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## Predictors Of Food Insecurity In 3 Central Florida Communities

Tangela Towns  
*University of Central Florida*



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# PREDICTORS OF FOOD INSECURITY IN 3 CENTRAL FLORIDA COMMUNITIES

by

TANGELA GEORGINA TOWNS  
M.A. University of Central Florida, 2009

A dissertation submitted in partial fulfillment of the requirements  
for the degree of Doctor of Philosophy  
in the Department of Sociology  
in the College of Sciences  
at the University of Central Florida  
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Major Professor: Fernando Rivera

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## **ABSTRACT**

This study examined the association between different socio-demographic factors and food insecurity in the Central Florida Communities of Maitland, Winter Park, and Eatonville. Data from the Institute for Social and Behavioral Sciences at the University of Central Florida were utilized to analyze 3 main questions: In which community is food insecurity more prevalent? To what extent are food consumption, transportation, poverty, and unemployment associated with food insecurity? Does the association between food consumption, transportation, poverty, unemployment, and food insecurity remain when controlling for self-reported overall health, education, marital status, and race. The results revealed differences in predictors of food insecurities. Particularly, there was a positive relationship between food consumption and the knowledge of recommended number of servings of fruits and vegetables suggesting that those who have nutritional knowledge practice healthy dietary behaviors. Furthermore, structural dysfunctions and affordability pose food consumption limitations on the communities studied (mainly Eatonville).

## **ACKNOWLEDGMENTS**

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## **STATEMENT OF THE PROBLEM**

Food insecurity is defined as inadequate food availability based on a consistent quality of food that is sufficient for the individual or family. Being food secure includes having adequate resources that allow the purchase of food for a healthy and nutritious diet, and having the appropriate knowledge of nutrition, care, and sanitation to sustain a healthy life (World Health Organization, 2012).

According to the U.S. Department of Agriculture (henceforth, USDA) food insecurity data, approximately 15 percent of U.S. citizens are food insecure (Coleman-Jensen et al., 2010). The prevalence of food insecurity differs by geographical area, race, family structure, socioeconomic background, and age. In Florida, over 16 percent of the population is living in food insecure households (Coleman- Jensen et al., 2010). In the U.S., many food insecure individuals are poor, are part of a racial or ethnic minority group, and are single parents (Coleman-Jensen et al., 2010). In addition, families with children have rates of food insecurity nearly twice that of families without children (20.2 and 11.7 percent, respectively) (Coleman- Jensen et al., 2010).

In 2010, 26.2 percent of Hispanic households and 25.1 percent of African American households were food insecure. Meanwhile, 10.8 percent of White households were food insecure (Coleman-Jensen et al., 2010). These racial differences in the prevalence of food insecure households are similar in proportion to poverty rates in the U.S. For instance, in 2010 approximately 27.4 percent of African Americans and 26.6 percent of Hispanic households lived in poverty, while Whites had the lowest percentage when compared to other races, as 9.9% lived in poverty in 2010 (DeNavas-Walt et al., 2010). Families who are nearly poor with an income-to-poverty ratio of 130 percent, that is 30 percent above

its poverty threshold, have similar food insecurity rates, 37.6 percent of nearly impoverished families are food insecure (Coleman-Jensen et al., 2010).

Past research has identified some underlying factors associated with food insecurity. These factors include: food consumption, transportation problems, poverty, and unemployment (Diez Roux, 2001; Coleman- Jensen et al., 2010). In detail, food consumption consists of the frequency or amount of fruit and vegetable consumption and has been identified as a strong indicator of food insecurity (Kendall et al., 1996). In theory, people who are food insecure eat less fruits and vegetables (the fruits and vegetables they do consume may be of poor quality) when compared to those who are food secure. Furthermore, some structural barriers such as poor transportation, socioeconomic characteristics, and mortality rates have been associated with deprivation, segregation, and poor health outcomes (Beaulac et al., 2009; Diez Roux, 2001). Lastly, reports from the USDA indicated that about 40 percent of households with earnings lower than the federal poverty line (under \$22,113 for a family of four in 2010) were food insecure (Coleman-Jensen et al., 2010). Many of these poor households are poor as a result of lack of employment. Unemployment rates for the general population were 9.6 percent in 2010; however, rates were higher for African Americans (16 percent) and Hispanics (12.5 percent) (Bureau of Labor Statistics, 2010).

In sum, examining the effects of food insecurities is essential to provide equal access to nutritious foods that enable healthy and active lives. Millions of households are affected by this social problem and contributing factors should be investigated to alleviate food insecurities throughout the United States. Additionally, new information concerning food insecurities will improve the understanding and knowledge to guide some of the strategies of the local organizations and agencies that service food insecure households.

This dissertation will compare the factors associated with food in food insecure and food secure communities. In particular, this dissertation will compare food consumption, transportation barriers, poverty, and unemployment across three Central Florida communities; Maitland, Winter Park, and Eatonville. These particular communities are within twenty minutes driving proximity of one another. Separately, these communities offer measurable racial diversity, socioeconomic differences, food consumption patterns, and food insecurity status.

This study contributes to the limited research on food insecurities at the local level. Because household food insecurity is multidimensional and encompasses many factors, there is a gap in sociological research that connects factors associated with food insecurity and comparisons between food insecure and food secure households. The findings from this dissertation will fill this gap and help improve the knowledge of this problem. Additionally it will expand the information that could be used to decrease the amount of food insecure households in Central Florida and other similar communities throughout the United States. Furthermore, this dissertation contributes to the food insecurity literature by comparing suburban communities, a community that is often neglected in food security studies. Kneebone and Berube (2013) suggest a national trend of the increase in suburban poverty. The suburban poor accounts for over a third of those experiencing poverty in the US (Kneebone and Berube, 2013) and related factors such as food insecurity, transportation, and a high demand of services are becoming problematic. Explanation of suburban poverty includes changes in affordable housing, increase in low wage jobs, population differences, and an unstable economy (Kneebone and Berube, 2013). This dissertation offers literature from the suburban perspective of food insecurity and related factors.

## CHAPTER ONE: INTRODUCTION

Food insecurity influences society on many levels. Influences include, but are not limited to, food availability (such as proximity to grocery stores that sell affordable fresh produce), food consumption (Kendall et al., 1996), and affordability of food for individuals and families (McEntee, 2009). More importantly, over time food insecurity yields poor diet behaviors (consuming unhealthy foods that are high in caloric value and have low nutritious value) and poor health outcomes (such as obesity and cardiovascular disease) (Beaulac et al., 2009). In the United States, the consequences of food insecurity are directly experienced by about 17.2 million citizens (USDA, 2010). They include welfare programs (such as the Supplemental Nutrition Assistance Program), churches, organizations that provide soup kitchens, National School Lunch and Breakfast Programs for children, the Special Supplemental Nutrition Assistance Program for Women, Infants, and Children (WIC), and others that feed America's hungry. These programs are often used to supplement the shortage of food in households through emergency food assistance programs. The USDA reports that many individuals who were food insecure in 2010 are often poor, are minorities, and are single parent households (Coleman-Jensen et al., 2010). Nearly 15 percent of Americans experience food insecurity and this percentage has remained steady since 2009 (USDA, 2010). Furthermore, the percentage of food insecure households has increased over the past decade (9.7 percent of households experiencing food insecurity in 2000) (USDA, 2010; USDA, 2000). Therefore, research considering the causes of this social problem are welcomed (USDA, 2010).

When assessing the impacts of food insecurities, many researchers attribute socio-demographic characteristics as possible contributing factors (Moore and Diez Roux, 2006; Zenk et al.; 2005; Larson et al., 2009). These factors include, but are not limited to; marital status, educational attainment, race, and employment status. These characteristics are related to food security through economic advantage,

living in neighborhoods with ample resources, and having the resources to afford and access healthy food options (Zenk et al., 2005). For instance, those with higher incomes and greater educational attainment are more likely to consume more fruits and vegetables (Zenk et al., 2005). Poverty is a common variable that has been identified as a contributing factor of food insecurity (Mello et al., 2010; USDA, 2010). Similar proportions of the population that are impoverished are also food insecure. For instance, the national percent of food insecure households (14.6 percent in 2009 and 2010) are similar to the rates for those living in poverty (14.3 percent in 2009) (DeNavas-Walt et al., 2009). Although these rates do not suggest casual relation, their distributions are parallel.

There are racial and ethnic disparities that relate to both poverty and food insecurity levels as well. A comparison of poverty rates shows that Whites have the lowest rates with 9.9 percent living in poverty (DeNavas-Walt et al., 2010). Meanwhile, approximately 27.4 percent of African Americans live in poverty, and 26.6 percent of the Hispanics live in poverty (DeNavas-Walt et al., 2009). Furthermore, 25.1 percent and 26.2 percent of African American and Hispanic households were also food insecure in 2010 (Coleman- Jensen et al., 2010).

Some sociological research links the cost of raising children and the despairs of living in poverty to heightened levels of food insecurity (Edin and Kenfals, 2005). The cost of raising children defers resources to the increase in mouths to feed and bodies to clothe. An increase in the amount of children also increases the number of persons in a household, which is considered in the calculation of poverty levels (U.S. Census Bureau, 2010). Financial responsibilities are even more difficult on single parents, compared to dual-earning households. According to the USDA (2009), single parent households with children have higher rates of food insecurity when compared to two parent households who are married with children (10.8 percent and 3.6 percent respectively). The rate of single parent households is higher for African Americans and Hispanics, compared to White single parent households (Edin & Kenfals,

2005). The U.S. Census reports that 30.1 percent of African American households are headed by a single female, 19.2 percent of Hispanic households are headed by a single female, and 13.1 percent of White households are headed by a single female (U.S. Census Bureau, 2010).

All of the dimensions discussed (poverty, income, race, neighborhood resources and location) impact food insecurity at different levels. The impacts of these dimensions on food insecurity are important to assist in the identification of food insecure households, in the development of preventative measures, in the understanding of the needs of those who are food insecure versus those who are food secure, and to measure the impact food insecurity has on our society as a whole (Webb et al., 2006). Furthermore, the understanding of food insecurity is still in the developmental stages; there is no clear uniform definition or uniform measurements used to declare food insecurity (McEntee, 2009; Webb et al., 2006). Notably, there are a lack of measures that focus on subjective measures and fundamental measures versus proxy measures (Webb et al., 2006). For instance, the USDA has four measures of severity of food insecurity ranging from least severe (...in the last 12 months we worried whether our food would run out before we got money to buy more) to most severe (...in the last 12 months did you ever not eat for a whole day because there wasn't enough money for food?) (2010). Other measures of food insecurity include caloric intake, food quality, dietary habits, and cultural acceptability (McEntee, 2009). These incongruences in measurement suggest that that the literature is lacking coherence as it lacks measures capturing the full experience of food insecurity (Webb et al., 2006). Furthermore it lacks identification of specific communities that are food insecure and compares the communities that are food secure (Wauchope and Ward, 2012). This study identifies one poor food insecure community (i.e. Eatonville) and compares findings to two affluent and assumingly food secure communities (i.e. Maitland and Winter Park). Methodologically, this study uses food insecurity measures that are opinion based and inquire about affordability difficulties.



Food insecurity also has physical and psychological consequences. Food insecurities have been reported to effect health outcomes, specifically in matters that increase the need for health care related to insufficient food (i.e. malnutrition, obesity, and other chronic diseases (Hamelin et al., 1999; Mello et al.; 2010). Other health consequences include physical impairments (such as hunger and illness) and psychological suffering (such as stress) (Hamelin et al., 1999). The social implications of food insecurities are extensive and are reflected in daily routines such as lowered productivity, impaired learning, decreased participation in social life, and exclusion in community involvement (Hamelin et al., 1999). Food insecurities can also be experienced on a macro level through socioeconomic inequalities and development (which personally affects individuals) (Hamelin et al., 1999).

### The Underlying Factors Associated With Food Insecurity

This section discusses some of the underlying factors associated with food insecurity: food consumption, structural barriers, poverty, and unemployment. All of these factors, on a broad spectrum, have been identified as contributors to social disparities, which often vary by race and socioeconomic status (Zenk et al., 2005; Morland et al., 2002; Kendall et al., 1996; Larson et al., 2009).

#### **Food Consumption**

Food consumption is the main factor that is used to describe food insecurity. Specifically, food insecurity is the availability and purchase of healthy and nutritious foods such as fruits and vegetables (WHO, 2012; Mello et al., 2010). There are a number of factors related to unhealthy food consumption (the frequency or quantity of fruit and vegetable intake). Past research describes some of these factors such as transportation barriers, economic factors, proximity to supermarkets, and the selection or quality of foods in neighborhood stores (Mello et al., 2010; Zenk et al., 2005). Larson and colleagues (2009) examined neighborhood environments and access to healthy foods and discovered a connection

between poor dietary consumption behaviors to neighborhood deprivation, neighborhood racial composition, and low population density.

Researchers also suggest an association between affordability of foods to unhealthy diets (Kumanyika et al., 2005; Mello et al., 2010; Zenk et al., 2005). Findings suggest that food insufficient households have lower nutrient fruit and vegetable intake and higher caloric intake when compared to food secure homes (Kendall et al., 1996; Mello et al., 2010). Reports also show that the consumption of fruits and vegetables is healthier when a supermarket is nearby residential areas (Zenk et al., 2005). Specifically Zenk and associates report that, “having a supermarket nearby facilitates the purchase of healthy foods” (2005, pp. 1). Subsequently, increased access to more supermarkets in residential areas are associated with a higher likelihood of consuming fruits and vegetables (Morland et al., 2002).

There are other possible factors that contribute to food consumption. Raine (2005) examines a number of determinants that are driven by personal preferences explaining eating behavior namely; food preference, nutritional knowledge, perceptions of healthy eating, and psychological factors. However, each of these determinants can be further explained by other factors such as social and cultural norms, perceptions of dietary guidelines, residential physical environment, transportation access, and individual emotional development (Raine, 2005).

### **Structural Barriers**

Structural barriers are other important factors used to identify and explain food insecurity. Some of these barriers include: store locations (Zenk et al., 2005), residential segregation (Diez Roux, 2001), and lack of accessible transportation (Morland et al., 2002; Horowitz et al., 2004). Structural barriers are exclusionary as they are often associated with limiting access to healthy and affordable foods. These barriers also influence limitations in retail choice (McEntee, 2009). Race and poverty are linked to food insecurities by the presence or absence of retail stores in select neighborhoods. For

instance, poor minority neighborhoods are less likely to have amenities, such as parks and walkways that encourage safe travel to retail stores (Shultz et al., 2005).

There are other indirect effects of structural barriers including: poor employment opportunities and institutional discrimination stressors (McEntee, 2009). Institutional discrimination stressors are identified as “a series of problems such as unemployment, discrimination, poor skills, low incomes, poor housing, high crime, ill health and family breakdown” (McEntee, 2009, pp.350). The social exclusion that results from neighborhood segregation is an indirect structural barrier (Schultz et al., 2005).

Neighborhood segregation has both direct and indirect effects on health outcomes; primarily through the unavailability of affordable healthy food in low income communities (Schultz et al., 2005). Other indirect effects include cultural and social constraints. For instance, in poor minority neighborhoods it is more likely that foods are prepared in unhealthy ways which is reinforced by socially acceptable cultural norms of preparation time and taste.

Lack of transportation is another structural barrier that contributes to food insecurities. Access to transportation affects food access and affordability (Beaulac et al., 2009). Specifically, structural barriers include the many constraints on the purchases of foods by the poor (Beaulac et al., 2009). Low income neighborhood stores tend to be more expensive and residents may choose to shop elsewhere. The intricacies of travel and shopping using public transportation factor in the decisions to purchase fruits and vegetables (Zenk et al., 2005). In addition, low income women do not have the flexibility to shop at stores outside of their neighborhoods that offer better quality and are more economical. Other transportation issues are the high cost of public or private transportation, limited public transportation, and poor transportation access (Wauchope and Ward, 2012).

## **Poverty and Unemployment**

Poverty and unemployment are two factors that contribute to social inequality. The effects of these are felt by poor and racial and ethnic minorities. Those in the lower socioeconomic hierarchy often exhibit poor health behaviors that are a direct result of limited access and availability to valued resources (Betancourt et al., 2004). Food insecure households are more likely to experience an unequal distribution of resources. Impoverished individuals are more likely to have less healthy diets that in turn, contribute to vitamin deficiencies, obesity and high cholesterol (Bhattacharya et al., 2002). Similarly, impoverished children and the elderly suffer more than other age groups (Bhattacharya et al., 2002).

Poverty and unemployment negates the flow of a steady income, which provides resources for the purchase of quality food. In 2010, the U.S. unemployment rate ranged from 9.4 percent to 9.9 percent (Bureau of Labor Statistics, 2012). Additionally, as the unemployment rates increase, the poverty rates increase (Wilson, 1987)). Nord (2009) finds evidence that shows that economic downturns, higher unemployment rates, and food price inflation are all related to higher rates of food insecurity across low income and poor households; but also those households of middle class status (Nord, 2009).

### What We Do Not Know About Food Insecurity

Food insecurity is well defined and understood throughout the literature by the use of various continuums ranging from low to high food security. The United States Department of Agriculture is a major contributor of food insecurity information pertaining to the current food insecurity status, the trends of food insecurity, the definitions, methods used to measure food insecurity, and the factors associated with food insecurity (which are listed in the previous section of this dissertation).

However, there are some limitations in the study of food insecurity; specifically there is insufficient research with regards to the access to food sources (USDA, 2009). Although, there are some reports on the limited and inadequate access to healthy foods, there are still several limitations regarding the best approach to measure the access, the availability and the prices of foods in impoverished areas, areas that are heavily populated with minorities, among others. In some cases, research illustrate how foods are limited in food insecure areas, however the literature is not clear on the quality of the foods that are for sale in many food insecure communities. Hence, not only are foods in these areas limited, but the foods are also inadequate (such as the sale of spoiling produce) (Zenk et al., 2005).

Additionally, some research identifies the reliance of proxy measures for many of the methods used in measuring food insecurity (Webb et al., 2006). For instance, there is a multitude of techniques to measure adequate resources for the purchase of consistent and healthy quality foods that are sufficient for the individual or family. Yet, other underlying factors of food insecurity (i.e. food consumption, structural barriers, income, and employment) measuring food insecurity are not adequately measured or are usually ignored. Food consumption has been measured in several ways, including: a dietary file (Food and Nutritional Technical Assistance, FANTA Project, 2005) (Swindale and Putnam, 2005), dietary recall interviews (NHANES, 2010), and the number of fruits and vegetables the respondent consumed the day prior to taking the survey (Healthy Central Florida Initiative, 2011). Structural barriers are often identified in the literature measured by identifying the location of food stores (Zenk et al., 2005), residential segregation (Diez Roux, 2001), and access to transportation (Morland et al., 2002; Horowitz et al., 2004). Income and employment measures are readily available in the literature. However, information concerning food quality and appropriate measures are limited. In sum, Webb and associates concludes that there is “no perfect single measure that captures all aspects of food insecurity” (Webb et al., 2006).

Lastly, existing literature does not measure the perception of food insecurity among those who experience food insecurity for lengthy periods of time. The few studies that measured the perception of food insecurity did so by asking the following questions: (1) "There are times when we do not have enough food in the house," (2) "I go to bed hungry at night," (3) "I do not get enough to eat at home," and (4) "Have you ever had to miss a meal (or not been able to eat) because there was no food at home?" (Smith and Richards, 2008). However, these questions failed to identify individuals as being food insecure.

In sum, some of the missing elements in the food insecurity literature includes:

- Ideal techniques that measures access,
- the availability and the prices of healthy foods in impoverished and heavily populated minority areas,
- how food insecurity effects individuals (their perception and identity).

(Webb et al., 2006; USDA Measurement, 2009; Hamelin et al., 1999)

In order to address the aforementioned limitations and to better understand how access, availability, and prices affect consumption behaviors; the following subsections discuss access, availability, and prices and food insecurity.

## **Access**

According to the Food Marketing Institute (2011), there are 36,569 supermarkets in the United States that gross over \$2 million or more in annual sales. It is also estimated that in 2012 individuals made an average of 2.2 trips per week to a supermarket (Food Marketing Institute, 2011). However, the average might be different in low income populations where access to affordable food sources is limited by poor transportation (Wauchope and Ward, 2012), availability of food type (Wauchope and Ward, 2012), and affordability (Larson et al., 2009). Current literature identifies that community's that are

impoverished, have poor access, and are minority communities are greatly affected by poor access to supermarkets and chain grocery stores (Larson et al., 2009).

### **Availability**

Stores that carry healthy foods at an affordable price are rare in poor and minority neighborhoods. Existing research suggests that, “poorer and non- White areas tend to have fewer fruit and vegetable markets, bakeries, specialty stores and natural food stores” (Moore and Diez Roux, 2006, pp.329). Often the availability of high quality produce is positively associated with higher vegetable intake (Zenk et al., 2005). Supermarkets and larger grocery stores carry better quality and more affordable produce when compared to convenience stores. Therefore, the availability and accessibility of supermarkets and grocery stores that carry quality and affordable fruits and vegetables are important factors in food insecurity research.

### **Prices**

During the last 20 years there has been general food price inflation (Schnepf, 2012). Since 1990, the annual food price inflation rate (which is measured by the Consumer Price Index [CPI] for all food) has averaged 2.5% inflation rate (this is considered low according to Agricultural Policy Analyst) (Schnepf, 2012). Low inflation rates stem from technology increases, management of inventory, economic stability, and increased competition (Food Marketing Institute, 2007). However, food price inflation rates have fluctuated from 0.8% in 2010 to 5.5% in 2008, and it is estimated that the 2013 food price inflation rate is 4.0% (Schnepf, 2012). Fortunately, since the 1960’s the average annual price change (or the mean of the cost) for food has dropped (Schnepf, 2012). This suggests that Americans now spend less on food compared to the cost of food in 1960 (considering inflation). Currently, the average American spends about one- sixth to about 9.9 percent of their income on groceries (Food Marketing Institute, 2007). According to the USDA’s consumer price indexes and the Bureau of Labor Statistics,

prices for beef, poultry, and fruit increased in 2012 (USDA: Food Price Outlook, 2013). Contrastingly, the prices of pork, eggs, vegetables, and nonalcoholic beverages decreased in 2012 (USDA: Food Price Outlook, 2013). In regards to comparisons across urban and suburban areas, those who live in urban areas pay more for groceries when compared to prices of groceries of those who live in suburban neighborhoods (Garasky et al., 2004). Lastly, supermarkets in total grossed approximately \$584,369 billion dollars in total sales (Food Marketing Institute, 2011).

Overall there are several questions that deserve further attention, including: How will food production sustain and allow equitably access to meet the needs of the population? How will shifting food prices affect global markets and poverty levels? What technologies and methodologies have the potential to offer solutions to reduce food production inequalities and food production sustainability?

Lastly, information about food insecurity in suburban populations remains limited. Much of the existing research focuses on urban and rural populations. The USDA reports that “access to a supermarket is a problem for a small amount of households” (USDA, 2009). However, existing literature lacks information regarding the availability of quality food as well as the structural barriers that exists for the suburban population. According to a recent report by the Brookings Institute, suburban populations experienced an unprecedented rise in poverty (Roberts, 2013). Thus some of the aforementioned factors related to food insecurity, particularly poverty, might have the same effects as those in urban and rural areas. Therefore, the subject of Food Security in Sociology would benefit from understanding how food insecurities affect suburban populations. The literature lacks understanding concerning the following:



- Availability of quality food
- Itemization and inspection of the quality of foods that are sold in suburban areas and are needed to ensure food security to the community
- Identification of the structural barriers that exists for the suburban population
- Current research lacks information regarding the identification and location details of supermarkets and grocery stores in suburban areas.

## CHAPTER TWO: WHY CENTRAL FLORIDA?

The aim of this project is to compare food insecure and food secure households in the following communities: Eatonville, Maitland and Winter Park, FL. The dissertation studies the influences of the differences across populations with the three communities, the diversity in food consumption behaviors compared among the three communities, differences in methods of transportation, and socioeconomic indicators such as poverty and unemployment. The Eatonville, Maitland, and Winter Park Central Florida communities are ideal communities because they offer differences in racial and socioeconomic composition, and food insecurity status.

The U.S. Census Bureau reports that Florida's population is 75 percent White, 22.5 percent Hispanic, and 16 percent African American (2010). Just over a quarter of the population has a bachelor's degree, approximately 14 percent (13.8 percent) of the population are living below the poverty line (\$22,314 for a family of four) and the median income in Florida is \$47,661 (U.S. Census Bureau, 2010). Below these socio-economic indicators are examined for the communities analyzed in this study Eatonville, Maitland, and Winter Park.

Eatonville, a historically prominent township, has 2,159 residents who are mostly African American (84.5 percent) and about 9 percent Hispanic (City-Data.com; U.S. Census, American Fact Finder, 2010). The median income for Eatonville is about \$20,000 less than the state's average (Eatonville \$27,344 versus Florida \$47,661) (City-Data.com).

In contrast, Maitland's demographics differ greatly. The majority of Maitland's population is White (80.6 percent), while African Americans and Hispanics account for the rest of the community's population (11.1 percent and 10.4 percent, respectively) (U.S. Census, 2010). The population of

Maitland is 16,076 (U.S. Census, 2010). Over 90 percent of the population is a high school graduate and over 50 percent of Maitland's population has a college degree (U.S. Census, 2010). The median income is higher than the national average (\$51,914) at \$77, 673 (U.S. Census, 2010). Therefore, it is expected that the average Maitland citizen has resources to accommodate a food secure lifestyle.

Similarly, Winter Park is about 87 percent White, 7.6 percent African American, and 7 percent Hispanic and has a larger population when compared to the other two communities housing 28,398 residents (U.S. Census, 2010). Over 90 percent of the city's residents are high school graduates and over 50 percent are college educated (U.S. Census, 2010). The median income of Winter Park is \$59,278 (U.S. Census, 2010), however there are residents of Winter Park that earn below the poverty line (10.8%) and this lowers the median income for the city as a whole (Wright et al., 2011). Excluding impoverished areas of Winter Park would increase the average income and decrease the poverty rate considerably (the rate is currently 10.8%) (Wright et al., 2011).

### Collectively the Communities Offer Diversity

The Healthy Central Florida Initiative survey solicited information about fruit and vegetable consumption as well as questions about travel in the Winter Park, Maitland, and Eatonville, Florida areas (Wright et al., 2011). Comparing these three communities is ideal because they offer diverse information regarding food insecurity, elements of food consumption, and types of structural barriers, poverty, and unemployment. Poverty rates for these communities include 6.8 percent in the Maitland community, 10.8 percent in Winter Park, and almost 28 percent in the Eatonville community (Wright et al., 2011). Collectively, the Eatonville area had the highest unemployment rate at 16 percent (Winter Park at 10.2 percent and Maitland 9.3 percent) (U.S. Census, 2010). Additionally, these three communities are within close proximity and yet reveal drastically different socioeconomic statuses.

In conclusion, although the literature has identified several factors associated with food insecurity, there is still several factors that have not been fully examined (availability of quality food, suburban food insecurity, location of grocery stores) utilizing a sociological lens. This paper is an attempt to fill this gap by providing a sociological perspective of food insecurities by the identifying some of the underlying factors that contribute to food insecure households (food consumption, structure barriers, poverty, and unemployment). This paper also identifies the lack of coherence in measures of food insecurity. Lastly, this study demonstrates how communities that are very close in proximity are vastly different. Specifically, this study illustrates how each community suffers from different social problems such as food insecurity while being so close to resources that permits food security. Based on the review of the literature and the identified gaps, the study is guided by the following research questions:

- 1) What is the association between food consumption and food insecurities?
- 2) If an association is found, how do they compare across the communities examined?
- 3) What is the association between socio-economic indicators and self- reported health status and food insecurity?

## **CHAPTER THREE: PICTURE PERFECT; MAITLAND, WINTER PARK, AND EATONVILLE FOOD SOURCES**

Specifically, this dissertation reviews the differences in food consumption behaviors, transportation, poverty, and unemployment between the Maitland, Winter Park, and Eatonville areas. Studying these three communities are ideal because they are so close in proximity, yet so different in various demographics and other measures. This chapter paints a picture of the three communities in several aspects; provides information regarding the proximity locations between each of the communities, offers a description of the historical backgrounds of each community to provide conceptual knowledge between the differences in the make-up of each community, and provides information regarding the food resources that are available in each community to link the picture of the communities to food insecurity. This section also discusses the youth and food insecurity and connects this to the challenges faced in the Orlando school district. Lastly, this chapter discusses and connects the woes of public transportation in the Orlando area as a structural barrier to the issue of food insecurity.

### Proximity

The Maitland, Winter Park, and Eatonville communities are all located within the Metropolitan Orlando, Florida area. Thus, for the purposes of this study, these communities are identified as suburban communities of Orlando, FL. As previously mentioned, these three communities are within close proximity of one another as well as within close proximity to the Orlando, FL city limits. Particularly, Maitland is about 1 mile northeast of Eatonville and Winter Park is about 1.7 south east of Eatonville. Maitland is about 6.5 miles in distance from Orlando, and 1.6 miles in distance from the Winter Park community. Orlando is about 5.9 miles south of the Eatonville community center.

## Historical Backgrounds

### **Maitland**

Originally, people began settling in the Maitland area because of the natural spring water and extensive pine forests. Over the years, Maitland's strength in industry, construction, and agriculture assisted in the growth and development of the central Florida area (i.e. citrus groves, factories, etc.). Now the area is known for its historical residences and its natural beauty. The city was incorporated as the Town of Lake Maitland in 1885. Maitland is 4.64 square miles in size.

### **Winter Park**

The Winter Park community established township in 1887 and was originally developed as a winter resort for wealthy Northerners seeking refuge from the harsh winters and sought a tranquil place to rest and relax. "Winter Park is famous for its stately trees, abundant parks, brick-lined streets, spectacular homes, museums, vibrant lakes and fine shops along Park Avenue" ( City of Winter Park, 2013). Winter Park is the largest of the three communities in this study; the city limits amounts to 7.34 square miles in size.

### **Eatonville**

Established in 1887, Eatonville, Florida, is known as the oldest African American municipality in America. The town takes great pride in its history and heritage in the arts including writing, painting and composing. This town was home to a legend of African American Literature, Zora Neal Hurston and has a festival annually to commemorate and celebrate the arts. Lastly, Eatonville is the smallest community in the study; .98 square mile in size.

## Food Insecurity and Local Grocery Stores

This section discusses the available food resources the three communities provide for its residents. The study uses the Merriam- Webster dictionary definition of supermarkets and grocery stores in the communities. The definition suggests that a supermarket (and grocery store) is a “large retail store operated on a self-service basis, selling groceries, produce, meat, bakery and dairy products, and sometimes nonfood goods” (Merriam- Webster, 2013). The findings in this section are based on this definition.

### **Winter Park**

Using Google and super pages (<http://yellowpages.superpages.com/>) web search, the sources revealed a host of food resources servicing the Winter Park, FL area. Specifically, the super pages web search results included 30 grocery stores and supermarkets, 9 convenience stores, and 5 gas stations. After further details analyses of the search, there were 19 grocery stores and supermarkets that qualified as grocery stores by definition (the search engine added some of the convenience stores into the results for grocery stores, which suggests the stores sale food). Using the [foodpantries.org](http://foodpantries.org) website, six food pantries were identified within the Winter Park city limits. Below is a chart listing the findings. The USDA website was used to identify a food desert in the community; results yielded 0 food deserts in the Winter Park, FL area.

### **Maitland**

Using Google and super pages web search, there were a host of food resources servicing the Maitland, FL area. In total, the super pages (yellow pages) identified 113 stores that are identified as grocery stores and super markets, 52 convenience stores, 29 gas stations, 1 health food store, 1 vitamin and food supplements retail store, 1 food and beverage delivery service, and 1 farm produce serving the Maitland community. Additionally, there was 1 farmers market ([www.nfmd.org](http://www.nfmd.org)), 0 food pantries

([www.foodpantries.org](http://www.foodpantries.org)), and the USDA food desert locator identified 0 food deserts in the Maitland, FL area.

During this search, the Eatonville area was incorporated into the Maitland area. These results are added into the Eatonville search. Other nearby areas were added into the results (e.g., Orlando, Winter Park, Fern Park, Altamonte Springs or other communities). After carefully checking the results, the source yielded 2 grocery stores and super markets, 3 convenience stores, 0 food pantries, 1 farmers market, and 0 food deserts in the Maitland community.

### **Eatonville**

A Google and super pages web search found a host of food resources servicing the Eatonville, FL area. Originally, using the Eatonville search, the search engine yielded 0 results for super markets and grocery stores, 0 convenience stores, 0 gas stations, 0 farmers markets, and 0 food pantries. However, after expanding the search using a 5 mile radius; findings suggested 117 grocery stores and supermarkets, 51 convenience stores, and 28 gas stations. After careful consideration using a Google map, I identified two Eatonville markets, 0 super markets, 0 grocery stores, 0 convenience stores, and 0 food pantries. The nearest supermarket, Publix, is 1.7 miles away from the Eatonville area. This may impose traveling difficulty for many of the residents that rely on a bicycle for means of travel.

In sum, these findings indicate that the Maitland community offers more resources that would ensure food secure households (based on the WHO definition of food security) in comparison to the resources of Winter Park and Eatonville communities. Table 1 provides the names and addresses of food resources in each community.



**Table 1: Winter Park Food Sources**

Grocery Stores And Supermarkets	Convenience Stores	Gas Stations	Food Pantries	Farmers Markets	Food Deserts
Whole Foods Market 1989 Aloma Ave Winter Park, FL 32792	7-Eleven 1901 Aloma Ave Winter Park, FL 32792	7-Eleven 1901 Aloma Ave Winter Park, FL 32792 zip code	Hope and Help Center 1935 Woodcrest Drive Winter Park, FL - 32792 (407) 645-2577	Winter Park Farmers Market New York Ave at New England Ave, Winter Park, FL 32789 Saturdays, 7am- 1pm	
Publix Super Market at Hollieanna Shopping Center 741 S Orlando Ave Winter Park, FL 32789	7-Eleven 6305 University Blvd Winter Park, FL 32792	7-Eleven 6305 University Blvd Winter Park, FL 32792	Jewish Family Service Center 2100 Lee Road Winter Park, FL - 32789 (407) 644-7593	Audubon Park Community Market 1842 E. Winter Park Rd Wednesdays 6pm-9pm	
Costco 3333 University Blvd Winter Park, FL 32792	7-Eleven 3608 Aloma Ave Winter Park, FL 32792	7-Eleven 3608 Aloma Ave Winter Park, FL 32792	Winter Park Housing Authority 845 W. Swoope Avenue Winter Park, FL - 32789 (407) 645-2869		
Winn-Dixie Supermarket 7800 S Highway 17-92 Winter Park, FL 32789	7-Eleven 1311 Howell Branch Rd Winter Park, FL 32789	7-Eleven 1311 Howell Branch Rd Winter Park, FL 32789	Patmos Chapel Seventh Day Adventist Church 821 West Swoope Avenue Winter Park, FL - 32789 (407) 629-7005		
Winn-Dixie 7580 University Blvd Winter Park, FL 32792	7-Eleven 1345 Lee Rd Winter Park, FL 32789	7-Eleven 3690 Howell Branch Rd Winter Park, FL 32792			
Publix Super Market at Winter Park Village 440 N Orlando Ave Winter Park, FL 32789 zip code	7-Eleven 3690 Howell Branch Rd Winter Park, FL 32792		Christian Service Center for Central Florida 3377 Aloma Avenue Winter Park, FL - 32792 (407) 628-1692		
Publix Super Market at University Plaza 4000 N Goldenrod Rd Winter Park, FL 32792	7-Eleven 101 W Fairbanks Ave Winter Park, FL 32789				
Publix Super Market at Aloma Shopping Center 2295 Aloma Ave Winter Park, FL 32792	Circle K 3100 Aloma Ave Winter Park, FL 32792				

Grocery Stores And Supermarkets	Convenience Stores	Gas Stations	Food Pantries	Farmers Markets	Food Deserts
Albertsons Supermarket 440 N Orlando Ave Winter Park, FL 32789	Circle K Store 7373 University Blvd Winter Park, FL 32792				
El Pueblo Mexican Grocery 7124 Aloma Ave Winter Park, FL 32792					
Island Food Store 3011 N Goldenrod Rd Winter Park, FL 32792					
Compare Supermarket 3020 N Goldenrod Rd Winter Park, FL 32792					
Forex Trader Diary LLC 1120 Valley Creek Run Winter Park, FL 32792					
Winn-Dixie Supermarket 151 S New York Ave Winter Park, FL 32789					
Anands Food 7414 University Blvd, Ste 108 Winter Park, FL 32792					
Safeway 204 S Semoran Blvd Winter Park, FL 32792					
Sahara Trading Winter Park, FL 32789					
ALDI Foods 6768 Aloma Ave Winter Park, FL 32792					
Albertsons Supermarket 517 S Semoran Blvd Winter Park, FL 32792					

**Table 2: Maitland Food Sources**

Grocery Stores And Supermarkets	Convenience Stores	Gas Stations	Food Pantries	Farmers Markets	Food Deserts
Winn-Dixie Supermarket 155 S Orlando Ave Maitland, FL 32751	7-Eleven 481 N Orlando Ave Maitland, FL 32751	7-Eleven 481 N Orlando Ave Maitland, FL 32751		Maitland Farmers' Market (0.7 mi) 701 Lake Lily Drive Maitland, FL	
Publix Super Market at Maitland Place 242 N Orlando Ave Maitland, FL 32751	7-Eleven 8510 S Us Highway 17/92 Maitland, FL 32751	7-Eleven 8510 S Us Highway 17/92 Maitland, FL 32751			
	7-Eleven 351 N Lake Destiny Rd Maitland, FL 32751	7-Eleven 351 N Lake Destiny Rd Maitland, FL 32751			

**Table 3: Eatonville Food Sources**

Grocery Stores and Supermarkets	Convenience Stores	Gas Stations	Food Pantries	Farmers Markets	Food Deserts
L & L Market INC 323 E Kennedy Blvd Maitland, FL 32751					
Roy's Mini Market 437 W Kennedy Blvd Orlando, FL 32810					

Children

One method of measuring food availability, food consumption, and affordability in the Maitland, Winter Park, and Eatonville communities is to review the data measuring free and reduced lunch programs in Orange and Seminole counties (the counties of Maitland, Winter Park, and Eatonville). In 2010-11, to be eligible for free lunches, a student from a four-person household in Florida would have an annual household income of less than \$28,665 (Florida Department of Education, 2013).

Approximately, 57 percent (N=100,387) of children in Orange County are eligible to participate in free or reduced lunch based on income restricted qualifications (Division of Accountability Research & Measurement, 2013). Additionally, 41 percent (N=26,348) of Seminole County children are eligible to participate in free or reduced lunch (Division of Accountability Research & Measurement, 2013).

Comparatively, 49.57 percent of Florida's students are eligible for free or reduced lunch. Only one other state has a higher percentage (California, 51.67 percent), with three other states having similar percentages (Texas, 48.76 percent and New York 44.74 percent) (Division of Accountability Research & Measurement, 2013). Notably, there is a problem with successfully implementing the free lunch program as about 37 percent of those who are eligible have not applied to receive free lunch (Orange County Public School, Food and Nutrition Services). However, enrollment rates in Orange county have risen to about 5 percent since 2009 (Orange County Public School, Food and Nutrition Services).

### Picturing Central Florida's Means of Travel

Traveling in Central Florida has a different meaning when compared to other cities. The means of travel in the Central Florida area tops the national list of dangerous cities for pedestrians (Transportation for America, 2012). In particular, on average one pedestrian is killed every week and two are injured every day. Thus, the metropolitan Orlando area is potentially deadly for pedestrians and those who use bicycles as a mean of transportation. Therefore, since bicycling is a means of transportation for many Eatonville residents, it poses a tremendous risk. Similarly, bicycling is also a choice for transportation for many Winter Park residents. This information suggests heightened transportation risks for both the Eatonville and Winter Park communities.

## **CHAPTER FOUR: THEORETICAL PERSPECTIVE ON POVERTY AND FOOD INSECURITY**

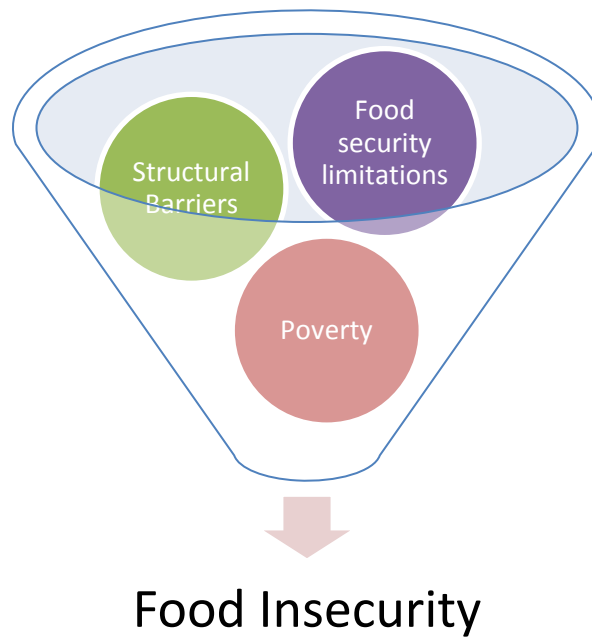
Food insecurity encompasses measures of deprived access and aspects associated with elements of poverty and financial strain. Food insecurities are often the result of many structural and economic constraints. The concept of food insecurity is associated with structural dysfunctions (i.e. constraints within one's community that regards transportation, limited services and resources, and yields disadvantages) that limit the purchase of quality food and thus impede a healthy and nutritious diet. These structural dysfunctions resonated well with Wilson's theories of poverty (class stratification) and disadvantage. Specifically, Wilson suggests that structural barriers within urban African American neighborhoods (the cycle of poverty and social isolation hypothesis) contribute to the underlying factors associated with food insecurity (1990) such as neighborhood deprivation, neighborhood racial composition (Larson et al., 2009), financial constrains (Mello et al., 2010; Zenk et al., 2005), lack of retail stores that offer affordable healthy foods (Shultz et al., 2005), access to transportation (Morland et al, 2002; Horowitz et al., 2002), and unemployment and underemployment (McEntee, 2009).

Theoretically, William Julius Wilson's (1990) ideology suggests that those living in poverty and low income urban areas are socially and economically deprived (food insecure areas are usually socially and economically deprived as well). Within this deprived area, unemployment and poverty rates are high and concentrated in a relatively small confined area (similarly, unemployment and poverty are strongly connected to food insecurity) (Wilson, 1990). Social and economic deprivation results in social isolation that put local businesses, potential places of employment and other services that provide resources to the community at risk of closing.

Food insecurity research identifies underlying factors similar to Wilson's (1990) structural and poverty frameworks. For example, Morland and associates (2002) report that supermarkets in African American neighborhoods are limited and implies that certain structural disadvantages in African American neighborhoods such as unhealthy consumption patterns and transportation limitations are associated with higher levels of food insecurity. Zenk and colleagues (2005) find that distances between racially segregated poor areas and supermarkets are greater when compared to non-African American areas that are more affluent. Lastly, Larson and associates (2009) identified lowered availability of supermarkets in minority areas that suggest racial and ethnic disparities and food insecurities that are stratified by class.

The theoretical perspective on poverty and food insecurity is associated with the Maitland, Winter Park, and Eatonville communities by two capacities. The first capacity explains the structural limitation experienced by a suburban area. The second capacity links the neighborhood segregation to poverty and resources. Limitations existing from living at distance from a major city increase the prevalence of food insecurity for rural areas (Morton and Blanchard, 2007). Similarly, suburban communities are often some distance from major cities and the city's resources. However, as communicated in chapter three of this study, suburban communities such as the Maitland and Winter Park areas offer ample food retail sources. In contrast, suburban areas such as Eatonville suffer from structural dysfunction (the first capacity), social isolation (an element of the first capacity), and poverty (the second capacity). To connect the theory, the Eatonville community lacks supermarkets and grocery stores within the city limits (exhibiting social isolation), Eatonville is a racially segregated and lower income area (exhibiting poverty), and the nearby supermarkets are further in distance when compared to non-African American areas that are more affluent (i.e. comparing the Maitland and Winter Park suburban communities).

Methodologically, this dissertation integrates structural barriers through the measure of access to transportation. Economic deprivation is theoretically integrated by the measure of affordability and access to resources through socioeconomic status (i.e. income and employment). Below is an illustration of the elements of food insecurity that creates a food insecure household (See Figure 1).



**Figure 1: Theoretical Framework Illustration of Food Insecurity**

## Research Questions and Hypotheses

Based on the review of the literature and the theoretical frameworks this dissertation analyzes the following research questions and hypotheses:

1. Research Question 1:

In which community is food insecurity more prevalent?

Research Hypothesis 1:

There will be significant differences between the three communities; Eatonville will have higher levels of food insecurity when compared to Maitland and Winter Park communities.

2. Research Question 2:

To what extent are social factors (food consumption, transportation, poverty, unemployment) associated with food insecurity?

Research Hypothesis 2:

Low food consumption, poor transportation, poverty and unemployment, are more likely to be associated with higher levels of food insecurity.

3. Research Question 3:

Does the association between food consumption, transportation, poverty, unemployment) and food insecurity remain when controlling for self-reported overall health, education, marital status, and race)?

Research Hypothesis 3:

Good, very good, and excellent overall self-reported health, higher educational attainment, being married, and being White will have positive associations with food security.



## CHAPTER FIVE: DATA AND METHODS

### Data

The data used in this study comes from the Healthy Central Florida Initiative, collected by the Institute for Social and Behavioral Sciences at the University of Central Florida (UCF) for The Winter Park Health Foundation (Wright, Morgan, and Donley, 2011). The data are important for several reasons. First, the data were created to evaluate the health behaviors in three Central Florida communities in efforts to change and promote healthier behaviors. Second, these data allows for the measurement of national and local health initiatives and public health goals from Healthy People 2020 and the Healthy Central Florida Initiative. Namely, the contributions that extend from the goals of Healthy People 2020 includes: efforts to eliminate health disparities (Healthy People, 2012) and improving the health of Winter Park, Maitland, and Eatonville residents by promoting healthy eating habits, among other health behaviors (Winter Park Health Foundation, 2013). Third, the measures in the Healthy Central Florida Initiative allow for the measurement of food security, but specifically it allows for the investigation of health behaviors, social determinants of health, and food insecurities across three Florida suburban communities Maitland, Winter Park, and Eatonville.

Although the understanding of the specifics regarding food security and how people experience or identify as being food insecure is still underdeveloped, previous literature and data were used to develop definitions and validity of food security measurements. Specifically, Frongillo (1999) focused on validating the measures of food insecurity of the Current Population Survey. His results provided strong evidence of the validity of the measures. The results illustrate that the measures are constructed utilizing the knowledge and understanding of food security; the measures' performances are consistent,

dependable, and accurate when being used in national surveys at the group and individual levels (Frongillo, 1999). However, since 1999, the food insecurity literature has expanded to study different elements of food security, such as rural food insecurity and prevalence rate changes among different populations (Coleman- Jensen, A. and Nord, M. USDA, 2013). Many of the measures used by the Current Population Survey are also used by the USDA (Coleman- Jensen, A. and Nord, M. USDA, 2012). Therefore, although the area of food insecurity is still growing, over the last decade there have been some developments in methodology and research. To date the definitions and measures utilized in these surveys continue to be the standard in the area of food insecurity in urban areas.

The data used in this study, the Healthy Central Florida Initiative targets the non-institutionalized civilian population of the Maitland, Winter Park, and Eatonville communities. The total sample size is 955 individuals. This data set is ideal to better understand the effects of food insecurities, health outcomes, food choices, and structural barriers within these three communities. Specifically, the Healthy Central Florida Initiative dataset offers data on food consumption, health diagnoses such as heart disease, stroke, diabetes, high blood pressure, high cholesterol, and structural barriers such as access to and means of transportation. The USDA survey uses measures of food consumption that are similar to the questions in the Healthy Central Florida Initiative survey. The National Health and Nutrition Examination Survey measures health diagnoses such as heart disease, stroke, diabetes, high blood pressure, high cholesterol and are proven to be valid measures (Center for Disease Control and Prevention, 2012). In seeking to understand the consequences of food insecurities, this project specifically limits the sample only to those who are 18 years of age and older (the survey did not interview individuals under the age of 18 years of age).

## Survey Details

The Healthy Central Florida Initiative survey was completed as a computer assisted telephone survey (within the Maitland and Winter Park, FL areas) and was conducted through personal interviews (within the Eatonville, FL area). To implement the phone survey, the UCF Computer Assisted Telephone Interview (CATI) lab purchased landline phone numbers from the Survey Sampling, Incorporated (a national sampling firm). Eatonville phone numbers yielded very low computer assisted telephone surveys and was therefore supplemented by personal interviews. The table below shows the sample size and population for each community in the survey (non-representative sample). Weighting of the data was used to account for the unequal probability selection of the sample.

**Table 4: Community Sample and Population**

<b>Community</b>	<b>Sample Size</b>	<b>Population</b>
Winter Park	459	27,852
Maitland	325	15,751
Eatonville	128	2,159
Total	911	45,762

## Variables

In total, the “Healthy Central Florida” survey offered 29 questions and an elderly supplement for persons aged 60 and older. Approximately 479 participants were 60 years old and over and participated in the elderly supplement. This study uses about 12 of the measures to estimate predictors of food insecurity. The information regarding each variable used in this study follows.

## Dependent Variable

**Food Insecurity:** Food insecurity is measured by using two dependent variables to examine the different conceptual components of the food insecurity definition (defined by WHO) (World Health Organization, 2010). Specifically these components measure the adequate resources that allow the purchase of food for the supply of a healthy and nutritious diet and the appropriate knowledge of nutrition to sustain a healthy life (WHO, 2012). The survey asks a question, “In the last 12 months, 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?” This measure of food insecurity is used by the USDA to assess household food insecurity (Coleman-Jensen and Nord, Measurement, 2012). Responses are recoded to reflect (0) yes and (1) no responses.

Knowledge of nutrition is measured by the question, “What do you think is the recommended number of servings of fruits and vegetables that should be eaten every day?” Responses were originally measured in categories ranging from 0-14 servings daily, therefore this study uses this variable as a semi-continuous variable ranging from 0-14 (i.e. a variable beginning with 0 and having a non-infinite end point) . Comparisons between the two dependent variables are made to assess relationships across conceptual components.

## Independent Variables

Measures of food consumption (consumption of fruits and vegetables), structural barriers (transportation), income (poverty), and employment (unemployment).

**Food Consumption:** Food consumption is measured by intake of fruits and vegetables. This is the main factor that contributes to food insecurity (USDA, 2012). There were two variables that measures food consumption. The first measures the consumption of fruits or fruit juices consumed the

day prior to the survey, “About how many servings of fruits or fruit juices did you have yesterday”.

Responses were open ended and are coded as semi-continuous variables ranging from 0 to 8 servings.

The second measurement of food consumption measured the intake of vegetables, “About how many servings of vegetables did you have yesterday”. Responses were open ended and are coded as semi-continuous and ranged from 0 to 9 servings.

**Structural Barriers:** Structural barriers lead to inadequate access of food sources that impact diet behaviors (Horowitz et al., 2004; McEntee, 2009; Morland et al., 2002). The survey measures uses a proxy to measure structural barriers; method of transportation. In poor communities, transportation may act as a barrier contributing to increased food insecurity (Morland et al., 2002). Reliance on bicycles for transportation was used as a proxy for transportation structural barriers. Respondents were asked if they own a bicycle, if so, individuals were asked if they use the bicycle for recreation, transportation, or both. Original coding for this variable was as follows: (1) “recreation” (2) “transportation” (3) “both”. There were a total of 452 individuals who did not have a bicycle and did not answer this question. Therefore, to avoid having 452 missing cases, these cases were coded as a dummy variable; no bicycle transport (1) “do not own a bicycle or did not ride a bicycle for recreation, transportation, or both” (0) “use a bicycle for recreation and/or transportation”. Responses were then recoded into dummy variables: transportation dummy (0) “do not own a bicycle or did not ride a bicycle for recreation, transportation” (1) “use bicycle for recreation and/or transportation”. In addition, this measure is a limitation of the dataset because it is the only variable that measures transportation and does not allow for a complete measure of transportation (with the exclusion of a transportation variable that was used in the elderly supplement).

**Poverty:** Literature often connects socioeconomic status (i.e. poverty and unemployment) as a contributing factor of structural barriers through affordability and poor access to resources (Myers et al., 2004). For the purpose of this dissertation, poverty is measured as one of four factors that contribute to food insecurity. Annual family income was measured on a five-point scale, from (1) <\$25,000, (2) \$25,000-\$35,000, (3) \$35,000-\$50,000, (4) \$50,000-75,000, and (5) >\$75,000. Additionally, income was dummy coded for comparisons across income categories. Categories included the lower class (>\$25,000), working class (\$25,000-\$35,000), lower middle class (\$35,000-50,000), middle class (\$50,000-75,000), and the upper class (<\$75,000). The reference category was the upper class income category.

**Unemployment:** Unemployment has been reported as a stronger predictor of food insecurity than poverty (WHO, 2012). Employment was measured using the following categories; Full-time, part-time, unemployed, and other (house keeper, student, disabled, retired). The employment variable was dummy coded to make comparisons across groups (full-time and part-time being the reference group). Responses were coded (1) “employed” (0) “unemployed”.

### **Control Variables**

Measures of health outcomes (heart disease, stroke, diabetes, high blood pressure, high cholesterol), education, marital status, race, and age.

**Overall Health:** Food insecurities may contribute to unfavorable health and diet-related outcomes (Beaulac et al., 2009). Therefore, the study controls for respondent’s self- health status. Respondents answered whether they rated their health as (1) excellent, (2) very good, (3) good, (4) fair, (5) poor. Overall health was dummy coded for comparison measures between groups. A recent study comparing four large national data sets showed that trends in self-rated health have changed over time. Specifically, dichotomizing self-rated health into excellent versus the other categories results in more

stable and reliable estimates of population health (Salomon et al. 2009). Dichotomizing the variable was used to compare across groups of self-rated health categories of (1) excellent health, very good health, and good health (0) fair health and poor health.

**Sociodemographics and Controls:** Educational attainment was measured in years from 0 to 20. Marital status was measured using six categories; married, living with partner, widowed, divorced, separated, and single. Marital status was dummy coded measuring (0) not married and (1) married. Original categories for race included (1) American Indian or Alaskan Native, (2) Asian, (3) Black or African American, (4) Native Hawaiian or Other Pacific Islander, or (5) White. This project recoded race into three categories of race, (0) Whites (1) Blacks and (2) Other. Race was dummy coded for comparison across groups, comparing Whites, Blacks and Others. Age was measured in years and ranged from 18-96 years.

## Methods

Three models are used to test the research questions. The first model measures: In which community food insecurity is more prevalent. The second model investigates the extent of the association between social factors such as food consumption, structural barriers, income, and employment and food insecurity. The third model investigates if the association between social factors and food insecurity remain when controlling for self-reported overall health, education, marital status and race? Each model was compared varying for communities (i.e. Maitland and Winter Park compared to Eatonville). There were two dependent variables, one measuring the knowledge of recommended number of servings of fruits and vegetables that should be consumed daily and the other measuring if individuals skipped meals or cut the size of meals as a result of low income.

To estimate the effects of community, social factors, and control variables on food insecurity based on the food insecurity component (having the availability of quality food that is sufficient for the entire household), whether or not one skips meals because there is not enough money is used. I estimated a binary logistic regression using this variable. A binary logistic regression was used because the analysis uses a dependent variable that is dichotomous (having two responses), such as “In the last 12 months, 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” responses were (0) yes and (1) no. Thus, here the models measures the odds of one not skipping meals because of limited financial resources based on the residential community one resides, social factors, and control variables such as educational attainment, marital status, and race. To assess the contribution of the predictors within the three models the Wald statistic was examined to assess the significance. Additionally, z-scores were used to assess the significance of the individual independent variables.

To estimate the effects of community, social factors, and control variables on food insecurity based on the food insecurity component (knowledge of nutrition), knowledge of recommended number of servings of fruits and vegetables that should be consumed daily was used in the prediction of an Ordinary Least- Squares regression (OLS). The ordinary least squares regression was chosen because it measures the relationship between a continuous dependent variable (in this case, the variable measures what the respondent thinks is the recommended number of servings of fruits and vegetables that should be eaten every day?” responses were measured ranging from 0-14 servings daily), various explanatory variables (i.e. the social factors), and the control variables based on the best fit line. Nested models were used to reflect the outcome of the OLS regression, finding the best model fit. Predicting the effects of community, social factors, and control variables on food insecurity based on the food insecurity component, knowledge of nutrition, using OLS can be assessed in the significance of the F- statistic.



In addition to the models used to test the research questions and hypotheses, models (models 4-6) were estimated to measure the outcomes of food insecurity, using a different approach. Specifically, the order of the models were rearranged such that model four tests the association between the control variables (controlling for self-reported overall health, education, marital status and race) and food insecurity. Model five tests the social factors (food consumption, structural barriers, income, and employment) influences on food insecurity. Lastly, model six adds the influence of community. A nested model was used to predict the effects of food insecurities. This was completed to see if the influence of the community, social factors, and control variables would be different. In these models, income was used as a dummy variable so there would be a comparison measure in the categories of income (to see if the significance of income would change).

The number of missing cases for variables such as income was 5 percent and did not pose a problem. Investigation of missing cases did not suggest any patterns. Patterns include missing completely at random (MCAR), missing at random (MAR), and missing not at random (NMAR). Missing cases were investigated by using the “misstable” command in Stata, among other investigation tools.

To deal with missing values, this project uses listwise deletion (and used in a regression). This method excludes data with missing cases. The values that are missing not at random, such as the respondents that did not answer the income question in the survey would be excluded after using listwise deletion. The listwise deletion was used in comparison to other methods such as imputation and pairwise deletion because listwise deletion was the least biased method (when compared to imputation and pairwise deletion). Additionally, replacing the missing data with substituted values was not appropriate with a sample size of 955 (number of observations in the weighted data). Thereafter, this project estimates a binary logistic regression which yielded 633 cases. Although, this is a large “bias”, listwise deletion was the most appropriate method. A nested model is used to predict those who skip

meals as a result of financial hardship. The OLS Linear regressions yielded 633 cases. The Healthy Central Florida Initiative data weights data by community to correct distributions in the sample to approximate the population.

## CHAPTER SIX: UNIVARIATE AND BIVARIATE ANALYSIS RESULTS

### Univariate Analyses (Table 4)

#### **Dependent Variables**

**Food Insecurity:** Food insecurity is measured using the following survey question; “In the last 12 months, 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?” With a mean of .07, it seems most of the sample do not skip meals because there was not enough money. Knowledge of nutrition is measured by the question, “What do you think is the recommended number of servings of fruits and vegetables that should be eaten every day?” With a mean of 4.56, it seems the overall sample has a fair foundation of knowledge of the amounts of fruits and vegetables that are recommended for daily consumption. This is similar to the 2 daily recommended servings of fruits and 3 servings of vegetables by the US Department of Health and Human Services Dietary Guidelines for Americans (Morland et al., 2002). The recommended number of servings of fruits and vegetables’ distribution has a skewness of .67 and a kurtosis of 4.22, which is very close to normal.

**Food Consumption:** Food consumption is measured by consumption of fruits and vegetables. The measurement of food consumption measuring fruits’ distribution has a skewness of .68 and a kurtosis of 4.09, which is very close to normal. This variable has a mean of 2.12, which is very close to the amounts recommended by the CDC. The recommended serving size for fruits is 2 servings per day (Morland et al., 2002). The measurement of food consumption measuring vegetables’ distribution has a skewness of .95 and a kurtosis of 5.16 which is very close to normal. The mean is 2.16, which is very

close to the recommended daily consumption. Guidelines recommended servings of vegetables are 3 servings daily (Morland et al., 2002).

## **Independent Variables**

**Structural Barriers:** The structural barrier variable uses transportation methods as a proxy measurement. Overall, the sample appears to not use bicycles for transportation. Approximately, 90 percent of the sample do not own a bicycle or do not ride a bicycle for recreation or transportation. About 10 percent (9.65%) of the sample uses a bicycle for recreation and/or transportation.

**Income:** Proportions of income are as follows: 16 percent earn less than \$25,000, 13 percent earn between \$25,000 to \$35,000, 16 percent earn between \$35,001 and \$50,000, 16 percent earn between \$50,000 and \$75,000, and 33 percent earn more than \$75,000. However, the mean of the variable is 3.56, reflecting that the average respondent has an annual income between \$35,000-\$50,000. The distribution is very close to normal, skewness of -.05 and kurtosis of 2.15.

**Unemployment:** Employment was measured using the following categories; Full-time, part time, unemployed, and other (house keeper, student, disabled, retired). The employment variable will be dummy coded to make comparisons across groups that are either employed or unemployed (full-time and part-time being the reference group). Responses were coded (1) “employed” (0) “unemployed”. The distribution of the sample was skewed as many of the individuals that participated in the survey were older (median age is 61). Thus, the majority of the population was not working, only 42 percent of the sample worked either full-time or part-time. The skewness was .33, the kurtosis was 1.11.

**Sociodemographic and Control Variables:** Control variables measure health outcomes, education, marital status, race, and age. About 20 percent of the sample report having excellent health,

40 percent report having very good health, 26 percent report having good health, and about 10 percent report fair health.

Educational attainment was measured in years. The sample seems to be well educated, 15 years of education was the mean (between an associate's degree and a bachelor's degree). Marital status was measured using six categories; married, living with partner, widowed, divorced, separated, and single. Marital status was dummy coded measuring (0) not married and (1) married. About half of the sample is married (mean of .51). Original categories for race included (1) American Indian or Alaskan Native (.21%), (2) Asian (.52%), (3) Black or African American (16%), (4) Native Hawaiian or Other Pacific Islander(4%), or (5) White (79%). This project recoded race into three categories of race, (0) Whites (1) Blacks and (2) Other. Race was often dummy coded for comparison across groups, comparing Whites, Blacks and Others. Proportions of the racial categories include; Whites 80 percent, Blacks 16 percent, and others (including American Indian or Alaskan Native, Asian, Native Hawaiian or Other Pacific Islander) 4 percent. The mean for age in this sample (using unweighted data) is about 61 years old.

**Table 5: Table of Descriptives for Variables used in Models 1-3 (N=911)**

	<i>Mean</i>	<i>SD</i>	<i>Range</i>	<i>Description</i>
<u><i>Dependent Variables</i></u>				
Skip Meals	.07	.25	0-1	0=No, 1=Yes
Recommended Number Fruits and Vegetables	4.56	1.99	0-14	0= No servings should be consumed daily, 14= 14 servings to be consumed daily
<u><i>Independent Variables</i></u>				
Food Consumption				
Ate Fruits (0-8)	2.12	1.39	0-8	0=No fruits consumed, 8 servings of fruits
Ate Vegetables (0-9)	2.16	1.37	0-9	consumed. 0=No fruits consumed, 9 servings of fruits consumed
Transportation (Bicycle Use)				
No Bicycle, No Use	9.65%	.30	0-1	0=No bike, no use
	90%			1= Use bike for recreation and transport
Income				
<\$25,000	16.08%	1.49	1-5	1= <\$25,000
\$25,000-35,000	13.38%			2= \$25,000-35,000
\$35,001- 50,000	16.35%			3= \$35,001- 50,000
\$50,001-75,000	16.35%			4= \$50,001-75,000
>\$75,001	32.84%			5= >\$75,001
Employed	.41		0-1	0=Unemployed 1= Employed
<u><i>Control Variables</i></u>				
Educational Attainment^ (11-20)	15	2.48	11-20 years	11=Less than High School 12= High School Graduate 13= Some College 14=AA Degree 16= College Degree 18= Master's Degree 20= Doctoral Degree/ Professional degree
Married	.51	1.58	0-1	0= Not Married 1=Married
Race				
White	79.56%			0=White
Black	16.10%			1=Black
Other	4.34%			2=Other
General Health				
Excellent/Very Good/Good	87.50%	.33	0-1	0=Fair, Poor Health
Fair/Poor	12.50%			1=Excellent, very good, good Health
Age	60.65years	17.18	18-96	18-96 years of age
Male	39.69%	.49	0-1	0=female 1=male

^Educational Attainment is measure in years  
Using Unweighted Data

**Table 6: Table of Descriptives for Variables used in Models 1-3 Using Weighted Data (N=955)**

	<i>Mean</i>	<i>SD</i>	<i>Range</i>	<i>Description</i>
<u><i>Dependent Variables</i></u>				
Skip Meals	.07	.25	0-1	0=No, 1=Yes
Recommended Number Fruits and Vegetables	2.91	1.23	0-6	0= No servings should be consumed daily, 6= 6 servings to be consumed daily
<u><i>Independent Variables</i></u>				
Food Consumption				
Ate Fruits (0-8)	2.12	1.39	0-8	0=No fruits consumed, 8 servings of fruits consumed.
Ate Vegetables (0-9)	2.16	1.37	0-9	0=No fruits consumed, 9 servings of fruits consumed
Transportation (Bicycle Use)				
No Bicycle, No Use	9.65%	.30	0-1	0=No bike, no use 1= Use bike for recreation and transport
No Bicycle, No Use	90%			
Income				
<\$25,000	16.93%	1.49	1-5	1= <\$25,000
\$25,000-35,000	14.08%			2= \$25,000-35,000
\$35,001- 50,000	17.21%			3= \$35,001- 50,000
\$50,001-75,000	17.21%			4= \$50,001-75,000
>\$75,001	34.57%			5= >\$75,001
Employed				
Unemployed	28.98%	.45	0-1	0=Unemployed 1= Employed
Unemployed	18.02%	.38	0-1	0=Employed 1=Unemployed
Retired	39.52%	.49	0-1	0=Employed 1=Retired
<u><i>Control Variables</i></u>				
Educational Attainment^ (11-20)	15	2.48	11-20 years	11=Less than High School 12= High School Graduate 13= Some College 14=AA Degree 16= College Degree 18= Master's Degree 20= Doctoral Degree/ Professional degree
Married	.51	.50	0-1	0= Not Married 1=Married
Race				
White	79.56%			0=White
Black	16.10%			1=Black
Other	4.34%			2=Other
General Health				
Excellent/Very Good/Good	87.50%	.33	0-1	0=Fair, Poor Health 1=Excellent, very good, good Health
Fair/Poor	12.50%			
Age				
Age	60.65years	17.18	18-96	18-96 years of age
Male				
Male	39.69%	.49	0-1	0=female 1=male

^Educational Attainment is measure in years  
Using Weighted Data

## Bivariate Analyses

Correlations, ANOVA, chi-squared, and t-tests analyses are used to test the relationships and associations between the study variables. Below are sections that discuss each analysis and the justifications behind why the specific analyses were completed.

### **Correlations (Table 5)**

This dissertation tested the degree of the relationships between two continuous or semi-continuous variables. Correlations between the following variables education and income, age and knowledge of recommended number of servings of fruits and vegetables that are believed by the participant to be consumed daily were completed. Correlations test whether the direction of the relationship is positive or negative. Additionally, correlations values between the values of -1.0 and 1.0. The closer the r value is to the value of 1, the stronger the relationships between the variables.

The first correlation assessed the relationship between educational attainment and family income. Educational attainment was measured and coded in years; therefore it was used as a continuous variable. Income was measured in dollars (thousands) and was used as a continuous variable. The results ( $r=.41$ ,  $p<.001$ ) indicate a positive relation between education and income. This result suggests that those with higher educational attainment tend to have higher incomes.

The second correlation tested the relationship between age and the knowledge of recommended number of servings of fruits and vegetables that are believed by the participant to be consumed daily. Age was measured in years and was used as a continuous variable. The variable measuring the knowledge of recommended number of servings of fruits and vegetables that are



believed by the participant to be consumed daily was used as a semi-continuous variable and measuring the number/ count of servings that should be consumed daily (from 0-14). There are many reasons behind why this analysis is important; as age increases, general knowledge increases; and social services provides prepared meals to some elderly and they may have other services that counsels on a balanced meal. The significant correlation coefficient ( $r=.08$ ,  $p<.05$ ) indicates that age and the knowledge of recommended number of servings of fruits and vegetables that should be consumed daily are positively related. This suggests that older people tend to have more knowledge of recommended daily servings of fruits and vegetables.

The third correlation tests the relationship between educational attainment and food consumption of vegetable intake. Educational attainment was measured and coded in years; therefore it was used as a continuous variable. Food consumption was measured by consumption of vegetables and was used as a semi-continuous variable ranging from 0-9 servings daily. This correlation is important to test as previous research suggests that more educational attainment is associated with increased knowledge about nutrition and suggested food intake (Kushi et al., 1988). Results ( $r=.17$ ,  $p<.001$ ) suggest that as educational attainment increases, the consumption of servings of vegetable intake increases.

The four correlation tests the relationship between educational attainment and food consumption of fruit intake. Food consumption was measured by consumption of fruits and was used as a semi-continuous variable ranging from 0-8 servings daily. The significant correlation coefficient ( $r=.13$ ,  $p<.001$ ) indicates a weak and positive relationship. Results suggest that as educational attainment increases, the consumption of servings of fruits increases.

The fifth correlation tests the relationship between educational attainment and knowledge of recommended number of servings of fruits and vegetables. Knowledge of recommended number of servings of fruits and vegetables that are believed by the participant to be consumed daily was used as a semi-continuous variable and measuring the number/ count of servings that should be consumed daily

(from 0-14). Scholars have suggested that greater educational attainment is associated with the consumption of fruit and vegetables (Zenk et al., 2005). Therefore, this relationship tests the degree of this relationship. The significant coefficient ( $r=.09$ ,  $p<.01$ ) indicates a weak and positive relationship. Results suggest that as education increases, knowledge of recommended number of servings of fruits and vegetables increase.

The sixth correlation tests the relationship between the respondent's age and family income. The variable measuring age was measured in years and was used as a continuous variable. Income was measured in dollars (thousands) and was used as a continuous variable. In general, as age increases, income may also increase. Interestingly, the coefficient ( $-.0002$ ) indicates a non-significant relationship between age and income. This might be a consequence of the age distribution of the sample (mean age=60.65 years).

The seventh correlation tests the relationship between the respondent's family income (measured in thousands of dollars) and knowledge of recommended number of servings of fruits and vegetables that are believed by the participant to be consumed daily. This variable was used as a semi-continuous variable and measured the number/ count of servings that should be consumed daily (from 0-14). Justification behind this examination is such that as income increases, the knowledge of recommended number of servings of fruits and vegetables also increases. A significant coefficient ( $r=.11$ ,  $p<.01$ ) suggests a weak and positive relationship. Thus, as income increases, knowledge of dietary guidelines increases.

The eighth correlation tests the relationship between family income and the consumption of vegetables. The consumption of vegetables was measured in the counting of servings that should be consumed daily (from 0-9). Past research suggest that people with higher incomes consumes more vegetables when compared to those with lower incomes (Zenk et al., 2005). The significant coefficient

( $r=.15$ ,  $p<.001$ ) suggests a weak and positive relationship. Therefore, as income increases knowledge about nutrition and the consumption of vegetables increases.

The ninth correlation examines the relationship between family income and food consumption (the consumption of fruits). Food consumption was measured in the counting of servings that should be consumed daily (from 0-8). Past research suggests that those with higher incomes consume more fruits (Zenk et al., 2005). The coefficient ( $r=.06$ ,  $p>.05$ ) suggests a non-significant relationship.

The tenth correlation examines the relationship between the age of the respondent and food consumption (the consumption of vegetables). Age of the respondent ranged from 18-96 years old. Food consumption was measured in the counting of servings that should be consumed daily (from 0-9). The relationship was not significant ( $r=.04$ ,  $p>.05$ ).

The eleventh correlation examines the relationship between the knowledge of recommended number of servings of fruits and vegetables and food consumption (the consumption of vegetables). A significant coefficient ( $r=.16$ ,  $p<.001$ ) suggests a weak and positive relationship. Therefore, more knowledge about dietary guidelines regarding fruits and vegetables is associated with higher consumption of vegetables.

The twelfth correlation examines the relationship between the knowledge of recommended number of servings of fruits and vegetables and food consumption (the consumption of fruits). A significant coefficient ( $r=.15$ ,  $p<.001$ ) suggests a weak and positive relationship suggesting that the more knowledgeable individuals are about dietary guidelines regarding fruits and vegetables the higher the consumption of fruits.

The final correlation examines the relationship between the food consumption variable measuring consumption of fruits and the food consumption variable (consumption of vegetables). A significant coefficient ( $r=.27$ ,  $p<.001$ ) suggests a weak and positive relationship between the two

variables. In other words, higher consumption of fruits is associated with higher consumption of vegetables.

**Table 7: Correlation Matrix Table. Relationships between food insecurity predictors**

<b>Variable</b>	Educational Attainment (11-20 years)	Income <sup>^</sup>	Age (years)	Knowledge of recommended Number Fruits and Vegetables (0-14)	Food Consumption of Vegetables (0-9)
Educational Attainment (11-20 years)					
Income <sup>^</sup>	.41*** (N=737)				
Age (years)	.05 (N=912)	.000 (N=727)			
Knowledge of Recommended Number Fruits and Vegetables (0-14)	.09** (N=949)	.11** (N=740)	.08* (N=916)		
Food Consumption of Vegetables (0-9)	.17*** (N=942)	.15*** (N=735)	.04 (N=909)	.16*** (N=948)	
Food Consumption of Fruit (0-8)	.13*** (N=941)	.06 (N=733)	.07* (N=909)	.15*** (N=947)	.27*** (N=946)

Data Source: The Winter Park Health Foundation

\*p<.05

\*\*p<.01

\*\*\*p<.001

<sup>^</sup> Measured in thousands of dollars

## **ANOVA (Table 6)**

This dissertation tested for significant differences between means between variables that were coded as categorical variables and continuous or semi-continuous variables. Using the ANOVA tests (Table 6), there is a comparison of the variance due to the between-groups variability (the Mean Square Effect,) with the within-group variability (called Mean Square Error). Under the null hypothesis, the variance estimated based on within-group variability should be about the same as the variance due to between-groups variability. Comparisons of the two estimates of variance were completed using the F test (or the F Distribution or F statistic), tests whether the ratio of the two variance estimates is significantly greater than 1 (Statsoft, 2012).

ANOVA analyses were completed using the following variables: educational attainment, age, knowledge of recommended number of servings of fruits and vegetables that are believed by the participant to be consumed daily, food consumption (servings of fruits), food consumption (servings of vegetables), race, transportation, general health, income, marital status, educational attainment, and employment status.

Hanson and colleagues (2007) suggest that “food insecurity was related to a greater likelihood of obesity among married women, those living with partners, and widows, when compared with never-married women” when comparing the data using a national representative sample (pp. 1460). Therefore, this dissertation sought to determine whether skipping meals because of financial hardship differed according to marital status. Skip meals was coded as a dichotomous variable, reflecting (1) Yes, the respondents skipped meals (0) No, did not skip meals. Marital status was measured using five categories; married, living with partner, widowed, divorced or separated, and single. A oneway analysis of variance yields a significant F-statistic ( $F=16.72$ ;  $p<.001$ ) indicating that there is a difference in means between groups for marital status and those who skip meals because there was not enough money for

food. The group with the highest mean (those who skip meals) were those who were separated or divorced.

Past research suggests that food insecurity limits the variety of foods that are available which often results in consumption of high energy, low cost foods, that does not include fruits and vegetables (Adams, Grummer-Strawn, Chavez; 2003). To determine whether skipping meals because of financial hardship differed according to one's food consumption patterns, specifically the consumption of fruits and vegetables, a oneway analysis of variance was tested. The results revealed a non- significant F-statistic ( $F=2.19$ ;  $p=.14$ ) indicating that there is no difference in means between groups of those who skipped meals because there wasn't enough money for food and those who did not skip meals among the number of fruits the respondent ate yesterday. A oneway analysis of variance yields a significant F-statistic ( $F=2.71$ ;  $p=.10$ ) indicating that there is not a significance difference in means between groups of those who skipped meals because there wasn't enough money for food and those who did not skip meals among the number of vegetables the respondent ate yesterday.

Past research reports that income is a strong predictor of food access (Carraher, Dixon, Lang, Carr-Hill, 1998). A oneway analysis of variance between income and the consumption of vegetables. yields a significant F-statistic ( $F=6.56$ ;  $p<.001$ ) indicating that those with higher incomes consume more servings of vegetables. The average serving of vegetables for those who earn less than \$25,000 is 1.70 servings of vegetables while the average servings of vegetables for those earning more than \$75,000 per year is 2.40 servings of vegetables. Using the Bonferroni test, the mean vegetable consumption for those with an income more than \$75,000 is statistically significantly different from the mean vegetable consumption for those with less than \$25,000 income ( $p<.001$ ). Similarly, a oneway analysis of variance between income and the consumption of fruits yields a significant F-statistic ( $F=3.12$ ,  $p<.01$ ) indicating that those with higher incomes consume more servings of fruits. The average serving of fruits for those

who earn less than \$25,000 is 1.75 servings of fruits while the average servings of fruits for those earning more than \$75,000 per year is 2.28 servings of fruits. Using the Bonferroni test, the mean fruit consumption for those with an income more than \$75,000 is statistically significantly different from the mean fruit consumption for those with less than \$25,000 income ( $p < .05$ ).

Baker and colleagues (2006) suggests that access to health food choices differs by race, specifically; “mixed-race or white high-poverty areas and all African American areas (regardless of income) were less likely than predominantly white higher-income communities to have access to foods that enable individuals to make healthy choices” (pp.1). A oneway analysis of variance between race and serving of vegetables consumed yields a significant F-statistic ( $F=5.91$ ,  $p < .001$ ) indicating that some racial categories consume more vegetables when compared to other races. The average serving of vegetables for those who categorized themselves as white consumed more vegetables (2.28 servings) when compared to Asians (2), Blacks (1.68), and Others (1.71). Using the Bonferroni test, the mean vegetable consumption is statistically different between blacks and whites ( $p < .001$ ).

Howard and associates investigated relationships between nutritional knowledge, attitudes and beliefs, and dietary adequacy of the elderly and reports that race is negatively associated with dietary intake (Howard et al., 1998). Therefore, the examination of whether racial categories differed when compared to the knowledge of the recommended number of servings of fruits and vegetables per day was completed using a oneway analysis of variance. A oneway analysis of variance yields a significant F-statistic ( $F=2.66$ ,  $p < .05$ ) indicating that some racial categories differ by knowledge of the recommended number of servings of fruits and vegetables per day differs when compared to other racial categories. The average belief of the recommended number of servings of fruits and vegetables highest for Whites (2.99), and lower for all other racial groups Blacks (2.68), Asians (2.6), Native Hawaiian (2.5), other

(2.47). Using the Bonferroni test, the mean belief of recommended number of servings of fruits and vegetables per day is statistically different between Blacks and Whites ( $p < .10$ ).

Lee and Frongillo (2001) compared food-insecure and food secure elderly person's dietary intake, nutritional status, and health status. Results suggest that food insecure individuals have poorer dietary intake, nutritional status, and health status than food-secure elderly individuals (Lee and Frongillo, 2001). A oneway analysis of variance determines whether self-reported health status differed when compared to food consumption (vegetables) yields a significant F-statistic ( $F=7.72$ ,  $p < .001$ ) indicating that those who report being in better health consumes more vegetables when compared to those who report poorer health statuses. The average vegetable consumption for the self-reported health status for those with excellent health is 2.41 servings of vegetables while those who reported very good health is 2.27, good health 1.99 servings of vegetables, and those who report fair or poor health is 1.76 servings. Thus, as health decreases, so does the reported consumption of vegetable intake. Using the Bonferroni test, the mean vegetable consumption is statistically different between those who reported excellent health and poor health ( $p < .001$ ), those who reported very good health and poor health ( $p < .01$ ), and those who reported excellent health and very good health ( $p < .01$ ), and very good health and good health ( $p < .10$ ). An examination determining whether self-reported health status differs according to the consumption of fruits was completed using a oneway analysis of variance. A oneway analysis of variance yields a significant F-statistic ( $F=2.38$ ,  $p < .10$ ) indicating that some who report being in better health consume more fruits when compared to those who report poorer health statuses. The average fruit consumption for the self-reported health status for those with excellent health is 2.32 servings of fruits while those who reported very good health is 2.14, good health 2.00 servings of vegetables, and those who report fair or poor health is 1.97 servings. The Bonferroni test did not show any significance between the means between health status groups.



Barker and associates (2008) conducted a report on women's educational attainment and food consumption. It was found that the lower the educational attainment, the lower the consumption of vegetables and fruits (Barker et al., 2008). A oneway analysis of variance determines whether educational attainment differs according to the consumption of vegetables yields a significant F-statistic ( $F=4.12$ ,  $p<.001$ ) indicating that those with higher educational attainment consumes more vegetables. The average self-report consumption of vegetables is 2.62 servings for those with a Ph.D/professional degree while the average self-reported consumption of vegetables is 1.57 for those with less than a high school educational attainment. Using the Bonferroni test, the mean vegetable consumption is statistically different between those with a Bachelor's Degree and High School graduate ( $p<.10$ ), Master's Degree and High School graduate ( $p<.001$ ), and Ph.D and High School Graduate ( $p<.01$ ).

A oneway analysis of variance testing whether educational attainment differs according to the consumption of fruit yield a significant F-statistic ( $F=3.88$ ,  $p<.001$ ) indicating that those with higher educational attainment consumes more fruits. The average self-report consumption of vegetables is 2.17 servings for those with a Ph.D/professional degree while the average self-reported consumption of fruits is 1.93 for those with less than a high school educational attainment. Using a Bonferroni test, the mean fruit consumption is statistically different between some college and high school diploma ( $p<.10$ ), bachelor's degree and high school diploma ( $p<.001$ ), Master's degree and high school diploma ( $p<.01$ ).

Past research discusses transportation and the limited access of foods in low income areas and its effects on food consumption (Bodor et al., 2006). An examination of whether transportation differs according to the consumption of vegetables was completed by using a oneway analysis of variance ( $F=2.67$ ,  $p<.05$ ). The results indicate that there is a difference between type of transportation methods and vegetable consumption. The average self-reported consumption of vegetables is lowest for those who use a bicycle for transportation (2 servings of vegetables), for those who use a bicycle for recreation

only 2.34 servings of vegetables, for those who do not have a bicycle or don't not use a bicycle for transport or recreation 2.07, and for those who use a bicycle for both recreation and transport 2.24 servings. A Bonferroni test, the mean vegetable consumption is statistically different between don't have a bike or no and those who use a bicycle for recreation ( $p < .05$ ).

Determining whether transportation methods differ according to fruit consumption was completed using an ANOVA. Past research discusses how limited access has negative effects on the purchase of healthy foods such as fruits and vegetables (Zenk et al., 2005). A oneway analysis of variance yields a significant F-statistic ( $F=2.93$ ,  $p < .05$ ) indicating that there is a difference between transportation methods and fruit consumption. The average self-reported consumption of fruits is lowest for those who use a bicycle for transportation (2 servings of fruits), for those who use a bicycle for transportation they consume 1.78, for those who don't have a bicycle or don't not use a bicycle for transport consumes 2.04, highest for those who use a bicycle for recreation 2.31, and for those who uses a bicycle for transport and recreation is 2.22 servings. A Bonferroni test, the mean fruit consumption is statistically different between don't have a bike or no and those who use a bicycle for recreation ( $p < .05$ ).

Riediger and colleagues (2008) explores patterns of fruit and vegetable consumption among the elderly. Findings suggest that marital status is a positive predictor of fruit and vegetable consumption (Reidiger et al., 2008). This dissertation determines whether vegetable consumption differs according to marital status. A oneway analysis of variance yields a significant F-statistic ( $F=3.22$ ,  $p < .05$ ) indicating that there is a difference between marital status and vegetable consumption. The means reflect that those who are single consume the least amount of vegetables. Using a Bonferroni test, the mean vegetable is statistically different between those who are single and those who are married ( $p < .05$ ).

A oneway analysis of variance yields a significant F-statistic ( $F=5.86$ ,  $p<.001$ ) indicating that there is a difference between the knowledge behind the recommended number of fruits and vegetables and how many servings of fruits and vegetables the respondent reported consuming. Using a Bonferroni test, the mean difference between the knowledge behind the recommended number of fruits and vegetables and those who responded "I don't know" were statistically different ( $p<.001$ ) with servings 0-3, ( $p<.01$ ) serving 4 and 6, ( $p<.05$ ) serving 5, ( $p<.10$ ) serving 7. Furthermore, a oneway analysis of variance yields a significant F-statistic ( $F=4.14$ ,  $p<.01$ ) indicating that there is a difference between employment status and the consumption of vegetables. The means suggests that those who are employed (2.28 for full-time, 2.34 for part-time) consume more vegetables when compared to those who are unemployed (1.71), with the exception of those who are retired (2.19).

Finally, a oneway analysis to test whether employment status differs according to the consumption of fruits yields a significant difference ( $F=2.01$ ,  $p<.10$ ) indicating there is a difference between employment status and the consumption of fruits. The means suggest that those who are employed full time, part time, and retired consume more fruits when compared to those who are unemployed.

**Table 8: Significant Relationships Identified by ANOVA Analyses**

<i>Variables</i>	<b>Mean</b>	<b>F</b>
Skip Meals (0-1)	2.40	16.72***
	2.12	2.19
	2.16	2.71
Recommended Number of Fruits and Vegetables (0-14)	2.91	5.86***
Food Consumption		
Ate Fruits (0-8)		
Ate Vegetables (0-9)	2.11	6.56***
Transportation (Bicycle Use)	2.18	2.67*
	2.16	2.93*
No Bicycle, No Use		
Income^^	2.08	3.12**
Employed	2.16	4.14**
	2.12	2.01^
Educational Attainment	2.16	4.12***
(11-20)	2.12	3.88***
Married	2.16	3.22*
Race	2.16	5.91***
White, Black, Other	2.91	2.66*
General Health	2.16	7.72***
Excellent/Very Good/Good		
Fair/Poor		

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Data Source: The Winter Park Health Foundation

^p<.10

\*p<.05

\*\*p<.01

\*\*\*p<.001

^^ Measured in thousands of dollars

## Chi-Squared (Table 8)

Bivariate analyses were completed using a Chi Squared test for relationships between variables. Chi squared test relationships between two dichotomous variables, a dichotomous and a categorical variable, and two categorical variables. Researchers often use chi-squared analyses to compare the observed versus expected data. The Cramer's V post hoc test was used in the following analyses to measure the strength of the association. Cramer's V scores suggest the following; a score less than .10 indicate a weak association, a score between .11 and .30 yields a moderate association, and a score greater than .30 a strong association. Below are sections that discuss each analysis that were completed.

Table 8 compares the relationships between predictors of food insecurity utilizing chi square and t-test analyses. The results from the chi square analysis indicate differences in those who skip meals and race ( $\chi^2 = 36.43$ ,  $p < .001$ , Cramer's  $V = .19$ ), therefore Whites and Blacks are more likely to skip meals compared to other race groups. A significant Chi-Square ( $\chi^2 = 20.21$ ,  $p < .001$ ) suggests that there is a moderate association (Cramer's  $V = .15$ ) between race (being black) and skipping meals because there was not enough money for food. Additionally, this project examines the relationship between race (being white) and food insecurity (skipping meals). A significant Chi-Square ( $\chi^2 = 30.65$ ,  $p < .001$ ) suggests that there is a moderate association (Cramer's  $V = .18$ ) between race (being white) and skipping meals because there was not enough money for food. The results from a chi square analysis also indicate differences in race and the recommended daily serving of fruits and vegetables ( $\chi^2 = 53.53$ ,  $p < .001$ , Cramer's  $V = .11$ ).

A significant chi-squared ( $\chi^2 = 14.38$ ,  $p < .001$ ) suggests that there is a relationship between transportation methods and individuals who report skipping meals because of low financial resources. The Cramer's V post hoc test score (.13) indicates a moderate association. This project also examines the

relationship between those in poverty and those who report skipping meals because of low financial resources. A significant chi-squared ( $\chi^2=40.88$ ,  $p<.001$ ) suggests that there is a relationship between living in poverty or not and individuals who report skipping meals because of low financial resources. The Cramer's V suggests a moderate association (Cramer's  $V=.24$ ).

Mello and associates provided research on low income and ethnically diverse households because research has found that food insecurity is prevalent in low income neighborhoods (2010). Therefore, results from a chi squared analyses examining the relationship between neighborhood residence and skipping meals because of financial hardship was completed. A significant chi-squared ( $\chi^2=9.55$ ,  $p<.01$ ) suggests that there is a relationship between living in Winter Park, Maitland or Eatonville and those who report skipping meals because of low financial resources. The Cramer's V suggests a weak association (.10). The cross tabulations suggests that there are fewer individuals in Eatonville reporting skipping meals.

It is generalized that healthy individuals partake in health behaviors. Hence, this project investigates the relationship between one's general health and the aspect of food insecurity measuring skipping meals resulting from low finances. Findings from a chi-square analysis indicate that there is a relationship between one's general health and skipping meals because of low finances ( $\chi^2=10.29$ ,  $p<.05$ , Cramer's  $V, .10$ ). A larger proportion of individuals who reported fair and poor health also report skipping meals because of low financial resources.

Access to healthy foods and neighborhood location are imperative to food security (Zenk et al., 2005). Significant Chi-Square ( $\chi^2=31.11$ ,  $p<.001$ ) suggest that there is a difference between Eatonville residents and Maitland/Winter Park residents and using a bike for transportation. Cramer's V suggests a moderate association (Cramer's  $V=.19$ ).

This project investigates the relationship between one's general health and neighborhood affiliation. A significant Chi-Square ( $\chi^2=18.92$ ,  $p<.001$ ) suggests that there is a difference between Eatonville residents and Maitland/Winter Park residents and those who report poor health. Cramer's V value of .14 suggests a moderate association. Additionally, the relationship was measured between those report very good health and living in the Eatonville area. A significant Chi-Square ( $\chi^2=15.56$ ,  $p<.001$ ) suggests that there is a difference between Eatonville residents and Maitland/Winter Park residents and those who report very good health. Cramer's V value of .13 suggests a moderate association. Relationship between Eatonville affiliation and self-rated excellent health and good health were found to be non- significant.

Since income and employment are often related, this dissertation investigates the relationship between employment and food insecurity. The association between being employed (employed dummy variable) and skipping meals was not significant ( $\chi^2=0.34$ ,  $p=.55$ ).

Similarly, income was investigated in the relationship with food insecurity (skipping meals). A significant Chi-Square ( $\chi^2=47.86$ ,  $p<.001$ ) suggests that there is a moderate association (Cramer's  $V=.25$ ) between skipping meals because there wasn't enough money for food and income. The majority of individuals who skipped meals were also in lower income categories.

The relationship between marital status and skipping meals because of financial hardship was investigated in this dissertation. A significant Chi-Square ( $\chi^2=34.80$ ,  $p<.001$ ) suggests that there is a moderate association (Cramer's  $V=.19$ ) between skipping meals because there was not enough money for food and marital status. Those who are single or divorced/separated, and married have high counts when compared to other those who live with a partner or widowed.

Predictors of food insecurity utilizing chi square examines the relationship transportation and race. A significant Chi-Square ( $\chi^2=35.50$ ,  $p<.001$ ) suggests that there is a moderate association (Cramer's  $V=.21$ ) between transportation and race. Out of the 81 individuals who use their bicycle for transport, 29 are Black and 43 are White, 7 are other. Similarly, this dissertation evaluates the relationship between transportation and income, as access to stores may be related to income. A significant Chi-Square ( $\chi^2=14.39$ ,  $p<.05$ ) suggests that there is a moderate association (Cramer's  $V=.155$ ) between transportation and income. Out of 70 individuals who use their bicycle for transportation, 21 of them earned less than 35,000 (family income).

### **T-Tests (Table 8)**

T-tests analyses were completed to compare the difference between two groups. T-tests are analyzed using a continuous variable and the groups. The t-tests are tested for the equality of variances before estimating the analyses. Below are sections that discuss each analysis that were completed and justifications behind why the analyses were completed.

Table 8 compares the relationships between predictors of food insecurity utilizing t-test analyses. The results from a t-test analysis indicate that the relationship between income and access to health food choices and found that there are significant. Specifically, the results from a t-test ( $t=2.78$ ,  $p<.01$ ) suggest that those who are not poor believe the number of recommended number of servings of fruits and vegetables that should be eaten daily is more than those who are poor. The mean number of daily servings of fruits and vegetables that is believed to be recommended is larger for those who are not poor (2.96) when compared to the mean of serving of fruits and vegetables recommended for those who are poor (2.61).



This dissertation investigates the associations between income and whether or not one skips meals. The results from a t-test ( $t=5.38$ ,  $p<.001$ ) suggest that those who do not skip meals as a result of low financial resources tend to earn more than those who skip meals as a result of low financial resources. The mean of those that skip meals is lower (2.48, equivalent to an income between \$25,000-35,000) when compared to the mean of those that report not skipping meals because of financial hardship (3.66, equivalent to an income between \$35,001-50,000).

This dissertation studies a majority minority area (Eatonville) compared to majority White areas (Maitland and Winter Park) against the recommended number of servings of fruits and vegetables. The results from a t-test suggest that Eatonville residents believe that the recommended number of servings of fruits and vegetables are lower than Winter Park and Maitland ( $t=3.15$ ,  $p<.01$ ). The mean recommended number of servings of fruits and vegetables for Eatonville is 2.61 and Winter Park and Maitland is 2.96.

Additionally, the results from a t-test suggest that Eatonville residents eat less vegetables when compared to Maitland and Winter Park residents ( $t=3.25$ ,  $p<.001$ ). The mean reported vegetable consumption was 1.78 servings for Eatonville residents (the day prior to the survey) while the mean vegetable consumption is 2.22 servings the day prior to the survey for Maitland and Winter Park residents. When comparing the difference between Eatonville and servings of fruits to Maitland and Winter Park, there was no significance.

The results from a t-test examining educational attainment and neighborhood residency suggest that Eatonville residents has fewer years of educational attainment when compared to Winter Park and Maitland ( $t= 16.86$ ,  $p<.001$ ). The mean years of educational attainment for Maitland and Winter Park are 15.45 years, while the mean years of education for Eatonville is 12.77.

When comparing the use of a bike for just transportation (as opposed to the use of a bike for recreational means) to the servings of vegetables, there was no significance ( $t=-.01$ ,  $p=.51$ ). Additionally, this dissertation examines the transportation methods to the consumption of vegetables. The results from a t-test suggest that those that do not have a bike or do not use their bike for transportation have lower intake of servings of vegetables ( $t=2.61$ ,  $p<.01$ ). The mean for those that do not use their bike for transport is 2.07, the mean for those that do use a bike for transportation mean serving of vegetables is 2.31 servings of vegetables the day prior to the survey. Furthermore, when comparing the use of a bike for just transportation (as opposed to the use of a bike for recreational means) to the servings of fruits, there was no significance ( $t=.22$ ,  $p=.41$ ).

Additional investigations of transportation were analyzed comparing the consumption of fruits. The results from a t-test suggest that those that do not have a bike or do not use their bike for transportation have lower intake of servings of fruits ( $t=2.49$ ,  $p<.01$ ). The mean servings of fruits for those that do not have a bike or do not use their bike for transport or recreation is 2.04, the mean of servings of fruits for those that do use a bike for recreation or transportation is 2.27 servings of fruits the day prior to the survey.

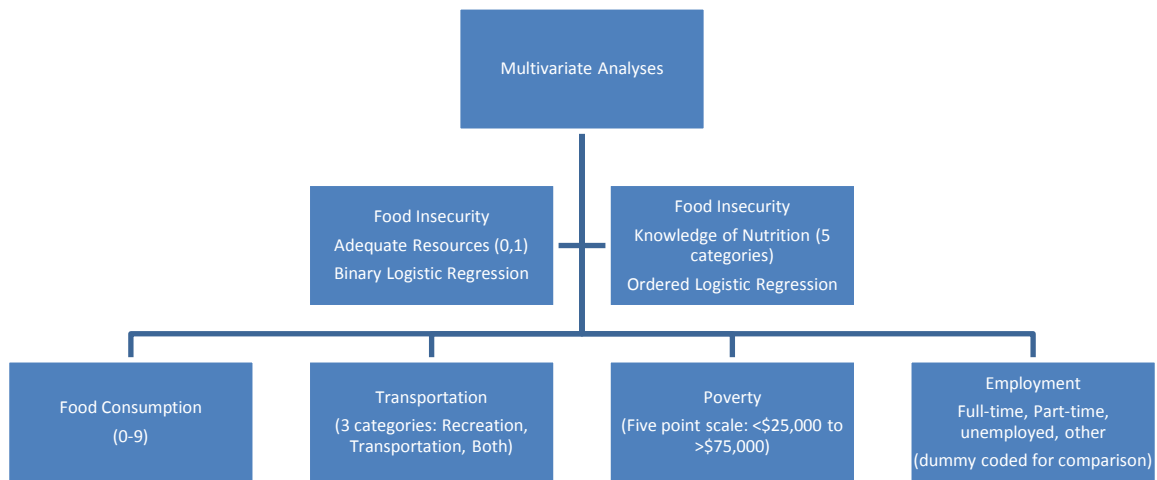
**Table 9: Comparison of the relationships between predictors of food insecurity. Significant Chi Square and T-test Analyses.**

Variables	$\chi^2$	t
Skip Meals	36.43***(N=955) 14.38***(N=838)	5.38*** (N=5.38)
Recommended Number of Fruits and Vegetables	53.53***(N=955)	2.78** (N=703)
Food Consumption		
Ate Fruits (0-8)		-.01 (N=831)
Ate Vegetables (0-9)		-3.25*** (N=948)
Transportation (Bicycle Use)	35.50***(N=827) 14.39*	
No Bicycle, No Use	(N=654)	2.61** (N=831) 2.49** (N=830) .22 (N=830)
Income^^	47.86***(N=740)	
Poverty	40.88***(N=703)	
Employed	.34 (N=949)	
Educational Attainment^		16.86***(N=949)
(11-20)		
Married	34.80***(N=953)	
Race		
White	30.65***(N=944)	
Black	20.21***(N=944)	
Other		
General Health	10.29*	
Excellent/Very Good/Good	(N=952) 18.92***(N=952) 15.56***(N=952)	
Fair/Poor		
Neighborhood Residency		
Eatonville		3.15** (N=955)
Maitland/Winter Park	9.55***(N=955) 31.11***(N=838)	

Data Source: The Winter Park Health Foundation

^p<.10, \*p<.05, \*\*p<.01, \*\*\*p<.001, ^^ Measured in thousands of dollars

Based on the review of the literature and the theoretical frameworks this dissertation applies and analyzes the research questions and hypotheses using multivariate analyses. The following is an illustration of how the variables are measured and operationalized in the multivariate analyses.



**Figure 2: Multivariate Analysis Diagram**

## CHAPTER SEVEN: MULTIVARIATE ANALYSES

This project uses two multivariate analyses to test the research questions, binary logistic regression and OLS linear regression. Three models are used to test the research questions. The first model measures which community is most affected by measures of food insecurity (skipping meals because of lack of financial resources and knowledge of servings of fruits and vegetables). The second model investigates the extent of association social factors such as food consumption, structural barriers, income, and employment has on food insecurity. The third model includes the demographic variables and factors that can be held constant. Each model was tested utilizing two different dependent variables, one measuring the knowledge of recommended number of servings of fruits and vegetables that should be consumed daily and the other measuring if individuals skipped meals or cut the size of meals as a result of low income. Each model was tested utilizing weighted data resulting in 3 tables (Tables 9-10). In addition, 3 additional models were estimated to measure the outcomes of food insecurity (Table 11).

### Research Questions:

Model 1: In which community is food insecurity more prevalent?

Model 2: To what extent are social factors associated with food insecurity?

Model 3: Does the association between social factors and food insecurity remain when controlling for self-reported overall health, education, marital status and race? Each model was compared varying for communities (i.e. Maitland and Winter Park compared to Eatonville).

Three additional models (models 4-6) were estimated to measure the outcomes of food insecurity, using a different approach. Specifically, the order of the models were rearranged such that model four tests the association between the control variables (controlling for self-reported overall health, education, marital status and race) and food insecurity. Model five tests the social factors (food consumption, structural barriers, income, and employment) influences on food insecurity. Lastly, model six adds the influence of community. A nested model was used to predict the effects of food insecurities. This was completed to see if the influence of the community, social factors, and control variables would yield different results from models 1-3. In these models, income was used as a dummy variable so there would be a comparison measure in the categories of income (to see if the significance of income would change).

To estimate the effects of community, social factors, and control variables on food insecurity based on the food insecurity component on having the availability of quality food that is sufficient for the entire household, the dependent variable measuring whether or not one skips meals because there is not enough money is used. Estimation of a binary logistic regression was used in models 1-6. A binary logistic regression was used because the analysis uses a dependent variable that is dichotomous (having two responses), such as “In the last 12 months, 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” responses were (0) yes and (1) no. Therefore, the binary logistic regression used a binary predictor to measure the effects of multiple outcome variables.

To estimate the effects of community, social factors, and control variables on food insecurity based on the food insecurity component, knowledge of nutrition, knowledge of recommended number of servings of fruits and vegetables that should be consumed daily was used in the prediction of an Ordinary Least- Squares regression (OLS). The ordinary least squares regression was chosen because it

measures the relationship between a continuous dependent variable (in this case, the variable measures what do the respondent thinks is the recommended number of servings of fruits and vegetables that should be eaten every day?" responses were measured ranging from 0-14 servings daily), various explanatory variables (i.e. the social factors), and the control variables based on the best fit line.

### Binary Logistic Regression

#### **Model 1**

To estimate the effects of community on food insecurity's component of having adequate resources to purchase healthy and nutritious foods, by whether or not individuals skipped meals resulting from low income, a binary logistic regression was estimated. The assumptions were checked and not violated for this model. Regressions were estimated measuring the effects of Maitland/ Winter Park compared to the Eatonville community. The results of a binary logistic regression using weighted data supported the hypotheses reflecting differences between the Maitland/ Winter Park communities compared to the Eatonville communities (Wald  $X^2=3.66$ ,  $p<.10$ ,  $N=906$ ). Maitland and Winter Park communities have a .46 lower odds of skipping meals because there was not enough money for food over the past 12 months when compared to the Eatonville, FL community.

#### **Model 2**

To estimate the effects of social factors on food insecurity's component of having adequate resources to purchase healthy and nutritious foods, by whether or not individuals skipped meals resulting from low income, a binary logistic regression was estimated. The assumptions were checked

and not violated for this model. Regressions were estimated measuring the effects of Maitland/ Winter Park compared to the Eatonville communities.

The results of a binary logistic regression using weighted data supported the hypothesis reflecting differences in lower income, and being retired (compared to being employed) (Wald  $\chi^2=24.54$ ,  $p<.001$ ,  $N=602$ ). Those with lower incomes are .29 less likely to skip meals because there was not enough money for food over the past 12 months compared to those with higher incomes ( $p<.001$ ). Those who are retired (compared to those who are employed full time or part time) are .63 less likely to skip meals because there was not enough money for food over the past 12 months ( $p<.05$ ). Community residence, food consumption, transportation, being unemployed, and not using a bicycle for transportation are non-significant predictors of food insecurity.

### **Model 3**

To estimate the effects of social factors (food consumption, transportation, poverty, and unemployment) on food insecurity's component of having adequate resources to purchase healthy and nutritious foods, when controlling for self-reported overall health, educational attainment, marital status, and race by whether or not individuals skipped meals because there was not enough money for food over the past 12 months resulting from low income (for the Maitland/ Winter Park community), a binary logistic regression was estimated. The results of a binary logistic regression using weighted data partially supported the hypothesis reflecting differences in lower income, and age; this model yielded the following results (Wald  $\chi^2=32.07$ ,  $p<.01$ ,  $N=599$ ). Those with lower incomes are .24 less likely to skip meals because there was not enough money for food over the past 12 months compared to those with higher incomes ( $p<.05$ ). Those who are retired compared to those who are employed are .60 less likely to skip meals because there was not enough money for food over the past 12 months ( $p<.05$ ). Those who report having excellent, very good, good health compared to those with fair, and poor health are



.49 less likely to skip meals because there was not enough money for food over the past 12 months (p<.10). Males are .44 less likely than females to skip meals because there was not enough money for food over the past 12 months (p<.05).

**Table 10: Binary Logistic Regression Measuring Predictors of Food Insecurity (Using Weighted Data)**  
**(Source: The Winter Park Health Foundation)**

<u>Skipped Meals Because of Financial Hardship</u>			
<i>Explanatory Variables</i>	Model 1	Model 2	Model 3
Neighborhood Residency			
Maitland/Winter Park	-.46 <sup>^</sup>	.27	.12
Food Consumption			
Ate Fruits (0-8)		-.02	-.05
Ate Vegetables (0-9)		.09	-.11
Transportation			
(Bicycle Use)		.14	.24
Income <sup>^^</sup>			
Employment		-.29***	-.24*
Unemployed		-.20	-.32
Retired		-.63**	-.60*
General Health			
Excellent/VeryGood/Good			-.49 <sup>^</sup>
Fair/Poor			
Educational			.00
Attainment <sup>^</sup> (11-20)			-.16
Married			
Race			
Black			.75
Age (18-96)			.00
Gender			-.44*
Intercept	-0.95	-.34	.40
Wald $\chi^2$ (df)	3.66(1)	24.54 (7)	32.07 (13)
N	909	602	599

<sup>^</sup>p<.10, \*p<.05, \*\*p<.01, \*\*\*p<.001, <sup>^^</sup> Measured in thousands of dollars  
N=599(Nested Model)  
Coefficients using weighted data

## OLS Linear Regressions

### **Diagnostics**

Regression diagnostics were conducted and the linearity assumption was checked by the use of scatter plots and other graphs against independent variables. In addition, since many of the variables that were tested were dichotomous variables, these relationships could not be used to detect linearity. After checking for omitted variables, normality of residuals, homoscedasticity, and multicollinearity nothing yielded problematic results. Lastly, outliers were observed and Cook's D was looked at in observation of other potential problems; none seemed to be problematic.

### **Model 1**

To estimate the effects of community on food insecurity's component of having adequate resources to purchase healthy and nutritious foods, by what the respondent thinks is the recommended number of servings of fruits and vegetables that should be consumed daily, an OLS linear regression was estimated. The results of an OLS linear regression using weighted data partially support the hypotheses reflecting positive associations with food consumption and transportation on food insecurity, ( $F=6.18$ ,  $p<.001$ ,  $N=602$ ). Those who consume more fruits have an increase in the knowledge behind the recommended number of servings of fruits and vegetables that should be consumed daily by a score of .16 ( $p<.01$ ). Those who consume more vegetables have an increase in the knowledge behind the recommended number of servings of fruits and vegetables that should be consumed daily by a score of .10 ( $p<.05$ ). Those who use a bicycle for transportation have a decrease in the knowledge behind the recommended number of servings of fruits and vegetables that should be consumed daily by a score of .32 ( $p<.05$ ).

## **Model 2**

To estimate the effects of community and social factors on food insecurity based on the food insecurity component, knowledge of nutrition, knowledge of recommended number of servings of fruits and vegetables that should be consumed daily, this dissertation uses an Ordinary Least- Squares regression (OLS). Regressions were estimated separately measuring the effects of Maitland/ Winter Park and Eatonville communities. The results of an OLS linear regression using weighted data partially support the hypotheses reflecting positive associations with food consumption on food insecurity ( $F=5.29$ ,  $p<.001$ ,  $N=599$ ,  $df=13$ , change in  $r^2= .03$ ). Those who consume more fruits have an increase in the knowledge behind the recommended number of servings of fruits and vegetables that should be consumed daily by a score of  $.16$  ( $p<.01$ ). Those who consume more vegetables have an increase in the knowledge behind the recommended number of servings of fruits and vegetables that should be consumed daily by a score of  $.10$  ( $p<.05$ ). Those who used a bicycle have a decrease in the knowledge of recommended number of servings of fruits and vegetables that should be consumed daily when compared to those who do not use a bicycle for transportation by a score of  $-.33$  ( $p<.05$ ).

## **Model 3**

To estimate the effects of community, social factors, and control variables on food insecurity based on the food insecurity component, knowledge of nutrition, knowledge of recommended number of servings of fruits and vegetables that should be consumed daily, this dissertation uses an Ordinary Least- Squares regression (OLS). Regressions were estimated measuring the effects of Maitland/ Winter Park and Eatonville communities. The results of an OLS linear regression using weighted data partially support the hypotheses reflecting positive associations with food consumption on food insecurity ( $F=5.29$ ,  $p<.001$ ,  $N=599$ ,  $df=13$ , change in  $r^2= .03$ ). Those who consume more fruits have an increase in the knowledge behind the recommended number of servings of fruits and vegetables that should be

consumed daily by a score of .13 ( $p < .05$ ). Those who consume more vegetables have an increase in the knowledge behind the recommended number of servings of fruits and vegetables that should be consumed daily by a score of .07 ( $p < .10$ ). Community residency, transportation, income, employment, general health, educational attainment, marital status, race, age, and gender were non-significant factors.

Additionally, the OLS linear regression was measured using an additional set of models which excludes the measurement of transportation as a result of the transportation measure being a limitation of the dataset (this is discussed in the methods section of this dissertation, see chapter five).

**Table 11: OLS Linear Regression Measuring Predictors of Food Insecurity  
(Source: The Winter Park Health Foundation) (Using Weighted Data)**

<i>Explanatory Variables</i>	<u>Knowledge of Recommended Number of Servings of Fruits and Vegetables That Should Be Consumed Daily</u>		
	Model 1	Model 2	Model 3
Neighborhood Residency			
Maitland/Winter Park	.07	-.13	-.33
Food Consumption			
Ate Fruits (0-8)		.16**	.13*
Ate Vegetables (0-9)		.10*	.07^
Transportation (Bicycle Use)		-.33*	-.24
Income^^		.04	.00
Employment			
Unemployed		-.17	-.14
Retired		-.01	-.22
General Health			
Excellent/VeryGood/Good			-.15
Fair/Poor			
Educational			.02
Attainment^(11-20)			
Married			-.05
Race			
Black			-.29
Age (18-96)			.00
Gender			-.16
Intercept	2.77	2.38	2.30
F (df)	.08(1)	6.18(7)	5.29(13)
R-Squared	.000	.09	.12
Change in R-Squared		.08	.03
N	909	602	599

^p<.10, \*p<.05, \*\*p<.01, \*\*\*p<.001, ^^ Measured in thousands of dollars

N=599(Nested Model)

Coefficients using weighted data

## **Additional Models**

Additional models were estimated to measure the outcomes of food insecurity. Specifically, the order of the models were rearranged such as model four tests the association between the control variables (controlling for self-reported overall health, education, marital status and race) and food insecurity. Model five tests the social factors (food consumption, structural barriers, income, and employment) influences on food insecurity. Lastly, model six adds the influence of community. A nested model was used to predict the effects of food insecurities. These models were estimated using unweighted data (since the use of weighted data did not yield significant differences in previous models).

### **Model 4**

To estimate the effects of control variables (controlling for self-reported overall health, education, marital status and race) on food insecurity's component of having adequate resources to purchase healthy and nutritious foods, a binary logistic nested regression was estimated. The analysis suggests that marital status and race are positive predictors of food insecurity.

To estimate the effects of control variables (controlling for self-reported overall health, education, marital status and race), social factors (food consumption, transportation, poverty, and unemployment), and the influence of community residence on food insecurity's component of having adequate resources to purchase healthy and nutritious foods, a binary logistic nested regression was estimated. The fourth model estimates the effects of control variables on food insecurity's component of having adequate resources to purchase healthy and nutritious foods. Additionally, the income variable in this model was recoded into dummy variables for comparison measures. The hypothesis was partially supported in this model. Model four yielded the following results (Wald  $X^2= 21.74$ ,  $df=5$ ,  $p<.001$ ). Those

who are married have a .45 lower odds of skipping meals because there was not enough money for food over the past 12 months when compared those who are not married ( $p < .01$ ). Blacks have a .55 lower odds of skipping meals because there was not enough money for food over the past 12 months when compared other races ( $p < .10$ ). Whites have a .67 lower odds of skipping meals because there was not enough money for food over the past 12 months when compared other races ( $p < .05$ ). General health and educational attainment were non-significant predictors of food insecurity's component of having adequate resources to purchase healthy and nutritious foods (skipping meals).

## **Model 5**

The estimation of the fifth model estimates the effects of control variables and social factors. These findings also yielded partial support of the hypothesis. Race, transportation, the upper class, lower class, and employed were significant predictors of food insecurity. Specifically, Blacks have a .62 lower odds of skipping meals because there was not enough money for food over the past 12 months when compared other races ( $p < .10$ ). Whites have a .59 lower odds of skipping meals because there was not enough money for food over the past 12 months when compared other races ( $p < .10$ ). Those who use a bicycle for transportation have .57 higher odds to skip meals because there was not enough money for food over the past 12 months when compared to those who do not use a bicycle for transportation ( $p < .05$ ). Those who are members of the upper class (making above \$75,000) have .47 lower odds of skipping meals because there was not enough money for food over the past 12 months when compared to those with lower incomes ( $p < .05$ ). Those who are members of the lower class (making below \$25,000) have .48 higher odds of skipping meals because there was not enough money for food over the past 12 months when compared to those with higher incomes ( $p < .01$ ). Those who are employed have .31 higher odds of skipping meals because there was not enough money for food over the past 12 months when compared those who are unemployed ( $p < .10$ ). General health, educational

attainment, marital status, food consumption, and members of the working class and middle class, were non-significant factors in this analyses. The addition of social factors did not improve the model fit (Wald  $X^2= 22.92$ ,  $df=9$ ,  $p< 0.01$ ).

## **Model 6**

The sixth model estimates the effects of control variables, social factors, and community residence. Findings suggests that race (being White), using a bicycle for transportation, being upper class, being lower class, and having employment are significant predictors of food insecurity ( when measuring the component of having adequate resources to purchase healthy and nutritious foods. Whites have a .67 lower odds of skipping meals because there was not enough money for food over the past 12 months when compared other races ( $p<.05$ ). Those who use a bicycle for transportation have .59 higher odds to skip meals because there was not enough money for food over the past 12 months when compared to those who do not use a bicycle for transportation ( $p<.05$ ). Those who are members of the upper class (making above \$75,000) have .47 lower odds of skipping meals because there was not enough money for food over the past 12 months when compared to those with lower incomes ( $p<.05$ ). Those who are members of the lower class (making below \$25,000) have .49 higher odds of skipping meals because there was not enough money for food over the past 12 months when compared to those with higher incomes ( $p<.01$ ). Those who are employed have .30 higher odds of skipping meals because there was not enough money for food over the past 12 months when compared those who are unemployed ( $p<.10$ ). General health, educational attainment, marital status, being Black, food consumption, members of the working class and middle class, and Eatonville residency (compared to Maitland and Winter Park) were non-significant factors in this analyses. The addition of model 3 (the addition of Eatonville into the model) did not improve the model (Wald  $X^2= 2.63$ ,  $df= 1$ ,  $p=0.10$ ).



**Table 12: Additional Models Binary Logistic Regression Measuring Predictors of Food Insecurity  
(Source: The Winter Park Health Foundation)**

<u>Skipped Meals Because of Financial Hardship</u>			
<i>Explanatory Variables</i>	Model 4	Model 5	Model 6
Neighborhood Residency Maitland/Winter Park			.53
Food Consumption			
Ate Fruits (0-8)		.02	.02
Ate Vegetables (0-9)		-.05	-.04
Transportation (Bicycle Use)		.57*	.59*
Income^^			
Upper Class		-.47*	-.47*
Lower Class		.48**	.49**
Working Class		-.26	-.26
Middle Class		.21	.19
Employment			
Employed		.31^	-.30^
General Health	-.16	-.10	-.09
Excellent/VeryGood/Good			
Fair/Poor			
Educational Attainment^(11-20)	-.06	-.02	-.03
Married	-.45	-.20	-.22
Race			
Black	-.55^	-.62^	-.29
White	-.67*	-.59^	-.68*
Intercept	0.32	-.68	-.58
Wald $\chi^2$ (df)	21.74(5)	48.28 (14)	2.63 (15)
N	633	633	633

^p<.10, \*p<.05, \*\*p<.01, \*\*\*p<.001, ^^ Measured in thousands of dollars  
N=633(Nested Model)  
Coefficients using unweighted data

## Limitations

According to the literature on underlying factors of food insecurity (Mello et al., 2010; USDA, 2010; Zenk et al., 2005), the causal factors of food insecurities are associated with issues of low income and unemployment experienced by many residents in the Eatonville community. However, like many datasets, this particular data set has limitations specific to this study. The survey does not ask questions about the structure of the communities nor travel distance to grocery stores and supermarkets. The data did however ask about bicycling for recreation, transportation, or both. (Which was used as a proxy measure for a structural barrier measuring lack of transportation to supermarkets that is further in distance). Eatonville residents had higher rates of every day bicycling (33.3 percent) compared to Winter Park residents (3.7 percent) and Maitland residents (1.8 percent) (Wright et al., 2011). This data could very well be used to demonstrate that a large portion of the Eatonville residents use bicycles as a mode of transportation, as they may not own cars. Transportation to markets that sold fresh and affordable produce was deemed an important aspect of food security (Beaulac et al., 2009; McEntee, 2009). Therefore, Eatonville residents may incur difficulty attaining fresh produce as a result of relying on bicycling long distances to markets selling affordable foods.

## CHAPTER EIGHT: DISCUSSION OF FINDINGS

### Purpose of Study

#### **Statement of the Problem**

This project examines the effects of food insecurities. Understanding the effects is essential to provide equal access to nutritious foods that enable healthy and active lives. Predictors of food insecurity are multidimensional and encompass many factors. This study concentrates on four factors; food consumption, transportation, income, and employment. After a review of the literature, this project identifies gaps in sociological research that connects factors associated with food insecurity and comparisons between food insecure and food secure households. Gaps in the literature includes: limitations in measuring the access of quality foods, and understanding the details regarding the availability and the prices of foods in impoverished areas. Lastly, current food insecurity research dismisses the importance of understanding what is going on in the suburban areas. This study is one of the first to examine factors that are associated with food insecurities in suburban communities.

The general purpose of this study is to identify predictors of food insecurity in three suburban areas and further understand how these predictors differs from food insecurity in more studied areas such as urban and rural communities.

#### **Major Methods Involved**

This study uses twelve variables to estimate predictors of food insecurity. The predictors were estimated using three main models. There were two dependent variables, one measuring the knowledge of recommended number of servings of fruits and vegetables that should be consumed daily

and the other measuring whether individuals skipped meals or cut the size of meals as a result of low income. There were nine independent variables measuring community residence, social factors, and demographics. The first model examines which community food insecurity is more prevalent? The second model investigates the extent of association social factors such as food consumption, structural barriers, income, and employment have on food insecurity. The third model estimates the demographic variables, social factors and community in the estimation of food insecurity. Collectively, there were three main models using weighted data. Models four, five, and six measured the effects of models one, two, and three in reverse order, measuring reverse causation. Model four tests the association between the control variables (controlling for self-reported overall health, education, marital status and race) and food insecurity. Model five tests the social factors (food consumption, structural barriers, income, and employment) influences on food insecurity. Lastly, model six adds the influence of community.

Acknowledgment of the underlying factors of food insecurity and conceptualizations used in previous studies of food insecurity research is linked to three theoretical frameworks as a basis of inquiry into the research questions within this study. Specifically, this study connects the theories of structural dysfunction, the cycle of poverty, social isolation hypothesis, and food consumption limitations to conceptualize the idea behind predictors of food insecurities in the three central Florida communities.

### Importance of the Study

This study is one of the first to examine food insecurities in suburban areas and to compare a minority community (African American population) to two mostly White communities. The importance of this study is not only limited to the Central Florida community, the information gained from this dissertation can be generalized and used to recognize food consumption, structural barriers, poverty,

and employment barriers that are an issue to individuals experiencing food insecurities in non-urban areas (such as smaller cities).

Understanding the sensitivity of the communities and differences between the Orlando, FL. suburban areas (Maitland, Winter Park, and Eatonville) is ideal in the implementation of services that can assist in the reduction of barriers that are unique to this population. In chapter three of this dissertation, identification of the local food resources illustrates possible barriers experienced by the community's residents. Specifically, severe barriers existed in the Eatonville community (i.e. food consumption, transportation, poverty, and employment). Findings suggest that although the communities are within close proximity ( both Maitland and Winter Park are at most a 1.7 mile distance from the Eatonville community center); Eatonville is without a super market, convenience stores, farmers markets, and food pantries. For this particular population, this information is an imperative source of evidence because many of the Eatonville residents surveyed do not own vehicles and therefore rely on bicycles or walking for transportation. Furthermore, findings also suggest that although there are at least 19 grocery stores in the Winter Park area, which is more affluent than the Eatonville area, the Winter Park community residents have access to six food pantries that are available for those in need. Additionally, the Winter Park area has the closest farmers market that is available for Eatonville residents to purchase fresh fruits and vegetables. However, the difficulty of transportation exists for many Eatonville residents that rely on a bicycle for transportation and live outside of the Winter Park community. Additionally, the most affluent community in this study, Maitland, has only one farmers market and does not have food pantries. This limits the sources of food that are affordable, available, convenient, and of quality to the Eatonville community residents that must commute to either Maitland or Winter Park to gain access to quality food resources.

Therefore, this study identifies the lack of resources and the abundance of resources in each of the communities. This information identifies the need for grocery stores in the Eatonville area, the need for farmers markets in the Eatonville and Maitland communities. As well as identifying the barriers of transportation, travel distances to attain resources such as healthy and quality foods, and limitations in purchasing foods. From here the discussion illustrates how the multivariate analyses identify the predictors of food insecurities.

### Factors Influencing Food Insecurity

The key findings from this study advocate that there are differences in predictors of food insecurities when measuring the different dimensions of food insecurities; predictors differ depending on when they are added into the models; there is a positive relationship between food consumption and the knowledge of recommended number of servings of fruits and vegetables suggesting that those who have nutritional knowledge, practice healthy dietary behaviors; theoretically, structural dysfunction and affordability pose food consumption limitations on these communities ( mainly Eatonville). Additionally, theoretical frameworks used in this study can be used to identify strategic plans in a community to reduce food insecurity in suburban areas.

### **Results of the Research Questions**

Again, this dissertation measures two dimensions of the food insecurity definition (lack of resources and nutritional knowledge components). Model one's findings from a binary logistic regression suggest that food insecurity differs by community. Similarly, the findings from the model one OLS linear regression suggest differences in the communities in regards to food insecurity and the measure of the respondent's knowledge of nutrition. Existing literature identifies employment and income as major

predictors of food insecurity (Haering and Syed, 2009). However, communities vary by income levels. In the case of this study, Maitland and Winter Park are the more affluent communities (average earnings are greater than \$59,000 annually) when compared to Eatonville (average earnings \$27,344 annually). Therefore, this study's first research question is interested in examining which community food insecurity is more prevalent. Significant predictors vary based upon differences in community resources and needs. Food consumptions differ based upon community grocery stores and availability, structural dysfunction harvests barriers which differ based on types of transportation, residence within the various communities are based on affordability, which has much to do with employment. Additionally, those who are knowledgeable about recommended food consumption guidelines also consume more fruits and vegetables in the Maitland and Winter Park communities (model one shows there are differences between the Maitland/Winter Park communities when compared to the Eatonville community). The findings suggest that those who can afford, have the availability, and have the knowledge of nutrition also consume healthier diets. These results are consistent to the cycle of poverty (Wilson, 1990) varying by community; the cycle of poverty (Wilson, 1990) is experienced by many of the Eatonville residents and possibly the lower income areas within Winter Park. The experiences living in a cycle of poverty include deprivation, social isolation, generational economic despair, and very few resources to overcome such as employment opportunities and higher educational attainment. In contrast, Maitland reports very few residents living in poverty.

The second research question in this study tests the extent social factors (food consumption, transportation, poverty, unemployment) are associated with food insecurity. Findings from model two, the multivariate binary logistic regression measuring whether or not one skips meals suggests that social factors particularly transportation, lower income, and being retired compared to being employed are predictors of food insecurity. This model was tested and found that social factors such as lower income

and being retired are predictors of food insecurity. When testing the food insecurity component using the OLS linear regression, those who have more knowledge of nutrition consume more fruits and vegetables. However, transportation, poverty, and unemployment are not significantly associated with the knowledge component of food insecurity. The findings in this study are supported by existing literature that suggests social factors such as employment and income are major predictors of food insecurity (Haering and Syed, 2009). Employment or the lack thereof is a predictor of income and therefore a major predictor of the affordability of food. Thus, employment and income (as major predictors of food insecurity) are also indirectly related to food consumption, transportation, and poverty.

Thus, the findings from model two comparing the components of food insecurity measured in this study suggest that predictors of food insecurity differ when assessing the different components of food insecurity. Different resources are needed to attain the various components of food insecurity. Mello and colleagues (2010) suggests that food insecure behaviors are multifaceted and involve personal choices, lack of knowledge, and income. Accordingly, having adequate resources allow the purchase of food for a healthy and nutritious diet (World Health Organization, 2012) and skipping meals because one lacks these resources are directly related to theoretical frameworks including affordability measures such as employment (McEntee, 2009) and income (Mello et al, 2010). Whereas the knowledge component of food insecurity measured by having the appropriate knowledge of nutrition, care, and sanitation to sustain a healthy life is directly related to food consumption based on the knowledge of a healthy diet. Nevertheless, these two components of the definition of food insecurity work together. Without the proper knowledge of a healthy and nutritious diet, one incurs difficulty choosing healthy foods that are affordable and available in a location that is convenient to the resident.



Structural dysfunction within the Eatonville community yields barriers of transportation, income limitations, and limited employment within close proximity to their homes. This constructs a cycle of poverty by producing food insecure environments through deprivation and yielding food consumption limitations. Likewise, many low-income individuals shop for groceries based on affordability, quantity and quantity; healthy foods may not be much of a driving force for individuals while shopping for groceries (Wiig and Smith, 2008).

Overall, research question's two hypothesis was supported mainly that food consumption, poor transportation, lower income, and being retired are associated with food insecurity. Additionally, research suggests that there is a gap in the research that measures the intake of fruits and vegetables (Mello et al., 2010).

The third research question measures whether the associations between the social factors (food consumption, transportation, poverty, unemployment) and food insecurity remain when controlling for self-reported overall health, education, marital status, race, age, and gender. This is important because it is inclusive of the demographics that scholars have identified as predictors of food insecurity (Mello et al, 2010; Vozoris and Tarasuk, 2003; USDA, 2009). Mello and associates suggests that minorities are more likely to experience food insecurity (2010). While Vozoris and Tarasuk (2003) report that education single female headed households are positively associated with food insecurity. Lastly, food access has also been linked to negative health outcomes (USDA, 2009). The findings in this study are consistent with existing literature.

When estimating the effects of social factors and control variables, findings were inclusive. Using weighted data, a binary logistic regression suggest that those with lower income, those who are younger, those who are retired (compared to those who are employed), those with excellent/ very

good/good health, and men are less likely to skip meals because of financial hardship. On the other hand, the OLS linear regression results reveal very different findings using the same model. These models suggest that those who have more knowledge of nutrition consume higher quantities of fruits and vegetables, and those who have higher educational attainment are more informed about nutrition. Transportation, poverty, unemployment, general health, marital status, race, age, and gender are not significantly associated with the knowledge component of food insecurity.

The findings of the third model pose several inquiries. Existing literature suggests an association between income, negative health outcomes, and employment as predictors of food insecurity. However, the inquiry regarding why the retired are less likely to experience food insecurity should be investigated. In this study, the data concerning the retired population seems reverse to what would be expected when compared to the existing literature (because the elderly are a vulnerable population). Existing research reports about 14.4% of older, low-income adults (who are often retired and over 65 years old) experience food insecurity (Harrison et al., 2002). However, the demographics of the Maitland and Winter Park populations are quite different when compared to other populations in the U.S. These individuals in this community on average are more affluent and the population of the data used in this study is older (see chapter three). The affluence of the population accounts for the food security of those who are retired compared to the general population.

In addition, the knowledge component of food insecurity yields different results when measuring the associations between the social factors (food consumption, transportation, poverty, unemployment) and food insecurity remain when controlling for self-reported overall health, education, marital status, race, age, and gender. Extending discussion on this investigation is ideal. Comparisons across different populations are pertinent to fully understand the needs of different populations. However, findings from this study illustrates that those who are more educated have the proper nutritional knowledge to

lead a healthier life. The theoretical frameworks used to conceptualize food insecurity in this study cannot be generalized to the predictors of being retired in model three.

## **Additional Models**

The additional models were tested to understand if the order of variables estimated by the models changes the predictors of food insecurity (models four, five, and six) to estimate the effects of control variables, social factors, and community residence (the reverse of models one, two, and three). Outcomes were different when comparing the outcomes of models one, two, and three. This suggests that the effects of variables differ when predicting food insecurity depending on the order of the variables in the models. When estimating the effects of overall health, educational attainment, marital status, race, gender, and age on food insecurity; marital status and race (both Blacks and Whites) were predictors of food insecurity. These findings are consistent with existing literature that illustrates minority status and race are significant predictors of food insecurity (Lee and Frongillo Jr., 2001). In model three (the model that estimates control variables), the only control variable that was significant was age. Model four shows that reverse causation of estimating the effects of overall health, educational attainment, marital status, race, gender, and age on food insecurity yields different results when compared to model three (which estimates outcomes using control variables). Race and marital status become significant when omitting correlated explanatory variables from the regression model. Those who were married had lower odds of skipping meals when compared to those who were not married. Given the increased stability and economic benefits of marriage, the likelihood of food insecurity for this population is reduced. In this study and others, race is a predictor of food insecurity. However, this study finds that both Blacks and Whites in these suburban Central Florida communities have lower odds of skipping meals when compared to other races/ethnicities. These might be a result of

the affluent areas within the study (i.e. because the average income of the community is higher, the odds of skipping meals is lower for communities such as Maitland and Winter Park).

Model five uses reverse causation to estimate the effects of control variables and social factors on food insecurity. Race, transportation, income, and employment were significant predictors of food insecurity; this is consistent with other examinations of food insecurity (USDA, 2009; Mello et al., 2010; Morland et al., 2002; Horowitz et al., 2004). A noteworthy finding from this model can be linked to the middle class and working class paradox. Those who are employed have higher odds of skipping meals when compared to those who are unemployed. A recent analysis of data from the urban institute revealed that about 12 percent of families with at least one parent working less than 26 weeks during the year receive unemployment benefits (or public assistance) and benefits from the Supplemental Nutrition Assistance Program (SNAP), thus receiving aid for the purchase of food (Nicols and Zedlewski, 2011). This limits their potential for experiencing food insecurity. However, middle class families do not qualify for Supplemental Nutrition Assistance Program. To qualify, a family of four must not exceed a net monthly income of \$1,921 (a yearly income of \$23, 052) (USDA, SNAP, 2013). In this study middle class was identified as making \$35,000-\$75,000 yearly. Further, after account for the cost of living and other expenses for a lower middle class family, these individuals have the potential to incur some elements of food insecurity (thus those who are employed having higher odds of skipping meals when compared to those who are unemployed). Additionally, Coleman- Jensen (2010) advocates that food insecurity is associated with low income service positions that create nonstandard work and instable income. This can produce a temporary food insecure household resulting from an unexpected income loss, changing of schedules, and other barriers (Coleman-Jensen, 2010). These factors (unexpected income loss and changing schedules can be connected to those working service positions that are members of the middle class. Qualifying and maintaining eligibility for food assistance programs can be discouraging,

time consuming, and ultimately not meeting the needs of a food insecure household (Coleman-Jensen, 2010).

Model six uses reverse causation to estimate the effects of control variables, social factors, and community residence on food insecurity. Using a bicycle for transportation, income (being upper class and lower class), and being employed (compared to unemployment) were significant factors in the estimation of food insecurity. Those who depended on a bicycle for transportation, those who are members of the lower class, and those who are employed have higher odds of experiencing food insecurity. Those who are of the upper class have lower odds of experiencing food insecurity. Findings suggest that those who depend on a bicycle for transportation (especially those in the Eatonville area) face transportation barriers when accessing quality and affordable foods.

### How predictors of food insecurity in suburban areas differ from predictors in urban and rural communities

There are similarities and differences in the comparison of urban, rural, and suburban communities. Predictors of food insecurity differ based on the needs within the community.

Morton and colleagues (2009) report an uneven distribution of food sources in rural areas defined by having places where there are few or no grocery stores. This is very similar to the structural limitations noted within this study; Eatonville has no grocery stores within the community's boundaries. Theoretically, this suggests that there are similarities in the predictors of food insecurities when comparing suburban and rural areas: structural dysfunction is problematic in regards to food consumption limitations in these communities. However, as opposed to the rural areas, in suburban areas (much like the area of Eatonville), a grocery store is at most 6 miles away from a metropolitan area's resources (Orlando). In addition, the suburban area namely Winter Park and Maitland offer stores

for a deprived suburban area (Eatonville) that is at minimum about 2 miles in distance from the nearest grocery store. Difficulties arise when assessing the structural barriers one may incur traveling to the grocery store. In contrast, rural areas that experience food deserts are often at least 10 miles from a supermarket. One study that focused on rural food deserts reports that many rural residents live “at least 20 miles from a major food retailer such as Wal-Mart” (Morton and Blanchard, 2007, pp.6).

### Implementations

This study offers some implications for practice, in theory, and changes at the community level. The results from this study are identified below in subsections based on key findings. The significance of the results identified in this study are discussed as follows:

#### **Dimensions of food insecurities**

Predictors of food insecurities differ by communities, under different circumstances, and vary when comparing against other measures. Predictors may be more prominent when other variables are not a factor in certain situations. Thus, in order to limit food insecurities, communities must identify the needs of their community as a preventative action to produce healthier households. This concept is consistent with existing literature advocating the “importance of community factors in impeding or promoting food access, and the need to include members of the population being served in decision-making and planning” (Anderson and Cook, 1999, pp. 144). Specifically, there have been several political actions taken to reduce food insecurity in the United States, namely; The Community Food Security Act in the 1996 US Farm Bill, Community Food Projects (Anderson and Cook, 1999), and the Food Research and Action Center, Farmers Market Nutrition Program (Winne, 2008) .

This dissertation suggests several methods of action to identify the needs of the community based on the dimensions of food insecurities (access and knowledge):

- Conducting a needs assessment of the community every five years (depending on the growth rate of the area)
- Identifying the resources (quality and affordable foods) that are accessible to the residents
- Identifying the social factors including structural barriers that may hinder the access to quality foods
- Educating the community on nutrition, healthy cooking methods, and healthy practices
- Implementing community involvement through community gardens, local agricultural developments, and farmers markets.

### **Predictors of food insecurity**

Every experience of food insecurity can be unique. Urban areas experience structural barriers that are different than in rural and suburban areas. For instance, the distances many have to travel to the nearest grocery store. There are more grocery stores in an urban area than in suburban communities and rural areas. Similarly, urban and suburban areas may face travel issues to attain healthy foods, however the travel issues are not to the detriment rural residents may face. This study and others have identified that race is a predictor of food insecurity. However, other predictors may be of importance before attempting rectification of race. Therefore, predictors of food insecurity differ depending on the other factors that are incorporated in the experiences of food insecurity. The findings from this study implicate that:

- Although predictors of food insecurity are similar across the board, experiences of the predictors vary based on experiences and populations.
- Assessments of the structural barriers (such as transportation) should measure accessibility, affordability, convenience, and location distance to important places such as supermarkets, hospitals, schools, and places of employment.
- There is a vast need for community level of analysis.
- Cultural diversity that lends educational information regarding nutrition and healthy cooking practices, and cultural diversity in grocery stores that offers healthy ethnic food options are ideal to implement change in racially diverse communities.

***Food consumption and the knowledge of recommended number of servings of fruits and vegetables***

The findings from this study advocate that those who have nutritional knowledge actually practice healthy dietary behaviors. However, this relationship requires further research. If individuals know higher consumption of fruits and vegetables is healthier, then why does this nation suffer from high rates of obesity, diabetes, high cholesterol and other ailments that are directly linked to diet behavior? This study relates the affluent communities (Winter Park and Maitland) to this finding. This is not the case for the Eatonville community. This study's findings suggest that Eatonville residents may have knowledge of nutrition but are unable to afford or access the resources to consume a healthy diet. Therefore, recommendations to encourage healthier food consumption include the following:

- Placing daily serving requirements of each food group in grocery stores in each grocery section (i.e. dairy section, meat/protein section, grains section, fruit, vegetable, and produce sections).
- Educating the public about daily serving requirements.



- Physicians and health practitioners should encourage food logs to identify food consumption.
- Subsidizing the cost of healthier foods in lower income communities.
- Implement local farms, community gardens, and encouraging their use. This can create jobs in local communities, and strengthen the community's economy and development while encouraging healthy diets.

### **Theoretical implications**

Theory in the discourse of food security is underdeveloped within sociology. Theoretical connections from structural dysfunction and affordability suggest food consumption limitations for the Eatonville community. This study's findings and theoretical frameworks are supported by previous research based on structural barriers and affordability measures such as neighborhood deprivation, neighborhood racial composition (Larson et al., 2009), lack of affordability (Mello et al., 2010; Zenk et al., 2005), lack of retail stores that offer affordable healthy foods (Shultz et al., 2005), access to transportation (Morland et al., 2002; Horowitz et al., 2002), and poor employment (McEntee, 2009). Additionally Anderson and Cook (1999) theoretically advocate for various projects that indirectly focus on eliminating the structural dimensions that yield food insecurity. These scholars focus on the community food security elements of food production that advocates for "decentralized, small-scale, local-level solutions, managed by local inhabitants with control or at least full representation, by low income people" (Anderson and Cook, 1999). An example of this is identified by encouraging state and local food policy by promoting local food systems and grass roots participation to end food insecurity (Winne, 2008). Specifically, suggestions from increased theoretical development in food security advocate include:

- Development of Food Security theory in the Sociology discipline.
- Increased food policy for community development and change leading an increase of food secure households (Cook and Anderson, 1999).
- Encourage community level of analysis.
- Connecting the links between predictors of food insecurity because food insecurity is often multifaceted and multidimensional.

### Conclusions

The USDA and other influential organizations identify underlying factors associated with food insecurity, namely: food consumption, transportation problems, poverty, and unemployment (Diez Roux, 2001; Coleman- Jensen et al., 2010). About 15 percent of U.S. citizens are food insecure (Coleman- Jensen et al., 2010), this number fluctuates from state to state, is higher in minority populations, and is higher in families with children. In order to provide equal access to nutritious foods that enable healthy and active lives, the suggested implications must be implemented to alleviate food insecurity within the local suburban communities that experience food insecurity. This information concerning suburban food insecurities and the development of theoretical frameworks that are community level analysis specific will improve understanding and allow the provisions for more effective strategies for local organizations and agencies that service food insecure households. Each dimension of the food security definition (World Health Organization, 2012) should be addressed in local assessments of food insecure households and policy development. Increasing accessibility and limiting structural barriers are ideal however; each measure corresponds uniquely with various populations (such as the differences experienced comparing suburban barriers and urban barriers).

More research is required to fully understand the relationships between these variables; future research directions include the use qualitative methods that give depth to the knowledge behind the experience of food insecure households. The findings from this study indicate the importance of studying unique populations such as suburban areas. The evidence gained from this dissertation can be generalized and used to recognize food consumption, structural barriers, poverty, and employment barriers that pose an issue for individuals experiencing food insecurities in non-urban areas (such as smaller cities).

The hypotheses from this study were generally supported. Key findings from this study suggest that differences in predictors are based on the measurement of which dimension of food insecurity is examined. The study also show which groups are more likely to have nutritional knowledge and practice healthy dietary behaviors. Finally, the results provided empirical support for the structural dysfunction and affordability arguments which are linked to food consumption limitations on these communities (mainly Eatonville).

There are several recommendations for future research. The first is to complete a comparison study of suburban communities in other metropolitan areas and states. Second, the discipline could benefit from examining previous efforts of food insecurity conceptualizations, policies, and efforts to improve food security in suburban communities (starting with the Eatonville community). These examinations will allow for improvements upon the understanding of what has worked in the past while providing an assessment for future studies and development of policy. Third, explore the links between food insecurity and health outcomes that are necessary for improved public health. Fourth, examine why consumption of healthy foods is problematic for suburban residents. It is also important to understand the complexity of the barriers experienced by food insecure households. This should be completed using qualitative methods. Additionally, much can be gained from this recommendation

through the understanding of how individuals interpret and perceive food insecurity. Lastly, a comparative analysis of food insecure households after community gardens, local agricultural developments, and farmers markets are implemented in the communities could offer insight into consumption patterns and other barriers to healthy food consumption and access.

## **APPENDIX A: SURVEY QUESTIONS**

1. What kinds of things do you currently do to take care of your health? RECORD VERBATIM.

Have you ever suffered from or been diagnosed with any of the following conditions?

	YES	NO	DK
Chronic heart disease, including coronary heart disease, angina, or a heart attack	1	0	9
Stroke?	1	0	9
Diabetes?	1	0	9
High blood pressure?	1	0	9
High cholesterol?	1	0	9

2. Now I would like you to think about the foods you ate or drank yesterday. When answering the following questions, please include *all the foods you ate*, both at home and away from home.

First, about how many servings of fruit or fruit juices did you have yesterday? One serving equals one medium-sized piece of fruit, 2 small pieces of fruit, or one cup of diced fruit.

\_\_\_\_\_ Enter number of servings of fruit eaten yesterday

3. And about how many servings of vegetables did you have yesterday? One serving equals a half cup of cooked vegetables or one cup of salad. Vegetables include broccoli, beans, lettuce, peas, and so forth.

\_\_\_\_\_ Enter number of servings of vegetables eaten yesterday

4. What do you think is the RECOMMENDED number of servings of fruits and vegetables that should be eaten every day? NOTE: RESPONSE MUST BE A WHOLE NUMBER, NOT A RANGE. "3-5 SERVINGS IS WHAT IS RECOMMENDED" IS NOT ADEQUATE.

\_\_\_\_\_ Record R's answer or circle 99 if R says "I don't know," "haven't a clue," etc.

[CALCULATION: Does R say he or she eats fewer servings than recommended? If YES, ask:]

5. What would you say are the main reasons you don't eat more fruits and vegetables? RECORD VERBATIM. IF NECESSARY, PROMPT: Is it because they cost too much, are not available where you shop, take too much time and trouble to prepare, you just don't like them, or what? PROMPT: Anything else?

6. In the last 12 months, 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? If YES: Was this something you and the other adults did regularly, from time to time, or just once or twice during the year?

0 No

1 Yes, once or twice

2 Yes, from time to time

3 Yes, regularly

9 All missing

7. Do you own or have access to a bicycle?

0 No

1 Yes

9 All missing

IF YES: How frequently would you say you ride your bicycle?

5 Every day

4 Almost every day

3 A few times a week

2 A few times a month

1 Less than a few times a month

0 Never

9 All missing

IF YES: Do you ride you bicycle for recreation, for transportation or both?

1 Recreation

2 Transportation

3 Both

9 All missing

8. How satisfied are you with living in [CITY] – very satisfied, somewhat satisfied, not too satisfied, or not satisfied at all?

3 Very

2 Somewhat

1 Not too

0 Not at all

9 All missing

#### Demographics

First, in what year were you born? \_\_\_\_\_ RECORD YEAR. 9999 = ALL MISSING

IF R WAS BORN IN 1951 OR EARLIER, SKIP INTO ELDERLY SUPPLEMENT.

Are you of Hispanic or Latino origin?

1 Yes

0 No

9 All missing

What do you consider to be your racial background? [READ CATEGORIES IF NEEDED]



- 1 American Indian or Alaska Native
- 2 Asian
- 3 Black or African American
- 4 Native Hawaiian or Other Pacific Islander
- 5 White
- 9 All missing

What is the highest grade or year of school you have completed?

- 1 Less than High School
- 2 High School graduate, including GED
- 3 Trade, vocational or technical school beyond high school
- 4 Some college but no degree
- 5 Associate degree
- 6 Bachelor's degree
- 7 Master's degree
- 8 PhD or professional degree
- 9 All missing

What is your current marital or relationship status?

- 1 Married
- 2 Living with Partner
- 3 Widowed
- 4 Divorced
- 5 Separated
- 6 Single; never married

About how much do you weigh? \_\_\_\_\_ RECORD TO NEAREST POUND

About how tall are you? \_\_\_\_\_ FEET \_\_\_\_\_ INCHES

Which of the following best describes your current employment status?

- 1 Working full time
- 2 Working part-time
- 3 With a job but not currently working (on vacation, on strike, etc.)
- 4 Unemployed and looking for work
- 5 Unemployed and not looking for work
- 6 Keeping house/homemaker
- 7 Student
- 8 Disabled
- 9 Retired
- 10 All Missing

IF UNEMPLOYED (4 OR 5): Have you been unemployed for a year or more, or for less than one full year?

- 1 A year or more
- 2 Less than a year
- 9 All missing

IF WORKING FULL OR PART TIME (1 OR 2): Are you self-employed?

- 1 Yes
- 0 No

9 All missing

IF WORKING FULL OR PART TIME (1 OR 2): In what city do you work?

RECORD CITY:

In a typical week, how often do you hear from or initiate contact with family or friends?

- 4 Every day
- 3 Almost every day
- 2 A few times a week
- 1 At least once a week
- 0 Never
- 9 All missing

Finally, which of the following categories comes closest to your family's total income for 2010?

- 1 Less than \$25,000
- 2 \$25,000 to \$35,000
- 3 \$35,000 to \$50,000
- 4 \$50,000 to \$75,000
- 5 More than \$75,000
- 8 Refused
- 9 All other missing

## **APPENDIX B: SCHEDULE FOR COMPLETION**

*Planning*

Defend Proposal: September 2012

*Data Analysis*

Data Analysis: September 2012 – November 2012

*Dissertation Writing*

Literature Review and Methods: November - December 2012

Findings: December 2012 – January 2013

Discussion and Conclusion: February - March 2013

Revisions: March 2013 – May 2013

Defense: June 2013

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