ABSTRACT

Title of Thesis:	EXAMINING THE FOOD-INSECURITY OBESITY PARADOX AMONG LATINO IMMIGRANTS
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Obesity is linked to chronic illnesses such as type 2 diabetes, cardiovascular disease, and some cancers (breast, kidney, and liver). Food insecurity refers to lack of access to nutritious and safe food. Latinos are a rapidly growing population in the US with higher levels of food insecurity than the national average, and higher obesity rates than non-Latino white adults. The "food insecurity-obesity" is a paradoxical relationship seen in rising obesity and correspondingly high food insecurity rates. We examined demographic factors, acculturation, stress, dietary habits, and food access among Latina immigrants to understand this paradox. This sub-analysis (n=128) found that education level (p=0.03) and marital status (p=0.08) were significantly and marginally significantly associated with food security level. Additionally, this analysis helped to better describe a population that lacks research. A better understanding of the "food insecurity-obesity" paradox and related factors will inform future culturally-tailored interventions to address obesity among Latina immigrants.

EXAMINING THE FOOD-INSECURITY OBESITY PARADOX AMONG LATINO IMMIGRANTS

by

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Chapter 1: Introduction

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Latinos and Obesity

Compared to individuals who are at a normal weight, people who are obese have an increased risk for numerous health conditions and diseases such as high blood pressure, type 2 diabetes, coronary heart disease and different types of cancer (i.e. breast and liver) (U.S. Department of Health and Human Services, 2013). Data from the 2015-2016 National Health and Nutrition Examination Survey (NHANES) demonstrates that an estimated 39.8% of U.S. adults aged 20 and over are obese, including 7.6% with severe obesity, and an additional 31.8% which are overweight (Fryer et al., 2018). In the United States, ethnic minorities have a higher prevalence of obesity than the general population, and higher levels are reported in Latinos/Hispanics (Daviglus et al., 2012; Flegal et al., 2012). In the U.S. adult Latino population, 40% of men and 44% of women are obese (Ogden et al., 2014).

For immigrants in general, increased time lived in the U.S. is associated with poorer health indicators such as poorer overall health, poor mental health, and poor physical health (Hadley, 2008). For Latinos, the risk of being overweight or obese increases exponentially with regard to the number of years that have been lived in the United States (Wolin et al, 2009; Afable et al., 2016; Goel et al., 2004; Barcenas et al., 2007; Kaplan et al., 2004).

Latinos have been labeled as the second-largest racial or ethnic group behind whites, accounting for 18% of the nation's population (Flores, 2017). Between July 1, 2015 and July 1, 2016, the Hispanic population grew by 2% to 57.5 million (United States Census, Bureau, 2017). The Latino population is predicted to continue to grow rapidly in the United States with a third of its citizens by 2060 being of Hispanic origin (United States Census Bureau, 2011). The growing Latino population and the steady prevalence of obesity among them will require necessary public health targeted expenses to intervene (Greenhalgh & Carney, 2014).

In order to accurately design and implement public health programs that will be used to target the rising obesity rates of the nation, there must be an understanding of the roots and causes that lead to obesity in an individual. The predictors and causes of obesity are numerous, including genetics (Choquet & Meyre, 2011; Singh et al., 2017), stress (Scott et al., 2012; Bose et al., 2010), physical activity (Strasser, 2012; Pietilainen et al., 2008), and dietary habits (Amin et al., 2008; Hassan, 2014). Although the reasons behind why dietary habits affect weight are multifaceted, the discussion regarding the association between food security and obesity is growing as a major contributor in this regard.

Latinos and Food Security

A relationship between hunger and obesity discovered in 1995 led to the increasing discussion regarding an association between weight status and food insecurity. This relationship seems paradoxical; food insecurity resulting from inadequate financial access to healthy foods, and obesity being a consequence of overconsumption of food (Dinour et al., 2007). The effect of food insecurity on obesity and weight gain has been seen to be stronger in women compared to men (Wilde & Petermen, 2006), in immigrant subgroups (Caspi et al., 2017), and in Hispanic women compared to white non-Hispanic women (Adams et al., 2003).

Based of ranges of food security in the United States, the USDA (2017) has established 4 labels to describe food security and food insecurity; *1.* high food security: no reported indications of food access problems or limitations, *2.* marginal food security: one or two reported indications (i.e. anxiety over food sufficiency) and little or no indication of changed diets or food intake, *3.* low food security: reports of reduced quality, variety, or desirability of diet and little or no indication of reduced food intake, *4.* very low food security: reports of multiple indications of disrupted eating patterns and reduced food intake. Food security refers to high food security and marginal food security. Food insecurity refers to low food security and very low food security. Food security and food insecurity can be measured at the child individual, adult individual, or household level.

Rates of food insecurity in 2016 were significantly higher than the national average (12.3%) for Black non-Hispanic (22.5%) and Hispanic headed households (18.5%). Prevalence of very low food security for Hispanic households (5.8%) was significantly higher than the national average (4.9%). Percentage of households with food-insecure children was higher for female headed households (16.0 %); Hispanic households (11.6 %) (Coleman-Jensen et al., 2016).

Immigrants may experience adverse psychological effects, such as chronic stress, that could impact food security. This food-insecurity disparity is exacerbated by language and cultural barriers. Public assistance programs, including food assistance programs, are underused even among legal immigrants because of misinformation on programs or fear of deportation (Miner et al, 2013). It is also common for immigrants to send some of the limited money that they have earned in the United States, back to family and friends that they have left in their home countries which contributes to their financial challenges and leads to stress (Hadley et al., 2017; Quandt et al., 2006).

Latinos and Stress

Stress is defined as the psychological demand that is placed on the body when an individual must adapt, cope, or adjust in a situation (American Psychological Association, 2017). Chronic stress experienced by racial, ethnic, and immigrant populations is linked to poorer health outcomes including obesity, substance-abuse, and depression (Williams et al., 2003; Regev-Tobias, 2012). The singular act of migration may be the cause of worsening health in the immigrant population due to stress associated with the immigration process (Kasl and Berkman, 1983) or due to discrimination in the country they have been received in (Vega and Amaro, 1994).

Research has supported the theory that links chronic stress experienced by racial/ethnic and immigrant populations and poorer health outcomes (Williams et al., 2003). The minority stress model proposes that stigma, prejudice and discrimination establish chronic psychosocial stressors that may lead to negative health outcomes (Meyer, 2003). This model supports the overwhelming evidence suggesting that the health of immigrants declines with time in the U.S. (Lara et al., 2005; Goel et al., 2004; Singh &

Hiatt, 2006). This decline in "good health status" of immigrants has been identified as the result of several possible predictors including an unhealthy diet and declining physical activity (Antecol & Bedard, 2006), the adoption of unhealthy behaviors such as drinking and smoking (Johnson et al., 2002), and increased chronic stress resulting from discrimination and the acculturation process (Finch et al., 2000; Araujo and Borrell, 2006).

Latinos and Acculturation

Acculturation is a normative multidimensional process that happens when a person from one culture comes in contact with another culture (Berry, 1989). In other words, acculturation occurs when individuals whose primary learning has been in one culture (e.g. Latino), take over characteristic ways of living (attitudes, values, and behaviors) from another culture (e.g. non-Hispanic white) (Hazuda et al., 1988). In terms of health research, the multiple dimensions of acculturation may refer to generational status, duration of time spent in the United States, language usage, cultural pride, and ethnicity of social networks (Woling et al., 2009). Although there are numerous multidimensional validated acculturation scales that are used (Marin et al., 1989; Wallen et al, 2002; Arcia et al., 2001), recently in the literature many studies have used the same three proxy measures to measure acculturation (Gallo et al., 2010; Park et al., 2016; Lora et al., 2018); language spoken at home, nativity, and time lived in the U.S.

Acculturation has been seen to be related to physical and mental health as well as political and economic behavior (Hazuda et al., 1988). In Western countries, dietary acculturation can be connected to a multitude of risky behaviors such as poor nutrition choices, high BMI, low physical activity levels, and bigger portions which all lead to obesity (Kaiser et al., 2003; Gordon-Larsen et al., 2003; Antecol & Bedard, 2006).

Significance of the Project

Previous literature has demonstrated the paradoxical relationship between food insecurity and obesity differentially affects individuals based on gender, income and race/ethnicity. This study aims to understand or further explore the relationship between food insecurity and demographics (time living in

the US, education level, marital status, income groups), stress, dietary habits, food access, and obesity, to address this research gap among Latina immigrants.

Healthy food access and low-income areas will be mapped and analyzed using geographic information system (GIS) mapping. This will provide another tool to understand the factors that may impact the food-insecurity – obesity paradox among Latina immigrants.

With a growing population of Latinos, and Latino immigrants, in the United States, health outcomes of these individuals will have an impact on the labor force and health care spending of the nation. Improving these health outcomes will not only have positive consequences for the Latino immigrant individuals and community, but also for the nation. Research is lacking on Latina immigrant health with regards to the relationship among food insecurity, demographics, stress, dietary habits, food access and obesity. A better understanding of the "food insecurity-obesity" paradox and related factors will inform future culturally-tailored interventions to address obesity among Latina immigrants.

Research Questions

1) How is food insecurity among Latina immigrants associated with demographics (education level, marital status, income groups), acculturation, stress, dietary habits, food access, and obesity?
2) What are the predictors of food access?
3) What are the predictors of obesity?

Table 1: Definition of Terms

Body Mass Index (BMI)	Body mass index (BMI) is found by measuring a person's weight in kilograms and dividing it by the square of height in meters. BMI is used to screen for weight categories that can help in identifying risk factors for health problems. BMI categories include; underweight=less than 18.5, normal weight=18.5 – 24.9, overweight=25-29.9, and obese=30 or more (Centers for Disease Control and Prevention, 2018).
High Food Security	No reported indications of food access problems or limitations (United States Department of Agriculture, 2017).
Marginal Food Security	One or two reported indications (ie. Anxiety over food sufficiency) and little or no indication of changed diets or food intake) (United States Department of Agriculture, 2017).
Low Food Security	Reports of reduced quality, variety, or desirability of diet and little or no indication of reduced food intake (United States Department of Agriculture, 2017).
Very Low Food Security	Reports of multiple indications of disrupted eating patterns and reduced food intake (United States Department of Agriculture, 2017).
Acculturation	A normative process which occurs when an individual from one culture comes in contact with a different culture (Berry, 1989).
Stress	"The psychological demand placed on the body when one must adapt, cope, or adjust" (American Psychological Association, 2017).
Food access	Accessibility to sources of healthy, affordable foods that make a healthy diet. Indicators: accessibility to sources of healthy, individual-level resources that may affect accessibility, and neighborhood-level indicators of resources (United States Department of Agriculture, 2017).
Latina	An individual who identifies as female and is of "Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin regardless of race" (U.S. Census Bureau, 2018).
Immigrant	Also known as "foreign-born" is an individual who lack U.S citizenship at birth (U.S. Census Bureau, 2016).

Chapter 2: Background

Obesity

As of 2016, the leading causes of death in the United States for all adults include diseases of the heart (23%) and cancer (22%) (Centers for Disease Prevention and Control, 2017a). These conditions are the leading causes of preventable, premature death and they are directly related to obesity. Approximately 93.3 million U.S. adults are obese, and individuals who are obese and overweight are more likely to develop these conditions, which is contributing to this substantial number of deaths (U.S. Department of Health and Human Services, 2013).

As defined by the 1988 overweight and obesity clinical guidelines, overweight is defined as a body mass index (BMI) of 25 to 29.9 kg/m^2 and obesity as a BMI of ≥30 kg/m^2 (NHLBI Obesity Education Initiative Expert Panel on the Identification, Evaluation, and Treatment of Obesity in Adults (US)). Although the use of BMI as a tool to measure obesity is somewhat controversial because of a lack of measurement of body fat percentage (Gómez-Ambrosi et al., 2011), BMI has been recognized as the most feasible, inexpensive, and easy to use anthropometric measure to characterize weight in individuals (Gurney & Gorstein, 1988; Caballero, 2001; O'Neill, 2015).

The most recent data from the Centers for Disease Control and Prevention (CDC) has reported that in 2015-2016, the prevalence of obesity among the adult population (≥18 years) in the United States was 39.8%. From 1999-2000 through 2015-2016 there has been a significant increasing trend in obesity observed in adults – an increased differenced of 9.1% (Hales et al., 2017). If this trend were to continue over the next 15 years, we could see the prevalence of obesity in the United States reaching 50% by 2035. In order to target obesity reduction, it is important to note that obesity influences some population subgroups more than others.

Among Latinos in the United States, the leading causes of death for adults as of 2016 are cancer (21%) and diseases of the heart (20%) (Centers for Disease Prevention and Control, 2017a). As mentioned previously, these conditions are very closely linked with obesity; compared to other subgroups, Hispanics

(47%) had the highest age-adjusted prevalence of obesity followed by non-Hispanic blacks (46.8%) and non-Hispanic whites (37.9%) (Hales et al., 2017). Within this adult Latino population in the United States, trends have been reported by education level, marital status, and income group (Ogden et al., 2014; Flegal et al., 2016; Ogden et al., 2017).

Obesity and Demographic Variables

Education Level

In 2017, the CDC reported that rates of obesity decreased with level of education. They noted that adults who had the highest self-report of obesity did not have a high school degree or equivalent (35.6%), followed by those with a high school degree (32.9%), adults with some college (31.9%), and college graduates (22.7%) (2018). Among other factors such as smoking and alcohol use, level of education has been found to have a negative association with higher BMI; demonstrating that overweight and obesity is more common with low educational attainment (Owolabi et al., 2017; Janghorbani et al., 2012; Sardinah et al., 2012). One cross-sectional study conducted in South Korea found that the association between obesity and educational level differs by sex. Researchers found that education seemed to have a negative association with obesity among women; while in contrast, education seemed to have a positive association with obesity among men (Chung et al., 2018). This has also been supported by other literature as well (Hales et al., 2018).

The literature regarding Latino obesity and education levels, explores the consequences of low education levels among the Latino population, finding that those who are less educated, are also more likely to be poor, less healthy, less likely than other ethnic/racial groups in the U.S. to have health insurance coverage (Ogden et al., 2017; Schappert, 1999; Hales et al., 2018; Kanna & Boutin-Foster, 2016). In Latino families, low education levels of parents have also been seen to be associated with higher BMIs among children, calling for the targeting of education level among Latino parents for not only their own health benefit but also that of their child (Butte et al., 2014).

Marital Status

It has long been established that marriage is positively linked to body weight (Hahn, 1993; Meltzer & Everhart, 1995). Researchers have also recently found that not only is marriage positively linked to body weight, but so is the act of cohabitating (Teachman 2016; Averette et al., 2012; Jeffrey & Rick, 2002). Additionally, recent researchers have found that those who are divorced or never married are associated with lower body weight (Teachman, 2016).

There are racial and ethnic differences in the desire to marry; Latinos have shown a greater desire to marry and a stronger commitment to marriage which has resulted in a more frequent occurrence of marriage (Oropesa & Landale, 2004; South, 1993), in comparison to Blacks in the U.S. who appear to have appear to have retreated from the idea of marriage (Cherlin, 2004). This may support the literature finding positive association between Latino marriage status and obesity (Sobal et al., 2012; Khan et al, 1997; Mukhopadhyay, 2008).

Income Group

In developed countries, associations between income and obesity have been seen to differ by sex. The CDC reports that among Hispanic men, the prevalence of obesity is lower in the lowest and highest income groups in comparison with the middle-income group (Ogden et al., 2017). Among Hispanic women, the CDC reported that obesity prevalence was the lowest in the highest income group in comparison to the middle- and lowest-income groups (Ogden et al., 2017). Numerous studies have investigated and support the above mentioned relationship between household income and obesity rates in women, and also in concordance with the other factors mentioned above (education level and marital status) (Ogden et al., 2017; Caspi et al, 2017; Krieger et al., 2008; Martin et al., 2017).

Consequences of Overweight and Obesity

With the above factors playing a significant role in affecting the prevalence of overweight and obesity in the general U.S. population, and specifically among Latinos as well, it is important to discuss the consequences of being overweight and obese. Individuals who are overweight or obese, compared to

individuals who are at a normal weight, have an increased risk for many dangerous health conditions and chronic illnesses such as high blood pressure, type 2 diabetes, coronary heart disease, stroke, gallbladder disease, sleep apnea and breathing problems, cancer (breast, colon, kidney, and liver) (Felgal et al., 2012; Guh et al., 2009; U.S. Department of Health and Human Services, 2013).

Understanding what obesity is and its detrimental consequences, is crucial to move forward in discussing what the predictors of obesity are and how they specifically affect the Latino population. There are numerous predictors of obesity including genetics (Choquet & Meyre, 2011; Singh et al., 2017), stress (Scott et al., 2012; Bose et al., 2010), physical activity (Strasser, 2012; Pietilainen et al., 2008), and dietary habits (Amin et al., 2008; Hassan, 2014). Although the discussion behind obesity predictors is robust, food security itself and its relationship with obesity has grown as a major contributor in this discussion.

Food Security

Food security is most commonly defined using the definition formulated in the 1996 World Food Summit which says "food security, at the individual, household, national, regional and global levels [is achieved] when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life." The United States Department of Agriculture (USDA) (2017) has established 4 labels to characterize food security and food insecurity at the adult, child, and household level;

- High food security - no reported indications of food access problems or limitations
- Marginal food security - one or two reported indications (i.e. anxiety over food sufficiency) and little or no indication of changed diets or food intake
- Low food security - reports of reduced quality, variety, or desirability of diet and little or no indication of reduced food intake,
- Very low food security - reports of multiple indications of disrupted eating patterns and reduced food intake.

In 2016, the USDA published a report detailing the data on household food in security in the United States during this year. Among its findings was the estimate that 87.7% of households in America were food secure during the entire year, while the remaining 12.3% of households were food insecure at least some time during that year. Of that 12.3% of food insecure households, 4.9% reported very low food security meaning that at least one member of the household experienced reduced food intake and disrupted eating patterns due to a lack of money or other resources for obtaining food (Coleman-Jensen et al., 2016). In Maryland, a study found that of 245 households measured 66% were experiencing food insecurity (Oberholser & Tuttle., 2004). In comparison to the national average (12.3%), households who were headed by Black non-Hispanics (22.5%) and Hispanics (18.5%) had higher rates food insecurity (Coleman-Jensen et al., 2016). Additionally, prevalence of very low food security for Hispanic households (5.8%) was significantly higher than the national average (4.9%).

Food security is most commonly measured using survey tools provided by the United States Department of Agriculture Economic Research Service (2017). These tools include the 18-item U.S. Household Food Security Survey Module (includes children in the household), the 10-item U.S. Adult Food Security Survey Module (includes households without children), and the six-item Short Form of the Food Security Survey Module (for surveys that cannot include the 18-item or 10-item measures). These tools describe participant ranges of food security (high food security and marginal food security) and food insecurity (low food security and very low food security).

The Food and Agriculture Organization of the United Nations met in 1996 and identified the four components of food security as availability, access, utilization, and stability (1996). Food availability refers to the sufficient quantities of food of appropriate quality; access refers to individuals having the adequate resources for obtaining appropriate food; utilization refers to the type and quality of food that individuals are consuming; and stability refers to how often an individual has access to adequate food. For the

purpose of this discussion, 'appropriate or adequate' food refers to food that is healthy, affordable, and contributes to a healthy diet.

The Food-Insecurity and Obesity Paradox

The discussion regarding a relationship between food insecurity and obesity, arose from dialogue concerning a similar relationship between hunger and obesity which was discovered in 1995. As a result of the originating factors of these two terms; food insecurity resulting from inadequate access to healthy foods, and obesity being a consequence of overconsumption of food, their relationship was deemed paradoxical (Dinour et al., 2007).

This paradoxical relationship could be a result of numerous circumstances. Previous literature has explored the possibilities that 1) individuals who are food insecure can only afford to consume foods that are calorie dense, causing weight gain (Jeffery & French, 1996; Cristofar & Basiotis, 1992;Rose & Oliveira, 1997) and 2) that food insecure individuals will go through periods without being able to consume food meaning that when they do have the opportunity, they may overeat to compensate causing weight gain (Wilson, 1993; Polivy et al., 1994; Wilde & Tanney, 2000). Current research continues to explore this paradoxical relationship, finding the relationship highlighted more strongly in certain subgroups.

The Food-Insecurity and Obesity Paradox Disparities

Twenty countries are recognized by the United Nations to make up Latin America (United Nations Educational, Scientific and Cultural Organization, 2017). Of these 20 countries, six (30%) have been deemed to have medium or low human development (United Nations Development Programme, 2016). Developing countries hold 98% of the global burden of undernutrition - and although undernutrition and food insecurity are not the same, they are closely linked in regard to the health and well-being of individuals (Food and Agriculture Association of the United States, 1996).

Although women contribute half of the world's food production and produce up to 80% of the food in developing countries, they continue to have more difficulty than men when trying to access

resources such as land, credit and agricultural services (Pradhan & Rao, 2018; Kassie et al., 2014; Kiewish, 2015; Lubbock & Borquia, 1988). In Latin American countries, this notion of men being inferior to women and less capable is the result of a concept called *machismo* (Valegia, 2016). The use of the term *machismo* continues to be controversial, with some researchers believing that it encompasses the negative stereotypes of Latin-American men (aggression, authoritarianism, sexual promiscuity, etc.), and others understanding it as a representation of ideal masculinity (honor, dignity, respectability, etc.) (Torres et al., 2002). However, it is well understood that *machismo* influences how gender plays a role in the familial household. In these developing Latino countries, women have therefore assumed the more traditional role as the caregivers and food prepares for the family, which influences and increases their susceptibility to food security compared to that of men (Ivers & Cullen, 2011; Wilde & Peterman, 2006).

In fact, some studies have suggested that the food-insecurity and obesity association is even limited to individuals of certain racial/ethnic groups (Leung et al., 2011). Adams and researchers found that among racial/ethnic groups, Asians, Blacks and Hispanics, were associated with increased risk of obesity but not for non-Hispanic whites (2003). In a study that aimed to examine the relationship of food insecurity to weight in low-income Latina women in five California counties, Kaiser and researchers found that food insecurity did appear to be related to obesity in those Latina women (2004).

In 2016 there were a reported 43.7 million people living in the United States who were foreign-born; and over half of those individuals were from Latin America (Radford & Budiman, 2016). Although numerous, these Latino immigrants are susceptible to a multitude of challenges in the United States such as economic constraints from poverty, language, low-wage employment, and job insecurity that may become barriers to food security (Hadley et al., 2007; Munger et al., 2015). Immigrants also pose a unique disadvantage to non-immigrants in regard to food security because of the common practice, and felt obligation, of sending their limited financial resources back to family in their country of origin; this

adds an overwhelming financial stress and burden that is only found among immigrants (Quandt et al., 2006).

Returning back to the definition of food security formulated in the 1996 World Food Summit, food insecurity would therefore refer to the absence of one or more of the conditions mentioned (access to sufficient, safe, and nutritious food) to meet dietary needs and food preferences (Food and Agriculture Organization of the United Nations, 1996). The absence of one or more of these conditions (i.e. food insecurity) can be affected by numerous factors because of its multidimensionality as a construct. The stress, the food environment, dietary habits, and acculturation of an individual will be discussed as possible impacting factors of food insecurity.

Stress

Stress is defined as the body's physical and emotional response to an event that is challenging or demanding (MedlinePlus Medical Encyclopedia, 2018). Stress can affect the body in numerous physiological ways leading to various health problems such as cardiovascular and upper respiratory disease. Stress can also affect health behaviors such as food intake (Schneiderman et al., 2005).

There is an established relationship between the role of stress and adverse health outcomes (especially in mental health) in the United States (Matthews et al., 2013; Gee et al., 2009; Berger & Sarnyai, 2015), and across the world (Wallace et al., 2006; Karlsen & Nazroo, 2002; Noh et al., 1999). This relationship between stress and adverse health outcomes has also been identified among Latino immigrants (McClure et al., 2011; Patiño & Kirchner, 2010; Revollo et al., 2011).

There is increasing interest in investigating the perceptions of racial/ethnic discriminations as a type of stressful life experience that could negatively impact health (Williams et al., 2008; Clark et al., 1999; Williams & Williams-Morris, 2000; Krieger, 1999). Among other racial/ethnic minorities, Latino immigrants are prone to these personal experiences of racial bias which have been seen as an inducer of stress and negatively affect health overall (Harrell et al., 2003). Stress, as a result of experiencing racial

bias, continues to be discussed as one mechanism through with racism can affect health (Williams, 1996; Rollock & Gordon, 2000; Jones, 2000)

There are three different types of stress; acute, episodic, and chronic. Acute stress is frequently the result of physiological (physical) stressors, while chronic stress is frequently the result of psychological stressors. These stressors disrupt the homeostasis of the body and lead to the body's physiological reactions and responses to the stressor. Each of these stressors affects the individual differently. For example, a decrease in dietary consumption is a physical stressor which may impact the body temporarily, but when resolved timely, the body can return to its natural homeostatic state (Moore & Cunningham, 2012). In comparison, chronic stress develops over time and is more long-term. Chronic stress has been found to be associated with food insecurity (Laraia et al., 2013; Salinas et al., 2018; Jones, 2017; Hadley et al., 2011)

Food Environment

Food deserts are defined by the United States Department of Agriculture (USDA) as neighborhoods who lack healthy food sources. The USDA uses a map titled the Food Access Research Atlas to map the numerous factors that make up food deserts in in communities across the United States (Unites States Department of Agriculture, 2017). Factors which are included on the map are low income and low access areas, as well as vehicle ownership. Based on these factors the atlas then provides the level of food access.

There is a growing body of evidence suggesting that in the United States, the geographic distribution of food is greatly influenced by race and ethnicity (Casagrande et al., 2009; Larson et al., 2009). Studies have found that in minority neighborhoods, retail food environments are more likely to "promote the overconsumption of calories" through fewer opportunities of healthy food options compared to predominately white neighborhoods (Larson, 2009; Lovasi, 2009). In 2016, the poverty rate for Latinos was 19.4%, and although this is a decrease from the previous year (21.4%), the poverty rate for Latinos living in the United States is still significantly higher than that of non-Hispanic whites (8.8%)

(United States Census Bureau, 2016). These predominately Latino, low-income, low-resource, rural neighborhoods have few grocery stores or chain markets (Odoms-Young, 2012; Powell et al., 2007). This means that the community relies on less-traditional food stores, such as corner stores or discount stores, which frequently stock a low supply of healthy foods, or keeps healthy foods at a high price (Cafer & Kaiser., 2015; Peterson et al., 2010; Freedman, 2009).

The result of the limited variability in food choices in these low-income neighborhoods is the continuous pattern of consumption of low-cost foods that are more calorie-dense rather than nutritious (Hofferth & Curtin, 2005; Drewnowski, 2004). The low-cost, high calorie, energy dense, processed foods are also more easy to prepare than non-processed food (Rolls & Barnett, 2000) which could be enticing to Latino parents and workers who are often working more than one low paying job and are strapped for time (Shihadeh & Barranco, 2010).

According to the 2010 census, Latinos account for 8.2% of the total population in the state of Maryland. The Latino population in Maryland (35%) is centered in Montgomery County and Prince George's county. In Montgomery county, Latinos account for 17% of the residents and in Prince George's county, Latinos account for 15% of the residents. (Pew Research Center Hispanic Trends, 2013). In the state of Maryland as of 2016, 27.34% of the population is living in a USDA defined food desert and 12.8% of the population is food insecure. In Montgomery county, 19.84% of the population is living in a food desert and 7.9% of the population is food insecure. In Prince George's county, 43.59% of the population is living in a food desert and 14.8% of the population is food insecure. Prince George's county is also ranked first for the greatest number of fast food chain restaurants compared to other counties in Maryland (Johns Hopkins Center for a Livable Future, 2016). These food environments play an important role in the dietary habits of individuals living in these counties.

Dietary Habits

In 2011, the U.S Department of Health and Human Services (HHS) and the U.S. Department of Agriculture (USDA) published the 2015-2020 Dietary Guidelines for Americans in which they introduced a

tool called MyPlate. MyPlate serves as a visual tool through which these government agencies can implement the recommended dietary guidelines by bringing attention to healthy choices among food groups to improve healthy eating patterns (Office of Disease Prevention and Health Promotion, 2015).

MyPlate replaced the previous visual tool used to represent the USDA's Dietary Guidelines, the food pyramid. The updated Dietary Guidelines draws focus on eating patterns rather than specific food groups, as previously seen. Instead of a pyramid, MyPlate shows that a recommended healthy plate of food should be half filled with a variety of vegetables, and whole fruits, be a quarter of grains (preferably whole), and the remaining quarter should be protein. It also includes dairy, as low-fat or fat-free yogurt or milk, and recommends limiting sodium, saturated fat and added sugars (not shown on plate) (Office of Disease Prevention and Health Promotion, 2015). These Dietary Guidelines are re-evaluated and re-published every 5 years because they are important tools used to influence nutritional programs across the nation that impact the health of every individual.

The first section of the 2015-2020 Dietary Guidelines explains the close relation between nutrition and health, stating that approximately half of American adults have chronic diseases such as, type 2 diabetes, high blood pressure, and cardiovascular disease, which are all preventable and related to poor diet patters and physical activity (Office of Disease Prevention and Health Promotion, 2015).

In a report to the Secretary of Health and Human Services and to the Secretary of Agriculture, the Dietary Guidelines Advisory Committee stated that the United States population does not meet dietary guidelines for vegetable intake and 8% do not meet the dietary guidelines for fruit intake (McGuire, 2016). The most recent data from the Centers for Disease Control and Prevention has reported that in 2015, 40.2% of adults in the United States reported consuming fruit less than one time per day and 22.1% reported consuming vegetables less than one time per day (2015). This data was collected from the Behavioral Risk Factor Surveillance System, which asked respondents to report frequency (times per day,

week or month) of consumption of certain fruits and vegetables (Centers for Disease Control and Prevention, 2015).

Racial/ethnic minority group diets are less likely to adhere to obesity prevention recommendations (Casagrande, 2007). Insufficient consumption of fruits, vegetables, whole grains, and overconsumption of fast food and sweetened beverages is found among most minority populations (Swinburn, 2009). Among the female Latino population, one study showed that cultural food preferences shaped food choices; to them, a healthier, satisfying and affordable meal was rice, beans, and meat, over fruit and fruit juice (Hromi-Fiedler., 2009). These preferences can explain why Latinos may consume fruit and vegetables less often than other race/ethnicity groups such as non-Hispanic blacks or non-Hispanic whites (Grimm et al., 2011; Di Noia et al., 2016).

There is growing evidence that links food insecurity with adverse dietary habits. Compared to individuals living in food secure households, individuals from food insecure households have been seen to have a lower nutrient intake (Rose, 1997) as well as less consumption of fruits and vegetables which decreases as the severity of food security increases (Kendall et al., 1996). Some studies report higher fruit intake among food insecure households; however, this is demonstrating fruit juice intake as part of the fruit group (Mello et al., 2011), which causes discrepancies since the fruit juice consumed and frequently found in low-income neighborhoods is high in sugar content and therefore not a healthy food choice leading to the chronic conditions aforementioned (Sohyun Park et al., 2016). The literature calls for further investigation of the relationship between food-insecurity and dietary habits specifically among the Latino immigrant population who are at risk for harmful dietary habits and food insecurity.

Dietary Measures

Dietary habits can be measured using various tools. Three of the most common measures of dietary habits include 24- hour recall, diet records, and food frequency questionnaires. Twenty-four-hour recall for dietary habits is a brief measure that is helpful for use in specific populations (such as low-income and low literacy) since it does not require writing or reading. This measure is also relatively brief

and inexpensive since it only relies on the memory of the participant, however this is also limitation. Additionally, this measure only captures dietary habit information for one day which may not be representative of the participants' normal dietary habits. (Johnson, 2002).

Diet records are another method that may be used to measure dietary habits. This measure requires participants to annotate all of the food and beverages that they consume for a specific amount of time. The strength of using diet records is that the researcher can pin-point the specific food intake for a period of time. However, diet records require a population that is literate as well as researchers who are trained in using the software needed to analyze the data from the records (Johnson, 2002).

The remaining common measure of dietary habits is food frequency questionnaires. This measure allows for tracking of nutrient intake of large groups and can allow for inquiry of specific food groups and foods in terms of frequency of consumption (Johnson, 2002). PrimeScreen is an example of a food frequency questionnaire. This 18-item measure identifies participant frequency of consumption of difference foods and food groups such as fresh fruits and vegetables, baked goods, and more (Rifas-Shiman et al., 2001).

Acculturation

Acculturation is defined as the adoption of values, beliefs, attitudes, customs and behaviors, that results from exposure to a culture different than the one an individual already has (LaFromboise et al., 1993). Acculturation has been measured in many different ways, however within the literature the most common measurement of acculturation is through three proxies; nativity, years living in the United States, and language spoken at home (or language preference) (Lora et al., 2018; Kandula et al., 2008; Carter-Pokras et al., 2008; Mainous et al., 2006). Nativity, or birth place, is used as a fixed indicator of acculturation in order to mark the initiation into the acculturation process; language use is used as a process indicator which hopes to capture the acculturation process dynamic (Pérez-Escamilla, 2011).

As mentioned, time lived in the United States is one of the three proxies used to measure acculturation. In other words, the longer an individual has lived in the United States, the higher their level of acculturation (without regard to language preference or nativity). Among immigrants, time lived in the U.S. has been associated with poorer health indicators (Hadley et al., 2007; Kandula et al., 2004; Singh & Hiatt, 2006; Kaplan et al., 2004)

Among Latinos, health practices and beliefs of individuals are influenced by their level of acculturation and therefore so are their health outcomes (Ayala et al., 2008; Constantine et al., 2009; Liu et al., 2008; Solis et al., 2011). This supports a study which found that acculturation was associated with increased fat intake, decreased fiber intake, and less physical activity among low-income Latino adults which may ultimately increase their risk for chronic illness (Pérez-Escamilla, 2011).

With the established negative health outcomes of acculturation regarding diet and obesity for Latino immigrants, we must explore food insecurity as an intermittent factor that can be targeted in the association.

Conceptual Framework

The purpose of this study is to explore the paradoxical relationship between food insecurity and obesity among Latino immigrants in the D.C. metro area of Maryland. The conceptual framework below (Figure 1) has been adapted from a more general conceptual framework exploring food insecurity and health (Weiser et al., 2015) to include the variables of interest of this study; food environment, acculturation, demographics, dietary habits, stress, food insecurity, and obesity. Each line drawn between variables shows an association of interest. Three levels of determinants are described in this framework; community, household, and individual. The broad structural factor discussed in this study that influences food security at the community level includes food access. At the household level is typically where food insecurity operates. Food insecurity shapes health outcomes through nutritional and mental health pathways. These household level clinical health outcomes include the outcome of interest in this study, obesity at the individual level. The individual level also includes characteristics such as acculturation and

demographics. The red variables are those which differed from the adapted model. The adapted model did not look at food access as a structural factor, individual characteristics such as acculturation and demographics, or stress as part of their mental health pathway.

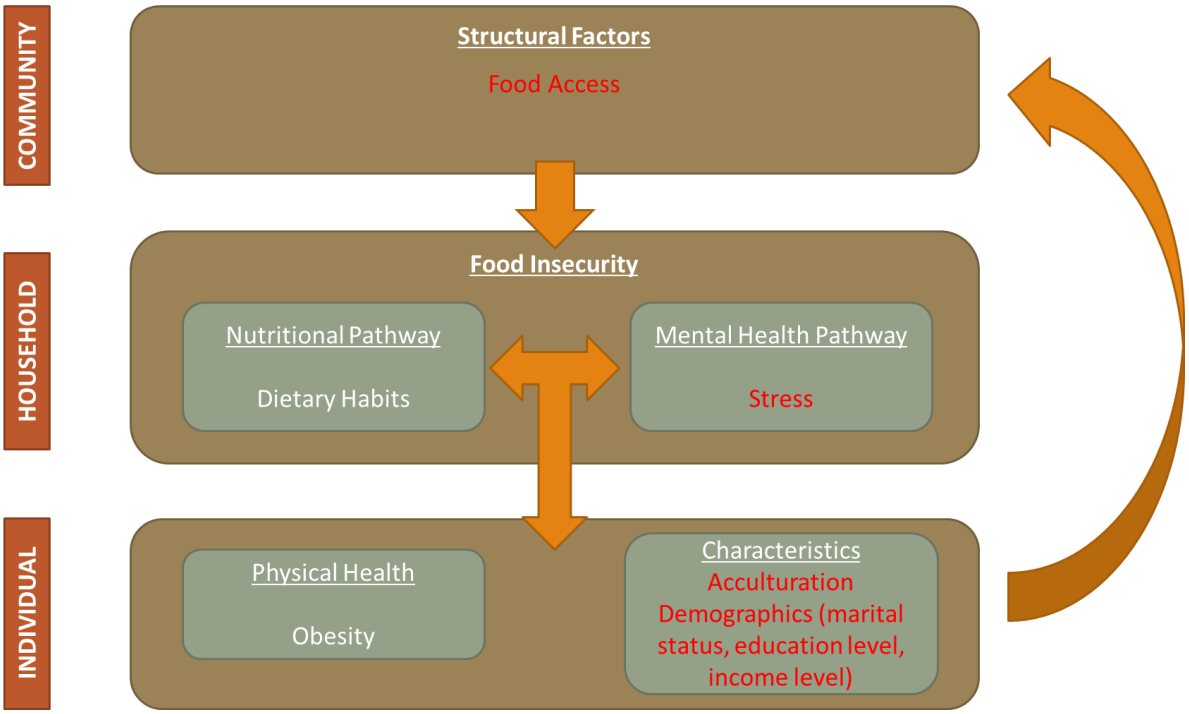

Figure 1: Adapted conceptual framework (Weiser et al., 2015)

Chapter 3: Methods

Overview and Study Design: Latino Employees at UMD: Assessing their Health Needs to Promote Health and Well-being

The data for this study was retrieved through the Latino Employees at UMD: Assessing their Health Needs to Promote Health and Well-being study, conducted by Dr. Mary A. Garza and Dr. Lesliam Quiros-Alcala. The research team aimed to assess the health and well-being of Latino workers as well as to learn more about their exposures to chemicals at work and at home, in order to identify barriers and facilitators of chronic disease prevention to inform health promotion programs in worksite settings. This larger study used a sequential mixed methods design based on focus groups (Phase 1: Qualitative) and surveys and biospecimen collection (Phase 2: Quantitative) to assess the health needs of the Latino workforce in a university environment. The data used for this thesis, and described below, was from the Phase 2.

This sub-analysis (n=138) aimed to understand how food insecurity is associated with demographics (education level, marital status, and household income groups), acculturation, stress, dietary habits, food access, and obesity in U.S. Latina immigrants. This analysis also explored the predictor variables of food access and obesity.

Study Sample

Recruitment

This study employed a community based participatory research approach. Key stakeholders were identified in each of the following three categories: Facilities, Dining, or Residential Management and one-on-one meetings were conducted to discuss the purpose of the research study and address any concerns. After Directors/Managers agreed to participate, they assisted researchers in identifying the best recruitment strategies for UMD Latino employees. Flyers (Appendix 1), in Spanish and English, included a brief description of the study, what participants were asked to do, what they would receive in return, and contact information for the study researchers. The flyers were distributed at key locations throughout campus and during presentations conducted in Spanish, which were given to upper

management and staff to provide more information about the research study. Participants were recruited in two ways: 1. Participants called the telephone number provided on the flyer and a voice recorded message in Spanish would invite them to leave their name and contact information in order for researchers to call back. 2. A recruiter employed by Facilities Management assisted in identifying participants and recruiting them into the study using the information on the flyer. All participants who showed interest were then screened for eligibility using a Screener in their preferred language English/Spanish (Appendix 2). Interested participants were screened either through the telephone or in person. All eligible participants were scheduled for an appointment immediately following the screening process. The goal was to recruit approximately 55 participants from each category in order to enroll 25% of the Latino workforce in the three categories (N=165). A total of 159 participants were recruited for this phase.

Eligibility

Individuals participating in the Latino Study had to be 18 years old or older, self-identify as Latino/Hispanic and employed at UMD in one of the three categories: Facilities, Dining or Residential Management.

Data Collection

The visit took approximately 1 hour (45-minute survey, 15-minute biological sample collection) and each participant received a $25 cash incentive for their time and participation. Research assistants were trained to conduct the interviews and to collect the biospecimens. In addition, a consultant (Rivera Group, Inc) was hired for the translation and data collection for Phases 1 and 2. All of the interviewers and research assistants were CITI (Collaborative Institution Training Initiative) trained.

Eligible participants who scheduled an appointment time and date, were received at the Center for Health Behavior Research in the School of Public Health at the University of Maryland. Upon arrival, the individual was welcomed by a bilingual greeter who cross-checked their name and time of appointment with their corresponding study folder. Each participant in the study was assigned a

'Participant ID' and a folder with their corresponding study materials (two copies of the consent form, a paper copy of the questionnaire, and a study checklist – for researcher use). Eligible participants were then taken to a private room by a bilingual interviewer who conducted the informed consent process. Consented participants were given a copy of the consent form for reference. These participants were then led by their interviewer to the laboratory for the biospecimen collection by one of the trained research assistants. After the biospecimen collection, participants were led back to a private room by their interviewer, where they administered the questionnaire.

The questionnaire was collected using RedCap – a web-based data collection tool. The RedCap application was loaded on multiple iPads which were then used to record participant answers as the interviewer asked them. Once the questionnaire was completely administered, the interviewer led the participant back to the entrance of the Center where they signed out and were given their incentive.

Measures

Demographic Variables (education level, marital status, household income groups)

The demographic variables that were measured and used in this study include time living in the U.S., education level, marital status, and household income. All of these variables were self-reported by the participants. To measure education level, participants were asked what their highest grade or level of school was completed or the highest degree that they received. Response categories included Elementary/Primary School (includes grades 1-6), Middle School/Junior High (includes grades 7-9), High School/Preparatory School (10-12), Trade School/Vocational School, University/College (1-3 years), College Completed or More, and Other. Education was recoded into three categories; less than a high school degree=0, high school equivalent=1, and some college/degree=2. No participants chose Other as a response for education. Participants selected marital status from four different possibilities; Married or living with my partner, Never married, Separated/divorce, or Widower. Marital status was recoded into 2 categories with married or living with partner=0 and single including divorced/widowed=1. To measure household income groups, participants reported their best estimate of all sources of total income of

family members during 2016 before taxes with an open-ended response. Total income reported ranged for $11,000 to $150,000. Frequencies were conducted and total income was recoded to three categories; less than $29,999=0, $30,000-$59,999=1, and $60,000 and above=2.

Food Insecurity

To measure food insecurity, four items from the USDA's 10-item U.S. Adult Food Security Survey were used. Participants were asked "(I worried/We worried) that the food would run out before having money to buy more," "The food that (I/we) bought just didn't last, and (I/we) didn't have enough money to get more food," "(I/We) couldn't afford to eat balanced meals," and "Were you ever hungry but didn't eat because there wasn't enough money for food?". Response options were: Occurred Frequently, Occurred Sometimes, or Never. Responses were later recoded based on frequency to Never=0 or Occurred Frequently/Occurred Sometimes=1. The sum of affirmative responses to the four questions in the Adult Food Security Scale is the household's raw score on the scale. A score of 0=very low food security, 1=low food security, 2= marginal food security, and 3=high food security.

Body Mass Index (BMI)

Anthropometric measurements of height and weight were taken. Body mass index was calculated by weight in kilograms divided by height in meters. According to the Centers for Disease Control classifications on weight status of body mass index, three categories were created; normal ≤24.99=1, overweight 25-29.99=2, and obese ≥30.

Stress

Participants were asked two questions to measure stress; "How would you rate the amount of stress in your daily life at work" and "How would you rate the amount of stress in your daily life at home." Response choices included Severe, Moderate, Light, and Minimal. Responses were recoded to minimal/light=1 and moderate/severe=2. Each stress item was recoded individually.

Acculturation

Acculturation was assessed using three proxy markers; nativity, years in the U.S., and language spoken at home. Nativity was determined from an open-ended question asking the participant for their

country of birth. Responses will be recoded as U.S born or foreign born. Among the foreign born, years in the U.S will be recoded as living in the U.S. ≥20 years, living in the U.S. 10-19 years, and living in the U.S. <10 years. Participants were asked to determine what language was spoken at home by responding only Spanish, more Spanish than English, both Spanish and English equally, more English than Spanish, or only English. Responses will be recoded to 2=English only, 1=English and Spanish, and 0=Spanish.

An acculturation score was constructed based on these proxy markers. A score range of 0-3 was utilized for nativity combined with years in the U.S. (3 = U.S. born, 2= foreign born and lived in the U.S. ≥20 years, 1= foreign born and lived in the U.S. 10-19 years, and 0 = foreign born and lived in the U.S. <10 years. A score range of 0-2 was utilized for language spoken at home (2= English, 1= English and Spanish, and 0= Spanish). The scores were summed to create the acculturation score from 0 (least acculturated) to 5 (most acculturated).

Food Access

Food access was measured by the Center for Geospatial Information Science at the University of Maryland using participant zip codes and Geographic Information Systems (GIS) mapping. The map was constructed using a Food Access Research Atlas provided by the USDA Economic Research Service (United States Department of Agriculture, 2017). This research atlas analyzes level of food access based on zip code. The neighborhoods are classified according to five categories; 1) urban or 2) rural, 3) neighborhood income, 4) vehicle ownership, and 5) distance to supermarkets. This study looked at GIS mapping for food access. Low access to healthy food is defined as being farm from a supermarket, supercenter, or large grocery store. Low access neighborhoods at 1 mile or ½ a mile are tracts in which at least 500 people or 33% of the population live farther than 1 mile or ½ a mile, respectively, from the nearest supermarket. These data helped explore the relationship between living in an area with limited access to healthy foods and food insecurity, obesity, dietary habits, and stress.

Dietary Habits – frequencies

A modified version of the 18-item PrimeScreen questionnaire was used to measure the dietary habits of participants. The 11 food items that were used in this study included; 1) baked products, 2) fresh vegetables, 3) fresh fruits, 4) processed meat, 5) fish/seafood (not fried), 6) deep fried, 7) whole milk dairy foods, 8) low-fat milk products, 9) whole grain foods, 10) pasta/rice/noodles, 11) beef/pork/lamb, and a question regarding additional salt use.

Response categories for each of the above 12 food items were in terms of frequency of consumption for each item. The categories included never, rarely, 1-3 times a month, 1-3 times a week, 4-6 times a week, and every day. Based on frequencies these categories were recoded to 0=never/rarely (never, rarely, 1-3 times a month), 1=sometimes (1-3/week), 2=frequently (4-6/week and every day).

Using these items, dietary habits were assessed through frequency of healthy food group consumption (vegetables, fruits, and fish) and frequency of unhealthy food group consumption (baked products, deep fried, and processed meat). These food categories were chosen because they are the most highly recommended by the USDA for dietary consumption. These food categories are the most telling food groups of overall diet quality. The recoded scores of the four items were summed to reveal the frequency level of healthy diet consumption (low, moderate or high) for each participant (Table 2).

Table 2:Dietary Habits Frequency Recoding

USDA Healthy Food Groups	Frequency	Score ranges and Frequency Level of Healthy/Unhealthy Diet Consumption
Fresh Vegetable Fresh Fruit Fish/Seafood Baked Products Deep Fried Processed Meat	0 = never, rarely, 1-3/month 1 = 1-3/week 2 = 4-6/week, everyday	0-2 = Low frequency of healthy/unhealthy diet consumption 3-5 = Moderate frequency of healthy/unhealthy diet consumption 6-8 = High frequency of healthy/unhealthy diet consumption

Analysis Plan

Overview

This study consisted of univariate, bivariate, and multivariate analyses to examine the relationship of participant demographics, stress, dietary habits, food access, food insecurity, and obesity using Statistical Software SPSS 25.0. The aim of this analysis plan was to answer the following research questions:

(1) How is food insecurity among Latina immigrants associated with demographics (education level, marital status, household income groups), stress, dietary habits, food access, acculturation and obesity?

(2) What are the predictors of food access?

(3) What are the predictors of obesity?

Univariate Analysis

In order to better understand the sample, the first step of the analysis process was to conduct descriptive statistics for each of the variables. Frequency tables were created to display demographic variables including marital status, education, and household income. Frequency tables were also created to display acculturation, dietary habits, stress, obesity, food access, and food insecurity classifications. These frequency analyses assisted in determining the distribution of participant responses and determined how the variables should be recoded, and later, grouped for the bivariate analysis.

Bivariate Analysis

Bivariate analyses were used to assess the first research question, "How is food insecurity among Latina immigrants associated with demographics, stress, dietary habits, food access, and obesity?" The variables being measured included demographics (time living in the U.S, education level, marital status, and household income groups), stress, dietary habits, food access, and obesity. Chi-square tests and post-HOC tests (Bonferroni correction) were conducted in order to determine the relationship between each of the variables.

Multivariate Analysis

Multivariate analyses were used to assess the last two research questions, “What are the predictors of food access?” and “What are the predictors of obesity?” The variables in these analyses were based on the significant associations with obesity and food access found during the bivariate analysis. Multivariate logistic regression models were used to determine the predictor variable of food access and obesity.

This sub-analysis (n=128) aimed to assess how food insecurity is associated with demographics (education level, marital status, and household income groups), acculturation, stress, dietary habits, food access, and obesity in U.S. Latina immigrants. The analysis also explored the predictor variables of food access and obesity. A better understanding of the “food insecurity-obesity” paradox and related factors will inform future culturally-tailored interventions to address obesity among Latina immigrants.

Chapter 4: Results

Sample Demographic Characteristics

The sample included 128 female participants, demographics described in Table 3. The majority were between 40-59 years old (76.6%) and married or living with their partner (65.5%). Half of the participants (50%) attained less than a high school education and the majority had a total annual household income of less than $29,999 (42%).

Table 3: Sample Demographic Characteristics (n=128)

	N (%)
Age	
19-39 years	13 (10.2)
40-59 years	98 (76.6)
60+ years	17 (13.3)
Total Household Income*	
Less than $29,999	54 (42.2)
$30,000-$59,999	42 (32.8)
$60,00 or more	29 (22.7)
Marital Status	
Married or living with partner	84 (65.6)
Single	44 (34.4)
Education Level	
Less than high school	
High school graduate	64 (50.0)
Some college/degree	45 (35.3)
	19 (14.8)

* three missing; responses not included
* two missing; responses not included

Univariate Analysis

Univariate Analysis of Outcome Variables

Table 4 demonstrates the univariate analysis of the three outcome variables of interest. The majority of participants were obese (69.5%) and living in a low food access area (78.9%). There were slightly more food secure participants (53.9%) compared to food insecure participants (46.1%).

Table 4: Outcome Variables

	N (%)
Body Mass Index (BMI)	
Overweight (25-29.99)	39 (30.5)
Obese (30+)	89 (69.5)
Food Security	
Food secure	69 (53.9)
Food insecure	59 (46.1)
Low Food Access*	
Yes	101 (78.9)
No	25 (19.5)

Univariate Analysis of Stress

Table 5 shows the stress composite variable. The stress composite variable was calculated as a sum from the stress at home and stress at home and stress at work items. Minimal to light stress at home (70.3%) was reported for a majority of participants, however a little more than half of participants reported moderate to severe stress at work (55%). Minimal/light stress (40.6%) was reported as most common level of stress among participants.

Table 5: Stress

	N (%)
Stress	
Minimal	52 (40.6)
Moderate	43 (33.6)
Severe	33 (25.8)
Stress at home	
Minimal to light	90 (70.3)
Moderate to severe	38 (29.7)
Stress at work	
Minimal to light	57 (44.5)
Moderate to severe	71 (55.0)

Univariate Analysis of Acculturation

The acculturation composite score in Table 6 was computed from three proxies; country of birth, language spoken at home, and time spent in the United States. The majority of participants spoke mostly Spanish (82.8%), were born in El Salvador (69.5%) and have spent more than 20 years in the U.S (70.3%). Approximately 85.9% of the participants were less acculturated.

Table 6: Acculturation

	N (%)
Acculturation	
Less acculturated	110 (85.9)
More acculturated	18 (14.1)
Country of birth	
El Salvador	89 (69.5)
Other, but not U.S	39 (30.5)
Language Spoken at Home	
Mostly Spanish	106 (82.8)
Both Spanish and English	21 (16.5)
Mostly English	1 (0.8)
Time in the U.S.	
Less than 10 years	13 (10.2)
10-19 years	25 (19.5)
20 or more years	90 (70.3)

Univariate Analysis of Dietary Habits

The frequency of healthy diet consumption composite score shown in Table 7 was computed from three healthy food items; fresh vegetables, fresh fruits, and fish/seafood. The majority of participants reported frequently consuming fresh vegetables (85.9%), fresh fruits (89.8%) and sometimes consuming fish/seafood (57%). The frequency of unhealthy diet consumption composite score was computed from three unhealthy food items; baked products, deep fried, and processed meat. Most participants reported sometimes consuming baked products (donuts, cookies, muffins, etc.) (62.5%), deep fried foods (66.4%), and processed meat. (84.4%). For most, there was moderate frequency of healthy diet consumption (60.9%) as well as a majority moderate frequency of unhealthy diet consumption (94.5%).

Table 7: Dietary Habits

	N (%)		N (%)
Frequency of Healthy Diet Consumption		Frequency of Unhealthy Diet Consumption	
Moderate	78 (60.9)	Moderate	121 (94.5)
High	50 (39.1)	High	7 (5.5)
Fresh Vegetables		Baked Products	
Sometimes	28 (14.1)	Sometimes	80 (62.5)
Frequently	110 (85.9)	Frequently	48 (37.5)
Fresh Fruits		Deep Fried	
Sometimes	13 (10.2)	Sometimes	85 (66.4)
Frequently	115 (89.8)	Frequently	43 (33.6)
Fish/Seafood		Processed Meat	
Sometimes	73 (57.0)	Sometimes	108 (84.4)
Frequently	55 (43.0)	Frequently	20 (15.6)

*No participants reported low/rarely for any food item

Bivariate Analysis

Bivariate analyses were conducted to determine participant associations by individual characteristics (marital status, education level, total household income, and acculturation), household mental health characteristic (stress level), nutritional characteristics (dietary habits) and structural factors (food access). Chi-squared cross tabulations were conducted with food security items, the food security composite score, BMI, and food access as the outcome variables with all the previously presented variables. Significance levels are denoted using one asterisk (*) for a significance level at p≤.10 and two asterisks (**) for a significance level at p≤0.05.

Bivariate Analysis of Food Security

Table 8 shows the bivariate analysis of food security. The second food security item "The food that (I/we) bought just didn't last, and (I/we) didn't have enough money to get more food" was found to be marginally associated with marital status (p=0.058). Of those who had experienced this phenomenon, the majority were married or living with their partner (57.6%). The third food security item "(I/we) couldn't afford to eat balanced meals" was found to be marginally associated with marital status (p=0.076), and education level (p=0.070). This item was also significantly associated with BMI (p=0.031).

Of those participants who had experienced this phenomenon, the majority were married or living with their partner (58.7%), and had an education level of less than high school (50.8%), and were obese (76.2%). The fourth food security item "Were you ever hungry but didn't eat because there wasn't enough money for food," was only found to be significantly associated with education level (p=0.030). Of those who had experienced this phenomenon, the majority had an education level of less than high school (57.5%). The food security composite score was found to be marginally associated with marital status (p=0.058), and education level (p=0.053). Of those participants who were food insecure, the majority were married or living with their partner (57.6%) and had an education level of less than high school (52.5%). No statistical significance was found with the first food security item, nor with stress, food access, acculturation or dietary habits with any of the food security items and the food security composite score.

Table 8: Bivariate Analysis: Food Security and Food Security Items with Demographics, Acculturation, Stress, Food Access, and Dietary Habits N(%)

	(I worried/We worried) that the food would run out before having money to buy more		The food that (I/we) bought just didn't last, and (I/we) didn't have enough money to get more food		(I/we) couldn't afford to eat balanced meals		Were you ever hungry but didn't eat because there wasn't enough money for food?		Food Security	
	No	Yes	No	Yes	No	Yes	No	Yes	Food Secure	Food Insecure
Marital Status										
Married or living with partner	43 (70.5)	41 (61.2)	50 (72.5)*	34 (57.6)*	47 (72.3)*	37 (58.7)*	58 (65.9)	26 (65.0)	50 (72.5)*	34 (57.6)*
Single	18 (29.5)	26 (38.8)	19 (27.5)*	25 (42.4)*	18 (27.7)*	26 (41.3)*	30 (34.1)	14 (35.0)	19 (27.5)*	25 (42.4)*
Education Level										
Less than high school	29 (47.5)	35 (52.2)	34 (49.3)	30 (50.8)	32 (49.2)*	32 (50.8)*	41 (46.6)**	23 (57.5)**	33 (47.8)*	31 (52.5)*
High school graduate	19 (31.1)	26 (38.8)	21 (30.4)	24 (40.7)	19 (29.2)*	26 (41.3)*	29 (33.0)**	16 (40.0)**	21 (30.4)*	24 (40.7)*
Some college/degree	13 (21.3)	6 (9.0)	14 (20.3)	5 (8.5)	14 (21.5)*	5 (7.9)*	18 (20.5)**	1 (2.5)**	15 (21.7)*	4 (6.8)*
Total Household Income* **										
Less than $29,999	21 (35.0)	33 (50.8)	25 (36.8)	29 (50.9)	26 (40.0)	28 (46.7)	36 (41.4)	18 (47.4)	24 (36.8)	29 (50.9)
$30,000-$59,999	23 (38.3)	19 (29.2)	24 (35.3)	18 (31.6)	19 (29.2)	23 (38.3)	30 (34.5)	12 (31.6)	23 (33.8)	19 (33.3)
$60,00 or more	16 (26.7)	13 (20.0)	19 (27.9)	10 (17.5)	20 (30.8)	9 (15.0)	21 (24.1)	8 (21.1)	20 (29.4)	9 (15.8)
Body Mass Index (BMI)										
Overweight (25-29.99)	22 (36.1)	17 (25.4)	22 (31.9)	17 (28.8)	24 (36.9)*	15 (23.8)*	26 (29.5)	13 (32.5)	23 (33.3)	16 (27.1)
Obese (30+)	39 (63.9)	50 (74.6)	47 (68.1)	42 (71.2)	41 (63.1)*	48 (76.2)*	62 (70.5)	27 (67.5)	46 (66.7)	43 (72.9)
Acculturation										
Less acculturated	16 (26.2)	22 (32.8)	16 (23.2)*	22 (37.3)*	14 (21.5)**	24 (38.1)**	28 (31.8)	10 (25.0)	16 (23.3)	22 (37.3)
Most acculturated	45 (73.8)	45 (67.2)	53 (76.8)*	37 (62.7)*	51 (78.5)**	39 (61.9)**	60 (68.2)	30 (75.0)	53 (76.8)	37 (62.7)
Stress										
Minimal	27 (44.3)	25 (37.3)	30 (43.5)	22 (37.3)	28 (43.1)	24 (38.1)	36 (40.9)	16 (40.0)	31 (44.9)	21 (35.6)
Moderate	19 (31.1)	24 (35.8)	23 (33.3)	20 (33.9)	21 (32.3)	22 (34.9)	32 (36.4)	11 (27.5)	23 (33.3)	20 (33.9)
Severe	15 (24.6)	18 (26.9)	16 (23.2)	17 (28.8)	16 (24.6)	17 (27.0)	20 (22.7)	13 (32.5)	15 (21.7)	18 (30.5)
Low Food Access* **										
No	11 (18.0)	14 (21.5)	12 (17.6)	13 (22.4)	11 (17.2)	14 (22.6)	15 (17.2)	10 (25.6)	13 (19.1)	12 (20.7)
Yes	50 (82.0)	52 (78.5)	56 (82.4)	45 (77.6)	53 (82.8)	48 (77.4)	72 (82.8)	29 (74.4)	55 (80.9)	46 (79.3)
Frequency of Healthy Diet Consumption										
Moderate	35 (57.4)	43 (64.2)	39 (56.5)	39 (66.1)	37 (56.9)	41 (65.1)	51 (58.0)	27 (67.5)	39 (50.0)	39 (66.1)
High	26 (42.6)	24 (35.8)	30 (43.5)	20 (33.9)	28 (43.1)	22 (34.9)	37 (42.0)	13 (32.5)	30 (43.5)	20 (33.9)
Frequency of Unhealthy Diet Consumption										
Moderate	57 (93.4)	64 (95.5)	64 (92.8)	57 (96.6)	61 (93.8)	60 (95.2)	83 (94.3)	38 (95.0)	65 (94.2)	56 (94.9)
High	4 (6.6)	3 (4.5)	5 (7.2)	2 (3.4)	4 (6.2)	4 (4.8)	5 (5.7)	2 (5.0)	4 (5.8)	3 (5.1)

* p <0.1 **p<0.05 ****some participants missing*

Bivariate Analysis of BMI and Low Food Access

Table 9 represents the bivariate analysis for demographic characteristics, acculturation, stress, and dietary habits, with BMI and low food access. No significant associations were observed. Participants who were obese were more likely to be married or living with their partner (64%), have an education level less than high school (47.2%), make less than $29,999 annually (39.5%), be less acculturated (84.3%), report minimal stress (42.7%), and have reported moderate frequency of healthy (59.6%) and unhealthy (93.3%) diet consumption. Participants who reported being overweight were more likely to be married or living with their partner (69.2%), have an education level of less than high school (56.4%), and report a total household income of less than $29,999 (51.3%). These participants reported to be less acculturated (89.7%) and an equal level of minimal and sever stress level (35.9%). Participants who were overweight reported moderate frequency of healthy (64.1%) and unhealthy (97.4%) diet consumption.

Of the participants living in low food access areas, 66.3% were married or living with their partner, 46.5% of them had an education level less than high school and 39.8% of them made less than $29,999 annually. The majority of these participants were also obese (69.3%), were less acculturated (84.2%) and reported minimal stress (40.6%). These participants also reported moderate frequency of healthy (59.4%) and unhealthy (95.0%) diet consumption. Participants who were not living in low food access areas were mostly married or living with their partner (64.0%), had an education level less than high school (60.0%), and reported a total household income of less than $29,999 (56.0%). These participants were also obese (72.0%), less acculturated (92.0%), evenly distributed in minimal and moderate stress level (44%). Participants who were not in low food access arear reported moderate frequency of healthy (59.4%) and unhealthy (95.0%) diet consumption. However, these findings were not significant.

Table 9: Bivariate Analyses: BMI and Low Food Access with Demographics

	BMI		Low Food Access	
	Overweight N (%)	Obese N (%)	No N (%)	Yes N (%)
Marital Status				
Married or living with partner	27 (69.2)	57 (64.0)	16 (64.0)	67 (66.3)
Single	12 (30.8)	32 (36.0)	9 (36.0)	34 (33.7)
Education Level				
Less than high school	22 (56.4)	42 (47.2)	15 (60.0)	47 (46.5)
High school graduate	12 (30.8)	33 (37.1)	6 (24.0)	39 (38.6)
Some college/degree	5 (12.8)	14 (15.7)	4 (16.0)	15 (14.9)
Total Household Income				
Less than $29,999	20 (51.3)	34 (39.5)	14 (56.0)	39 (39.8)
$30,000-$59,999	10 (25.6)	32 (37.2)	6 (24.0)	35 (35.7)
$60,00 or more	9 (23.1)	20 (23.3)	5 (20.0)	24 (24.5)
Body Mass Index (BMI)				
Overweight (25-29.99)	X	X	7 (28.0)	31 (30.7)
Obese (30+)	X	X	18 (72.0)	70 (69.3)
Acculturation				
Less acculturated	10 (25.6)	28 (31.5)	6 (24)	32 (31.7)
Most acculturated	29 (74.4)	61 (68.5)	19 (76.0)	69 (68.3)
Stress				
Minimal	14 (35.9)	38 (42.7)	11 (44.0)	41 (40.6)
Moderate	11 (28.2)	32 (36.0)	11 (44.0)	30 (29.7)
Severe	14 (35.9)	19 (21.3)	3 (12.0)	30 (29.7)
Frequency of Healthy Diet Consumption				
Moderate	25 (64.1)	53 (59.6)	17 (68.0)	60 (59.4)
High	14 (35.9)	36 (40.4)	8 (32.0)	42 (40.6)
Frequency of Unhealthy Diet Consumption				
Moderate	38 (97.4)	83 (93.3)	23 (92.0)	96 (95.0)
High	1 (2.6)	6 (6.7)	2 (8.0)	5 (5.0)

Multivariate Analysis

Binary and multivariate logistic analyses were proposed to assess the predictors of BMI and food access. No significant bivariate associations were found in the bivariate analysis with food access, therefore, the multivariate analysis was not conducted. The only significant association found with BMI was with one of the food insecurity items. Since there was only one significant association found with BMI, the multivariate analysis was not conducted. However, food security was explored as an outcome and significant bivariate associations were found among food security with education level and marital status. Therefore, multivariate analyses were conducted.

Multivariate Analysis: Food Security

The logistic regression presented in Table 10 was performed to ascertain the effects of marital status and education level on the likelihood that participants are food insecure. These variables were chosen because they were found to be significant or marginally significant in the bivariate analysis. After conducting the multinomial logistic regression, marital status and food security were marginally significantly associated. Participants who were married or living with their partner were less likely to be food insecure than participants who were single (p=0.08). Participants with an education level less than high school were significantly more likely to be food insecure (p=0.03) than individuals with more than a high school degree. Participants with only a high school degree were also significantly more likely to be food insecure (p=0.01) than individuals with more than a high school degree.

Table 10: Multivariate Logistic Regression with Food Security

	Food Insecure
	OR (95% CI)
Marital Status	
Married or living with partner	0.498 (0.228, 1.089)*
Single	Reference
Education Level	
Less than high school	4.168 (1.182, 14.704)**
High school graduate	5.141 (1.395, 18.940)**
Some college/degree	Reference

** p <0.1 **p<0.05*

Chapter 5: Discussion

Central Findings and Implications

Overview

This sub-analysis aimed to examine the food insecurity obesity paradox in a sample of Latino immigrants residing in the DC metropolitan area. The results of these analyses found significant bivariate associations between BMI and one food security item ((I/we) couldn't afford to eat balanced meals), and between food security with marital status and education level. Logistic regression analyses found that participants who were single were more likely to be food insecure than participants who were married and that participants who had an education level of high school or less were more likely to be food insecure than participants with an education level higher than high school. Unlike previously reported literature, no other significant associations were identified among demographics, stress, acculturation, and dietary habits, with BMI, food access, and food security. This exploratory study aimed to examine the associations between these variables to further understand their relationship to one another and contribute to the literature regarding Latino immigrant health in the United States.

Food Security

This analysis focused on three outcome variables of interest; BMI, food access, and food security. Among the participants, more than one third (46%) were food insecure. This is consistent with the high rates of food insecurity reported among Hispanic headed households (18.5%) compared to the national average (12.3%) in the United States (Coleman-Jensen et al., 2016). Food security items and the food security composite score were associated with marital status, education level, and body mass index. In this analysis, the individual food security items from this study, as well as the composite score were included in the bivariate analysis for this sample. Previous literature has show the validity of 1 to 2 question item tools that can be used for rapid assessment of adult and child household food security (Urke et al., 2014; Kleinman et al., 2007; Hager et al., 2010; Young et al., 2009). The food security survey supplied by the USDA is more commonly used by computing a composite score from the items.

This sub-analysis found that although the food security composite score was not significant with BMI, the item "(I/We) couldn't afford to eat balanced meals" was marginally significant with BMI (p=0.078). This is consistent with the present literature demonstrating that the relationship between nutritious, balanced diets does play a role in indicating food security (Derrickson et al., 2001; Dave et al., 2009; Mello et al., 2010; United States Department of Agriculture, 2018) and obesity (Habib et al., 2017; Mokdad et al., 2001; Bonow & Eckel, 2003; Lim, 2018). In fact, this sample showed that among participants who responded "Yes" to this item, more than two-thirds (76.2%) were obese.

Within the identified population, participants who were single were more likely to be food insecure than participants who were married. Marriage and cohabitating with a partner have been seen in the literature to affect levels of food security. Being married increases family income and wealth (Zagorsky, 2005) and co-habitating partners share resources which relieves the presence of economic challenges (Vogler, 2005; Bauman, 1999). Women also typically take on the role of managing the household food intake by cooking the majority of the meals and doing the majority of the food shopping (Bove et al., 2003; Kirk & Gillespie, 1990). Literature has demonstrated that women may put the food intake of others in the family, especially children, before their own, depriving themselves of nutrients in order to feed others. This also establishes unhealthy patterns of food intake which involves women restricting themselves when there is not enough food, and binging when there is enough food (Olson, 2004). This occurrence highlighted in the literature, may be exacerbated among single women because they are providing for their children independently without the economic and social support of a partner, therefore they are more likely to experience food security than married or cohabitating women.

This analysis also identified a positive association between education level and food security. Participants who had an education level of high school or less were more likely to be food insecure than participants with an education level higher than high school. Several studies have explored the relationship between education and food security (Headley, 2013; Nyako, 2013; Bashir & Schilizzi, 2013;

Gebre, 2012; Mutisya et al., 2016). However, the majority of this literature is based on rural populations. The present analysis addresses this gap and introduces this association among an urban population. This association of education and food security in urban populations can be a result of three proxies; employment, household income and decision making. Each of the aforementioned proxies affect access, utilization and availability which are dimensions of food security (Mutisya et al., 2016). All participants in this study were employed by the University of Maryland. The majority of the sample (42.2%) had a total household income of less than $29,999 and 50% of the sample had less than a high school education. This is supported by the literature which states that employment, household income and decision making are directly correlated with the number of years of completed schooling. High education completion means more and better employment opportunities, a more efficient work ethic, and increased income (Gebre, 2012; Bashir & Shilizzi, 2013). With food security being so closely tied to the financial status of a household, individuals with higher educational attainment are more likely to be food secure because they have more monetary means to spend on food as well as the ability to make educated decisions about the foods they are purchasing (Bashir & Shilizzi, 2013).

There was no significant association between acculturation and food security. However, the literature includes mixed views on this association; there are some studies that have found that lower levels of acculturation are significant with food insecurity (Hunt et al., 2019; Iglesias-Rios et al., 2013; Dhokarh et al., 2011) and others that have found that higher levels of acculturation are significant with food insecurity (Kamimura et al., 2017; Mazur et al., 2003). This analysis used a composite score of country of birth, language spoken at home, and time in the U.S., to determine the level of acculturation. Each of these proxies, individually have been found to be significant with food security in previous studies. In this study, 99.2% of participants preferred Spanish over English. Mazur and colleagues conducted a study which found that Latino youths whose parents primarily spoke Spanish at home, were more likely to experience food insecurity (2003). Additionally, less time spent in the U.S is aligned with

less acculturation, since it is more likely that the immigrant is still maintaining a similar lifestyle to that of the country the migrated from. A majority of participants in this sample have been in the United States for 20 years or more (70.3%), however, incorporating other proxies into the acculturation method has shown that the majority of the sample is less acculturated (85.9%). It is important to note, if time in the U.S. alone, was used as the proxy for acculturation it would have been reported that the sample was more acculturated. In this sample, increased time in the U.S also demonstrated higher rates of food security. Among participants who had been in the U.S. 20 years or more, 59% of them were food secure. Additionally, among all participants who were food secure, 77% had live in the U.S. 20 years or more. This is supported by the literature, including a study conducted among Liberian refugees, in which researchers found that food insecurity prevalence decreased with more years spent in the U.S (Hadley et al., 2007).

As shown in other studies, the association of food insecurity and low levels of acculturation may be for many reasons. One explanation for this association may be the language barrier that immigrants face when they arrive to the United States. In this sample, 83% of the participants spoke mostly Spanish. This may impact their ability to find the foods that they are searching for, the programs and stores that may help them purchase the food, and their ability to understand what the food is when they are purchasing it. Higher levels of acculturation mean familiarization with their neighborhoods and resources, as well as social circles around them that can assist them with their needs because of more time spent in the U.S.

BMI and Food Access

The lack of significance of BMI with all of the explored variables (marital status, education, total income, acculturations, stress, dietary habits, and food security) is uncommon when compared to the literature. Whether positive or negative, BMI has been seen to be associated with these variables as explored in the literature review. Similarly, this analysis did not find significant associations of food access with the aforementioned variables. The literature has demonstrated significant associations of food access dietary habits and BMI (Booth et al., 2001; Sallis & Glanz, 2006; Elbel., 2015; Cummins et al., 2014) while other variables where exploratory, with little previous research. Although we did not find association, as compared to the other literature, this exploratory was able to describe the primarily El Salvadorian Latino immigrant population. This analysis shows no significant relationship between food security and obesity to support or refute the food insecurity obesity paradox. The significant associations between food security with marital status, education level, and acculturation may be co-factors in the food insecurity obesity paradox, but it cannot be concluded from this analysis.

Limitations

The population in this study was unique, which is both a strength and a limitation during exploratory research. This sub-analysis used convenience sampling to explore the El Salvadorian population, therefore it cannot be generalized. The results and conclusions of this study are specific to the Latino population in the District of Columbia-Maryland-Virginia (DMV) region. Additionally, since the majority of the population (70%) was from El Salvador, it is more difficult to look at other Latino immigrant populations. The sample size used for analysis (n=128) was also relatively small, therefore the power was not as significant as it could've been with a larger sample size which impacted the data analysis and results.

The questionnaire that was used for this analysis included condensed questions from the PrimeScreen questionnaire for dietary screening. Response categories from the original questionnaire included less than once per week, once per week, 2-4 times per week, nearly daily or daily, or twice or

more per day. The questionnaire that was used for this study had similar but not equal responses; never, rarely, 1-3 times a month, 1-3 times a week, 4-6 times a week, and every day. These differences made comparing the frequencies difficult and challenging to apply to meaning such as USDA recommendations. Although these answers were referring to frequency of consumption, there was no reference available for the quantity of consumption. Future studies should reference to cup size or serving size as a more reliable and specific way to depict dietary habits.

Strengths

Population

Immigrant health is a growing area of importance and interest in public health research and this study is contributing to the limited information that there is regarding Latino immigrants that are not Mexican American, Cuban, or Puerto Rican. As mentioned previously, the study sample focused on the Latino immigrant population. Because of its homogeneity in country of origin, this sample was representative of immigrants from El Salvador who reside in the D.C. metropolitan area. This sample was used from the Latino Employees at UMD: Assessing their Health Needs to Promote Health and Well-being study from which randomly recruited Latino workers at the University of Maryland in facilities, dining, or residential management. This meant that the study was efficient in representing the specific population of Latino workers and their health. Another strength of this particular sample was that all of the participants were immigrants. As a population that faces BMI and food security at disproportionate rates in comparisons to other populations in the United States, research involving Latino immigrants can help design and implement culturally appropriate and effective interventions.

Community-Based Participatory Research

The Latino Employees at UMD: Assessing their Health Needs to Promote Health and Well-being study employed a community based participatory research approach. This meant that researchers engaged with key stakeholders and established a relationship with leaders in these employee environments in order to create a mutually benefitting experience.

Study Design

This study was conducted using numerous methods to assure cultural competency and the ease and comfort of participant participation. The study itself was conducted by a majority bilingual team where the participant was being addressed by the familiar face of a specific interviewer or researcher that they had been working with in their native language throughout the whole study process. No third-party interviewers were necessary. Researchers also used RedCap, web-based data collection tool, to facilitate the questionnaire as well record responses. This allowed interviewers to read each question and answer to the participant. Additionally, this study was conducted on the University of Maryland campus where all of the participants are employed. Immense efforts were made to assure that participants did not have to stay after their work time and that they would still be compensated for their time.

Directions for future research and intervention

This exploratory study contributes to the growing literature regarding the health outcomes of the Latino immigrant population in the United States. This study is especially unique because the majority of the population is from El Salvador. As mentioned previously, there is a large community of immigrants from El Salvador living in the DC metropolitan area surrounding the University of Maryland, College Park. By exploring this community, we are better able to understand what this community looks like, what its needs and strengths are, and what we as researchers can contribute to improve their health outcomes.

Based on previous literature it has been established that there is a paradoxical relationship between food insecurity and obesity. However, this study demonstrated that there were no associations among the variables explored. Therefore other important variables that could be added to the analysis of future studies to more accurately depict the food insecurity obesity paradox include, the number of children or family members that each household is providing for, proximity and use of food aid programs such as food pantries and food banks, vehicle ownership, Supplemental Nutrition Assistance Program (SNAP), and food stamp beneficiaries with the food stores that accept them. Future studies hoping to

better understand a geographical community and its food access, should work to incorporate these variables into their analysis for a more rounded view of food access for individuals Additionally, these analyses could be applied to different Latino populations as well as, other immigrant populations.

Overall, this study calls for intervention programs that aim to reduce food insecurity among Latino immigrant women by targeting financial education and decision making, specifically among single women, rather than nutrition education programs. This study also calls for further exploratory research regarding food access and dietary habits among this specific population of Latino workers in the Washington Metropolitan area. By collecting information regarding dietary habits that are comparable to USDA recommendations, researchers will be better able to make assumptions and conclusions regarding the relationship of dietary habits with BMI, food access, and food security. Further research regarding food access is also recommended, in order to explore how food aid programs (e.g., food banks) and vehicle ownership as co-determinants of food access affect food security and BMI and if/how demographics, stress, acculturation, and dietary habits play a role in food access determination.

Conclusion

The purpose of this study was to conduct a secondary analysis to explore the food insecurity obesity paradox through the associations of BMI, food access and food security, with demographics (marital status, total household income, education level), stress, acculturation, and dietary habits. Significant bivariate relationships yielded that participants who had an education level of high school or less were more likely to be food insecure than participants with an education level of higher than high school and participants who were single were more likely to be food insecure than participants who were married.

The findings of this analysis, both significant and not significant, are important contributions to the growing literature examining the food insecurity obesity paradox because of its specific population and geographic area. In order to improve future studies examining this paradox in a similar population,

the strengths and limitations of this study can be used as key guiding principles especially regarding dietary habits and food access. As previously mentioned, this was an exploratory study among the Latino immigrant population. Although the paradox has been extensively studied in the literature, this study is contributing to the limited exploration of these relationships among Latino immigrant women, who are disproportionately affected by food insecurity and obesity.

Appendix 1: Recruitment Flyers (Spanish/English)

Estudio Para Investigar la Salud de los Empleados Latinos en UMD

POR QUÉ SE ESTA REALIZANDO ESTE ESTUDIO?

Queremos aprender más sobre sus necesidades y preocupaciónes de salud, cuando se trata de su ambiente en casa y en el trabajo.

QUIÉN PUEDE PARTICIPAR?

- Empleados actuales de UMD que tienen 18 años de edad o más
- Se identifica como Hispano/a o Latino/a y
- Trabaja en Manejo de Servicios, Servicios de Comedor, o Servicios Residenciales.

QUÉ TENDRÉ QUE HACER?

- Completar una encuesta
- Proveer una muestra de orina (analizaremos los químicos a los cuales usted puede estar expuesto en casa o en el trabajo).
- Proveer una muestra nasal

CUÁNDO Y DÓNDE SE LLEVARÁ A CABO EL ESTUDIO?

El estudio se llevará a cabo en un lugar privado en la Escuela de Salud Pública a una hora que es conveniente para usted.

Su participación tomará approximadamente una hora.

Usted recibirá $40 por su tiempo y participación

Para más información, pongase en contacto con nosotros al

(301)-314-1924

UMD Latino Study (301)-314-1924 UMD Latino Study (301)-314-1924 UMD Latino Study (301)-314-1924 UMD Latino Study (301)-314-1924 UMD Latino Study (301)-314-1924 UMD Latino Study (301)-314-1924 UMD Latino Study (301)-314-1924 UMD Latino Study (301)-314-1924 UMD Latino Study (301)-314-1924 UMD Latino Study (301)-314-1924 UMD Latino Study (301)-314-1924 UMD Latino Study (301)-314-1924 UMD Latino Study (301)-314-1924 UMD Latino Study (301)-314-1924

UMD Latino Employee Health Study

WHY IS THIS STUDY BEING CONDUCTED?

We want to learn more about your health needs and concerns as they relate to your home and work environment.

WHO CAN PARTICIPATE?

- Current UMD employees who are 18 years of age or older
- Self-identify as Hispanic/Latino, and
- Work in Facilities Management, Dining Services, or Residential Facilities.

WHAT WILL I NEED TO DO?

- Complete a survey
- Provide a urine sample (we will test for chemicals you may be exposed to at home or at work).
- Provide a nasal swab sample

WHEN & WHERE WILL THE STUDY TAKE PLACE?

The study will take place in a private location at the School of Public Health at a time that is convenient for you.

Participation will take approximately one hour

You will receive $40 for your time and participation

For more information, contact us at (301)-314-1924

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Appendix 2: Screeners (Spanish/English)

Un Estudio de los Empleados Latinos en UMD, Evaluando sus Necesidades de Salud para Promover la Salud y el Bienestar

ESCRITURA PARA LA INVESTIGACIÓN DE ANTECEDENTES FASE 2

Propósito del Instrumento para el Estudio: Esta escritura se debe usar para evaluar posibles participantes para asegurar que ellos cumplan con los criterios para calificar antes de inscribirlos en el estudio. Volantes serán publicados alrededor de la Universidad, y un teléfono se proveerá para contactar a los miembros del estudio y para ser evaluado para asegurar que cumple con los criterios. El entrevistador del estudio o 'SI' entonces leerá la escritura abajo para determinar si la persona califica y después obtendrá su información de contacto para la inscripción.

Escritura:

Buenos días. Gracias por su interés en nuestro estudio. El propósito de este estudio es recolectar información sobre la salud y el ambiente de los empleados Latinos en la Universidad de Maryland para aprender sobre sus necesidades de salud, exposiciones ambientales, y obstáculos de la prevención de enfermedades crónicas.

Participación en este estudio requiere que usted:
-complete una encuesta breve sobre datos demográficos, su salud y el ambiente de su casa y trabajo; y que
-provee una muestra de orina y
-provee una muestra nasal. Para colectar la muestra nasal, le frotaremos cuidadosamente cada nasal con un hisopo dos veces.

El tiempo total para la visita es aproximadamente una hora. Usted recibirá $40 por su participación.

¿Todavía tiene interés de participar en este estudio?

- *Si ->*
  Gracias. Para determinar si es elegible para participar en el estudio le tendré que hacer algunas preguntas. [SI: Proceda a hacer las preguntas que se encuentran abajo.]

- *No ->*
  Gracias por su tiempo y que tenga un buen día.

Cuestionario para Evaluar la Elegibilidad

1. ¿Cuál es su fecha de nacimiento? ___/ ___/ ___ (Día/Mes/Año)

[SI: Si el participante nació después de 1999, pare y agradezca al participante por su tiempo:]
Gracias, pero desafortunadamente tiene que tener por lo menos 18 años para ser elegible para este estudio.

2. ¿Trabaja usted en ……..Facilities Management/Manejo de Servicios……..…….....1
Dining Facilities/Servicios de Comedor…….....2
Residential Facilities/Servicios Residenciales…….....3
Ninguna de estas opciones…PARE…4

[SI: Si el participante indica "Ninguna de estas opciones," pare y agradezca al participante por su tiempo:]
Gracias, pero desafortunadamente tiene que trabajar en uno de estos departamentos para ser elegible.

3. ¿Se identifica usted como Latinx o Hispano?.....No……**PARE** …. 1
Si…..... 2

[SI: Si el participante indica "No," pare y agradezca al participante por su tiempo:]
Gracias, pero desafortunadamente tiene que identificarse como Latinx o Hispano para ser elegible.

4. Participó usted en el grupo de enfoque?..... No…..... 1
Sí…..... 2

SI ES ELIGIBLE: "*Gracias. Usted es elegible para participar en este estudio. Ahora, tomaré algunos datos para poder llamarle y programar su visita."*

5. Información de Contacto:
Nombre:_____
Teléfono (celular):_____ (casa):_____
¿Mejor horario para contactarle? _____AM/PM

6. ¿Cuáles fechas y horarios son más convenientes para que usted participe?

Opción 1:_____
Opción 2:_____
Opción 3:_____

Muchas gracias y que tenga un buen día. Estaremos en contacto con usted para programar una fecha y un horario pronto.

Latino Employees at UMD Assessing their Health Needs to Promote Health and Well-being Study

PHASE 2 SCREENING SCRIPT

Purpose of Study Instrument: This script is to be used to screen potential participants to ensure they meet eligibility criteria prior to enrolling them in the study. Flyers will be posted around campus and a phone number will be provided to reach study staff and be screened for eligibility. The Study Interviewer or SI will then read the script below to determine if the person is eligible and obtain their contact information for enrollment.

Script:

Good day. Thank you for your interest in our study. The purpose of this study is to gather information on the health and environment of Latino employees at the University of Maryland to learn about your health needs, environmental exposures, and barriers of chronic disease prevention.

Participation in this study will require that you:

- *complete an interview-administered questionnaire to provide information on your demographic characteristics, your health and your environment at home and work; and that you*
- *provide a urine sample, and*
- *provide a nasal swab sample. To collect the nasal swab, we will gently rub a Q-tip swab around each nostril 2 times.*

The total time for the visit is approximately 1 hour. You will receive $40 for your participation.

Are you still interested in participating in this study?

- ☐ *Yes ->*
  Thank you. To determine if you are eligible to participate in the study, I will need to ask you some questions. [SI: Proceed to ask the questions below.]

- ☐ *No ->*
  Thank you for your time and have a nice day.

Eligibility Screening Questionnaire

1. What is your date of birth? ____/_____/_____ (month/day/year)

[SI: If born after 1999, stop and thank the person for their time:]
Thank you, but unfortunately you must be at least 18 years of age to be eligible to participate in our study.

2. Do you work in …….…… Facilities Management ……..... 1
Dining Facilities……..... 2
Residential Facilities……..…3
None of the above….STOP……..4

[SI: If respondent indicated "None of the above", stop and thank the person for their time:]
Thank you, but unfortunately you must work in one of these departments to be eligible.

3. Do you self-identify as Latinx or Hispanic?.....No……**STOP** …. 1
Yes…..... 2

[SI: If respondent indicated "No", stop and thank the person for their time:]
Thank you, but unfortunately you must self-identify as Latinx or Hispanic to be in the study.

4. Did you participate in the focus group?..... No…..... 1
Yes…..... 2

IF ELIGIBLE: "Thank you. You are eligible to participate in our study. Now, we will collect some contact information from you so that we may schedule your visit."

4. Contact Information:
Name:_____
Telephone (cellular):_____ (home):_____
Best times to reach you? _____AM/PM

6. Which dates and times are most convenient for you to participate?
Option 1:_____
Option 2:_____
Option 3:_____

Thank you and have a nice day. We will be in touch with you to schedule a date and time soon.

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