.)
- Sweets (e.g. hard/gummy candy, candy bars, regular soft drinks, jams/jellies, honey, table sugar, etc.)

69. As a student, generally how do you feel about your current food situation? Choose all that apply.

- | | | | |
|-------------|-----------|----------|------------|
| Satisfied | Secure | Pleased | Fine/OK |
| Embarrassed | Ashamed | Guilty | Humiliated |
| Anxious | Worried | Insecure | Helpless |
| Angry | Resentful | Sad | Frustrated |
- Other: please indicate _____

70. What would currently help you improve your food situation? Choose all that apply.

- | | | |
|------------------------------|--|--------------------------|
| Part-time/full-time job(s) | Better transportation to the store | Learn to grow food |
| Get a roommate | Financial help from others (e.g. parents or friends) | |
| More financial aid at school | Learn how to shop for food | Learn how to eat healthy |
| Learn how to make a budget | Food pantry on/near campus | Garden on/near campus |
| Sign up for school meal plan | Learn to cook | |
- Other: please indicate _____

71. Can you count on anyone to provide you with support in accessing food such as driving you to the store or helping you prepare meals?

- Yes No Don't need help

72. In the **last 12 months**, who was *most helpful* in providing you with **access to food**? Choose one choice only.

- | | | | |
|----------------|----------------|-----------|------------------------|
| Spouse | Sister/Brother | Parent | Friend |
| Other relative | Neighbors | Coworkers | Other: please indicate |
- _____
- | | | | |
|----------------|--------------|---------------|------------|
| Church members | Club members | Professionals | Don't know |
|----------------|--------------|---------------|------------|

73. A. In the **last 12 months**, could you have use more support with food than you received?

- Yes No Don't know

If you answered "Yes" to question 73A, please complete the rest of this question.

B. How much support could you have used?

A lot more Some A little more

Thank you for completing this questionnaire!

Vita

Ariel Danek was born in St. Charles, Illinois, and enjoyed growing up with her two older brothers in the suburbs of Chicago. She established her passion for nutrition at the University of Kentucky, earning her Bachelor of Science in Nutrition and Dietetics in December of 2013. After relocating with her family to Lake Norman, North Carolina, Ariel was accepted into the combined Master of Science in Nutrition and Dietetic Internship program at Appalachian State University. Ariel has participated in professional research regarding mindful eating, weight loss, and food insecurity. She hopes to excel at her future career as a Registered Dietitian Nutritionist, with a specific interest in infant and pediatric nutrition.