

ABSTRACT

Title of Dissertation: FOOD INSECURITY AMONG COMMUNITY COLLEGE STUDENTS: PREVALENCE AND RELATIONSHIP TO GPA, ENERGY, AND CONCENTRATION

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The latest U.S. government surveys indicate that one in six Americans suffer from food insecurity, which means they have trouble affording adequate food. Previous research has shown that food insecurity affects adult cognitive ability, energy levels, ability to concentrate as well as child academic success. Food insecurity has been studied in college students at 4-year institutions; however, research on the community college population is sparse. This study aimed to better understand the extent and implications of food insecurity among community college students attending two community colleges in Maryland.

The research was carried out using a survey that collected data related to student food insecurity, demographics, along with self-reported Grade Point Average (GPA), energy, and concentration levels in 301 community college students. Approximately half of the students attended a suburban community college (n=151) and half of the students attended an urban community college (n=150). Data from each school were compared to examine issues affecting students attending each institution.

The study revealed that over half of the community college student respondents were food insecure and that food insecurity was slightly less prevalent among respondents at the suburban community than those from the urban community college. African American students and multiracial students were more likely to experience food insecurity than White students. Students who lived alone, with roommates or with spouses/partners were more likely to experience food insecurity than students who lived with parents or relatives. Single parents were also more likely to be food insecure than students who were not single parents.

Food insecurity was significantly associated with student GPA, energy, and concentration in the overall student sample. Food insecure students were more likely to fall into a lower GPA category than they were to fall into the highest GPA category. Food insecure students were also more likely to report lower energy and concentration levels and the degree of food insecurity appeared to affect the probability of low energy or difficulty concentrating. When considering each community college separately, food insecurity was significantly associated with GPA at the suburban community college but not at the urban community college. Also, food insecurity had a stronger association with energy and concentration at the urban community college than at the suburban community college.

FOOD INSECURITY AMONG COMMUNITY COLLEGE STUDENTS:
PREVALENCE AND RELATIONSHIP TO GPA, ENERGY, AND
CONCENTRATION

by

Maya E. Maroto

A Dissertation Submitted in Partial Fulfillment
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Thank you to my wonderful parents, Deborah and Terry Edmonds for your support throughout my entire life, including this dissertation process. Sincere thanks go to my husband, Mike Maroto, for his encouragement and patience as I pursued this degree. I am also appreciative of the daily smiles, laughs, and hugs from my wonderful son Mazi, who in his toddlerhood remains completely oblivious to my doctoral journey, which is refreshing. And I would also like to express heartfelt appreciation for my best friend, Dee Moultrie, for standing beside me and showing up whenever I needed her there.

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List of Abbreviations

AACC:	American Association of Community Colleges
CCHIP:	Community Childhood Hunger Identification Project
CPS:	Current Population Survey (Census)
DHHS:	Department of Health and Human Services
FSP:	Food Stamp Program (now known as SNAP)
FSS:	Food Security Supplement
GAO:	United States General Accountability Office
GPA:	Grade Point Average
HFSSM:	Household Food Security Survey Module
NHANES:	National Health and Nutrition Examination Survey
NNMRRRA:	National Nutrition Monitoring and Related Research Act
SNAP:	Supplemental Nutrition Assistance Program
UCLA:	University California Los Angeles
USDA:	United States Department of Agriculture
WIC:	Special Supplemental Nutrition Program for Women, Infants and Children

"Others have questioned if hunger exists in our country; I can tell you that hunger does exist in this country. For many adults and children, going to sleep hungry is not a threat; it's a regular occurrence. And it must end."

~ Former USDA Secretary Mike Espy (Minnesota Food Share, n.d.)

"When you are hungry, you can't think about anything else."

~ Juana "Janie" Mendez, 17 (Minnesota Food Share, n.d.)

"In a country as affluent as America, people should be eating"

~ Food insecure Oregon resident (De Marco, Thorburn, & Kue, 2009)

CHAPTER I: INTRODUCTION

In 2011, one in six Americans could not afford enough food to lead a healthy life (Coleman-Jensen, Nord, Andrews, & Carlson, 2012b). Food insecurity exists whenever the availability of nutritionally adequate and safe foods or the ability to acquire acceptable foods in socially acceptable ways is limited or uncertain (Anderson, 1990). The latest U.S. government estimates indicate that food insecurity affects 50.1 million Americans representing 14.9% of U.S. households and is one of the highest recorded levels of Americans struggling to obtain enough food since data collection started 17 years ago. Food insecurity affects people from all ages, races, and ethnicities in every area of the country (Nord, Coleman-Jensen, Andrews, & Carlson, 2011). College students are not immune to food insecurity; and, in fact, the media (Minderhout, 2010; Powers, 2012; Rivera, 2010) and peer-reviewed literature (Chaparro, Zaghoul, Holck, & Dobbs, 2009; Hughes, Serebryanikova, Donaldson, & Leveritt, 2011; Shive & Morris, 2006) suggest a need to better understand the extent, implications, and possible solutions for this issue on college campuses.

It may be difficult to believe that food insecurity is in fact a serious problem

in a country where almost 70% of the adult population is either overweight or obese (Centers for Disease Control and Prevention, 2012). However, numerous studies show that food insecure adults are more likely to be obese than food secure adults. This association is especially strong for women and is hypothesized to be exacerbated by a food system where the least expensive foods are typically very high in calories and low in nutrients (Larson & Story, 2010). Food insecurity and obesity have been described as “two sides of the same coin” and may both be addressed by increasing the availability and affordability of healthy food options (White House Task Force on Childhood Obesity, 2010, p. 49).

Statement of the Problem

Food insecurity is known to impact both child and adult academic success (Alaimo, Olson, & Frongillo Jr, 2001; Behrman, 1996; Chilton, Chyatte, & Breaux, 2007; Cook & Frank, 2008; Frongillo, Jyoti, & Jones, 2006; Gao, Scott, Falcon, Wilde, & Tucker, 2009; Jyoti, Frongillo, & Jones, 2005; Murphy et al., 1998; Winicki & Jemison, 2003), energy and concentration levels (Hamelin, Habicht, & Beaudry, 1999; Radimer, 1990; Zekeri, 2007). In 2010, over 32 million students in America’s K–12 educational system received low-cost or free lunches through the National School Lunch Program (NSLP); however, no such school food safety net exists for the nation’s college students (United States Department of Agriculture Economic Research Service, 2012). Colleges generally have the goal of student academic success embedded in their mission statements and

strategic plans; and if students lack energy, cannot concentrate and receive low academic grades, they are not likely to reach their educational goals.

Community colleges enroll a disproportionate number of minority and low-income students; these demographic groups are most likely to experience food insecurity (Nord et al., 2011). Research on food insecurity, specifically in the community college population, is missing from the literature on the subject. While evidence of the presence of food insecurity on college campuses does exist in a few studies (Chaparro et al., 2009; Freudenberg et al., 2011; Hughes et al., 2011), research examining the prevalence of food insecurity among community college students and whether food insecurity is correlated with academic success, concentration, and energy is missing from the literature. Therefore, examining food insecurity on college campuses and its relationship to student energy levels, concentration, and GPA would be a natural extension of existing food insecurity research which has largely omitted the community college population. By exploring the issue of food insecurity among community college students, college administrators can identify potential issues that arise when students are food insecure and may be inspired to address the issue of student food access on their campuses.

Study Purpose

The purpose of this quantitative study is to examine the prevalence of food insecurity among community college students at one suburban campus in an affluent area and one urban campus in an economically-disadvantaged area in

Maryland in order to determine the predictors, extent, and potential academic consequences of this problem. The study was carried out at two institutions in order to determine whether the extent and ramifications of food insecurity differ in a community college in an affluent area and a community college in an area with a higher rate of poverty. The research was conducted using a survey designed to collect data related to student food insecurity, demographics, along with self-reported Grade Point Average (GPA), energy, and concentration levels. Energy and concentration were self-assessed by survey questions where students rated their energy level on a scale of “very poor” to “very good” and students self-reported their overall GPA by selecting a grade range. The relationship between food insecurity (the independent variable) and all dependent variables including self-reported Grade Point Average, energy level, and concentration ability were examined. Data were examined in the aggregate and then separated by student demographics to look for similarities and differences among student population groups. Each school was compared to examine issues affecting students attending each institution.

Significance of the Proposed Study

The proposed study contributes to the body of research by filling a gap in knowledge about community college students, food insecurity, and academic achievement. To date, no peer-reviewed research covers this particular set of topics; however, a review of the literature shows a clear need to better understand this phenomenon due to linkages between food insecurity and

academic success, research showing significant food insecurity on four-year institution campuses, and the possibility of implementing successful food security interventions on community college campuses. Furthermore, the economic and employment downturn beginning in 2008 in the United States is driving up the number of food insecure Americans which makes this a pressing issue to examine at the present time (Nord et al., 2011).

Theoretical Model

The theoretical model for the current study is based on the foundational work of Radimer who conducted the seminal qualitative study on the experiences of hunger among 32 black and white women residing in both urban and rural areas of upstate New York (Radimer, 1990). Radimer found that “hunger” (her research pre-dates the term “food insecurity” which came about in 1995), was a phenomenon associated with inadequate income. For this reason, any survey questions related to food insecurity must reflect constrained economic resources. Radimer’s qualitative research yielded the central themes of food insecurity including having an uncertain or insufficient food supply, experiencing insufficiency in the quantity or quality of diet, and experiencing reduced food intake or the feeling of hunger. These categories of experiences were used to develop the survey questions on the USDA Household Food Security Survey Module (HFSSM) which will be used in the present study to assess food insecurity.

Radimer's research also revealed the negative psychological and physical consequences of food insecurity. Food insecure individuals reported experiencing fatigue, worry, feelings of deprivation, helplessness, depression, irritability, humiliation, anger, weight loss, and illness. Although these experiences are not included in the surveys currently used to measure food insecurity, it is essential that food insecurity research take into account the possible ramifications of lack of food on the livelihood and productivity of food insecure individuals.

Radimer (1990) also made recommendations on the uses for a survey instrument that measured hunger. Hunger surveys are recommended to be used for problem identification to determine whether hunger is an issue within a given population group or geographic area. The hunger survey measures specific dimensions of hunger including anxiety about running out of food, household food depletion and disruptions to the quality and quantity of food consumed. These dimensions can be measured separately and used to formulate and evaluate programs and policies to address the specific issues experienced by a particular population.

Additional literature on food insecurity yielded several other themes that allowed the current study concept to take shape. First, the literature indicates that at this time in history, Americans are experiencing relatively high levels of food insecurity measured by the federal government over the past 17 years due to the economic downturn (Nord et al., 2011). The prevalence of food insecurity

is even higher among specific demographic groups including people of lower socioeconomic status, racial/ethnic minorities (namely African Americans and Hispanics), and women who are single parents (Nord et al., 2011). In studies of food insecure college students, those who lived independently (specifically, those who did not live with parents or a spouse) were more likely to experience food insecurity (Chaparro et al., 2009). For this reason, data on student demographics; including race/ethnicity, age, gender, income, and living situation were collected and analyzed for relationships with food insecurity. Furthermore, food insecurity has been found to adversely affect academic success in both children and adults (Alaimo et al., 2001; Gao et al., 2009; Jyoti et al., 2005; Reid, 2000; Winicki & Jemison, 2003). For this reason, data on student GPA were collected to determine whether a correlation between food insecurity and lower GPA exists, even though that data may not be entirely reliable because they are self-reported. Other adverse outcomes of food insecurity include fatigue and lack of concentration experienced by food insecure individuals (Hamelin et al., 1999; Radimer, 1990; Zekeri, 2007). These variables were also examined in the present study. A theoretical model linking the concepts involved in the present study is found in Figure 1.

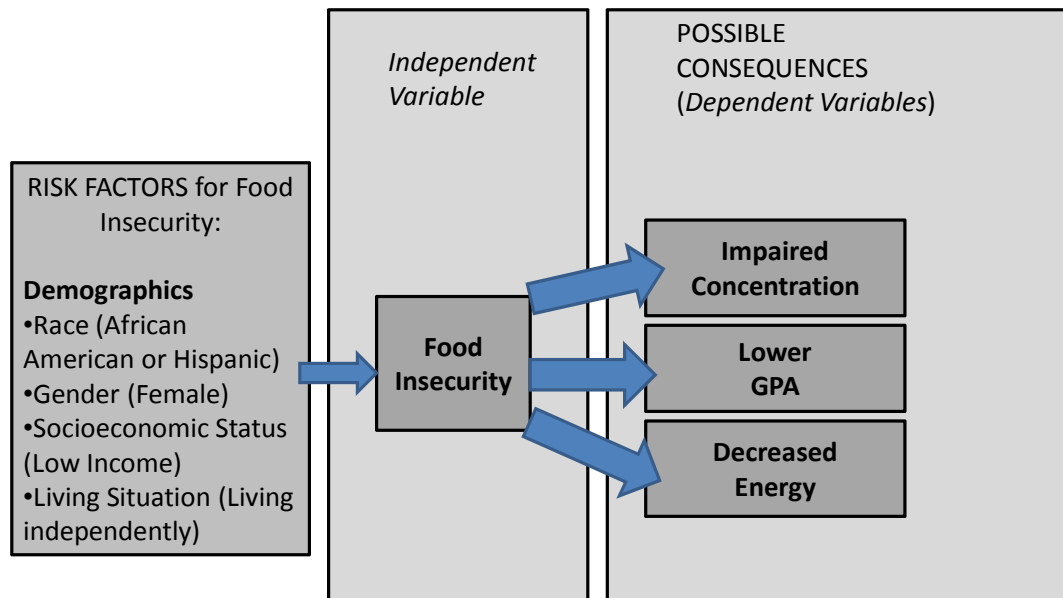


Figure 1. Proposed study theoretical model illustrating links between demographics, food insecurity and potential consequences

Research Questions

The study addressed several questions related to the possible risk factors and consequences of food insecurity among community college students.

- 1) At an urban and a suburban community college, what is the frequency of students reporting food insecurity?
- 2) What is the relationship between food insecurity and student reported GPA?
- 3) What is the relationship between food insecurity and student reported energy level?

- 4) What is the relationship between food insecurity and student reported concentration ability?
- 5) What is the relationship between student demographics and food insecurity?
- 6) What are the differences between the urban community college and the suburban community college when comparing results of food insecurity?

Methods and Procedures

This study employed a cross-sectional, intercept survey designed to assess the food security status of a convenience sample of 301 students over the age of 18 attending two different community colleges in Maryland. The survey also contained questions about student GPA; self-perceived energy and concentration levels; and demographics (gender, age, race/ethnicity, living situation, and income). Survey results were also analyzed to assess the prevalence of food insecurity among students and to explore potential correlations between food security status and GPA, energy, and concentration levels. Results were also analyzed by demographic group to assess whether there are differences between students based on gender, living situation, income, and race/ethnicity. The college locations and names have been made anonymous and will be referred to as “urban” and “suburban” throughout the remainder of the report.

Scope, Assumptions, Delimitations, and Limitations

This study has several assumptions and limitations regarding student sampling and data. First, the study was conducted at two community college

campuses which limits generalizing the results to all community college students. However, the selected community colleges are located in very divergent socio-demographic areas. One college is located in a suburban area which has been rated the one of the most affluent counties in the United States by *Forbes Magazine* (Vardi, 2012) with a median household income of \$103,273 and a poverty rate of 4.2% (U.S. Census, 2012). The other college is located in an urban area where 21.3% of residents live below the poverty level and the median household income is \$39,386 (U.S. Census, 2012). Second, because both community colleges' Institutional Review Board (IRB) protocols prohibit researchers from surveying students during class time, students were surveyed as they encountered researchers in public areas of the campuses. The students who volunteered for the survey may be different from non-participating students, which makes it impossible to generalize the findings to the entire student body. This study has the further limitation of being cross-sectional in design. A cross-sectional study can certainly measure the prevalence of the independent (food insecurity) and dependent variables (GPA, energy and concentration levels) as well as analyzing possible correlations between food insecurity the dependent variables. However, statements of causality will not be possible because longitudinal data on whether the food insecurity preceded low GPA, energy or concentration or if those conditions existed before the food insecurity came about will not be available. Future longitudinal studies will be recommended to further investigate causality. Furthermore, potential unmeasured confounding variables

(such as poverty, stress, physical or mental health issues) may explain the relationship between food insecurity and GPA.

Assumptions

The researcher made several assumptions about the investigation:

- 1) Students will be honest in answering the questions on the survey.
- 2) Students will accurately report their GPAs, demographics and income.
- 3) The Household Food Security Survey Module is a valid and reliable tool in assessing food insecurity.

Delimitations

The proposed study has the following delimitations:

- 1) Exclusion of students under the age of 18 from study participation.
- 2) Self-selection bias in participation in the study due to intercept-interview technique.
- 3) Inclusion of students at two colleges in Maryland instead of a nationally representative multi-campus study.

Limitations

The proposed study has the following limitations:

- 1) This study, as all cross sectional nutritional studies, will be used to describe population characteristics and suggest areas for future study (Margetts & Nelson, 1997).
- 2) Causality between variables cannot be determined from a cross-sectional study.

- 3) Potential unmeasured confounding variables may mediate relationships between variables.
- 4) First semester students will not have GPAs to report and will not be considered in the data analysis.
- 5) Students may not accurately report their GPAs, demographics, and/or income.

Definition of Key Terms

The foundational definitions of food security, food insecurity, and hunger were crafted by the Life Sciences Office of the Federation of American Societies for Experimental Biology in 1990 (Anderson, 1990). The United States Department of Agriculture (USDA) accepts and uses the Life Sciences Office of the Federation of American Societies for Experimental Biology's definitions on its website as well as in publications related to food security in the United States (United States Department of Agriculture Economic Research Service, 2010).

Food security is defined by the United States Department of Agriculture (USDA) as "the access by all people at all times to enough food for an active, healthy life." Food secure households are able to readily access nutritionally adequate and safe foods and are able to acquire these foods in socially acceptable ways—that is without resorting to emergency food supplies, scavenging, stealing or other coping strategies (Nord, Andrews, & Carlson, 2009). Food insecurity is a condition arising from a lack of income and other resources for food (Bickel, Nord, Price, Hamilton, & Cook, 2000). Depending on

the level of food insecurity, individuals can suffer from reduced quality, variety, or desirability of diet as well as missed meals or whole days without food (Nord et al., 2009). Based on the answers to a series of questions on a standard and well-researched survey, the USDA classifies households somewhere along a continuum from most severe to least severe: very low food security, low food security, marginal food security, food secure (see definitions below). For most reporting purposes, the USDA describes households with high or marginal food security as food secure and those with low or very low food security as food insecure (United States Department of Agriculture Economic Research Service, 2010). Selected terms that are relevant to the present study are defined below.

Food Security:

- Access by all people at all times to enough food for an active, healthy life and includes at a minimum: a) the ready availability of nutritionally adequate and safe foods, and b) the assured ability to acquire acceptable foods in socially acceptable ways (e.g., without resorting to emergency food supplies, scavenging, stealing, and other coping strategies; Anderson, 1990).

Food Insecurity:

- Food insecurity exists whenever the availability of nutritionally adequate and safe foods or the ability to acquire acceptable foods in socially acceptable ways is limited or uncertain (Anderson, 1990).

Hunger:

- The uneasy or painful sensation caused by a lack of food. Hunger and malnutrition are potential, although not necessary, consequences of food insecurity (Anderson, 1990).

Food Insecurity:

- An inadequate amount of food intake due to a lack of money resources as determined by reporting that a person or family sometimes or often did not get enough food to eat (Alaimo et al., 2001).

Community Food Security:

- Prevention-oriented concept that supports the development and enhancement of sustainable, community-based strategies to improve access of low-income households to healthful nutritious food supplies; increase the self-reliance of communities in providing for their own food needs; and to promote comprehensive responses to local food, farm and nutrition issues (Andrews, 2010).

High food security:

- Households had no problems, or anxiety about, consistently accessing adequate food (Nord & Coleman-Jensen, 2011).

Marginal food security:

- Households had problems at times, or anxiety about, accessing adequate food, but the quality, variety, and quantity of their food intake were not substantially reduced (Nord & Coleman-Jensen, 2011).

Low food security:

- Households reduced the quality, variety, and desirability of their diets, but the quantity of food intake and normal eating patterns were not substantially disrupted (Nord & Coleman-Jensen, 2011).

Very low food security:

- Eating patterns of one or more household members were disrupted and food intake reduced because the household lacked money and other resources for food (Nord & Coleman-Jensen, 2011).

Household Food Security Survey Module (HFSSM):

- A set of 10 questions for households with no children and 18 questions for households with children that is used by the United States government as part of the Current Population Survey to calculate household food security and then to estimate the prevalence of food insecurity (Wunderlich, 2006, p. 30).

Summary

Food insecurity is a phenomenon that negatively affects the health and well-being of millions of adults and children. The lack of access to a nutritious and dependable food supply is known to have adverse cognitive effects on children and adults yet, research on food insecurity and community college student GPA, energy, and concentration is currently missing from the literature. This study examined the prevalence of food insecurity among students on two community college campuses in Maryland and its correlation with student Grade

Point Average (GPA), energy, and concentration levels. If significant numbers of students are found to be food insecure or if a correlation between food insecurity and GPA, energy, or concentration exists, efforts to combat food insecurity on community college campus should be seriously considered by college administrators, faculty, staff, and students.

In chapter 2 of this proposal, background literature on food insecurity history, prevalence, and measurement will be reviewed. Chapter 2 will also provide information about the link between food insecurity and GPA, energy, and concentration levels followed by data on the community college student demographics, financial stress during college and will conclude with research on food insecurity among college students and interventions to combat food insecurity among college students. In chapter 3, the research methods will be outlined including the research design, setting, and sample, survey questions, a description of data analysis techniques and measures implemented to ensure the protection of participants' rights and privacy. In chapter 4, the results of the study will be outlined including the prevalence of food insecurity, relationships between food insecurity and demographics, GPA, energy, and concentration. Chapter 4 will also compare the similarities and differences between the urban and the suburban community college. Chapter 5 will discuss the results as well as relevant conclusions, implications, and recommendations.

CHAPTER II: REVIEW OF THE LITERATURE

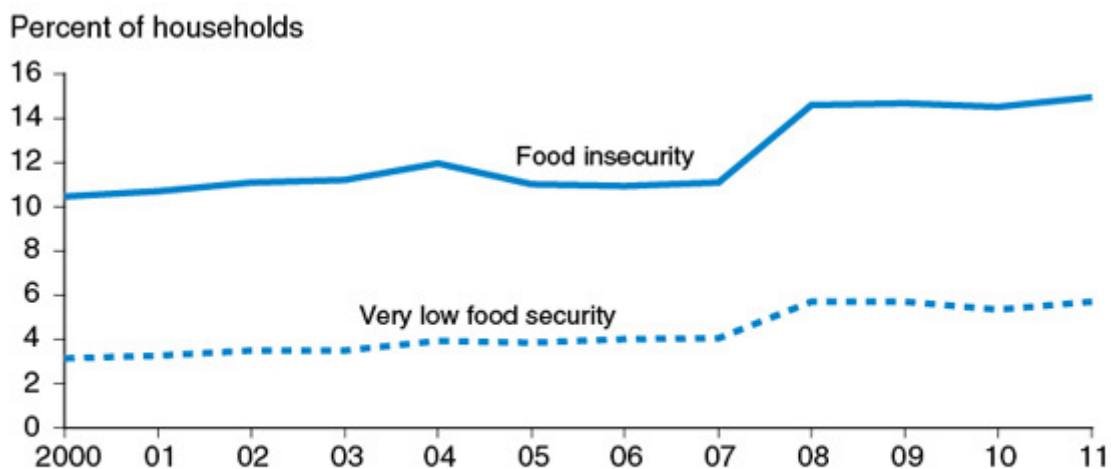
The purpose of this study was to examine the prevalence of food insecurity among students attending two community colleges in Maryland and to assess whether food insecurity is associated with GPA, energy, and/or concentration levels. Students are unlikely to be able to lead healthy lives and reach their full academic potential if they lack access to adequate food or are unsure of whether they can afford the foods they need. Community colleges have the potential to participate in the struggle against food insecurity by providing food pantries or linking eligible students to food assistance programs if this is an issue on their campus. College administrators may also consider installing fruit and vegetable gardens; serving as sites for farmers' markets; or offering instruction on shopping for and preparing food on a limited budget if they wish to address food insecurity among their students.

Although food insecurity has been widely studied in many contexts, little research on the relationship between food insecurity, GPA, energy levels, and concentration among community college students exists to date. This chapter will provide an overview of food insecurity prevalence and trends, the history of food security measurement in the United States, and methods for measuring food insecurity. Furthermore literature on food insecurity and academic outcomes, energy, and concentration will be reviewed. Finally, the demographic profile of community college students, financial stress during college, food

insecurity among college students, and possible interventions for combating food insecurity on college campuses will also be reviewed.

Food Insecurity Prevalence and Trends

Food insecurity is an increasingly common phenomenon in the United States. In 2006, 10.94% of U.S. households were food insecure; that number increased to 11.1% in 2007 and rose to its highest point since data collection began at 14.9% in 2011. The 2011 food insecurity level reflects the highest rates of food insecure Americans recorded since the first nationally representative food security survey in 1995. Food insecurity rose rapidly as the economy declined in 2008 (Coleman-Jensen et al., 2012b). Trends in food insecurity between 2000 and 2011 are illustrated in Figure 2.



Source: Calculated by USDA, Economic Research Service based on Current Population Survey Food Security Supplement data.

Figure 2. Trends in prevalence of food insecurity and very low food security in U.S. households, 2000–2011. From “Coleman-Jensen, A., Nord, M., Andrews,

M., & Carlson, S. (2012). Household Food Security in the United States in 2011: United States Department of Agriculture, Economic Research Service.”

Population Demographics Experiencing High Food Insecurity

Several population groups are disproportionately affected by food insecurity. According to Coleman-Jensen et al. (2012b), those most likely to experience food insecurity are single-female households with children (36.8%), Black and Hispanic Americans (25.1% and 26.2% respectively), and low income families with income under 185%¹ of the federal poverty guidelines (34.5%). Factors contributing to food insecurity include: “poverty, high housing and utility costs, unemployment, medical and health costs, mental health problems, lack of education, transportation costs, and substance abuse” (Holben, 2010, p. 1370). Reducing food insecurity is a national priority for the U.S. Department of Health and Human Services *Healthy People 2020* goals. *Healthy People 2020* states that food insecurity should be reduced from the current level of 14.5% to 6% of American households and that very low food security should be “eliminated” in households with children by 2020 (U.S. Department of Health and Human Services, 2011).

¹ The poverty guidelines are determined annually by the U.S. Department of Health and Human Services to determine financial eligibility for federal programs. In 2012, poverty guideline was established as an income below \$23,050 for a family of four (U.S. Department of Health and Human Services, 2012). The Nord (2010) report considered families “low income” if their income was below 185% of the poverty guideline—using this particular example, a family of four would be considered “low income” if their income was below \$42,642 (185% of \$23,050).

Despite the *Healthy People 2020* goals, food insecurity is rising both nationwide and in the state of Maryland. In the years 2006–08, 9.6% of Marylanders were estimated to be food insecure compared with a national average of 12.2% during that same period (Nord et al., 2009). The level of food insecurity among Maryland residents rose to 11.1% in the 2007–2009 data set compared with a national average of 13.5% during the same period (Nord, Coleman-Jensen, Andrews, & Carlson, 2010). In the most recent state food insecurity assessment, the level of food insecurity in Maryland rose even further to 12.5% for 2009–2011 compared to the national average of 14.7% over that timeframe (Coleman-Jensen et al., 2012b). Data also indicate that from 2008 to 2012, the number of Maryland residents receiving food stamps and visiting food pantries has doubled (Johnston, Straumsheim, & McGonigle, 2012).

According to recent data, the suburban community college is located in an area with a population of 293,142 (U.S. Census, 2012) of which 7.4% are deemed to be food insecure (Map the Meal Gap, 2011). The student population at the suburban college, is 27% African American, 47% White, 8% Hispanic or Latino, and 13% Asian or Pacific Islander. Females outnumber males as the student body is 57% female and 43% male (Mini-Profile of “Suburban Community College” Fall Credit Enrollment Statistics, 2011). The second community college is located in an urban area with a population of 619,493 (U.S. Census, 2012) of which 21.7% of residents are food insecure. The student population at the urban community college city is 80% African American, 9.2% White, 4.8% Asian, and

3.2% international. Females outnumber males as the student body is 70% female and 30% male (Urban Community College factbook, 2011). The high proportions of African Americans on both campuses may signal a prevalence of food insecurity exceeding national and state averages.

History and Measurement of Food Insecurity

History of Food Security Measurement

The United States government began addressing the issue of food insecurity and hunger among citizens in the late 1930s during the Great Depression with the introduction of the Food Stamp Program (FSP). The FSP's original goal was to help farmers by distributing surplus commodities to the poor (Biggerstaff, Morris, & Nichols-Casebolt, 2002). The next large scale government program aimed at hunger came in 1947 with the passage of the National School Lunch Act which was prompted by the discovery that 40% of men called to serve in World War II were suffering from physical disabilities due to poor nutrition (Parker, 2002). Further expansions in outreach to feed the hungry in America came after a 1967 study by a group of physicians tasked with traveling across the United States to observe the living conditions and health of impoverished American children. These physicians reported to the 90th U.S. Congress in 1968 that "wherever we went and wherever we looked, whether it was the rural south, Appalachia, or an urban ghetto, we saw children in significant numbers who were hungry and sick, children for whom hunger was a daily fact of life and sickness in many forms, an inevitability" (Bhattacharya,

Currie, & Haider, 2006, p. 3). Congress responded to these revelations by expanding the Food Stamp Program, implementing the School Breakfast Program, requiring that low-income children be offered free and reduced price meals, implementing summer feeding programs, and developing the Special Supplemental Nutrition Program for Women, Infants and Children also known as “WIC” (Parker, 2002).

In the 1980s, a renewed focus on hunger was spurred by adverse economic conditions which led people to believe that the prevalence of hunger may have been on the rise again. The Reagan administration convened a Task Force on Food Assistance to establish a working definition of “hunger” and to assess the extent of undernutrition among the American public. The task force concluded that no established methodology was available to measure the extent or trends in undernutrition in the U.S. which elevated the issue of accurate measurement of hunger to a national policy priority (Radimer, 2002). In response, The Food Research and Action Center (FRAC) developed the Community Childhood Hunger Identification Project (CCHIP) to assess the prevalence of childhood hunger (Haering & Syed, 2009) and researchers at Cornell University conducted extensive qualitative and quantitative research to develop the Radimer Cornell scale of measuring hunger (Radimer, 2002).

The U. S. government began its attempt to quantify food insecurity among citizens by analyzing responses to a single question on the periodically conducted Nationwide Food Consumption survey beginning in the mid-1980s. In

the late 1980s, food insecurity was measured by the National Center for Health Statistics in the third National Health and Nutrition Examination Survey (NHANES III) by using a variation of the previously mentioned Nationwide Food Consumption survey question along with several questions from the CCHIP questionnaire; however, there was a lack of consensus on the appropriateness, accuracy or validity of this method (Wunderlich, 2006).

In 1990, the National Nutrition Monitoring and Related Research Act (NNMRRRA) was passed by Congress ("National Nutrition Monitoring and Related Research Act," 1990). The NNMRRRA required the secretaries of the Department of Agriculture and the Department of Health and Human Services to confer with a board to implement a ten-year comprehensive plan to assess the nutritional status of the U. S. population. The secretaries were also charged with measuring the prevalence of "food insecurity" in the U.S. with a methodology that could be used at the national, state, and local level. To that end, USDA and DHHS brought together academic, private-sector, and other food security stakeholders in 1992 to form the Federal Food Security Measurement Project. Subsequently, USDA and DHHS convened the First National Conference of Food Security Measurement and Research in 1994 which tasked a group of experts to clarify terminology, operationalize, and create a survey instrument for measuring food insecurity on a national level. Per recommendations of the conference participants, USDA conducted additional analytical work on the Radimer Cornell and CCHIP questionnaires and finally drafted the Food Security

Supplement (FSS; over 70 questions) that has been included in the Census Bureau's Current Population Survey (CPS) since 1995. The FSS asks respondents about food expenditures, food spending behavior, use of food assistance programs, food sufficiency and security, and coping strategies. Within the FSS, the Household Food Security Survey Module (HFSSM:10 questions for households without children and 18 questions for households with children) is used to estimate the national prevalence of food insecurity (Wunderlich, 2006).

Methods for Measuring Food Insecurity

Currently three scales can be used to measure food security in the United States: The U.S. Household Food Security Scale Module (HFSSM: 18-items for households with children; 10-items for households without children; and 6-item Short Form HFSSM), the Community Childhood Hunger Identification Project (CCHIP) hunger index, and the Radimer Cornell measure of hunger and food insecurity (Goetz, 2008). The HFSSM (18-item, 10-item, and 6-item) is the most validated, comprehensive and widely used food security measure available. Strengths of the HFSSM include distinguishing among various levels of severity of food insecurity and the ability to compare sample data with national and state-level data published by the USDA on an annual basis. The 10-question subset of the HFSSM will be used in the present study to assess the prevalence of food insecurity among community college students. The advantages of the 10-item HFSSM are that the shortened survey reduces respondent burden and the

survey does not ask questions about the food security of dependent children in the household which is irrelevant in the current study. The HFSSM includes questions to cover the established dimensions of food insecurity which include lack of financial resources which cause individuals and households to experience uncertainty and food depletion, insufficient quality or quantity of diet, and possibly reduced food intake and the feeling of hunger. Further information on measuring food insecurity using the HFSSM is provided in chapter 3 of this proposal.

Evaluating the Quality of Relevant Food Insecurity Research

Several criteria were important in evaluating the quality of food insecurity research relevant to the current study for inclusion in the literature review. First, studies examining the impact of food insecurity on academic success in both children and adults were included in this review. These studies were included because of their direct relationship to the study hypothesis examining community college student GPA in relation to food security status. Studies on child food security and academic achievement were included despite differences in age between this population and the community college population because more studies have been conducted on children than adults in this area. Studies on the impact of food insecurity on energy and concentration were also included in the review. Reports on the profile and demographics of community college students were reviewed in order to understand the characteristics of community college students that may make food insecurity more likely in this population. Literature on the experiences of financially stressed college students was also included

because financial difficulties are a precursor to food insecurity. Furthermore, newspaper articles and peer-reviewed journal articles related to food insecurity among college students were considered important because the present study seeks to examine food security among students attending a community college. Peer-reviewed journal articles are considered the “gold standard” in research; however, several newspaper articles were included in this literature review because the news media has done a more thorough job covering the issue of campus food pantries and college students’ use of food assistance programs (such as SNAP formerly known as “food stamps”) than peer-reviewed journals. Finally, peer-reviewed articles, U.S. government literature, and media reports related to possible interventions that could be used to combat food insecurity are included as these approaches may be relevant if food insecurity is found to be a significant problem for community college students.

In all cases, the literature was evaluated based on the design (epidemiological/observational, experimental, case study); the number of study participants; the similarities between the population and the community college student population; and publication date (priority to more recent research). The literature included in this review focuses on food insecurity in the United States or in other developed countries. Food insecurity and hunger in the developing world is widespread and often more severe than the food insecurity experienced by individuals in developed countries such as the United States. Abundant literature has been published on the causes, consequences, and possible

solutions for hunger in the developing world, but it is not included in this summary because of the difference in severity just noted.

Food Insecurity and Grade Point Average

Food insecurity has many consequences including nutrient deficiencies, impairments to mental and physical health in adult women; depression in women; adverse health outcomes for infants and toddlers; behavioral problems in children; decreased educational achievement; and depression and suicidal symptoms in adolescents (Nord & Prell, 2007). Research included in the following sections will focus on the impact of food insecurity on cognition and academic outcomes in children and adults (Alaimo et al., 2001; Frongillo et al., 2006; Gao et al., 2009; Jyoti et al., 2005; Murphy et al., 1998; Reid, 2000; Weinreb et al., 2002; Winicki & Jemison, 2003) as these studies are relevant to the hypothesis that food insecurity may be associated with lower GPA in community college students.

Food Insecurity and Adult Cognition

Gao et al. (2009) conducted a quantitative study on the relationship between food insecurity and cognitive functioning among Puerto Rican adults (n=1,358) aged 45 to 75 living in Massachusetts. Food security status was assessed using the 10-question HFSSM and respondents were classified as “food secure” or “food insecure” (food insecure were further categorized as “low food security or “very low food security”) in accordance with USDA methodology. The researchers found that 12.1% of their study population was food insecure

and that food insecurity was associated with lower global cognitive functioning as indicated by verbal memory tests, the Mini-Mental Status Evaluation, visual-spatial ability tests, and verbal fluency tests after adjusting for a variety of potential confounding factors such as age, education, poverty, smoking, alcohol use and health conditions. The researchers conclude that “the difference in global cognitive scores between participants with very low food security and those with food security was equivalent to accelerating cognitive aging by 8 years” meaning that an adult of age 70 with very low food security displayed the cognitive ability of a 78 year old (Gao et al., 2009, p. 1202). This Gao (2009) study is highly relevant to the present study because this is one of very few studies investigating the relationship between food insecurity and adult cognitive functioning. It should be noted that the study population in Gao’s study was older (mean age 57 years) than the typical community college student. Furthermore, while cognition, which refers to a person’s ability to think, reason, and remember (Merriam Webster, 2012), is not necessarily reflected in GPA, a person with impaired cognition may have trouble completing academic work which typically requires some cognitive skill. Therefore, the results of Gao’s study provide a potential hypothesis for the proposed investigation of the relationship between food insecurity and academic performance in community college students.

Food Insecurity and Child Academic Success

While research on food insecurity and adult academic success is scarce, research on the adverse impact of food insecurity on children’s academic

achievement provides an impetus to evaluate the proposed study hypothesis. It is well known that “a student who is hungry. . .cannot benefit fully from schooling” (Dunkle & Nash, 1991, p. 4). Chilton, Cayette, and Breaux (2007) reviewed the literature on food insecurity and child development and found that although the majority of children affected by food insecurity reside in the developing world, that “truncated development due to poverty and food insecurity is also seen in developed countries” (Chilton et al., p. 263). The researchers also note that food insecurity does not have to be severe to result in lasting consequences and that even the “slightest forms” of food insecurity can negatively affect children’s academic success (Chilton et al., 2007, p. 263). A second large literature review by Cook and Frank (2008), concluded that consistent adverse affects of food insecurity have been found “on physical and mental health, academic performance, and behavioral and psychosocial problems in preschool-aged and school-aged children” (Cook & Frank, 2008, p. 201). Cook and Frank conclude with a statement that food insecurity is “rapidly remediable” with existing food resources available in a country as wealthy as the United States but that the “only constraint is political will” (Cook & Frank, 2008, p. 193).

Further research on the effect of food insecurity on academic achievement was conducted by Winicki et al. (2003). The researchers conducted a quantitative longitudinal study on the effect of food insecurity on academic achievement in kindergarteners (n=21,260) using data from the Early Childhood Longitudinal Study (ECLS) which includes the 18-item HFSSM questionnaire.

Winicki et al. (2003) found that 9% of their study population was food insecure (answered affirmatively to ≥ 3 questions on HFSSM) and that any degree of food insecurity adversely affected academic outcomes during the 1-year timeframe of the study. Specifically, students from food insecure homes scored lower on baseline academic testing and were found to learn less during the school year than children from food secure homes. Another interesting finding in this study was that students from households that answered one or two items affirmatively on the HFSSM were essentially indistinguishable from those who answered three or more items affirmatively. This study is relevant to the current investigation because relationships between academic performance and food insecurity were investigated, and this relates directly to the hypothesis that food security status may affect community college student GPA.

Jyoti et al. (2005) investigated the relationship between food insecurity and children's academic, social, and physical development in a longitudinal study using ECLS data on 21,260 children. The researchers found that 15.6% of their study population was food insecure (defined in this study as answering affirmatively to ≥ 1 question on HFSSM) and food insecurity in children predicted impaired academic performance in both reading and mathematics for boys and girls. The study had the added strength of being longitudinal which enabled the researchers to observe changes in food security status along with changes in academic achievement from kindergarten to 3rd grade. For example, the researchers found that food insecure kindergarteners had decreased reading

performance and that those who became food secure by the 3rd grade had improvements in their reading scores. This study provides further impetus to investigate the relationship between academic performance and food insecurity in adults enrolled in college.

Reid (2000) conducted an analysis of Child Development Supplement to the Panel Study of Income Dynamics (PSID) examining the relationship between food insecurity and children's school performance. The PSID is a longitudinal study that includes measures of economic, demographic, psychological, and sociological status of a representative sample of U.S. men, women, and children. Reid's analysis included 3,500 school aged children and found that food insecurity had a significant negative effect on school performance indicated by decreased test scores on letter-word, calculation, and passage comprehension assessments. The researchers also found that for every year a child's family experiences food insecurity there was a corresponding decline in the child's letter-word score, passage comprehension score, and calculation test score.

A construct related to food insecurity is food insufficiency which refers to "sometimes or often not having enough to eat" (Hamrick, 2003, p. 1). Alaimo, Olson, and Frongillo (2001) examined the impact of food insufficiency on cognitive, psychosocial and academic outcomes of children ages 6 to 11 (n=3,286) and 12 to 16 (n=2,036) using nationally representative data from the National Health and Nutrition Examination Survey (NHANES). Alaimo et al. found that 9% of children and adolescents were food insufficient. The

researchers found that food insufficient children and adolescents were more than twice as likely to have repeated a school grade compared to food sufficient children and teenagers. The effect persisted after controlling for confounding variables leading the authors to conclude that food insufficiency is “another risk factor that should be considered” when assessing educational outcomes (Alaimo et al., 2001, p. 49).

Further investigation into food insecurity and academic outcomes was conducted by researchers who examined academic and behavioral patterns of 204 inner-city school aged children in Philadelphia and Baltimore (Murphy et al., 1998). The researchers used the CCHIP measure to classify students as “hungry,” “at risk for hunger” or “not hungry” and found that 27% of the children were “at risk for hunger” and 8% were “hungry.” Students who were “at risk for hunger” or “hungry” were absent or late from school significantly more frequently and had significantly more teacher reports of behavioral, attention, and emotional problems than children classified as “not hungry.” The researchers urge school psychologists to increase their screening for hunger among school children and to refer families to federal food assistance programs such as SNAP and WIC since “childhood hunger, a stress that should be remedied, may also be a potential. . .contributing factor to later aggressive behavior and school drop-out during adolescence” (Murphy et al., 1998, p. 169).

Although the majority of the literature shows a that food insecurity has an adverse effect on academic achievement, one study of preschool and school

aged children found no association between food insecurity and academic outcomes (Weinreb et al., 2002). Weinreb et al. surveyed 408 homeless and low-income mothers on their food security status using items from the Community Childhood Hunger Identification Project (CCHIP) measure. Children were classified as experiencing “no hunger,” “moderate child hunger,” or “severe child hunger.” The researchers found that school aged children who experienced severe hunger were significantly more likely to have anxiety, behavior problems and chronic illness than food secure children but found no relationship between academic outcomes and food security status. The researchers note that while previous studies have found a relationship between child hunger and academic outcomes, theirs did not. They postulate that the reasons for this difference may stem from previous studies using more economically diverse sample populations—the Weinreb study only included very low income female-headed families which did not allow for much variation in socioeconomic status. Furthermore, they state that the measure of academic achievement used in their study (Wechsler Individual Achievement Test Screener) may have lacked the sensitivity to accurately assess the impact of hunger on academic outcomes.

The relationship between food sufficiency and academics has been strengthened by studies showing that when children who were previously not receiving enough food were provided with food, their academic achievement improved. Frongillo, Jyoti, and Jones (2006) found that children from families that started participating in the Food Stamp Program (FSP) between

kindergarten and third grade received a 3-point greater score on a standardized math and reading test compared to children from families that stopped participating in the FSP over the same time period. The effects of the FSP on boosting test scores were notably larger for females than males in this study. The researchers conclude that “the results of this study provide the strongest evidence to date that FSP participation plausibly has beneficial effects for children on non-nutritional outcomes, specifically academic learning during the first 4 years of school” (Frongillo et al., p. 1079). The researchers go on to say that the mechanisms for this relationship may be due to nutritional intake or stress. They state that the FSP should be regarded as a “means of enhancing academic performance and learning” for school aged children (Frongillo et al., 2006, p. 1079). This research suggests that enrollment in food assistance programs could have beneficial effects that may hold for college-aged students as well, although this hypothesis has not yet been tested on a college-age population.

The wealth of research on food insecurity and academic success and cognitive functioning has largely excluded the college population to date. The present study examined the relationship between food insecurity and GPA in college students which may suggest whether students struggling to obtain enough food are also receiving lower course grades than those who are able to afford adequate food. Although GPA is not a perfect surrogate for academic success, this measure may provide some indication about whether food

insecurity has adverse effects on community college students' educational success.

Food Insecurity and Decreased Energy and Concentration Levels

Several possible mechanisms to explain the adverse effects of food insecurity on learning and academic outcomes have been discussed in the literature including stress, depression (Gao et al., 2009), fatigue, difficulty concentrating (Hamelin et al., 1999; Radimer, 1990; Zekeri, 2007), and nutrient deficiencies (Jyoti et al., 2005). These mechanisms have been investigated in qualitative or mixed-method studies seeking to elucidate the experiences of food insecure adults and households. Radimer (1990) conducted the seminal qualitative study on the experiences of food insecure adults using interviews with 32 food insecure women in New York. The research found that fatigue was reported by women during times of food insufficiency which could impact a person's ability to learn. Some of the interviewees reported being fatigued due to an inability to sleep at night from hunger pangs. Others reported that they "feel weak all the time" (Radimer, 1990, p. 205) or that during times of food deprivation "what we mostly did was sleep" (Radimer, 1990, p. 389). In another study, Hamelin (1999) reported that in 98 interviews with food insecure individuals, 40 respondents reported feelings of fatigue and indicated that this might lead to "lack of concentration at school and low work capacity either at home or at work" (Hamelin et al., 1999, p. 526S). Hamelin et al. concluded that one of the social implications of food insecurity is impaired learning for both children and adults.

Zekeri (2007) in another study, examined the experiences of food insecure families was conducted by interviewing 100 African American single mothers residing in Alabama. Zekeri's results revealed many psychological repercussions of food insecurity including depression (48%), sadness (57%), loneliness (45%), sleep disturbances (50%), difficulty concentrating (48%), and worry (65%). Additional psychological implications of food insecurity in adults found in qualitative research include feelings of anxiety, desperation, fear, deprivation, anger, and embarrassment (Wolfe, Frongillo, & Valois, 2003).

The literature reviewed in this section suggests a need to understand whether college students who are food insecure are also experiencing decreased energy levels or ability to concentrate. Students who are frequently tired or who cannot concentrate may have trouble achieving their academic goals. The present study examined the link between food insecurity, GPA, energy, and concentration levels in community college students.

Community College Student Demographics and Food Insecurity

Community colleges are educating almost half of the undergraduates in the U.S. (American Association of Community Colleges, 2011) and it is important to understand who these students are in the context of the current study on food insecurity. According to Bueschel (2003), community college students are more likely to be "older, more ethnically and racially diverse and less affluent than their 4-year counterparts" (Bueschel, 2003, p. 5). Community colleges also serve as a gateway for first-generation college students (American Association of

Community Colleges, 2011). According to the AACC (2011), 58% of community college students are women, 45% are minorities, and 80% of full-time community college students are employed (21% employed full time; 59% employed part time). Community colleges enroll a disproportionate percentage of African American and Hispanic students, and research indicates that these students are more likely to drop out of college than their White counterparts. First generation college students are also overrepresented at the community college, and these students also have an elevated dropout rate (Joo, Durband, & Grable, 2009). The community college student population is generally older than their 4-year counterparts; Bueschel (2003) reports that 32% of community college students are 30 years or older.

Demographics including race/ethnicity, gender, and living situation were examined in this study as African Americans, Hispanics, women who are single parents, low income individuals, and college students who live independently are more likely to experience food insecurity than the general population (Chaparro et al., 2009; Freudenberg et al., 2011; Hughes et al., 2011; Nord et al., 2011). Individuals with these demographic characteristics may be overrepresented at community colleges which makes these institutions a logical setting to examine food insecurity.

Affordability of Community Colleges

Community colleges represent a more affordable alternative to four-year institutions and are more likely to enroll students of lower socioeconomic status.

The American Association of Community Colleges (2011) reports that the average tuition for public four-year college exceeds that of a community college three-fold. Four-year college tuition is on average, \$7,605 per year, compared with \$2,713 to attend a community college. Community colleges are an affordable option for millions of students who would not otherwise be able to obtain post-secondary education. An analysis by the National Center for Education Statistics (Horn, Nevill, & Griffith, 2006) found that 26% of students enrolled at community colleges were in the lowest income quartile compared with 21% of those enrolled at 4-year institutions. Qualitative research on the experiences of food insecure adults has indicated that these individuals may seek out community college education as a means to improve their educational and employment prospects (De Marco et al., 2009). Research on the affordability of community colleges is important to the proposed study as low-income individuals are significantly more likely to experience food insecurity and these individuals are more likely to attend community college than 4-year institutions.

Financial Stress During College

College students are certainly not immune to experiencing economic hardship, and many studies show both the extent and repercussions of financial stress during college. Perhaps most importantly, economic hardship during college often leads to lack of funds to purchase food. For adults experiencing tight budgets, food is one of the few flexible expenses. While rent, car payments,

electricity, tuition, telephone and other bills are non-negotiable, food spending is elastic and often must fit with funds remaining after these other expenses are paid (Shipler, 2005). Recent research indicates that many college students have difficulty paying for food and are resorting to credit cards to pay for their food bills (Hornak, Farrell, & Jackson, 2010; McGlynn, 2006; Robb & Pinto, 2010; Sallie Mae, 2009). By definition, food insecurity is the lack of food resulting from inadequate finances. Therefore, college student finances will be examined in this section of the proposal.

The American College Health Association found that 34% of college students reported that finances were “traumatic or very difficult to handle” and finances negatively affected the academic achievement of 6.5% of students in their Spring 2011 survey (American College Health Association, 2011). Researchers at a large college in the Southwestern U.S. found that 5% of students reported that finances “very often” interfered with their academic performance (Joo et al., 2009). Financially stressed students are less likely to complete their college education and are in need of campus supports to help ease the financial burdens of college.

Recent increases in both tuition and ancillary materials required for college attendance, such as textbooks, are contributing to the financial strain of college students. The United States General Accountability Office (GAO) reported to Congress that textbook prices rose by 186% from 1986 to 2004, while tuition rose 240% over that same time period. Both textbook prices and tuition

increases dwarfed the 72% rise in inflation from 1986 to 2004. The GAO also estimated that at a two-year institution, the cost of textbooks and supplies comprised 72% of student expenses and was \$886 per student in the 2003–04 academic year. Nationwide, in the 2003–04 academic year, students and their families spent \$6 billion on new and used textbooks. These high costs are placing unprecedented financial burdens on college students and their families (College Textbooks: Enhanced Offerings Appear to Drive Recent Price Increases, 2005).

The literature provides several studies examining the experiences of low-income and working students. A recent longitudinal mixed methods study on the experiences of first-time, full-time undergraduate students who were working for income during their first academic year of school provides rich information on the impact of financial struggles on the academic achievement of college students (Hornak et al., 2010). The researchers examined the experiences of 65 students attending four different Midwestern colleges over the course of one year and found that the number of hours students spent working caused a myriad of issues leading to decreased academic success. Working, in addition to being a student, restricted student's participation in study sessions, limited their ability to purchase required and supplemental textbooks, interfered with class scheduling, and caused the majority of working students to drop out of social and academic groups.

The Hornak study also found that many students had trouble paying for food and had to resort to using credit cards to finance their food intake. The authors conclude that their findings “illustrate that financial hardship in college can impact engagement, well-being, relationships, return rates and ultimately graduation rates as students struggle to meet the rising costs to attend college each year” (Hornak et al., 2010, p. 491). The authors found that students felt the school did not provide adequate support services with regard to the hidden costs of attending college and quoted students in focus groups saying the following: “Once here, they don’t care for us.”; “They can show a bit more compassion. We are being ripped off.” These sentiments are contrary to the stated mission of higher education institutions: to nurture learning and academic success (Hornak et al., 2010, p. 493).

Today, increasing numbers of economically disadvantaged students are attending college, but their completion rates pale in comparison to students from more affluent backgrounds. According to a review of the literature conducted by Johnson and Collins (2009), in 2000–01, the college completion rate of low-income students lagged significantly behind their higher income counterparts. While 52% of high income students completed a bachelor’s degree by age 24, only 16% of middle income and 9% of low income students were able to complete a bachelor’s degree in a similar timeframe. Similarly, Joo et al. (2009) found that financially stressed students were significantly more likely to drop out of college than other students because of being in a cycle of financial stress

leading to increased work hours which results in compromised academic performance and ultimately academic interruption. College dropouts have significantly decreased lifetime earnings compared to college graduates and are also more likely to end up in prison (Joo et al., 2009). These findings highlight the need for additional attention and resources on campus for lower income students who are at increased risk for dropping out of college.

Financial strain is more likely to manifest itself in community college students than their 4-year college counterparts and may affect college persistence. A recent article reports that some of the key indicators of college persistence are related to financial strain including being a single parent, being financially independent (relying on one's own income to attend college), working more than 30 hours per week, and being a first generation college student (Kuh, Kinzie, Buckley, Bridges, & Hayek, 2006). Community college students are more likely than their four-year counterparts to encounter these difficulties which may provide an impetus for college administrators to put in place as many relevant social services on campus to assist students with their financial struggles. In order to help economically disadvantaged students not only enter but also complete their college education, colleges need to focus on providing the "academic, financial, and social supports" to make this a reality (Howard, 2001, p. 7).

College students are accumulating unprecedented amounts of credit card debt during college which may have financial implications that haunt them for

many years after their college experience. A study by Hornak et al. (2010) found that college students are not using credit cards for “frivolous or luxury spending” as the most frequently cited reason for credit card use was to purchase food (Hornak et al., 2010, p. 488). Similar findings have been discussed by McGlynn who finds that “71% of students are charging books and food” to credit cards (McGlynn, 2006). Sallie May, a major educational loan provider, conducts periodic studies on undergraduate credit card usage and found that food was purchased on credit cards by 84% of undergraduates which makes food the most common credit card expense of college students. Furthermore, food was the most frequent expense for nearly a quarter of students surveyed (Sallie Mae, 2009). In a related study, Robb and Pinto (2010) surveyed over 1,200 undergraduates at two different universities and found that 48% of the students were using credit cards to pay for groceries and 54% were charging meals at restaurants to their credit cards. The researchers also found that the students who were “financially at risk” were even more likely to resort to credit cards for groceries and eating out expenses, 57% and 67% respectively (Robb & Pinto, 2010). Financially, at risk students are more likely to be African American, Hispanic and/or financially independent, and these groups are overrepresented in the community college student population. These findings support the notion that college students are often faced with difficult financial decisions, and many are struggling to find ways to pay for their next meal—and may be paying for those meals with interest for many years to come.

Food Insecurity and College Students

The literature clearly shows reduced scholastic achievement among food insecure adults and children and documents struggles of college students to afford food and other living expenses. Therefore, it is important to research how prevalent food insecurity is among college students as well as which students, if any, are at increased risk of suffering from food insecurity. To date, only a few studies have investigated food insecurity among college students and those studies will be reviewed in detail in the following section.

One such study examining food insecurity among college students was conducted by Chaparro et al. (2009). This study was a cross-sectional quantitative analysis of food insecurity among University of Hawai'i Manoa (UHM) students. Freshmen were excluded because the questionnaire included questions on eating habits during the previous year and first year students may not have been college students during the entire previous year (Chaparro et al., 2009). The researchers separated all school courses into categories by the college level of their typical enrollees (sophomores, juniors, seniors, graduate students) and randomly selected courses within each category so that a representative sample of students could be surveyed. Instructors of chosen courses were contacted and asked if a 15-minute survey could be distributed to their students. In total, 95 instructors were contacted and 31 (33%) agreed to allow the survey to be distributed in their courses. From the 31 courses, 441 out of 445 students who were present agreed to participate in the study.

Furthermore, 31 students were excluded for the following reasons: students who were freshmen ($n = 3$), unclassified students ($n=5$), students who were on special diets due to illness ($n=8$), pregnant students ($n=1$), and students who did not complete the food security questions ($n=14$); resulting in a total of 410 surveys included in the research data.

The researchers cited previous research validating the use of the HFSSM in the Asian/Pacific Islander population which comprises a large proportion of UHM students. Prior to the study, the survey was pilot tested on a convenience sample of students who took the survey and provided feedback on the readability and relevance of each question to the college population. Student suggestions and clarifications were included in the final questionnaire. Student demographics including age, marital status, gender, ethnicity, major, academic year, living arrangements, place of birth, meal plan participation, length of residency in Hawai'i, food program participation were collected on the survey along with the answers to the 10-item HFSSM to assess food security status. Students were also asked to estimate their monthly expenditures in a variety of spending categories.

The researchers used SPSS (version 15.0) to examine differences between students who were food secure (high or marginal food security) versus those who were food insecure (low or very low food security). In this study, food security was considered the dependent variable. The researchers conducted χ^2 tests, t tests, and linear-by-linear associations using a significance level of

$P < 0.05$. Multivariate logistic regression models were used to examine the effect of independent variables (living arrangement, ethnicity, years of residence in Hawai'i, place of birth, and expenditures) on food insecurity.

The researchers found that 21% of students at UHM were food insecure (15% having low food security and 6% having very low food security). Furthermore, 24% of students reported having one or two indicators of food security classifying them as marginally food-secure or at risk of food insecurity. When taken together, 45% of UHM students surveyed were either food-insecure or at risk of being food insecure. Students living on campus, off-campus with unknown arrangements, and off-campus with roommates were significantly more likely to be food-insecure than were students living with their parents or relatives.

Chaparro et al. (2009) suggest future studies on the impact of food insecurity on college students' academic performance and studies at colleges with student demographics which differ from their study population in order to allow policy makers to assess the magnitude of the problem and to design effective strategies to reduce its prevalence. These suggestions for future research highlight the need for this study which includes an assessment of food insecurity and academic achievement among community college students.

A second cross-sectional study on food insecurity among college students was conducted at an Australian university and showed high levels of food insecurity among students (Hughes et al., 2011). Hughes et al. distributed a self-

administered questionnaire containing 39 food security-related and 15 demographic questions to 399 students at a Queensland-based university.

The Hughes (2011) study was conducted using heterogeneous purposive sampling at various campus locations. The researchers approached students and asked ask them to complete an informed consent document and an anonymous survey and return it directly to the researchers. The researchers aimed to recruit 400 students from a student body of 13,800 based on sample size calculations using a 95% confidence interval and an estimate of food insecurity of up to 21% as per the results found by Chaparro et al. (2009) which suggested that at least 250 participants would be required to attain sufficient study power. In total, 399 students completed the survey out of 575 students who were approached which is a response rate of 71.5% and represents 3% of the total student body. The sample was found to be representative of the student population with respect to the percentage of undergraduates and graduate students, gender, Aboriginal, and Torres Strait Islander heritage, but the sample overrepresented international students and full-time students.

The questionnaire used by Hughes et al. (2011) included items on demographics, food habits, food security, support service usage, living situation, transportation and finances. The survey took approximately 10 minutes to complete. The food habits and food security questions focused on students' current year of schooling. Food insecurity was measured by using questions from the USDA Community Food Security Assessment Toolkit and a single-item

question from the Australian National Nutrition Survey (NNS): *In the last 12 months, were there any times that you ran out of food and could not afford to buy any more?* The researchers used a methodology for classifying students as “food secure,” “food insecure without hunger,” and “food insecure with hunger” which does not match the USDA methodology for these classifications. The researchers did not mention any previous studies validating their questionnaire or food insecurity classification methodology which mixed questions from two different food security measurement tools and used a coding methodology for the USDA questions that is inconsistent with USDA’s own methodology. Results were analyzed using SPSS (version 17.0) and χ^2 analysis was used to compare food security measures with other categorical variables.

The researchers found that between 12.7 and 46.5% (variability based on method of analysis) of the students were experiencing some degree of food insecurity. Hughes reported that the single-question Australian National Nutrition Survey was administered to the Australian population at large and found that 5.2% of Australians were food insecure. When the single-item NNS question was considered, 12.7% of university students were considered food insecure (more than double the rate in the general Australian population) while the USDA questions categorized 46.5% of students as food insecure. However, it seems that there were some methodological issues in the interpretation of the USDA questions that yielded the estimate of 46.5% food insecurity in the Hughes study. Students in the Hughes study who answered affirmatively to one USDA food

security question were classified as food insecure while USDA methodology requires affirmative answers to at least three questions in order to be classified as food insecure. Therefore the rate of 46.5% cannot be compared with national or state-level data in the United States and may be an overestimate of food security as measured by the U.S. government.

In the Hughes study, over 25% of students reporting food insecurity according to the single-item NNS measure reported losing weight as a result of not having enough money to purchase food. Students who had other people cooking most of their meals and who lived with their parents were less likely to be food insecure which is similar to the findings of Chaparro (2009). A small percent of the students (3.1%) reported resorting to emergency measures (stealing, pawning assets) to obtain food and these behaviors were more prevalent among food insecure students (8.0%). The authors conclude that:

university students appear to be at risk of food insecurity, both as a product of their socioeconomic and demographic attributes, and also as a result of an apparent misalignment of government policy that promotes tertiary education participation with inadequate financial and other student supports. (Hughes, 2011, p. 31)

While the methodology in the Hughes study differs from the proposed study in terms of food insecurity assessment, this study is still relevant in documenting that students are having difficulty affording adequate food and that higher education could do more to support students who are having these struggles.

Shive and Morris (2006) aimed to evaluate the effectiveness of a social-marketing campaign to improve knowledge, attitudes and intake of fruit among California community college students while taking into account what proportion of community college students experience dimensions of food insecurity. The researchers assessed selected aspects of food insecurity among community college students on two different campuses using yes-or-no questions that asked students a) if their households ever ran out of money to buy food, b) if they cut meals or skipped meals because of a lack of money, and c) if they used government or emergency food assistance programs. The researchers did not attempt to say how many students were food insecure but rather noted what percentage of the student population answered affirmatively to each question. The researchers found that 24 to 27% (variability due to measurement on two campuses) of students lived in households that ran of money to buy food (compared with 9.5% nationally); 22 to 24% reported cutting or skipping meals because of running out of money; 18 to 28% used government food assistance programs; and 7 to 10% reported using emergency food at some time to sustain themselves. While the methodology employed by these researchers does not align with the USDA methodology for assessing food insecurity it certainly uncovers striking statistics on the number of community college students who may be struggling financially to obtain adequate food.

Shive and Morris go on to discuss the need for outreach on college campuses to screen students for eligibility in the Food Stamp Program (FSP),

taking into account the barriers to participation including stigma, difficult application process and lack of awareness of eligibility. The researchers also note that their results indicate a need for nutrition education for community college students that focuses on meal planning on a budget so that students can make the best use of government or emergency food assistance.

The City University of New York (CUNY) sought to examine the issue of food insecurity among its students due to concern about “student hunger, homelessness, and psychological well-being in light of the economic recession” (Freudenberg et al., 2011). The results of the CUNY study are not located in the peer-reviewed literature, but rather in a report that is publicly available on its website entitled *“Food insecurity at CUNY: Results from a survey of CUNY undergraduate students.”* The sample included 1,086 students attending both community colleges and 4-year institutions who responded to surveys administered via telephone or internet and who were found to be representative of the overall student population at CUNY. The researchers used a four-question sub-set of the USDA food insecurity questionnaire and asked respondents about their experiences with food over the previous 12-months including: a) how often they worried that they would not have enough money for food, b) how often they cut or skipped meals because they lacked money for food, c) how often they were unable to eat balanced meals because of a lack of money, and d) how often they went hungry because of a lack of money. Students were classified as food insecure if they answered “often” or

“sometimes” to at least 2 out of the 4 questions on the survey. This methodology also deviates from the established USDA methodology requiring at least three affirmative responses to be classified as food insecurity which makes these data difficult to compare with national or state data. The researchers found that 39.2% of students experienced food insecurity in the past 12 months and that Black and Latino students were 1.5 times more likely to have experienced food insecurity than White and Asian students. Students with household incomes under \$20,000 per year were twice as likely to be food insecure than students from households with income over \$50,000 per year. Students were also more likely to be food insecure if they were working more than 20 hours per week or if they were supporting themselves financially. The researchers also found that students who suffered health problems (including mental health problems, such as depression) were more likely to be food insecure than those who did not suffer from health problems. Finally, the researchers found that very few students were using food pantries (7.2%) or food assistance programs such as SNAP (6.4%).

Based on these findings a number of policy recommendations were outlined including increased outreach efforts to enroll CUNY students into food assistance programs, partnerships with food companies to provide discounted foods to students, increased availability of food pantries and improved access to healthy affordable foods via campus food service operations. The CUNY study is relevant to this research study as it provides further evidence that many

college students struggle to obtain enough food and that colleges could put programs in place to help remedy the situation.

Several other publications have looked at food insecurity and college student eating habits in Canada. Rondeau (2007) wrote an article for a Dietitians of Canada newsletter publication about food insecurity among college students and reported a rise in campus food banks, increases in tuition and fees, and an insufficient student loan system as indications that food insecurity may be a problem for post-secondary students in Canada. Roneau's report documents that food bank usage at the University of Alberta doubled from 1993 to 2005.

Research on food insecurity in the community college population is warranted because a disproportionately high percentage of community college students nationwide are African American or Hispanic (American Association of Community Colleges, 2011), and these population groups are at increased risk for food insecurity. Furthermore, the socioeconomic status of dependent students attending two-year colleges tends to be lower than that of the dependent students attending four-year institutions (Cohen & Brawer, 2008). Students attending community college are more likely to live in poverty than their 4-year institution counterparts and would be expected to be more likely to experience food insecurity. All of the research and publications reviewed on food insecurity among college students indicates that food insecurity is a significant issue among college students and is one that could be handled more effectively

by administrators who seek to reduce this issue on their campuses. None of the prior research has looked at the link between college student food insecurity and Grade Point Average, energy, and concentration which are important aspects to examine to provide further justification to administrators in taking preventative and corrective action to reduce food insecurity among students.

Comparison between Previous Research and Proposed Study

This study differs from the studies reviewed in the previous section in several important ways. First, none of the previous studies assessed student GPA as a dependent variable. Student self-reported GPA was included in this study in light of research linking food insecurity to impaired adult and child cognition and academic success in previous research (Alaimo et al., 2001; Gao et al., 2009; Jyoti et al., 2005; Reid, 2000). If in fact food insecurity is correlated with GPA, efforts to improve food security can be justified by college administrators in accordance with the mission of community colleges as stated by the American Association of Community Colleges: “to prepare students for further education or the workplace” (American Association of Community Colleges, 2011).

Another difference between the previous research and this study is that the previous studies of Chaparro (2009) and Hughes et al. (2011) were conducted at four-year institutions both of which were outside of the 48-contiguous United States. Cultural and socioeconomic differences separate the previous study populations from the population at the community college where

this study was conducted. Food insecurity is highest among low-income individuals and among African Americans and Hispanics in the United States (Holben, 2010). In light of research showing that community college students are more likely to be from low-income households (Horn et al., 2006), and are more likely to be African-American or Hispanic (American Association of Community Colleges, 2011) than their four-year counterparts, research on food insecurity in the community college population is warranted.

This study also differs from the CUNY (Freudenberg et al., 2011) and Hughes (2011) studies because USDA methodology for assessing food insecurity was employed which allows for comparisons to national and state-level food insecurity statistics. The USDA food insecurity assessment methodology is more stringent in classifying households as food insecure than the Hughes (2011) or Freudenberg (2011) studies which classified students who answered one or two food insecurity questions affirmatively as food insecure while USDA requires at least three affirmative answers to be classified as food insecure. These studies may be overestimating the prevalence of food insecurity due to their methodology.

A final difference between the previous studies and this study is the inclusion of all students regardless of their grade level (both freshman and sophomores as the college is a 2-year institution) using a 12-month timeframe for the food security questions. The rationale for including both freshmen and sophomores lies in the fact that at a 2-year institution, presumably approximately

half of the students would be barred from participating in the study if freshmen were excluded as they were in the Chaparro study (2009). Chaparro excluded freshmen because the food insecurity questions make reference to the past 12-months and freshmen may not have been students during the entire 12-month timeframe. However, it is my opinion that this still does not remove the possibility that students experienced food insecurity during a time when they were not attending school as a student. If, for example, a sophomore answered the Chaparro survey and had experienced food insecurity during the past 12-months but had that experience during summer months while living at home with parents and not taking classes this would not reflect the college experience that the researchers were seeking. Or if students completed some portion of school, took a year off and then returned as a sophomore, junior, senior or graduate student, they would have answered the 12-month questions relating to a time period when they were not students. Hughes et al. (2011) attempted to ensure that their survey reflected the college experience by referencing a timeframe that “concentrated on the students’ food habits and experiences of food insecurity during their current year of university” (Hughes et al., 2011, p. 28). This methodology precludes using the 12-month timeframe recommended by the USDA as the most reliable and valid method of measuring food insecurity. For these reasons, the survey included in Appendix A was administered to a sample of willing students who are over the age of 18 using a 12-month frame of reference. The results of the survey reflect how many community college

students experienced food insecurity over the past 12-months and whether or not that experience has any correlation with their current GPA, energy or concentration levels. GPA will be self-reported and one of the study assumptions that GPA will be reported accurately by students. Students who do not report their GPA will not be included in the analysis of whether food insecurity and GPA are correlated.

College Food Insecurity Interventions

Food Safety News recently covered the increasing prevalence of food banks on college campuses (Minderhout, 2010). The article documents the huge numbers of K–12 students who receive food assistance through the National School Lunch and Breakfast programs (over 31 million students served in 2009) who go on to attend college and are left without food assistance on campuses that lack food pantries. Many university students face competing financial demands of rising tuition, textbook and housing costs which may take away from funds that could be spent on food. The article spotlights the food pantry at Oregon State University (OSU) which serves over 200 students per month. Laura Pick coordinates the OSU food bank and says "I think more colleges are recognizing that hunger is an issue for students and trying to combat it" (Minderhout, 2010, p. 1).

Rivera (2010) published an article in the *Los Angeles Times* about the food pantry program at the University of California, Los Angeles (UCLA). UCLA campus officials became concerned about the effects of the current economic

downturn on students as they began to hear anecdotal evidence of hungry and homeless students on their campuses. A concerned student who said he knew personally of 10 to 15 homeless students and many others who were consuming an entire diet of Taco Bell \$1 burritos spoke with campus officials and began *The Food Closet* program at UCLA. *The Food Closet* receives 40 to 50 student visitors every day who are in need of food. The article contains quotes from students who have left notes behind at the food pantry expressing their gratitude for the service as well as addressing the difficulty of admitting they needed help obtaining food.

The expanding numbers of college students who are struggling to afford a healthy diet was highlighted in *USA Today* with an article entitled “Campus food banks help students through tough times” (Powers, 2012). According to the article, food pantries have opened at Tennessee State University, Austin Peay State University, University of Arkansas, University of Georgia, and Utah Valley University in the past year. Angela Oxford, the director of the University of Arkansas Center for Community engagement, estimates that approximately 25 colleges and universities in the U.S. have established food pantries. She is quoted as being contacted by about “10 campuses in the past year” to get advice on how to start a food pantry for students. The University of Arkansas pantry has served over 800 students and staff in its first year of operation from February 2011 until February 2012. The food pantry at the University of Michigan which was established in 1993 reports a spike in usage that started in the 2005–2006

school year and they continue to see 200 to 300 students every other Wednesday when the pantry is open. The food pantries are stocked with donated and purchased items and operated by volunteers, paid student workers and college staff.

College food pantries are becoming such an important trend that the Oregon Food Bank has published a 112-page manual entitled "*So you want to start a college food pantry? A how-to manual*" (Cunningham & Johnson, 2011). The manual contains an overview of literature on college student food insecurity, followed by information on opening and operating a college food pantry and concludes with projections for the future of college food pantries which they believe are on the rise due to increasing inquiries from colleges seeking guidance on starting food pantries.

In addition to providing food pantries, nutrition education is another possible intervention to combat food insecurity among adults. Eicher-Miller (2009) examined this phenomenon with female food stamp recipients in a single-blind randomized study. Participants (N=219) were randomized to the experimental group (n=137) and received 5 nutrition education lessons in their own homes on selecting and preparing healthy foods while the control group (n=82) did not receive nutrition education. Participants completed a pre- and post-test assessing their food security status using the 6-item HFSSM. The researchers found significant reductions in food insecurity in the experimental group compared to the control group (P=0.03) and conclude that "nutrition

education is an appropriate intervention for food insecurity” (Eicher-Miller et al., 2009, p. 161). Although these study participants were not college students, nutrition education may be a food insecurity intervention that could be explored for college students.

Other programs to address food insecurity on college campuses have involved providing free prepared meals to students as well as providing funds on dining cards to students who qualify based on income, financial aid and expenses (Bidiman, 2007; Cunningham & Johnson, 2011). Many college students may also be unaware that they qualify for government food assistance programs such as the Supplemental Nutrition Assistance Program (SNAP, formerly known as “food stamps”) or Women Infants and Children program (WIC). In the state of Maryland, college students who meet income guidelines and other qualifications may be eligible to receive SNAP or WIC benefits (Maryland Department of Human Resources: Food Supplement Program). College administrators could implement screening programs to alert students of their potential eligibility and assist them with the application process for food assistance programs. Additional methods of improving student food security on campus could involve providing access to farm fresh foods through gleaning programs (programs providing low cost or free produce that farmers often discard), campus farmer’s markets that accept SNAP and WIC benefits, access to community supported agriculture programs and installation of campus produce

gardens with work for food options (Hoisington, Butkus, Garrett, & Beerman, 2001; Kantor, 2001).

Summary

The purpose of this study was to investigate the prevalence of food insecurity among students attending one suburban and one urban community college in Maryland and whether food insecurity is associated with GPA, student energy level or student concentration ability. This chapter reviewed food insecurity prevalence and trends as well as the history and measurement of food insecurity in the U.S. Furthermore, research on the impact of food insecurity on adult and child academic outcomes, energy level, and concentration ability was explored. Finally, research relevant to the profile of community college students, financial stress during college, previous studies on food insecurity among community colleges, and college food insecurity interventions were reviewed.

CHAPTER III: METHODOLOGY

This chapter describes the quantitative methodology that was used to collect and analyze data for this study. The chapter is organized into seven sections: a) overview of food security research methodology, b) validity of the survey tool, c) research design and approach, d) setting and sample, e) instrumentation and materials, f) data analysis, and g) measures to protect participants' rights.

Overview of Research Methodology

While quantitative research lacks the ability to delve deeply into the reasons and consequences of a phenomenon, it is a useful tool for determining the extent of the problem, if one exists. According to Creswell (2008) quantitative research is conducted by selecting a research topic, asking questions with quantifiable answers of participants, and using statistics to analyze numerical responses in an objective manner. In quantitative research, the research problem describes trends or explanations of relationships between variables. This quantitative approach works well in the current exploration of the prevalence of food insecurity among students attending two community colleges in Maryland and its relationship with student GPA, energy, and concentration levels which are the dependent variables. In this study, a quantitative cross-sectional design was employed to determine the prevalence of food insecurity on two community colleges campuses and to determine whether any correlation with GPA, energy or concentration levels existed.

Research Design

A convenience sample of students on each campus over the age of 18 was invited to participate in the study using an intercept survey method. Students were approached by researchers in a public area of each community college and asked if they would be willing to complete an anonymous survey that would take approximately 5 minutes. Informed consent was obtained from each survey participant to ensure that they understood the voluntary nature of participating in the study, purpose of the study, and that their responses would remain anonymous. Students who were willing to participate each received a \$5 gift card redeemable at the college bookstore as an incentive to participate. In total, 301 students (150 students at the urban community college and 151 at the suburban community college) were surveyed using the 10-item HFSSM survey and a 12-month timeframe for the food security questions. The 12-month timeframe has been validated more thoroughly than the 30-day timeframe and has also been found to be more reliable than the 30-day timeframe (Hamilton & Cook, 1997). A draft of the survey is located in Appendix A.

Sample size calculations were based on several variables including the upper range of food insecurity found in previous studies of college students, the desired confidence level, and the total student population on the community college campus. Previous research found that 21% (Chaparro et al., 2009) of college students are food insecure. The proposed study is based upon a sample size of 250 which was determined using the previous upper level estimates of

food insecurity of 21% found by Chaparro (2009) with a 95% confidence level. Since 250 usable surveys are needed, 301 students were surveyed. In addition to gathering information on food security, student GPA, energy levels, concentration levels, gender, age, race/ethnicity, and living situation was also gathered. The questions on energy and concentration were adapted from the Chaparro survey instrument which was shared with me by Pia Chaparro (P. Chaparro, personal communication, February 4, 2010). Chaparro is the author of a peer-reviewed study examining food insecurity among college students in the United States utilizing food insecurity assessment methodology outlined by the USDA.

Research Questions

1. At an urban and a suburban community college, what is the frequency of students reporting food insecurity?
2. What is the relationship between food insecurity and student reported GPA?
3. What is the relationship between food insecurity and student reported energy level?
4. What is the relationship between food insecurity and student reported concentration ability?
5. What is the relationship between student demographics and food insecurity?

6. What are the differences between the urban community college and the suburban community college when comparing results of food insecurity?

Study Populations

The study was conducted at community colleges located in areas with divergent demographic populations and poverty rates. The suburban community college was located in an area with food insecurity and poverty rates that are below the national average and a median income that exceeds the national average. The urban community college was located in an area that has food insecurity and poverty rates that exceed the national average and a median household income lower than the national average. Table 1 compares the national and area-specific food insecurity prevalence, poverty rate, and median household income.

Table 1. Food Insecurity, Poverty, and Income in Study Locations

	National	Suburban Area	Urban Area
Food Insecurity Prevalence	14.5%	7.4%	21.7%
Poverty Rate	15.1%	4.2%	21.3%
Median Income	\$49,445	\$103,273	\$39,386

(Map the Meal Gap, 2011; Nord et al., 2011; U.S. Census, 2012)

The community colleges themselves differ in demographics from national population averages and have disproportionately high percentages of African American students and female students and disproportionately low percentages of White students. Table 2 compares national averages and community college specific demographic profiles from Fall 2011.

Table 2. Community College Demographic Profiles

	National	Suburban Community College	Urban Community College
Number of Students		10,081	7,035
African American (%)	12.6%	27%	80%
White (%)	72.4%	47%	9%
Asian (%)	4.8%	13%	5%
Hispanic (%)	16.3%	8%	NA
Female(%)	51%	57%	70%

(Urban Community College factbook, 2011; Census, 2010; Mini-Profile of Suburban Community College Fall Credit Enrollment Statistics, 2011)

Null Hypotheses

The first research question states the percentage of sampled students on each campus who were determined to be food insecure. This question does not lend itself to hypothesis testing. The remaining research questions have generated the following hypotheses:

H₂₀—There is no difference between food secure and food insecure students' GPAs.

H₃₀—There is no difference between food secure and food insecure students' energy level.

H₄₀—There is no difference between food secure and food insecure student's concentration ability.

H₅₀—There is no difference between the demographic characteristics of food secure and food insecure students.

H₆₀—There are no differences between the urban and suburban community college when comparing the results of food insecurity.

Variables

Certain demographic population groups including African Americans, Hispanics, women who are single parents and students living independently are more likely to experience food insecurity (Chaparro, 2009; Nord et al., 2011). Demographics in this study include student age, gender, single parent status, race/ethnicity, income, and living situation and are found in survey questions 12, 13, 14, 15, and 16 (Appendix A). The relationships between the independent and dependent variables were analyzed for the overall student sample. Data were also examined by institution to compare differences in food insecurity between an urban and a suburban community college population.

Independent Variables

The independent variable in this study is food insecurity which will be assessed using the 10-item HFSSM survey represented by questions 1 through 8(a) on the survey.

Dependent Variables

Dependent variables in this study are student GPA, energy level and concentration level which will be assessed in the survey in questions 9, 10, and 11.

Instrumentation and Materials

Elements of Food Insecurity

Questions 1 through 8(a) on the survey found in Appendix A will be used to assess food insecurity status of survey respondents. The significance of each question in that section of the survey will be explained in this section. Generally speaking, government reports about the prevalence of food insecurity in the United States are expressed in “hard numbers” and could be interpreted as strictly quantitative research. However, an investigation of the history of food insecurity measurement reveals that the foundational questionnaire for measuring food insecurity (The Radimer Cornell Survey) was based on phenomenological qualitative data collected by interviewing 32 women in rural and urban areas of Upstate New York (Radimer, 1990). The researchers developed a grounded survey based on women’s descriptions of their experiences with hunger including antecedents and consequences of hunger, coping strategies to deal with hunger, and confounding variables associated with hunger.

Radimer’s methods included conducting semi-structured interviews with open-ended questions as distinguished from a quantitative approach of searching for facts through questionnaires and statistics. The responses gathered from the women were extremely rich and could be broken down into four general areas related to their experiences with hunger : a) problems with quantity of food intake, b) problems with quality of food intake, c) problems with

their supply of food, and d) food supply anxiety. Radimer (1990) found that there was a predictable sequence of events common among the women in the study related to the severity of food insecurity which begins with worrying about food sufficiency, followed by strategies to augment the food supply which might then lead to decreases in the quality of food consumed. Then, the women in the survey reported decreasing the quantity of their own food consumption in order to provide sufficient food for their children. Only in the most severe circumstances was the quantity of food provided to children disrupted. Based on data gathered in the interviews, a quantitative survey (the Radimer Cornell Scale) for assessing hunger was developed to include all relevant dimensions related to the experiences and severity of food insecurity and was found to be both reliable and valid in its measurement. The Radimer Cornell Scale was used by the USDA as part of the process of developing the Household Food Security Survey Module (HFSSM) which is widely used to assess food insecurity on the national, state, and local levels in the United States.

The HFSSM is the most comprehensive and widely used food security measure available. By definition, food insecurity, as measured in the United States arises due to constrained economic resources, not due to voluntary dieting, fasting, illness or other reasons. For that reason, each question in the HFSSM specifies the concept of economic constraint by including words indicating that money or affordability was central driving reason for food supply anxiety, decreased quantity or quality of food intake (Wunderlich, 2006).

Strengths of the HFSSM include distinguishing among various levels of severity of food insecurity and the ability to compare sample data with national-level data published by the USDA on an annual basis. The questions begin with the least severe manifestations of food insecurity and progress to the most severe issues related to lack of food. The 10-question subset of the HFSSM and was used in this study to assess the prevalence of food insecurity among community college students. The 10-item HFSSM is a shortened survey (the full survey is 18-items) which reduces respondent burden and which does not ask questions about the food security of dependent children in the household which is irrelevant in the current study. The survey also allows for comparisons between national, state, and sample survey data and is applicable to both households and individuals.

The HFSSM includes the following ten questions (United States Department of Agriculture Economic Research Service, 2008) which are included verbatim in the survey instrument:

Table 3. Household Food Security Survey Module Questions and Research Base

HFSSM Survey Question	Rationale for Inclusion
1. I worried whether my food would run out before I got money to buy more. Was that <u>often</u> true, <u>sometimes</u> true, or <u>never</u> true for you in the last 12 months?	Relates to the dimension of financial uncertainty about acquiring sufficient food. This concept emerged as a major theme in Radimer's (1990) foundational qualitative examination of hunger experiences where food anxiety was expressed by many individuals who experienced hunger.
2. The food that I bought just didn't last, and I didn't have money to get more. Was that <u>often</u> , <u>sometimes</u> , or <u>never</u> true for you in the last 12 months?	Relates to the concept of food depletion. This concept emerged as a major theme in Radimer's (1990) research where issues with household food depletion were central to experiences of food insecurity in America.
3. I couldn't afford to eat balanced meals. Was that <u>often</u> , <u>sometimes</u> , or <u>never</u> true for you in the last 12 months?	Relates to the concept of dietary quality. Individuals experiencing food insecurity often report consuming a low variety of foods or sometimes only a single food or food group for prolonged periods of time (Radimer, 1990).
4. 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? 4a. (If yes to Question 4) How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?	Relates to the concept of dietary quantity and reduced food intake. Individuals experiencing food insecurity often report consuming less food at a particular meal or skipping meals in order to stretch their resources (Radimer, 1990).
5. In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money for food?	Relates to reduced food intake. Radimer's (1990) research uncovered that food insecure individuals often eat less than the amount required for them to feel full and satiated.
6. In the last 12 months, were you every hungry but didn't eat because there wasn't enough money for food?	Relates to reduced food intake and the feeling of hunger. In the more severe stages of food insecurity, individuals ignore their hunger signals and do not eat (Radimer, 1990).

Table 3 (cont.)	
HFSSM Survey Question	Rationale for Inclusion
7. In the last 12 months, did you lose weight because there wasn't enough money for food?	Relates to reduced food intake. In the most severe stages of food insecurity, individuals may lose weight due to consuming inadequate amounts of food (Radimer, 1990).
8. In the last 12 months, did you ever not eat for a whole day because there wasn't enough money for food?	Relates to reduced food intake. In the most severe stages of food insecurity, individuals may not eat for a day or more due to lack of money for food (Radimer, 1990).
8a. (If yes to Question 8) How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?	

USDA research methodology on the HFSSM outlines that responses to these questions are to be coded on a 10-point scale. Responses of “yes,” “often,” “sometimes,” “almost every month,” and “some months but not every month” are coded as affirmative and are worth 1-point. Adults are characterized as “high food security” (score of zero), “marginal food security” (score of 1 or 2), “low food security” (score of 3 to 5), or “very low food security” (score of 6 to 10). High and marginal food security are considered “food secure” while low and very low food security are considered “food insecure” (Bickel et al., 2000). Table 4 includes a summary of food security levels and a description of what each level indicates.

Table 4. USDA Food Security Labels

General Categories	Label	Description of Household Conditions
Food Security	High Food Security	No reported indications of food-access problems or limitations
	Marginal Food Security	Answers 1 or 2 survey questions affirmatively. Indicates anxiety over food sufficiency or shortage of food in the house. Little or no indication of changes in diets or food intake
Food Insecurity	Low Food Security	Answers 3 to 5 survey questions affirmatively. Reports of reduced quality, variety, or desirability of diet. Little or no indication of reduced food intake
	Very Low Food Security	Answers 6 to 10 survey questions affirmatively. Reports of multiple indications of disrupted eating patterns and reduced food intake

(United States Department of Agriculture Economic Research Service, 2010)

Concentration and Energy Level Questions

Survey questions 9 and 10 assessed students' self-perceived concentration levels and energy levels. These questions were adapted from the survey instrument used in the study of food insecurity at the University of Hawaii (Chaparro et al., 2009). Previous research has indicated that food insecurity may have adverse effects on energy level and concentration which may contribute to decreased academic performance (Hamelin et al., 1999; Radimer, 1990; Zekeri, 2007). The questions are worded as follows:

9. In general, would you say your concentration level is:

very good good fair poor very poor

10. In general, would you say your energy level is:

very good good fair poor very poor

GPA Question

Survey question 11 asks students to self-report their Grade Point Average. In addition to providing numerical choices, letter grade averages are included to help guide students who may not be sure of their numerical GPA. This data was collected as a means of examining whether there is a relationship to food security status and GPA. Prior research on food insecurity and adverse cognitive functioning and academic success suggests a need to understand whether such a relationship may exist in the community college population. The GPA question is worded as follows:

11. What is your current Grade Point Average (GPA) at this community college?

- 3.5–4.0 (A/B average)
- 3.0–3.49 (B average)
- 2.5–2.9 (B/C average)
- 2.0–2.49 (C average)
- Less than 2.0 (D/F average)
- Don't know

Demographic Questions

Survey questions 12 through 16 assess student demographic characteristics including age, gender, living situation, race/ethnicity, and income. These demographic characteristics have been determined to be important predictors of food insecurity in prior research and will allow for comparison between demographic groups in the proposed study. The demographic questions are worded as follows:

12. Age (in years) _____

13. Gender: male female

14. Living situation

alone with parents/relatives with spouse/partner with roommate(s)

14 a. Are you a single parent?

yes no

15. Which of the following do you consider yourself to be (check all that apply):

African American/Black

American Indian

White

Non-Resident Alien, Indicate nationality

Hispanic/Latino

Asian or Pacific Islander

Unknown

16. What is your average income per month?

\$0–\$500 \$501–\$750 \$751–\$1000 \$1001–\$1500 \$1501–\$2000

greater than \$2001 Don't know

This study used a quantitative methodology to examine the prevalence of food insecurity among community college students at two institutions in Maryland using the 10-question HFSSM and examined relationship between food security status, college GPA, student energy, and concentration levels. Other items on the survey included age, gender, race/ethnicity, living situation, and perceived energy and concentration level. The research questions that this study seeks to answer are located in chapter 1 and are compared with the survey instrument in Table 5. The full survey is located in Appendix A.

Table 5. Alignment of Survey Questions and Research Questions

Survey Section	Survey Heading	Survey Questions (see Appendix A)	Research Questions (see Chapter 1)
A	Food Security Questions	1, 2, 3, 4, 4a, 5, 6, 7, 8, 8a	1, 2, 3, 4, 5, 6
B	Concentration and Energy Level Questions	9, 10	3, 4
C	GPA Question	11	2
D	Demographic Questions	12, 13, 14, 14a, 15, 16	5

Reliability and Validity of the Survey Tool

The validity of this USDA HFSSM survey was assessed by the National Research Council of the National Academies of Sciences, the body responsible for advising the federal government on scientific matters (Wunderlich, 2006). The researchers looked at three major categories of food insecurity: whether the household experienced “uncertainty, insufficiency in quality of food; reduced food intake; or the feeling of hunger” (Wunderlich, 2006, p. 59) and compared these areas with the questions on the HFSSM survey. The researchers found that questions 1 and 2 related to household experience of uncertainty and food depletion, question 3 relates to insufficiency in quality or quantity of diet, and questions 4 to 8a relate to reduced food intake or the feeling of hunger. The concept of the balanced meal (question 3) is included based on the ethnographic research of Radimer (1990) as she found that food insecure women expressed concerns about not having specific foods or food groups in their diet. The

National Research Council report also deemed the 12-month and 30-day time frames (the above questions can be re-worded to reference the previous 30 days instead of the previous 12-months) to be an appropriate reference period for the survey (Wunderlich, 2006).

Further validation of the questions on HFSSM was conducted by Frongillo (1999) who concluded that the questionnaire:

provides valid measurement of food insecurity and hunger for population and individual uses. The construction of the national food security measure is well grounded in our understanding of food insecurity and hunger, its performance is consistent with that understanding, it is precise within usual performance standards, dependable, accurate at both group and individual levels within reasonable performance standards, and its accuracy is attributable to the well grounded understanding (Frongillo, 1999, p. 508s).

Additional work validating the HFSSM was conducted by the USDA Food and Nutrition Service, Office of Analysis, Nutrition and Evaluation (Hamilton & Cook, 1997; Ohls, Radbill, & Schirm, 2001). Hamilton et al. (1997) undertook the work of validating the HFSSM used in the Current Population Survey (CPS). Hamilton's research used a sample of 18,370 households participating in the CPS which completed a battery of food security questions to finalize the development of the HFSSM. The sample was divided into three groups: households with children, households with elderly/no children, and households

with no elderly or children and the survey results were analyzed for reliability and validity for each group. Results were subjected to linear and non-linear factor analysis based on the Rasch statistical model. The Rasch model is a “concise one-factor non-linear Item Response Theory (IRT) model” (Hamilton & Cook, 1997, p. 22) that was chosen because it fit the CPS data. Further testing was conducted for intravariance between the three types of households included in the sample and it was determined that a single scale could be used for all households. Additional tests were conducted for robustness and reliability and found good results in both areas. Questions were developed to separate people into the stages of food insecurity which generally follows this pattern: adjustments to household food budget and to patterns of food acquisition and use, adults reduce food intake while protecting children’s intake, reductions of intake for both children and more severe restrictions for adults. Hamilton concludes that the scale “meets standard requirements of reliability and validity” (Hamilton & Cook, 1997, p. 61) and that “an extensive series of tests found the food security scale to have good reliability, including good internal (or content) validity and good external (or construct) validity” (Hamilton & Cook, 1997, p. v.). Ohls et al. (2001) conducted further analysis on the validity of the Rasch model in providing stable estimates of food insecurity over time and concluded that the model is stable and consistent over time and the estimates fit a modal response pattern which further confirms the validity of the survey. According to Dr. Mark Nord who heads the effort to measure nationwide food insecurity at the USDA

Economic Research Service, the HFSSM “is, perhaps, the single most widely validated food security measurement module in the world” (M. Nord, personal communication, July 1, 2011).

The HFSSM has also undergone extensive reliability testing. An instrument is reliable when it is able to “provide similar results if administered to the same individual on two occasions under similar conditions” (Hamilton & Cook, 1997). Hamilton suggests that scores of .7 to .9 are generally regarded as acceptable reliability values within the realm of education and health research. The HFSSM has been subject to a number of reliability tests including the Spearman-Brown reliability estimate, Rulon’s reliability estimate, Cronbach’s alpha and Rash reliability estimate. These tests show reliability values ranging from .86 to .93 for the 12-month scale. Hamilton et al. (1997, p. 23) also found that the 12-month timeframe outperformed the 30 day timeframe in terms of reliability.

The survey for this study used the widely validated HFSSM questions as questions 1 through 8(a) followed by questions on energy and concentration levels in questions 9 and 10 which were adapted from the Chaparro study survey (Chaparro et al., 2009). Questions 11 through 16 ask about student GPA and demographics including race/ethnicity, age, gender, living situation, single parent status, and monthly income.

Data Analysis

Data analysis was similar to the Chapparo (2008) and Hughes (2011) studies which used descriptive statistics to describe the prevalence of food insecurity among college students and inferential statistics to make comparisons between groups of students.

Descriptive Statistics

According to Creswell, descriptive statistics are used to describe trends in the data to a single variable or question (2008). Descriptive statistics include frequency and percentage and were applied to research question 1 to assess the number and percentage of the sample population who experiences food insecurity.

Inferential Statistics

Inferential statistics are used to compare groups in terms of the dependent and independent variables. Food secure (students receiving scores of 0, 1 or 2 on questions 1 through 8a) and food insecure students (students receiving scores of 3, 4, 5, 6, 7, 8, 9 or 10 on questions 1 through 8a) were compared using inferential statistics including χ^2 with a significance level of $P < 0.05$ to answer research questions 2 through 6. Linear and logistic regressions were used to further examine the relationships between student demographics, living situation, food insecurity, GPA, energy, and concentration. Data were analyzed using SPSS version 20.

Protection of Study Participants

All study participants were presented with informed consent documents (located in Appendix B) informing them of the purpose of the study, benefits of the study, anonymous nature of participation, voluntary nature of their participation, and contact information of researchers for further information. This study was approved by the Institutional Review Boards of the community colleges included in the study and Morgan State University (documentation of approval located in Appendix C) which provides a level of assurance that methodology to protect the survey respondents has been carefully considered by the researchers. No identifying information was collected on the surveys of participants who elect to participate in the study, and there are no perceived risks of study participation. Surveys were self-administered by study volunteers further shielding respondents from the potential embarrassment of having to discuss their food security status with a researcher.

Summary

The purpose of this study was to examine the prevalence of food insecurity among students attending two community colleges and to examine whether food insecurity is associated with student GPA. This chapter explained the research methodology employed to conduct the study. Intercept surveys allowed researchers to survey a convenience sample of students attending each college. A summary of the instrumentation process was also described in this chapter. Finally, the chapter discussed the data analysis methods that were

used to arrive at study conclusions and the measures implemented to protect the privacy of study participants.

Chapter IV: FINDINGS

Introduction

The purpose of this study was to examine the prevalence of food insecurity among students attending two community colleges in Maryland as well as to analyze associations between food security status and student self-reported GPA, concentration ability, and energy level. The findings are divided into three sections. The first section presents the descriptive findings of questions 1 and 5 regarding the prevalence of food insecurity among the sample of community college students as well as the demographic characteristics of food insecure students. The second section presents the findings from the hypothesis testing in research questions 2 through 4 examining food insecurity, GPA, and student concentration. The final section reviews the differences between the urban and suburban community colleges with respect to food insecurity, GPA, energy, and concentration as outlined in research question 6.

Characteristics of Respondents

This study was conducted in the fall 2012 semester at two community colleges with a combined headcount of 17,000 students. Characteristics of the college populations and the study sample are presented in Table 6.

Table 6. Comparison of Study Sample Population with College Population and National Population

	U.S. National Average	Suburban Community College Overall	Suburban Community College Sample	Urban Community College Overall	Urban Community College Sample	Overall Student Sample
Number of Students	NA	10,081	151	7,035	150	351
African American	12.6 %	27%	54%	80%	87%	71%
White	72.4%	47%	26%	9%	3%	15%
Asian	4.8%	13%	3%	5%	2%	3%
Hispanic	16.3%	8%	7%	NA	1%	4%
Female	51%	57%	45%	70%	57%	55%
Male	49%	43%	55%	30%	43%	45%
Age (mean)	NA	27	21	30	25	23

On both campuses, African American students and male students were oversampled while White, Asian, Hispanic, and female students were under sampled. The mean age of the student sample on both campuses was younger than the overall student population. Since this study used a volunteer sampling technique, those who volunteered for the study might differ from those who did not volunteer for the study. For these reasons, the data collected in the study cannot be generalized to the overall student populations of either school.

Over and under sampling was not done purposively and simply reflects the population of students who were available and willing to complete the survey

during the time the researchers were on campus. The researchers visited each campus during the morning and early afternoon hours on weekdays in November 2012. The response rate at the suburban community college was 54% (a total of 281 students were approached and 151 students participated). At the urban community college the response rate was 74% (a total of 202 students were approached or approached the researchers and 150 students participated). Potential respondents were asked whether they were over the age of 18 and whether they were students at the community college. Any potential respondent who was under 18 or not a student on the campus was informed that they were not eligible to complete the survey. Furthermore, at the urban community college, approximately 25% of participating students did not have to be approached and in fact approached the researchers due to hearing about a study with a \$5 gift card incentive.

Food Insecurity Prevalence and Demographics

Prevalence of Food Insecurity

This study addressed the prevalence of food insecurity in research question 1:

- 1) At an urban and a suburban community college, what is the frequency of students reporting food insecurity?

Students responding to the survey were characterized as “high food secure” (score of zero), “marginally food secure” (score of 1 or 2), “low food secure” (score of 3 to 5), or “very low food secure” (score of 6 to 10) depending on the

number of affirmative answers given to survey questions 1 through 8a. In accordance with USDA food insecurity methodology, high and marginal food security (a score of 0–2) are considered “food secure” while low and very low food security (a score of 3–10) are considered “food insecure” (Bickel et al., 2000).

For the entire sample of 301 student respondents, 24% of students in the sample were “high food secure,” 20% were “marginally food secure,” 26% were “low food secure” and 30% were “very low food secure.” Using the USDA methodology for distinguishing food secure and food insecure, 56% of students in the overall sample were food insecure and 44% were food secure. At the urban community college, 60% of students in the sample were food insecure and 40% were food secure. At the suburban community college, 53% of students in the sample were food insecure and 47% were food secure. The prevalence of food insecurity among respondents was higher at the urban community college (60% of students) than at the suburban community college (53% of students); but that difference was not statistically significant ($\chi^2 = 1.502$, $df=1$, $p=0.220$). The prevalence of “very low food security,” which is the most severe form of food insecurity, was higher at the urban community college (35% of students) than at the suburban community college (26% of students); however, this difference was not statistically significant ($\chi^2 = 2.787$, $df=1$, $p=.095$). Table 7 presents the summary of the descriptive statistical findings on the prevalence of food insecurity.

Table 7. Prevalence of Food Insecurity Among Students at an Urban and a Suburban Community College

	Overall		Urban Community College		Suburban Community College	
	N=301		N=150		N = 151	
	n	%	n	%	n	%
High food secure	72	24%	35	23%	37	24%
Marginally food secure	61	20%	26	17%	35	23%
<i>Food Secure (high and marginally food secure; score of 0–2)</i>	<i>133</i>	<i>44%</i>	<i>61</i>	<i>40%</i>	<i>72</i>	<i>47%</i>
Low food secure	77	26%	37	25%	40	27%
Very low food secure	91	30%	52	35%	39	26%
<i>Food Insecure (low and very low food security; score of 3–10)</i>	<i>168</i>	<i>56%</i>	<i>89</i>	<i>50%</i>	<i>79</i>	<i>53%</i>

Demographic Characteristics and Food Insecurity

This study addressed the relationship between student demographics and food insecurity in research question 5:

- 5) What is the relationship between student demographics and food insecurity?

H₅₀—There is no difference between the demographic characteristics of food secure and food insecure students.

African American, Hispanic, and Asian students were more likely to be food insecure than their White counterparts. A very small number of Hispanic (n=12), Asian (n=8), and non-resident Alien (n=1) students participated in the study, which makes it difficult to make reliable estimations about the food security status of those populations. Two students selected “don’t know” with regard to race on the survey. Overall, 61% of African Americans students (n=213) and 50% of Hispanic (n=12) and Asian (n=8) students were food insecure compared to 32% of White students (n=44). Furthermore, 71% students who self-identified as multi-racial (n=21), were food insecure. Chi Squared analysis revealed a significant impact of race on food security status ($\chi^2 = 18.4$, df=6, p=.005). Table 8 shows the distribution of food security status by race and ethnicity for the overall student sample.

At the suburban community college, African American, Hispanic, and Asian students were more likely to be food insecure than their White counterparts. A very small number of Hispanic (n=10), Asian (n=5) students responded to the survey, which makes it difficult to reach reliable conclusions about the food security status of those populations. At the suburban community college, 63% of African Americans students (n=82), 64% of Multi-racial students (n=14) and 40% of Hispanic (n=10) and Asian (n=5) students were food insecure compared to 31% of White students (n=39).

At the urban community college, 59% of African American students were food insecure (n=131) compared to 100% of Hispanic (n=2), 67% of Asian (n=3),

86% of Multi-Racial (n=7) and 40% of White (n=5) students. The number of non African-American students was very small making it difficult to make any reliable estimates about their food security status.

Female students were found to be more likely to suffer food insecurity than males; however, this association was not statistically significant. Overall, 58% of female students (n=168) were food insecure compared to 53% of male students (n=133; $\chi^2=0.979$, df=1, p=0.323). Table 8 shows the distribution of food security status by gender.

Living situation was significantly associated with food security status. Students who lived alone, with spouses/partners or with roommates were more likely to be food insecure than students living with their parents or relatives. Living alone was a notable risk factor with 82% of students who live alone (n=28) reporting food insecurity. Furthermore, 70% of those living with roommates (n=20) and 61% of those living with spouses/partners (n=33) were food insecure compared to 51% of students who lived with their parents or other relatives (n=219; $\chi^2=12.15$, df=3, p=0.007).

There were a number of single parents in the sample (n=31) and 77% of the single parents were food insecure compared to 54% of students who were not single parents (n=243; $\chi^2=6.4$, df=1, p=0.011). Most (65%) of the single parents were female, but the association between being a single parent and gender was not statistically significant ($\chi^2=.898$, df=1, p=0.343). Table 8 displays the distribution of food security status by student living situation.

Income was not significantly associated with food security status; however, students who reported lower incomes were more likely to be food insecure than students reporting higher incomes. Of the students whose incomes were from \$0 to \$750 per month (n=179), 58% were food insecure compared to 51% of students with income over \$751 per month (n=69; $\chi^2=1.100$, df=1, p=0.294). Fifty-three students (18% of the sample) were unable or unwilling to report their income. The relationship between income and food insecurity is presented in Table 8. All “P values” are from Chi Squared analyses.

Table 8. Summary of Demographic Characteristics and Food Insecurity

Demographic Characteristic	Food Secure		Food Insecure		P value
	n	%	n	%	
Gender					0.323
Male (n=133)	63	47%	70	53%	
Female (n=168)	70	42%	98	58%	
Race/Ethnicity					0.005*
African American (n=213)	84	39%	129	61%	
White (n=44)	30	68%	14	32%	
Hispanic (n=12)	6	50%	6	50%	
Asian (n=8)	4	50%	4	50%	
Multi-racial (n=21)	6	29%	15	71%	
Non-Resident Alien (n=1)	1	100%	0	0%	
Living Situation					0.007*
Alone (n=28)	5	18%	23	82%	
With Parents (n=219)	108	49%	111	51%	
With spouse/partner (n=33)	13	39%	20	61%	
With roommate/s (n=20)	6	30%	14	70%	
Single Parent					0.011*
Yes (n=31)	7	23%	24	77%	
No (n=243)	113	47%	130	54%	
Income					0.294
\$0–750 /month (n=179)	75	42%	104	58%	
>\$751/month (n=69)	34	49%	35	51%	

Note: Missing data not included in frequencies and percentages in this table.

*P<0.05 = statistically significant

Relationship Between Food Insecurity, GPA, Energy, and Concentration

Food Insecurity and GPA

This study addressed the relationship between food insecurity and student GPA in research question 2:

- 2) What is the relationship between food insecurity and student reported GPA?

H₂₀—There is no difference between food secure and food insecure students' GPAs.

Student food security status was not significantly associated with GPA when all GPA categories were considered ($\chi^2=4.839$, $df=5$, $p=.436$; Table 9). Table 9 shows the results of Chi Squared statistical analysis comparing food secure and food insecure students with respect to student GPA. However, when students in the highest GPA category (3.5–4.0) were compared to students in a lower GPA category (2.0–2.49), there was a significant relationship between food insecurity on student GPA. These two groups of students were selected for comparison to evaluate whether the most academically at risk students (those with GPAs in the 2.0–2.49 range) were different than the students with the highest academic performance (3.5–4.0 range). Students in the lowest GPA category (less than 2.0) were not included because only two students were in that GPA category.

Food insecure students were significantly less likely to fall into the 3.5–4.0 GPA category and more likely to fall into the 2.0–2.49 category ($\chi^2=4.234$, $df=1$, $p=0.039$; Table 10). Table 10 shows the results of Chi Squared statistical analysis comparing food secure and food insecure students of selected GPA categories (3.5–4.0 versus 2.0–2.49).

A binary regression analysis showed a significant relationship between food security status and GPA going from food insecure to food secure would be expected to have a have a positive effect on students' GPA ($B=.941$, $p=0.042$; Table 11). Table 11 shows the results of linear and logistic regression analysis of food insecurity and GPA. The GPA variable was dichotomized into high (GPA 3.5–4.0) and low (GPA 2.0–2.49) for the sake of creating a binary regression analysis. The regression analysis indicates that being food insecure is associated with a 22% lower likelihood of having a 3.5–4.0 GPA than a 2.0–2.49 GPA. However, when additional independent variables including student race and living situation were added to the regression, the significant relationship between food insecurity and student GPA disappeared (Table 12).

A Chi Squared analysis of the relationship between the severity of food insecurity and student's probability of falling into the highest GPA category (3.5–4.0) or a lower GPA category (2.0–2.49) showed that more severely food insecure students were more likely to fall into the lower GPA category than students at less severe levels of food insecurity, although this trend was not statistically significant ($\chi^2=4.715$, $df=3$, $p=0.194$). Table 13 shows the relationship

between increasingly severe food insecurity and student grades at the high and low end of the GPA spectrum. All “P values” in the following tables are from Chi Squared analyses.

Table 9. Chi Squared Analysis of Food Insecurity and Grade Point Average

Dependent Variable	Food Secure n=133		Food Insecure n=168		P value
	n	%	n	%	
GPA					0.436
<2.0	1	.8%	1	.6%	
2.0–2.49	11	8%	27	16%	
2.5–2.9	42	32%	50	30%	
3.0–3.49	39	29%	50	30%	
3.5–4.0	24	18%	23	14%	
Don't know	16	12%	17	10%	

*P<0.05 = statistically significant

Table 10. Chi Squared Analysis of Food Insecurity and Selected High and Low Grade Point Average

Dependent Variable	Food Secure n=35		Food Insecure n=50		P value
	n	%	n	%	
GPA					0.039*
2.0–2.49	11	31%	27	54%	
3.5–4.0	24	69%	23	46%	

*P<0.05 = statistically significant

Table 11. Summary of Regression Analysis on GPA and Food Insecurity

Dependent Variable	Independent Variables	Binary Logistic Regression		Linear Probability Model	
		B	Sig.	Beta	Sig.
GPA (2.0–2.49 vs 3.5–4.0)	Food Secure vs. Food Insecure	-.941	.042*	-.223	.040*

*P<0.05 = statistically significant

Table 12. Summary of Regression Analysis on GPA and Food Insecurity With Covariates

Dependent Variable	Independent Variables	Binary Logistic Regression		Linear Probability Model	
		B	Sig.	Beta	Sig.
GPA (2.0–2.49 vs 3.5–4.0)	Food Secure vs. Food Insecure	-.803	.121	-.144	.173
	African American	-2.165	.010*	-.379	.006*
	White	-1.057	.290	-.122	.353
	Living Alone	-1.913	.077	-.211	.079
	Living with Parents	-1.680	.024*	-.271	.024

*P<0.05 = statistically significant

Table 13. Chi Squared Analysis of Degree of Food Insecurity and GPA Level

Dependent Variable	High Food Security (score of 0)		Marginal Food Security (score of 1 or 2)		Low Food Security (score of 3 to 5)		Very Low Food Security (score of 6 to 10)		P Value
	n	%	n	%	n	%	n	%	
GPA	n=14		n=21		n=24		n=26		.194
2.0–2.49	5	36%	6	29%	12	50%	15	58%	
3.5–4.0	9	64%	15	71%	12	50%	11	42%	

Food Insecurity and Energy

This study addressed the relationship between food insecurity and student self-reported energy level in research question 3:

- 3) What is the relationship between food insecurity and student reported energy level?

H₃₀—There is no difference between food secure and food insecure students' energy level.

Students were asked to self-rate their energy level on a scale of “very good,” “good,” “fair,” “poor” or “very poor.” Student energy level was significantly associated with food security status. Students who were food insecure were more likely to report having lower energy levels than students who were food secure. Seventy-six percent of high food secure students had a “good” or “very good” energy level compared to 43% of very low food insecure students. Twenty-four percent of high food secure students had “fair,” “poor,” or “very poor” energy level compared to 57% of very low food secure students ($\chi^2=15.675$, $df=1$, $p=0.000$). Table 14 illustrates the relationship between student energy level and various degrees of food insecurity ranging from “high food security” to “very low food security.”

Table 15 displays logistic and linear regression analysis, which was used to examine the relationship between food security and energy. The regression analysis showed a significant relationship between food security status and energy level. Becoming food secure would be expected to have a have a positive effect on students' energy level, without respect to race or living situation. A linear probability model indicates that being food insecure is associated with a 21.8% lower likelihood of having high energy levels “good” or “very good” (Table 15). All “P values” in the following tables are from Chi Squared analyses.

Table 14. Chi Squared Analysis of Degree of Food Insecurity and Energy Level

Dependent Variable	High Food Security (score of 0) n=72		Marginal Food Security (score of 1 or 2) n=61		Low Food Security (score of 3 to 5) n=77		Very Low Food Security (score of 6 to 10) n=91		P Value
	n	%	n	%	n	%	n	%	
Energy Level									0.000*
Fair, poor, or very poor	17	24%	16	26%	27	35%	52	57%	
Good or very good	55	76%	45	74%	50	65%	39	43%	

Note: Missing data not included in frequencies and percentages in this table.

*P<0.05 = statistically significant

Table 15. Summary of Regression Analysis on Energy Level and Food Insecurity

Dependent Variable	Independent Variables	Binary Logistic Regression		Linear Probability Model	
		B	Sig.	Beta	Sig.
Energy (Fair, poor or very poor vs. good or very good)	Food Secure vs. Food Insecure	-.947	0.000*	-.218	.000*
	African American	.200	0.566	.042	.569
	White	.157	0.735	.026	.729
	Living Alone	-.296	0.540	-.043	.522
	Living with Parents	.064	0.844	.013	.849

*Sig.<0.05 = statistically significant

Food Insecurity and Concentration

This study addressed the relationship between food insecurity and student reported concentration ability in research question 4:

- 4) What is the relationship between food insecurity and student reported concentration ability?

H_{4o} - There is no difference between food secure and food insecure student's concentration ability.

Students were asked to self-rate their concentration ability on a scale of "very good," "good," "fair," "poor" or "very poor." Student concentration ability was significantly correlated with food security status. Students who were food insecure were more likely to report having lower concentration levels than students who were food secure. Seventy-nine percent of high food secure students had good or very good concentration levels compared to 46% of very low food secure students. Twenty-one percent of high food secure students had fair, poor or very poor concentration levels compared to 54% of very low food secure students ($\chi^2=22.821$, $df=1$, $p=0.000$). Table 16 illustrates the relationship between student concentration and various degrees of food insecurity ranging from "high food security" to "very low food security." Table 17 displays linear and logistic regression analysis, which was used to examine the relationship between food security and concentration. The regression analysis showed a significant relationship between food security status and concentration level. Becoming food secure would be expected to have a positive effect on students'

concentration level, without regard to race or living situation. A linear probability model indicates that being food insecure is associated with a 26% lower likelihood of having high concentration levels (“good” or “very good”; Table 17). All “P values” in the following tables are from Chi Squared analyses.

Table 16. Chi Squared Analysis of Degree of Food Insecurity and Concentration Level

Dependent Variable	High Food Security (score of 0) n=72		Marginal Food Security (score of 1 or 2) n=61		Low Food Security (score of 3 to 5) n=77		Very Low Food Security (score of 6 to 10) n=91		P Value
	n	%	n	%	n	%	n	%	
Concentration									0.000*
Fair, poor, or very poor	15	21%	15	25%	34	44%	49	54%	
Good or very good	57	79%	46	75%	43	56%	42	46%	

Note: Missing data not included in frequencies and percentages in this table.

*P<0.05 = statistically significant

Table 17. Summary of Regression Analysis on Concentration Level and Food Insecurity

Dependent Variable	Independent Variables	Binary Logistic Regression		Linear Probability Model	
		B	Sig.	Beta	Sig.
Concentration (Fair, poor or very poor vs. good or very good)	Food Secure vs. Food Insecure	-1.157	0.000*	-.260	.000*
	African American	-.016	0.965	-.002	.975
	White	-.053	0.911	-.007	.921
	Living Alone	-.954	0.056	-.133	.045
	Living with Parents	-.230	0.495	-.046	.492

*Sig.<0.05 = statistically significant

Comparison of Urban and Suburban Community College Food Insecurity

This study addressed the differences between an urban and a suburban community college when comparing the results of food insecurity in research question 6:

- 6) What are the differences between the urban community college and the suburban community college when comparing results of food insecurity?

H₆₀ - There are no differences between the urban and suburban community college when comparing the results of food insecurity.

Table 18 shows the analysis of the main independent and dependent variables separated by campus. Chi squared analysis revealed that food insecurity was significantly associated with lower GPA status at the suburban community college ($\chi^2=7.342$, $df=1$, $p=0.007$) but not at the urban community

college ($\chi^2=0.008$, $df=1$, $p=0.927$) when only students in the highest GPA category (3.5–4.0) and a lower GPA category (2.0–2.49) were compared (Table 18). Student concentration was significantly correlated with food insecurity at the urban community college ($\chi^2=23.073$, $df=3$, $p=0.000$) but not at the suburban community college ($\chi^2=8.440$, $df=4$, $p=0.077$; Table 18). Student energy was significantly correlated with food insecurity at the urban community college ($\chi^2=27.865$, $df=3$, $p=0.000$) but not at the suburban community college ($\chi^2=7.840$, $df=4$, $p=0.098$; Table 18).

Tables 19 and 20 present the results of Chi Squared analysis of the relationship between the severity of food insecurity and student energy and concentration level on each campus. On both the urban and suburban campuses, there was a significant association between the severity of food insecurity and student concentration level (Table 19; $\chi^2=21.329$, $df=3$, $p=0.000$; $\chi^2=9.354$, $df=3$, $p=0.025$, respectively). Energy level was significantly associated with the degree of student food insecurity at the urban community college ($\chi^2=33.783$, $df=3$, $p=0.000$) but not at the suburban community college ($\chi^2=3.563$, $df=3$, $p=0.313$; Table 20).

Table 21 present the results of Chi Squared analysis of the relationship between the severity of food insecurity, high student GPA (3.5–4.0) and low student GPA (2.0–2.49) on each campus. On the suburban campus, there was a positive linear relationship between the degree of food insecurity and the

probability of students' falling into a lower GPA category and that result was approaching statistical significance ($\chi^2=7.691$, $df=3$, $p=0.053$). There was no relationship between the degree of food insecurity and student GPA at the urban community college ($\chi^2=1.009$, $df=3$, $p=0.799$). All "P values" in the following tables are from Chi Squared analyses.

Table 18. Comparison of Relationship Between Food Insecurity and Student GPA, Energy and Concentration at an Urban and Suburban Community College

Dependent Variable	Urban Community College			Suburban Community College			P value
	Food Secure n (%)	Food Insecure n (%)	P value	Dependent Variable	Food Secure n (%)	Food Insecure n (%)	
Grade Point Average	n=51	n=77	0.941	Grade Point Average	n=66	n=74	0.154
<2.0	0 (0%)	0 (0%)		<2.0	1 (2%)	1 (1%)	
2.0 – 2.49	7 (14%)	13 (17%)		2.0 – 2.49	4 (6%)	14 (19%)	
2.5 – 2.9	19 (37%)	28 (36%)		2.5 – 2.9	23 (35%)	22 (29%)	
3.0 – 3.49	17 (33%)	22 (28%)		3.0 – 3.49	22 (33%)	28 (38%)	
3.5 – 4.0	8 (16%)	14 (18%)		3.5 – 4.0	16 (24%)	9 (12%)	
Grade Point Average	n=15	n=27	0.927	Grade Point Average	n=20	n=23	0.007*
2.0 – 2.49	7 (47%)	13 (48%)		2.0 – 2.49	4 (20%)	14 (61%)	
3.5 – 4.0	8 (53%)	14 (52%)		3.5 – 4.0	16 (80%)	9 (39%)	
Concentration Level	n=61	n=89	0.000*	Concentration Level	n=72	n=79	0.077
Very poor	0 (0%)	0 (0%)		Very poor	0 (0%)	2 (2.5%)	
Poor	0 (0%)	9 (10%)		Poor	5 (7%)	8 (10%)	
Fair	13 (21%)	39 (44%)		Fair	12 (17%)	25 (32%)	
Good	24 (39%)	30 (34%)		Good	40 (56%)	34 (43%)	
Very good	24 (39%)	11 (12%)		Very good	15 (21%)	10 (13%)	
Energy Level	n=61	n=89	0.000*	Energy Level	n=72	n=79	0.098
Very poor	0 (0%)	0 (0%)		Very poor	0 (0%)	1 (1%)	
Poor	3 (5%)	11 (12%)		Poor	2 (3%)	7 (9%)	
Fair	7 (12%)	35 (39%)		Fair	21 (29%)	25 (32%)	
Good	23 (38%)	32 (36%)		Good	33 (46%)	39 (49%)	
Very good	28 (46%)	11 (12%)		Very good	16 (22%)	7 (9%)	

*P<0.05 = statistically significant

Table 19. Chi Squared Analysis of Degree of Food Insecurity and Concentration Level

Dependent Variable	High Food Security (score of 0)	Marginal Food Security (score of 1 or 2)	Low Food Security (score of 3 to 5)	Very Low Food Security (score of 6 to 10)	P Value				
Suburban CC	n=37		n=35		n=40		n=39		
	n	%	n	%	n	%	n	%	
Concentration	0.025*								
Fair, poor, or very poor	6	16%	11	31%	19	48%	16	41%	
Good or very good	31	84%	24	67%	21	53%	23	59%	
Urban CC	n=35		n=26		n=37		n=52		
	n	%	n	%	n	%	n	%	
Concentration	0.000*								
Fair, poor, or very poor	9	26%	4	15%	15	40%	33	64%	
Good or very good	26	74%	22	85%	22	60%	19	36%	

Note: Missing data not included in frequencies and percentages in this table.
*P<0.05 = statistically significant

Table 20. Chi Squared Analysis of Degree of Food Insecurity and Energy Level

Dependent Variable	High Food Security (score of 0)		Marginal Food Security (score of 1 or 2)		Low Food Security (score of 3 to 5)		Very Low Food Security (score of 6 to 10)		P Value
Suburban CC	n=37		n=35		n=40		n=39		
	n	%	n	%	n	%	n	%	
Energy	0.313								
Fair, poor, or very poor	9	24%	14	40%	16	40%	17	44%	
Good or very good	28	76%	21	60%	24	60%	22	56%	
Urban CC	n=35		n=26		n=37		n=52		
	n	%	n	%	n	%	n	%	
Energy	0.000*								
Fair, poor, or very poor	8	23%	2	8%	11	30%	35	67%	
Good or very good	27	77%	24	92%	26	70%	17	33%	

Note: Missing data not included in frequencies and percentages in this table.
*P<0.05 = statistically significant

Table 21. Chi Squared Analysis of Degree of Food Insecurity and GPA Level

Dependent Variable	High Food Security (score of 0)		Marginal Food Security (score of 1 or 2)		Low Food Security (score of 3 to 5)		Very Low Food Security (score of 6 to 10)		P Value
Suburban CC	n=7		n=13		n=14		n=6		
	n	%	n	%	n	%	n	%	
GPA									.053
2.0–2.49	1	14%	3	23%	8	57%	6	67%	
3.5–4.0	6	86%	10	77%	6	43%	3	33%	
Urban CC	n=7		n=8		n=10		n=17		
	n	%	n	%	n	%	n	%	
GPA									.799
2.0–2.49	4	57%	3	37%	4	40%	9	53%	
3.5–4.0	3	43%	5	63%	6	60%	8	47%	

Note: Missing data not included in frequencies and percentages in this table.

*P<0.05 = statistically significant

Summary

This section presented the findings of the study in three sections: demographics of food insecure students and prevalence of food insecurity; relationship between food insecurity, student GPA, energy, and concentration; and differences between an urban and suburban community college with respect to food insecurity. The study revealed that over half of the community college student respondents were food insecure (56%) and that food insecurity was slightly less prevalent among respondents at the suburban community college (52%) and slightly more prevalent among respondents at the urban community college (60%). African American students and multiracial students were more likely to experience food insecurity than White students. Students who live alone, with roommates or with spouses/partners were more likely to experience

food insecurity than students who lived with parents or relatives. Single parents were also more likely to be food insecure than students who were not single parents. Gender and income were not significantly associated with food insecurity.

Hypothesis testing with regard to the association between food insecurity and GPA, student energy, and concentration level was also conducted. Food insecure students were more likely to have lower GPA (2.0–2.49) than food secure students. Food insecurity was significantly associated with lower student energy and concentration levels in the overall student sample.

Finally, the hypothesis related to the relationship between food insecurity, GPA, energy, and concentration were tested at each community college separately. These analyses revealed that food insecurity had a negative effect on the suburban community college student's GPAs when only the high and low GPA students were considered. Also, concentration and energy level were significantly correlated with food insecurity at the urban community college but not at the suburban community college.

Chapter V: DISCUSSION, CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

Overview of the Study

This study sought to examine the prevalence of food insecurity among community college students at one suburban campus in an affluent area and one urban campus in an economically-disadvantaged area in Maryland in order to determine the predictors, extent, and consequences of this problem. The study was conducted at two institutions in order to determine whether the extent and ramifications of food insecurity differ based on local economic conditions. Relationships between food insecurity and student GPA, self-reported energy, and concentration level were examined.

Food insecurity is known have adverse impacts on child academic success, adult cognition (Alaimo et al., 2001; Behrman, 1996; Chilton et al., 2007; Cook & Frank, 2008; Frongillo et al., 2006; Gao et al., 2009; Jyoti et al., 2005; Murphy et al., 1998; Winicki & Jemison, 2003), and adult energy and concentration levels (Hamelin et al., 1999; Radimer, 1990; Zekeri, 2007). The prevalence of food insecurity is highest among specific demographic groups in the U.S. including people of lower socioeconomic status, racial/ethnic minorities (namely African Americans and Hispanics), and single parents (Coleman-Jensen et al., 2012b).

A previous study at a 4-year institution showed that college students may experience food insecurity at a rate exceeding the national average (Chaparro et al., 2009). Research on food insecurity among community college students was missing from the literature.

This study was conducted using a cross-sectional, intercept survey designed to assess the food security status of a convenience sample of 301 students over the age of 18 attending two different community colleges in Maryland. Food security status was assessed using the validated 10-item Household Food Security Survey Module. The survey also contained questions about student GPA; self-perceived energy and concentration levels; and demographics (gender, age, race/ethnicity, living situation, and income). Survey results were coded and entered into SPSS for analysis. Descriptive statistics were used to describe the prevalence of food insecurity among students. Furthermore, Chi-Squared analysis was used to assess potential correlations between food security status and GPA, energy, and concentration levels. Results were analyzed by demographic group to assess whether there are differences between students based on gender, living situation, income, and race/ethnicity. Binary regression analysis was used to determine the impacts of multiple independent variables on the dependent variables (GPA, energy, and concentration). All relationships were tested at the 0.05 significance level.

This study was designed to answer six research questions:

- 1) At an urban and a suburban community college, what is the frequency of students reporting food insecurity?
- 2) What is the relationship between food insecurity and student reported GPA?
- 3) What is the relationship between food insecurity and student reported energy level?
- 4) What is the relationship between food insecurity and student reported concentration ability?
- 5) What is the relationship between student demographics and food insecurity?
- 6) What are the differences between the urban community college and the suburban community college when comparing results of food insecurity?

The following three sections discuss the results of the study in light of these questions. The first section discusses the prevalence of food insecurity and demographic characteristics associated with food insecurity. The second section discusses the relationships between food insecurity and GPA, energy, and concentration. The third section discusses the differences found between the suburban and urban community college with respect to the impact of food insecurity. The discussion is framed in the context of previously published literature and the results of the present study.

Discussion

Prevalence of Food Insecurity and Affected Demographic Groups

The theoretical model for this study presented demographic factors that were expected to be predictive of food insecurity (Figure 1). The findings of this study confirm the relationship between food insecurity and some demographic factors (race, living situation, and single parenthood), but not others (gender and income). The prevalence of food insecurity among community college students and relationships between student demographics and food insecurity will be discussed in this section.

As outlined in table 7, 56% of the student sample was food insecure (26% low food secure and 30% very low food secure). The food insecurity rate among the student sample is dramatically higher than the food insecurity prevalence for the general population of the U.S. where 16.4% of individuals are food insecure (10.9% low food secure and 5.5% very low food secure; Coleman-Jensen et al., 2012b). This rate is also higher than the food insecurity prevalence previously found at the University of Hawaii where 21% of students were food insecure (15% low food secure and 6% very low food secure; Chaparro et al., 2009). This finding suggests that community college students may be experiencing higher levels of food insecurity than the general U.S. population and the 4-year college student population.

One possible reason for this elevated rate of food insecurity is the high number of African Americans in the study sample as this demographic group is

known to have rates of food insecurity that exceed the national average.

Nationally, 25% of African American households are food insecure (14.6% low food security, 10.5% very low food security). The rate of food insecurity among African American students found in the current study (61%) far exceeds the national rate indicating that race is not the only factor leading to the elevated food insecurity prevalence among the student sample.

Perhaps community college students are experiencing many of the hardships described by Hornak (2010) where students were balancing work and academics and struggling “to meet the rising costs to attend college each year” (Hornak et al., 2010, p. 491). The reasons for food insecurity among community college students were not the focus of the present study and present an opportunity for further investigation in future studies.

The prevalence of food insecurity was higher at the urban community college (60%) than at the suburban community college (53%; Table 7). However, the prevalence of food insecurity at the suburban community college was still much higher than the national average. This finding was somewhat surprising given the location of the suburban community college in a geographic area with a median income far exceeding the national average (Table 1; U.S. Census, 2012). These findings suggest that while community colleges located in urban or low-income areas may have more severe issues with food insecurity, suburban community colleges in affluent communities may also have large numbers of students who are having trouble affording adequate food.

It is also noteworthy that the prevalence of “very low food security,” which is the most severe form of food insecurity, was almost 10 percentage points higher among the students surveyed at the urban community college (35%) than among students surveyed at the suburban community college (26%; Table 7). This difference was not statistically significant but does indicate that more students in the urban community college sample are experiencing a severe form of food insecurity. “Very low food insecurity” indicates that eating patterns have been disrupted and food intake has been reduced (United States Department of Agriculture Economic Research Service, 2010).

Demographic characteristics that were significantly associated with food insecurity included race/ethnicity, living situation, and being a single parent. Each of these associations will be explored in the following section.

In the present study sample, 61% of African American students were food insecure compared to 32% of White students which means African American students were roughly twice as likely to be food insecure as White students (Table 8). African American race was postulated to be a demographic factor that would be predictive of a higher risk of food insecurity in this study’s theoretical model. In the general U.S. population, 25.1% of African American households are food insecure compared to 11.4% of White households, making African Americans a little more than twice as likely as Whites to be food insecure (Coleman-Jensen et al., 2012b). Although the rates found in the present study are higher than the national average, the ratio of food insecurity between African

Americans and Whites is similar (roughly 2:1). Hispanic race was also included in the theoretical model as a factor that would be linked to food insecurity, but the number of Hispanic students in the sample was very small which makes it difficult to estimate the food insecurity prevalence of Hispanic students.

In the theoretical model, students who lived independently were predicted to have a higher rate of food insecurity. This was illustrated by the findings of the present study because students who lived alone had the highest rate of food insecurity compared to students in all other living situations. Living situation had a significant association with food security status; students who lived with parents or other relatives had the lowest prevalence of food insecurity (51%) compared to those living with spouses/partners (61%), with roommates (70%) or living alone (82%; Table 8). The most comparable study to the present study was conducted at the University of Hawaii and also found that students living with parents had the lowest rate of food insecurity compared to students with other living situations (Chaparro et al., 2009). In the Chaparro study, 11% of students living with parents were food insecure compared to 13% of those living off campus with a spouse, 17% living off campus alone, 28% living off campus with unknown roommate situations, 31% living off campus with roommates and 38% of students living on campus. In both the present study and the Chaparro study, students living with parents or a spouse/partner were less likely to experience food insecurity than students in other living arrangements.

The Chaparro study notes that previous research has linked high housing

costs with increased risk for food insecurity and that students who live with their parents or spouses are likely to spend “substantially less on housing” than students in other living situations which makes them less likely to be food insecure (Chaparro et al., 2009, p. 2100). The same phenomenon seems to be at work in the present study as the prevalence of food insecurity is highest among students who live alone and presumably have no one to share housing expenses with them.

In the present study, single parents were significantly more likely to be food insecure (77%) than students who were not single parents (54%; Table 8). Previous research on food insecurity among college students has not asked respondents to report whether or not they were single parents (Chaparro et al., 2009; Hughes et al., 2011). The Chaparro study did include data on food security of parents and non-parents and found the same food insecurity prevalence among college students with children and those without children (21%).

National estimates of food insecurity have found that individuals who are raising children under the age of 18 without a spouse are more likely to experience food insecurity than the general population. Thirty-seven percent of households with children that are headed by single females are food insecure and 26% of households that are headed by single males are food insecure compared to 21% of overall households with children according to the latest

national food insecurity estimates (Coleman-Jensen, Nord, Andrews, & Carlson, 2012a).

The prevalence of food insecurity among students who identified as “single parents” was much higher in the present study than the national average. Being a single parent is known to be a financial stressor as female headed households with children are more than twice as likely to be in poverty (34%) than the national average (15.9%; U.S. Census, 2011). Perhaps being a single parent along with the demands of being a student is particularly financially draining which further increases the risk of food insecurity.

The theoretical model also predicted that female gender and income would be linked to food insecurity; however, those demographic characteristics were not significantly associated with food insecurity. These findings will be discussed in the following section.

In the present study, females were more likely than males to be food insecure, but this difference was not statistically significant (58% versus 53% respectively; Table 8). This finding is not completely unexpected as gender is not a notable predictor of food insecurity in national estimates where women and men who live alone have a food insecurity prevalence that is nearly indistinguishable, 15.6% and 15.5% respectively (Coleman-Jensen et al., 2012a). The reason it was thought that women might have a higher prevalence of food insecurity than men was because national estimates show an elevated rate of food insecurity among single parents, the majority of whom are female

(Coleman-Jensen et al., 2012b). The number of single parents in the present study was relatively small ($n=31$; 10% of the sample). Although single parents did have a higher rate of food insecurity than non-single parents in the sample, the number of female single parents was not very high within the overall sample of 301 students ($n=20$; 7% of the sample). Previous research in the college population by Chaparro also failed to find significant differences between the food insecurity prevalence among males and females. In the Chaparro study, 25% of male students and 18% of female students were found to be food insecure ($p=0.080$).

Although the theoretical model predicted that socioeconomic status would be linked to food insecurity, the present study found that income was not significantly associated with food insecurity among community college students. There was a higher rate of food insecurity among students with incomes between \$0 and \$750 per month compared to students with incomes over \$751 per month, 58% and 51% respectively (Table 8). National food security estimates show that people who live in poverty are more likely to be food insecure than those at higher incomes (Coleman-Jensen et al., 2012b). The present study did find a higher rate of food insecurity among students with lower incomes, but the difference was not statistically significant. This lack of a significant association may be explained in part by the difficulty of ascertaining income data from students who, as noted in previous research, often receive financial support from parents or other relatives (Chaparro et al., 2009). In the present study, 73% of

the 300 student respondents who provided information on their living situation reported living with their parents (n=219). In these cases, parental income is probably more relevant to the student's financial situation than their own personal income. Eighteen percent of students in the present study chose "don't know" as an answer to the survey question on income question further highlighting the difficulty many college students have with reporting income. It is possible that many of the students who selected "don't know" were aware that their parent's income was the most relevant answer to the question and selected that response due to lack of knowledge of parental income.

Furthermore, income data has limited predictive power over socioeconomic status without additional information on total household income and family size which are used to calculate poverty in U.S. government statistics. College loans and grants are another source of funding that some students may receive that may subsidize student income. For all of these reasons, the question on income had a limited utility to determine student "socioeconomic status" in the present study. Perhaps if more accurate household income and family size data were available, significant associations between food insecurity and lower socioeconomic status might have been uncovered.

Food Insecurity and GPA

The theoretical model of this study predicted that food insecurity would be associated with lower student GPA. Previous researchers investigating food insecurity among college students have suggested a need for studies on "the

impact of food insecurity on college students' academic performance" (Chaparro et al., 2009, p. 2102). The present study aimed to address that particular question by examining associations between GPA and college student food security status.

When all GPA categories were considered, there was no significant difference between food secure and food insecure student GPAs. However, when only considering students who fall into the highest GPA category (3.5–4.0) and a lower GPA category (2.0–2.49), it was found that food insecure students were significantly more likely to fall into the lower GPA category than food secure students.

The findings related to food insecurity's negative effect on student GPA at the high and low end of the GPA spectrum could be explained by a number of factors that have been found in previous research including adult cognitive impairment (Gao et al., 2009), childhood academic impairment (Alaimo et al., 2001; Frongillo et al., 2006; Jyoti et al., 2005; Winicki & Jemison, 2003), nutrient deficiencies (Jyoti et al., 2005), or behavioral and psychosocial issues (Cook & Frank, 2008; Murphy et al., 1998). Overall, the prior literature shows significant associations between food insecurity and impaired academic performance. The findings of the present study contribute to that body of work with the finding that food insecure community college students are more likely to be in a lower GPA category (2.0–2.49) than the highest GPA category (3.5–4.0).

Although this non-experimental study cannot deduce that food insecurity causes academic impairment, it certainly strengthens the association between these variables and provides an impetus for researchers to continue to explore the experiences of food insecure college students. If in fact food insecurity is a hindrance to optimal academic performance, students' struggles with food might also be impacting college retention and completion rates. It is well known that low-income students have lower college completion rates than their higher income counterparts (Johnson & Collins, 2009; Joo et al., 2009) and perhaps food insecurity is a component of this phenomenon for some students. The present study also provides a potential hypothesis for GPA impairment with the finding that food insecurity has a negative impact on student energy and concentration levels. Students who lack energy or have difficulty concentrating may also have difficulty with academic tasks.

Food Insecurity and Energy and Concentration Levels

The theoretical model predicted that students who were food insecure would have lower energy and concentration levels and that finding was true for the overall student sample. Food insecurity was significantly associated with student self-reported energy level and concentration level. Food insecure students were more likely to report having lower energy levels ("fair, poor or very poor") and concentration ability ("fair, poor, or "very poor") and as the degree of food insecurity intensified (from "high" to "marginal" to "low" to "very low"), the

percentages of students reporting low energy or difficulty concentrating increased in a linear fashion.

Prior research has found that food insecure adults report feelings of physical weakness, fatigue, difficulty concentrating, and sleep deprivation (Hamelin et al., 1999; Radimer, 1990; Zekeri, 2007). Perhaps the food insecure students in the present study were experiencing some or all of these issues which caused them to indicate lower energy levels and concentration ability on the survey. This research also uncovered that student energy level and concentration ability worsened with every degree of increase in their food insecurity level. This provides a theory that even if food insecurity is made less severe (for example, going from “very low food secure” to “low food secure”), students’ energy levels and ability to concentrate could potentially be improved.

Comparison of Urban and Suburban Community College Food Insecurity

The theoretical model linking food insecurity to lower student GPA, energy, and concentration was examined for the overall sample and then for each community college separately. A comparison of the similarities and differences between these relationships at the urban and suburban community colleges included in this study will be discussed in the following section.

College Comparison: Food Insecurity and GPA

At both community colleges, there was no significant association between food security status and overall student GPA. However, a comparison of the highest GPA category (3.5–4.0) and a lower GPA category (2.0–2.49) showed

that food insecurity was associated with lower GPA at the suburban community college but not at the urban community college. The association between food insecurity and college student GPA has not been examined in prior published research so there is little literature to draw on in this specific area to explain the findings.

It is possible that there is a difference in academic rigor between the colleges which may contribute to the more severe negative effect of food insecurity on student GPA at the suburban community college than the urban community college. However, this proposition is not based on any available data and an assessment of the academic rigor of each institution is beyond the scope of the present study.

Another possible explanation for the differential effects of food insecurity on student GPA between the colleges relates to the complicated nature of assessing GPA in students who are enrolled in developmental coursework. Technically, developmental courses taken at community colleges do not count toward a student's official college GPA. Students answering the survey may not have been aware of that fact or even if they were aware, they may not have been able to self-calculate their GPA excluding developmental courses and only taking college-level courses into account. According to the Maryland Higher Education Commission (MHEC), developmental enrollments (measured in Full Time Equivalent Students; FTES) account for 25% of the student enrollments at the urban community college and 11% of enrollments at the suburban community

college (Maryland Higher Education Commission, 2011). It is possible that the elevated developmental coursework rate played a role in decreasing the effect of food insecurity on student GPA at the urban community college.

College Comparison: Food Insecurity, Energy, and Concentration

When comparing the effects of student concentration and energy level, the results showed that these variables were significantly associated with student food security status at the urban community college but not at the suburban community college. As with GPA, the relationships between food insecurity and college student energy and concentration levels have not been examined in prior published research.

One possible explanation for the differential degree of the effect of food insecurity on student energy and concentration levels may be the variation in the depth of food insecurity that was found between the schools. Although the difference was not statistically significant, a higher percentage of students at the urban community college suffered from severe food security (“very low food security”) than at the suburban community college. In order to be classified as “very low food secure,” a person must answer affirmatively to between six and ten questions on the ten-question HFSSM survey module. In order to answer at least six questions affirmatively, one must indicate having cut the size of meals, skipped meals, lost weight and/or not eaten for an entire day because there was not enough money for food. The overall trend showed that increasingly severe food insecurity was associated with increasing chances of having low energy and

concentration (Table 14 and Table 16). Since the food insecurity experienced by the suburban community college students was more likely to be less severe than that of the urban community college students, the impacts on their energy and concentration were slightly less pronounced. It is noteworthy that although the data at the suburban community college was not statistically significant, the link between increasing degree of food insecurity and worsening student energy and concentration was still apparent (Tables 19 and 20).

A second potential explanation for the differential effect of food insecurity on student energy and concentration could be variation between low-income individuals in urban areas and low-income individuals in suburban areas. A Brookings Institution analysis of U.S. Census data examined the recent poverty trends in the U.S. (Kneebone & Garr, 2010). The researchers found that the overall poverty rate grew by 15.8% between 2000 and 2008. However, suburban areas experienced a 25% increase in poverty during that same timeframe compared to a 5% increase in urban areas. Although some of the rise in poverty in suburban areas is due to the movement of poor individuals from urban areas to suburban areas and an influx of immigrants to suburban areas, there is also a rise in the “new poor” of the suburbs. Some of those new to poverty in the suburbs are former members of the middle-class who recently lost a job or suffered financially due to the downturn in the U.S. housing market.

Studies on the experiences and impacts of food insecurity on these “new poor” in the suburbs are lacking in the literature. The lower impact of food

insecurity on student energy and concentration rates in the suburban community college may be related to differences in the length of time that poverty has been experienced between urban and suburban students. Students from urban areas who live in poverty are more likely to have grown up in poverty and to perhaps have experienced food insecurity during their childhood years than those in the suburbs who are more likely to be a part of the “new poor.”

The literature provides several studies confirming negative effects of food insecurity on the intellectual development and academic performance of children (Alaimo et al., 2001; Chilton et al., 2007; Cook & Frank, 2008; Jyoti et al., 2005; Murphy et al., 1998; Reid, 2000). Furthermore, Reid (2000) found that for every year that a child’s family experiences food insecurity, there was a corresponding decline in standardized test scores. If students at the urban community college are more likely to have experienced food insecurity for a prolonged period of time due to exposure to lifelong poverty, it follows that the impact on their energy and concentration levels might be more pronounced.

Based on an analysis of the data and a review of the literature, a revised theoretical model for the relationships between demographics, food insecurity, and student GPA, energy, and concentration is proposed in figure 3.

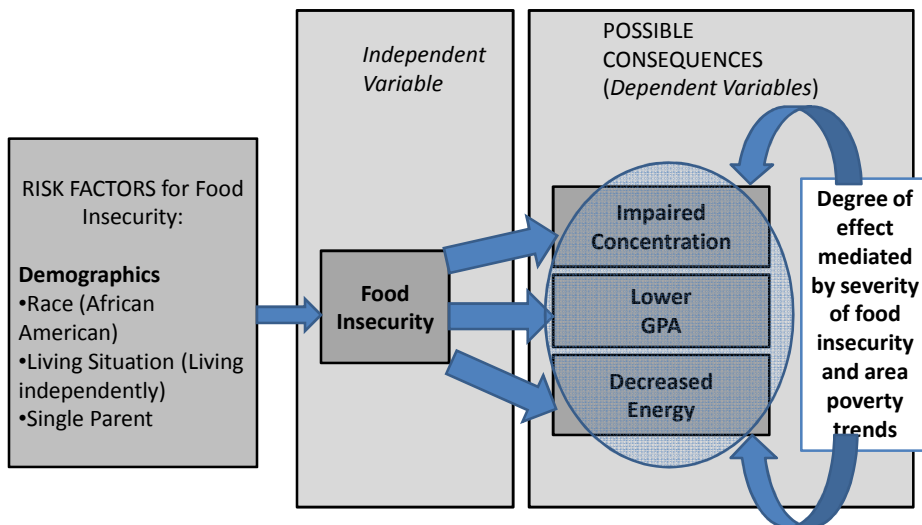


Figure 3. Revised Theoretical Model

Finally, in any non-experimental study, it is possible that the relationships that have been observed are a result of one or more unmeasured confounding factors. It is conceivable that food insecure community college students have other characteristics or experiences that distinguish them from food secure students. Those factors may be more important in influencing student GPA, energy or concentration than food insecurity. For example, food insecurity may be a marker for other life circumstances including stress, housing instability or severe poverty. Food insecurity could work synergistically with other student characteristics to affect student energy, concentration, and GPA. Simply eliminating food insecurity with programs such as food pantries may not have the

intended effect of improving student GPA, energy, and concentration if there is a confounding variable and that variable is not addressed. A theoretical model including the potential for confounding variable(s) is presented in figure 4.

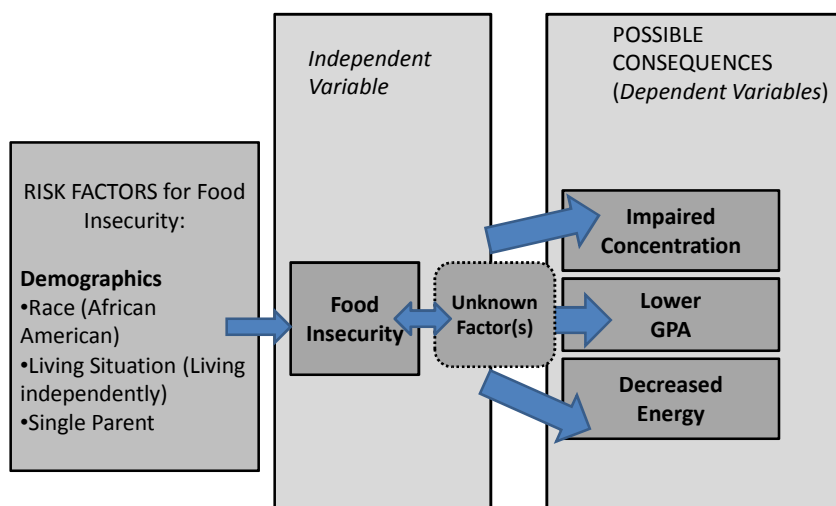


Figure 4. Theoretical Model With Unknown Confounding Factors Mediating Relationship Between Food Insecurity, Student GPA, Energy, and Concentration

Conclusions

This study provides compelling evidence of the existence of food insecurity among a sizable number of community college students in both urban and suburban Maryland. Although the urban community college was located in an area with a dramatically higher poverty rate and lower median income than the suburban community college, the food insecurity rate was not significantly higher than that of the suburban community college. When comparing the

degree of food insecurity between the colleges, it was found that the most severe form of food insecurity (“very low food security”) was more prevalent at the urban community college than the suburban community college. These results show that community college students may be more likely than the general U.S. population to suffer from food insecurity and that food insecurity may be more common and more severe among community college students in lower-income urban areas than those in relatively affluent suburban areas.

The variables found to be predictive of food insecurity among community college students included being African American, living alone, or being a single parent. All of those variables have been linked with increased risk of food insecurity in prior studies (Chaparro et al., 2009; Coleman-Jensen et al., 2012b). Student gender and income were not predictive of student food insecurity. There were difficulties with collecting accurate data to assess the financial status of students whose income may not have been representative of their socioeconomic status due to living with parents or other relatives.

Food insecurity was significantly associated with student GPA when comparing students in the highest GPA category (3.5–4.0) to those in a lower GPA category (2.0–2.49) in the overall student sample and at the suburban community college. These results strengthen the prior association found in the literature between food insecurity and academic outcomes in children and food insecurity and cognitive ability in adults (Alaimo et al., 2001; Frongillo et al., 2006; Gao et al., 2009; Jyoti et al., 2005; Winicki & Jemison, 2003). The lack of

association between food insecurity and student GPA at the urban community college may reflect differences in academic rigor between the schools or may be mitigated by high student enrollment in developmental courses which do not count toward student GPA. The possible relationship between food insecurity and student academic performance could have far-reaching consequences if this is a factor that ultimately affects student retention and graduation rates.

Food insecurity was associated with a significant negative effect on student energy and concentration in the overall student sample and at the urban community college but not at the suburban community college. Food insecurity would be expected to have a negative effect on student energy and concentration based on prior research confirming such an association in adults (Hamelin et al., 1999; Radimer, 1990; Zekeri, 2007). There was an association between food insecurity and student energy and concentration at the suburban community college but the association was weaker than the trend observed at the urban community college. The findings in this area suggest that the severity of food insecurity and area poverty characteristics may have an impact on the strength of the association between food insecurity and poor energy and concentration.

Implications

This study on community college food insecurity has implications for college students, faculty, staff and administrators. The implications of this study for each of those groups will be discussed in the following section.

Food insecurity may be an issue for many students attending community college. Students entering college should consider their ability to afford college tuition, fees, books, transportation, housing as well as adequate and acceptable food. Students should be aware that their ability to afford enough food may have an impact on their future success in college. Students who have experienced lifelong poverty or severe food insecurity may be particularly at risk for the deleterious effects of food insecurity on energy and concentration. Students should be made aware of this risk and targeted with interventions to decrease or eliminate their food insecurity in order to increase their chances of academic success in college.

College faculty and staff, who are on the “front lines” working directly with many students on a daily basis, should also be aware of widespread nature and possible consequences of food insecurity among community college students. Faculty and staff should be sensitive to the potential role that food insecurity could play in their students’ academic work and class participation. These professionals are also in a position to assist food insecure students with locating food aid which may in turn boost students’ academic performance, energy levels, and concentration ability.

Furthermore, the results of this study have implications for college administrators. This study suggests that food insecurity is a possible factor that may affect student success. If food insecure students have lower GPAs, decreased energy levels or difficulty concentrating, they may have difficulty

persisting with college and graduating from their programs. The results of this study have particularly important implications for college administrators in areas with entrenched poverty where food insecurity may have an even more pronounced effect on student energy and concentration levels. Colleges or programs with high populations of African American students, students who live independently, and students who are single parents should also be aware of the increased risk of food insecurity among those population groups.

Recommendations

Recommendations for College Practice

It is important for students who are struggling to afford food to investigate sources of government food aid (including SNAP “food stamps” and WIC) and local emergency food (including food pantries). Students may not realize that if they meet certain qualifications, they may be eligible for these food assistance programs. Students may also benefit from seeking information on how to stretch their food dollars by planning and preparing inexpensive nutritious meals. Such information could be provided directly to students during new-student orientation programs or other “Welcome Week” activities.

Colleges should seek to provide students with information regarding food assistance programs and low-cost meal planning. Community college Offices of Student Life, Student Services or Counseling Services could be more involved in pointing students toward existing community programs and resources. The Office of Admissions or Registration could become involved in screening

students for food insecurity as they interact with all incoming students. Students who are flagged as being food insecure or at-risk for food insecurity could be provided with a standard packet of information regarding food assistance programs and possibly assisted with the application process for government food aid. Such screening could also feed anonymous aggregate information back to the college Office of Research to track trends in food insecurity among students in order to respond effectively to the issue. Faculty and advisors who work with students and may find out through informal conversations that students are struggling with food insecurity should also be armed with information to provide to those students.

In addition to providing information about existing programs in the community, community colleges should seek to increase their provision of such resources directly to students. College administrators should consider on-campus resources and programs designed to address food insecurity among students as part of their strategic initiatives to promote student success, retention, and completion. The implementation of community college food pantries should be considered as college food pantries are growing in popularity and student demand (Cunningham & Johnson, 2011; Minderhout, 2010; Powers, 2012; Rivera, 2010). Colleges could also implement nutrition education to raise student awareness about food budgeting, smart shopping, and low-cost meal preparation as such information has been shown in previous research to help decrease food insecurity among low-income adults (Eicher-Miller et al., 2009).

Colleges could also consider other programs to address food insecurity on campus including providing free prepared meals to students or putting funds on dining cards to students who qualify based on income, financial aid, and expenses (Bidiman, 2007; Cunningham & Johnson, 2011).

Recommendations for Future Research

The exploration of food insecurity among community college students is in its infancy and presents a rich area for future research. Future studies should be conducted at colleges of varying sizes, demographic profiles and geographic locations, including both 2-year and 4-year institutions. These studies could shed light on whether particular college students in specific geographical areas of the U.S. are suffering from higher rates of food insecurity as well as on differences between community colleges and 4-year institutions. Food insecurity data is available on both the state and county level in the U.S. Research should be conducted in areas with a high local prevalence of food insecurity as well as areas with low local food insecurity rates. Studies on campuses with various demographic profiles could also provide valuable information about which students are most likely to experience food insecurity.

Qualitative research on the experiences of food insecure community college students is also warranted. While the present study shows the extent and a few of the implications of food insecurity, qualitative studies on this topic have the potential to provide a more complete picture of the experiences and coping mechanisms of food insecure and food secure students. By interviewing

students, researchers could learn more about the factors differentiating food secure and food insecure students which could potentially be used in future interventions to combat food insecurity. Such studies could also be illustrative in uncovering potential confounding variables that may work synergistically with food insecurity in affecting college student energy, concentration and academic performance.

Further research on the link between food insecurity and college student academic outcomes and socioeconomic status would also enrich this area. Although some links between food insecurity and GPA were made in the present study, future research using verified student GPAs from unofficial transcripts might be able to investigate this area more thoroughly. Researchers should also investigate methods to more accurately assess college student household income and size in order to better understand the link between student socioeconomic status and food insecurity.

Finally, while many colleges are implementing food assistance programs on their campuses, such as food pantries, little data exists to measure the effectiveness of such programs. Future research on student food insecurity rates before and after such programs, on the reach of the programs in terms of the percent of students served, or on the experiences of students who utilize on-campus food assistance services would allow colleges to learn from existing programs and develop “best practices” appropriate for their particular populations.

Summary

This study was motivated by a desire to investigate the predictors, extent and consequences of food insecurity among community college students attending two community colleges in Maryland. Food insecurity is known to affect child academic outcomes and adult cognitive ability, energy, and concentration levels. While research on food insecurity among students in the K–12 educational system is abundant and reflects student food insecurity as a significant predictor of academic success, such research is lacking on the community college population.

The results of this study indicate that food insecurity rates among the community college students in the sample exceed the national average. Food insecurity affected the majority of students in the sample at both the urban and suburban community college. African American students, students living alone, and students who were single parents were most likely to experience food insecurity. Food insecurity had a negative effect on student GPA as well as their self-reported energy levels and concentration ability. Several differences between the suburban and urban community college were observed indicating differences between the effects of food insecurity on each campus. It appears that increasing degree of food insecurity is associated with progressively severe adverse effects on student GPA, energy, and concentration.

Future research should be conducted at colleges of varying sizes, demographic profiles and geographic locations. Qualitative research on the

experiences of food insecure community college students is also warranted to provide more holistic information about the experiences of food insecure students. Research should also be gathered on various food insecurity and hunger interventions that are being implemented at the nation's colleges to evaluate the effectiveness of those programs.

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Appendix A. Survey Tool

Food Security among College Students

Please answer all questions as honestly as possible.

Have you completed this survey before? yes no

A. Food Security Questions

In the last 12 months, which of these situations applied to you:

- | | Often | Sometimes | Never |
|--|--------------------------|--------------------------|--------------------------|
| 1. I worried whether my food would run out before I got money to buy more. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. The food that I bought just didn't last, and I didn't have money to get more. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. I couldn't afford to eat balanced meals. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

In the last 12-months:

- | | Yes | No |
|---|--------------------------|--------------------------|
| 4. Did you or other adults in your house ever cut the size of your meals or skip meals because there wasn't enough money for food? (Consider ONLY adults who share food expenses with you) | <input type="checkbox"/> | <input type="checkbox"/> |

a. **If you answered "yes" to question 4**, how often did this happen?

- Almost every month Some months but not every month Only 1 or 2 months

In the last 12-months:

- | | Yes | No |
|---|--------------------------|--------------------------|
| 5. Did you ever eat less than you felt you should | <input type="checkbox"/> | <input type="checkbox"/> |

because there wasn't enough money for food?

6. Were you ever hungry but didn't eat because there wasn't enough money for food?
7. Did you lose weight because there wasn't enough money for food?

In the last 12-months:

- | | Yes | No |
|---|--------------------------|--------------------------|
| 8. Did you or other adults in your house ever not eat for a whole day because there wasn't enough money for food? | <input type="checkbox"/> | <input type="checkbox"/> |

(Consider ONLY adults who share food expenses with you)

a. **If you answered “yes” to question 8**, how often did this happen?

- Almost every month Some months but not every month Only 1 or 2 months

B. Concentration and Energy Level Questions

9. In general, would you say your concentration level is _____

- very good good fair poor very poor

10. In general, would you say your energy level is _____

- very good good fair poor very poor

C. GPA Question

11. What is your overall Grade Point Average (GPA) at this community college?

- 3.5–4.0 (A/B average)
- 3.0–3.49 (B average)
- 2.5–2.9 (B/C average)
- 2.0–2.49 (C average)
- Less than 2.0 (D/F average)
- Don't know

D. Demographic Questions

12. Age (in years) _____

13. Gender: male female

14. Living situation

alone with parents/relatives with spouse/partner with roommate(s)

14a. Are you a single parent? yes no

15. Which of the following do you consider yourself to be (check all that apply):

African American/Black

American Indian

White

Non-Resident Alien, Indicate nationality

Hispanic/Latino

Asian or Pacific Islander

Unknown

16. What is your average income per month?

\$0-\$500 \$501-\$750 \$751-\$1000 \$1001-\$1500 \$1501-\$2000

greater than \$2001 Don't know

Thank you for your participation!!

Appendix B.1. Informed Consent Document for Suburban Community College

Informed Consent Form

Food Insecurity among Community College Students: Prevalence and Relationship to GPA

Primary Investigator: Maya Maroto

Instructor, American University School of Education, Teaching and Health

Purpose of Study

You are invited to participate in a research study taking place at [Suburban Community College] during the 2012-2013 school year. The purpose of this research is to examine food insecurity among community college students and the relationship between food insecurity and Grade Point Average (GPA). Food insecurity relates to the concept of having enough food to live an active, healthy life.

Should you opt to participate, you will be given a 16-question, multiple-choice survey to fill out. The survey will take approximately five minutes to complete and results will be kept anonymous. Surveys will be collected from 150 students.

To thank you for your time, you will receive a \$5 gift certificate redeemable at the bookstore.

Foreseeable Risks

There are no known risks related to the research study.

Potential Benefits of the Research Study

Through your participation in this study, researchers will be able to better understand 1) the prevalence of food insecurity among students, and 2) the relationship between food insecurity and GPA. This research will be potentially helpful for professors and administrators at by providing a better understanding of food insecurity among students. Results could potentially be used by and other institutions in developing or implementing strategies to help eliminate food insecurity on campus through avenues such as food pantries, nutrition education programs, campus farmers markets, and community gardens. By participating in this research study, you are also helping us contribute to the future success of students across as well as other community college campuses.

Protection of Confidentiality

Your confidentiality is important to us. Your name will remain anonymous throughout the entire research process. A numbering system will be used so that survey results can be tracked without collecting names or any other personally identifiable information. No names will be recorded on the surveys.

Following collection of the surveys, research results will be tabulated. Once again, your identity will not be revealed in any component of the research study or publication of the material.

Voluntary Participation

Participation in the study is completely voluntary. There are no consequences of declining to participate. If you decide to dismiss yourself from the research study at any time, you are allowed to do so. Though we want you to complete the study, you have every right to withdraw from participation. Withdrawing still maintains your protection of confidentiality.

Exclusion of Participation

If you are under the age of eighteen, for the purposes of this research study, you are excluded from participation.

Termination of Participation

If you do not complete the survey in full, your participation in the study will be terminated. If you intentionally falsify responses or provide duplicate survey entries, your participation in the study will be terminated.

Contact information

If any questions or concerns arise before, during, or after the research study, please contact Maya Maroto at maroto@american.edu. If you have any questions regarding the project's procedures on campus, please contact the IRB director (contact information removed)

Consent

I have read and understand the explanation provided to me. I have had all my questions answered to my satisfaction, and I voluntarily agree to participate in this study. I have been given a copy of this consent form.

Name (printed)

Signature

Date _____

Appendix B.2. Informed Consent Document for Urban Community College**INSTITUTIONAL REVIEW BOARD****"CONSENT FORM"****[URBAN] COMMUNITY COLLEGE**

Title of Research Project:

**Food Insecurity among Community College Students:
Relationship to Student GPA, Energy and Concentration**

Explanation of Research Project:

You are invited to participate in a research study taking place at [Urban Community College] during the 2012-2013 school year. The purpose of this research is to examine food insecurity among community college students and the relationship between food insecurity and Grade Point Average (GPA), energy-level and concentration-level. Food insecurity relates to the concept of having enough food to live an active, healthy life.

Should you opt to participate, you will be given a 16-question, multiple-choice survey to fill out. The survey will take approximately five minutes to complete and results will be kept anonymous. Surveys will be collected from 150 students in total.

To thank you for your time, you can choose to receive a \$5 gift card redeemable at the college bookstore.

Foreseeable Risks

There are no known risks related to the research study.

Potential Benefits of the Research Study

Through your participation in this study, researchers will be able to better understand 1) the prevalence of food insecurity among students, and 2) the relationship between food insecurity and GPA, energy and concentration. This research will be potentially helpful for professors and administrators by providing a better understanding of food insecurity among students. Results could

potentially be used by this and other institutions in developing or implementing strategies to help eliminate food insecurity on campus through avenues such as food pantries, nutrition education programs, campus farmers markets, and community gardens. By participating in this research study, you are also helping us contribute to the future success of students across [Urban Community College] as well as other community college campuses.

Protection of Confidentiality

Your confidentiality is important to us. Your name will remain anonymous throughout the entire research process. A numbering system will be used so that survey results can be tracked without collecting names or any other personally identifiable information. No names will be recorded on the surveys.

Your participation in this project is completely voluntary. You have the right to withdraw from the research study/services program at any time. Even if you do not want to join the study/program, or if you withdraw from the study/program, you will receive the same quality of education available to you at [Urban Community College]. Your decision also will not jeopardize your educational status or employment status at [Urban Community College]. You should ask the principal investigator listed below any questions you may have about this research study. You may also ask him/her questions in the future if you do not understand something that is being done. The investigators will share with you any new findings or information that may develop while you are participating in this study.

If you want to talk to someone about this research because you think you have not been treated fairly or think you have been hurt by joining the study, or you have any other questions about the study, you should call the principal investigator,

Maya Maroto, at 301-485-9430 or call the Administrator of the [Urban Community College] Institutional Review Board at (phone number removed). Either the principal investigator or the staff in the IRB office will answer your questions. The [Urban Community College] does not have any program to provide compensation to you if you experience injury or other bad effects which are not the fault of the investigators.

If you agree to participate in this study, please sign your name below.

Subject's signature
(including children, when applicable)

Signature of Parent or
Guardian (when applicable)

Witness to Consent
Procedures*

Signature of Investigator
Date: _____

***Optional unless subject is illiterate, or unable to sign.**

Note: Signed copies of this consent form must be: a) retained on file by the Principal Investigator; b) given to the participant; and c) put in the participant's medical record (when applicable).

Appendix C.1. Morgan State University IRB Approval



Examination Review Panel (IRB)

November 1, 2012

Dr. Henry Linck
School of Education and Urban Studies
Morgan State University

RE: IRB #12/10-0061

Dear Dr. Linck:

Following a review of the materials you submitted to the IRB with respect to the study being conducted by your student, Maya Maroto, entitled "Food Insecurity Among College Students: Prevalence and Relationship to GPA, Energy and Concentration", I am pleased to inform you that **IRB Approval** is hereby granted for the project.

Please note that the current approval is for a one-year period from the date of this letter. Also note that it is your responsibility to inform the IRB promptly should there be a material change in the study methodology.

Do not hesitate to contact me at X3190, or Dr. Isuk at X3447 should you have any questions.

Sincerely,

Annette Palmer, Ph.D.
IRR Chairperson



Cc

Dr. Edet Isuk, IRB Administrator

Appendix C.2. Urban Community College IRB Approval



INSTITUTIONAL REVIEW BOARD



September 7, 2012

Maya Maroto, Principal Investigator
American University, School of Education, Teaching and Health
4400 Massachusetts Avenue, NW
Washington, DC 20016

RE: Protocol: *Food Insecurity Among Community College Students: Relationship to Student GPA, Energy, and Concentration*
IRB No.: [REDACTED]

Dear Ms. Maroto:

Your above-captioned protocol and Consent Form have been received and reviewed by the [REDACTED] Institutional Review Board (IRB). Your protocol and Consent Form have been approved under the expedited review process. The approval is valid for one year or until September 7, 2013. If you wish to continue your project past September 7, 2013, please complete and submit the attached Annual Review Form.

Please contact [REDACTED] in advance to schedule when you will be on campus to conduct the research. In addition, you must supply a copy of the IRB approval letter from your graduate institution on or before November 7, 2012 or your [REDACTED] Consent Form may be invalidated. When your project is completed, you must file a Termination Report (attached to this letter), and forward it to the [REDACTED] IRB office.

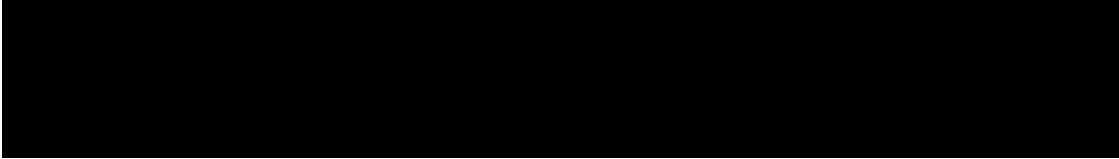
Thank you for your participation in the [REDACTED] IRB process.

Sincerely,

[REDACTED]
[REDACTED] IRB Administrator



Appendix C.3. Suburban College IRB Approval



April 10, 2012

Maya Marota

School of Education, Teaching and Health, American University
Washington, DC.

Dear Ms. Marota,

On January 10, 2012, [REDACTED] reviewed your application materials and approved your request to work with our students in the manner described below to collect data for your dissertation: *Food Insecurity Among College Students: Prevalence and Relationship to GPA*.

Students will be approached by researchers in a public location (*we offered our* [REDACTED] [REDACTED] and asked if they would be willing to complete an anonymous survey. Participants will be provided with an informed consent document to sign before the survey is administered, and will receive a \$5 gift certificate redeemable at the college bookstore as an incentive to participate.

The survey used in this research is a 10-question subset of the USDA's HFSSM. In addition to gathering information on food security, information on student GPA, gender, age, race/ethnicity, living situation, and self-perceived energy and concentration (possible mediating factors between food insecurity and GPA) will be gathered.

We will need to notify security of your authorized presence on the campus, so please contact me once you know the days you will be with us.

Sincerely,

