ABSTRACT

Title of Thesis: **EXAMINING THE ROLE DIETARY HABITS PLAY WITH FOOD ACCESS, STRESS, AND CHRONIC CONDITIONS AMONG AFRICAN-AMERICANS**

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Abstract: African-Americans experience higher rates of chronic conditions, are more likely to live in low food access communities and not adhere to dietary recommendations. Limited research analyzes African-American adults' diet and food access by specific neighborhood. This thesis, a secondary data analysis, used Health Advocates In-Reach and Research(HAIR) data, a study evaluating family health history intervention to promote cancer screening. Participants(n=164) were recruited from barbershops/salons in low-income neighborhoods in the Washington D.C. metropolitan area. Baseline data was used to assess diet, food access, and chronic conditions with demographics, stress, and lifestyle behaviors. Over half of participants were female(54.3%), obese(51.8%), and lived in low-income and low access neighborhoods(57.3%). Bivariate analysis found associations between body mass index with income and meals away from home($p \leq 0.05$). Multivariate analysis found those who earned less income and consumed more meals away from home were less likely to be overweight/obese($p \leq 0.05$). This information can inform behavioral and systems-based interventions.

EXAMINING THE ROLE DIETARY HABITS PLAY WITH FOOD ACCESS, STRESS, OBESITY, AND CHRONIC CONDITIONS AMONG AFRICAN-AMERICANS

By

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Chapter 1 - Introduction

Problem

Food Access

African-Americans, regardless of income, are more likely than any racial/ethnic group to live in areas with limited access to healthy foods or low food access communities (Robert Wood Johnson Foundation, 2015b; The Food Trust for the Healthy Corner Stores Network, 2012). Areas with limited access to healthy foods are referred to as low food access or food insecure communities. These terms incorporate the accessibility of food retailers, travel to shopping and transportation, food prices, availability and diversity of healthy foods, as well as neighborhood household income. According to a report by the United States Department of Agriculture Economic Research Service, approximately 12.3% of Americans experienced low food security, equivalent to 15.6 million Americans (2017) . Low food access communities are associated with high rates of chronic conditions, leading to a poorer quality of life and poor health outcomes (City of Baltimore, 2015; Gittelsohn & Sharma, 2009; Mari Gallagher Research & Consulting Group, 2006; The Food Trust for the Healthy Corner Stores Network, 2012). Residents of low food access communities face environmental constraints, which include the distance to supermarkets, lack or inadequacy of public transportation, high prices, limited variety, and little nearby availability of fresh food in existing neighborhood stores (Gittelsohn & Sharma, 2009; Jetter & Cassady, 2006). Ultimately, to address disparities in overall health and diet consumption among African-Americans, food environments must be analyzed to determine how they may exacerbate

increased rates of chronic conditions and what types of interventions may be effective based on the local food environment.

Chronic Conditions

Research shows that African-Americans are diagnosed with higher rates of obesity (48%) as well as chronic diseases associated with diet compared to Whites (34.5%) (Centers for Disease Control, 2016b; Gittelsohn et al., 2010; Satia, 2009; Wang et al., 2013). According to the Centers for Disease Control (CDC), African-Americans have the highest rates of age-adjusted obesity (48.1%) compared to non-Hispanic Whites (34.5%). Persons who are obese are at increased risk of chronic conditions, poorer health outcomes, mental illness, body pain, increased oxidative stress, cancers, and a poorer quality of life (Centers for Disease Control, 2017). African-Americans are also diagnosed with the highest rates of diabetes at 15% as compared to 7% among non-Hispanic Whites and a national average of 9% (Centers for Disease Control and Prevention, 2017).

With an increasing rate of chronic conditions, younger African-Americans have increased diagnosis of many conditions which are typically found at older ages; these differences in the diagnosis of chronic conditions are showing in the 20s, 30s, and 40s age groups. Earlier diagnosis of chronic conditions is associated with shorter life expectancy (Centers for Disease Control and Prvention: Vitalsigns, 2017). African-Americans, aged 35-64, are 50% more likely than non-Hispanic Whites to have high blood pressure and are less likely to have their high blood pressure under control compared to Whites. African-Americans are also 77% more likely to be diagnosed with diabetes compared to Whites. Overall life expectancy for African-Americans is 75.1

years compared to 78.9 years for non-Hispanic Whites (Centers for Disease Control, 2016b; Centers for Disease Control and Prvention: Vitalsigns, 2017).

Dietary Habits

Exercise and diets high in fruit and vegetable intake play a role in preventing, controlling, and managing chronic conditions (Centers for Disease Control and Prevention, 2014; The American Heart Association, 2017). Chronic diseases such as hypertension, diabetes, and heart disease are significantly associated with unhealthy dietary habits (Lee et al., 2011; Morland, Wing, Diez Roux, & Poole, 2002; Office of Disease Prevention and Health Promotion, 2015). Factors such as race and ethnicity, physical environment, socioeconomic status, or psychosocial factors contribute to dietary habits, and play a significant role in dietary habits and health outcomes, specifically the rate of chronic conditions of a community (Bower, Thorpe Jr., Rohde, & Gaskin, 2014; Satia, 2009).

Stress and Dietary Habits

Physical environment, along with social and cultural environment, affect dietary habits. Emotional eating is commonly discussed when people undergo stress but it is important to analyze the dietary habits related to chronic stress or prolonged stress, which African-Americans tend to experience greatly (American Psychological Association, 2017; Hayman, McIntyre, & Abbey, 2015). Chronic stress is associated with perceived discrimination, neighborhood stress, and environmental stress, among others (American Psychological Association, 2017). Chronic stress also derives from stressors, such as prolonged feelings of despair or hopelessness, often a result from factors such as poverty, family, or traumatic childhood experiences. When individuals experience stress for a

long-term period, the body's stress response system is halted-- a risk factor for many chronic conditions (Moore & Cunningham, 2012). Some of these conditions include heart disease, obesity, diabetes, and depression. According to the literature, the stress pathway recognizes that adverse neighborhood environments characterized by social or economic disadvantage are seen as chronic stressors that influence obesity through disruption of the hypothalamic-pituitary-adrenal axis (Glass, Rasmussen, & Schwartz, 2006; Sullivan et al., 2016). This over activation can increase cortisol levels in the body, subsequently increasing the risk of developing obesity, specifically abdominal obesity (Foss & Dyrstad, 2011; Pasquali, 2012; Sullivan et al., 2016).

Stress and African-Americans

African-Americans report higher levels of stress than any other racial or ethnic group, partially due to the interpersonal or institutional/structural racism and discrimination experienced by African-Americans due to multiple historical factors including but not limited to slavery, segregation, and racist and discriminatory housing policies (Hayman et al., 2015; LeBron et al., 2014; Yu et al., 2015). Previous studies have found that African-Americans have been greatly impacted by diet related chronic conditions (i.e. hypertension, diabetes) due to chronic stress resulting specifically from discrimination (Kaholokula et al., 2012; Williams, Yu, Jackson, & Anderson, 1997). As previously mentioned, a significant chronic stressor is poverty. African-Americans experience the highest rate of poverty at 24.1% compared to non-Hispanic Whites at 11.6% (Semega, Fontenot, & Kollar, 2017). The median family income from 1967-2016, according to the United States Census Bureau, was $39,490 for African-Americans compared to $65,041 for non-Hispanic Whites (Semega et al., 2017). These disparities in

rates of poverty and income contribute to chronic stress in African-American communities (Moore & Cunningham, 2012).

Previous studies recommend that research on food security should be shifted to local food environments (i.e. county or zip code areas) and specific to priority populations (Hilmers, Hilmers, & Dave, 2012; Jablonski, McFadden, & Colpaart, 2016; Xiang Chen & Mei-Po Kwan, 2015). Future interventions have potential to be more effective if based on the local food environment research with consideration to culture, demographics of the specific population, and the geographic community in order to address behavioral and systems based approaches (Anderson Steeves, Martins, & Gittelsohn, 2014; Laraia, Leak, Tester, & Leung, 2017). There is limited information on the frequency food group consumption based on specific neighborhood location and research should investigate dietary servings (Cummins, Flint, & Matthews, 2014). Research has called for the importance of focusing on populations of older adults (aged 65+) and their dietary habits because much of the literature on diet focuses on children and adolescents (Zizza, 2014).

To reduce these health disparities, it is necessary to understand the relationships between dietary habits, food access, chronic conditions, stress, and behaviors to inform the development of effective behavioral and systems based approaches and interventions (Laraia et al., 2017).

Significance of Project

This research aims to understand the relationships of dietary habits, food access, and stress with obesity and diabetes of African Americans. The study also analyzed food access through the utilization of an online mapping tool by the USDA. The assessment of

food access in the communities of participants provided insight into the complex factors that may influence dietary habits including economic environment, demographics, and access.

Since the African-American community suffers disproportionality from chronic conditions, it is imperative that research is conducted to seek a greater understanding of the positive and negative factors that affect chronic conditions. There is little research analyzing the combination of African-American adults' demographics, dietary habits, food access, stress, and chronic conditions. The results of this study can be used to drive relevant, effective, creative, and multi-faceted interventions.

Research Questions

(1) How are food access and dietary habits associated with chronic conditions (obesity and diabetes), demographics (i.e. gender, education, marital status, income, education, employment), stress, and lifestyle behaviors (i.e. physical activity, smoking)?

Univariate analysis was conducted on all variables measured followed by bivariate analysis to test associations between variables.

(2) What are the predictors of dietary habits?

Significant variables associated with dietary habits in the bivariate analysis were used as potential predictor variables in the multivariate analysis.

(3) What are the predictors of food access?

Significant variables associated with food access in the bivariate analysis were used as potential predictor variables in the multivariate analysis.

Chapter 2: Background

Chronic Conditions and Health Disparities

African Americans experience a disproportionate burden of disease and death from chronic conditions. African Americans experience a higher rate of obesity, diabetes, high blood pressure, and heart disease which are associated with poorer health outcomes. When compared to non-Hispanic Whites, African-Americans, ages 35-64, are 50% more likely to have uncontrolled high blood pressure. African Americans are 77% more likely to be diagnosed with diabetes than Whites and 50% more likely to be diagnosed with heart disease (Centers for Disease Control, 2016b). In fact, African-Americans, ages 18-49, are twice as likely to die from heart disease than Whites (Centers for Disease Control and Prvention: Vitalsigns, 2017). In 2013, the American Medical Association recognized obesity as a disease rather than only a risk factor for chronic conditions (Advisory Board, 2013). The change in classification of obesity as a disease recognizes the multiple pathophysiology aspects of obesity which requires a diverse set of interventions to advance obesity treatment and prevention.

Obesity and Health Disparities

Approximately 48.1% of African-Americans are obese compared to Hispanics at 42.5% and non-Hispanic Whites at 34.5% (Centers for Disease Control, 2016a). Obesity is associated with all-causes of death, high blood pressure, type 2 diabetes, heart disease, stroke, some cancers, poor quality of life, and mental illness, among other conditions (Centers for Disease Control, 2017). Chronic conditions, such as obesity and diabetes, not only have significant implications on health and contribute to the exacerbation of health disparities but also have a significant economic impact on the United States healthcare

system. Obesity is related to increased medical costs that are both direct and indirect ("Health Affairs," 2011). Direct costs refer to diagnostic, treatment, and preventive services, while indirect costs relate to morbidity and mortality costs which includes worker productivity or employee absenteeism. This also has financial implications on the individual as they may be unable to work and are coping with increased burden of healthcare costs which may exacerbate stress for low-income individuals.

African-American Chronic Conditions by Demographics

Varying demographics, including life expectancy, marital status, education, income, employment, and health coverage, interact differently with chronic conditions in African-Americans. Some variables may be associated with chronic conditions and some demographic variables serve as protective factors. Life expectancy is used as a measure to gauge the overall health of a population. Life expectancy for African-American men was 71.7 years, behind non-Hispanic White men at 76.4 years. For women, African-Americans also had the lowest life expectancy at 77.9 years, behind non-Hispanic White women at 81.1 years (Arias, 2015).

Marital Status

In the literature, marital status has been proven to be significantly associated with chronic conditions (Beckett & Elliott, 2002; Koball et al., 2010). Being married or having a long-term partner is a protective factor against chronic conditions. Protective factors are any individual or environmental characteristics, conditions, or behaviors that lessen the effects of life events such as chronic conditions (Centers for Disease Control, 2015). Marriage is perceived as a protective factor, since it can provide social support, reduce risky behaviors, combine partners' resources, and strengthen social integration (Lillard &

Panis, 1996). However, marital status is more significantly associated as being a protective effect for morbidity and mortality for men than women (Beckett & Elliott, 2002; Harris & Graff, 2011; Hu & Goldman, 1990). Studies have found inconclusive evidence whether marriage as a protective effect is stronger for White women and not significant for African-American women (Beckett & Elliott, 2002; Waldron & Jacobs, 1989). Although marriage is typically found to be a protective factor against negative health outcomes, some researchers have found that negative health outcomes are associated with marriage among African-American women, specifically an increased likelihood of developing chronic conditions that are caused by obesity (Waldron & Jacobs, 1989). However, other researchers found that marriage among African-American women was significantly more protective against mortality (Beckett & Elliott, 2002). Through the lifespan, African-American women also have higher obesity rates than White women and also have lower rates of marriage than White women (Koball et al., 2010).

Education

Another protective factor against chronic conditions is educational attainment. Education is associated with positive health outcomes by reducing morbidity and mortality. Education may impact health from a multitude of perspectives including at the individual and economic level. At the individual level, education may improve the health of an individual through improved health behaviors and cognitive skills which may also increase an individual's ability to navigate systems such as the healthcare system. One U.S. study found that adults, at age 25, without a high school diploma can expect to live 9 years less than college graduates (Robert Wood Johnson Foundation, 2015a). Higher

educational attainment may also increase access and attainment to economic resources such as financial and social resources, which serve as support networks that an individual has access and exposure to (Robert Wood Johnson Foundation, 2015a).

Educational attainment is also associated with increased economic stability. Therefore, people with higher education may live in communities of a higher economic status which may also increase access to resources such as healthy food or healthcare (Zimmerman & Woolf, 2014). In fact, Americans with lower educational attainment have an increased likelihood of developing chronic conditions such as diabetes and heart disease. In 2011, it was found that the prevalence of diabetes among those without a high school education was at 15% as compared to 7% for college graduates (Robert Wood Johnson Foundation, 2015a). African-Americans with any type of higher education have a higher life expectancy compared to Whites without a high school education. It is important to note educational disparities persist among African-Americans as compared to Whites, and highly educated African-Americans live four years less than similarly educated Whites. As the rates of high school graduates increase, those without a high school diploma are experiencing a decreased life expectancy and increased chronic conditions (Robert Wood Johnson Foundation, 2015a).

Income

Higher income may serve as a protective factor against chronic conditions such as disease and premature death. The relationship between income and health is multi-layered. For example, lower income Americans may experience poorer health outcomes than middle class Americans, while middle class Americans tend to experience poorer health outcomes than high income Americans (Woolf et al., 2015). Low income adults

experience a range of health issues, such as higher rates of diabetes, heart disease, stroke, and other chronic conditions as compared to higher income Americans (Woolf et al., 2015; Zimmerman & Woolf, 2014). Lower income Americans may also experience higher rates of negative risk factors that increase their likelihood of developing chronic conditions. For example, Americans who earn less than $35,000/year are three times as likely to be smokers (27.3%) than families who earn $100,000/year or more (9.2%) (Woolf et al., 2015). Those in lower income brackets also have lower levels of physical activity which may be associated with the environmental condition such as neighborhood accessibility to exercise and financial accessibility to exercise. These negative risk factors are associated with the development of chronic conditions. Residing in a low income community is associated with low food access which is a significant indicator of dietary habits which affects the development and rates of chronic conditions (Woolf et al., 2015; Zimmerman & Woolf, 2014). Lower income Americans are also more restricted in their ability to access healthcare and are more likely to be uninsured or underinsured which may affect health outcomes (Woolf et al., 2015; Zimmerman & Woolf, 2014).

Economic disparities contribute to the health disparities that much of the African-American community experiences. In 2015, the median income of African-American households was $36,898 compared to $60,109 of White households (Semega et al., 2017). This is a stark difference that may affect overall health outcomes and increase risk of developing a chronic condition. Even after controlling for income, racial and ethnic differences in obesity prevalence persist (Centers for Disease Control, 2011). Those of a lower economic status are less likely to consume fruits and vegetables and are more likely to have higher consumption of total and saturated fats (American Public Health

Association, 2007). Foods high in total and saturated fats include fast food, processed and packaged foods, as well as fatty meats which all are high energy dense foods that are most accessible and affordable to low food access communities (World Health Organization, 2018). Food financial assistance programs such as the Women, Infants, and Children (WIC) program and the National School Lunch Program (NSLP) provide access to food for low income communities, however, they were found to provide insufficient exposure to fresh whole foods (American Public Health Association, 2007). Unhealthy dietary patterns that are established through childhood may then be carried through adulthood.

Employment

Job loss and unemployment is associated with various negative health effects (Robert Wood Johnson Foundation, 2013). Employment is an important determinant of health and may lead to improved health (Lead Center, 2015). Steady employment with safe working conditions is not only an indicator of income but also the benefits and stability necessary for positive health outcomes. Employment is associated with an increase in household income and a decrease in economic hardship which both improve physical and psychological well-being (Robert Wood Johnson Foundation, 2013). Employment is also associated with key mental health components including self-esteem, self-worth, purpose, and identity (Lead Center, 2015). It is critical to examine health behavior and risk factors of individuals who may be unemployed, specifically in regard to negative stress relieving habits such as smoking or diet.

Rates of employment vary between races. African-Americans experience the highest unemployment rates at 8.2% compared to Whites at 4.3% as of 2016 (U.S.

Bureau of Labor Statistics, 2017). Whites are more likely to obtain college degrees (41%) than African-Americans, however, even when controlling for education, the unemployment rate among African-Americans remains to be twice as high than it is for Whites (Wilson, 2015). Those who earn lower incomes are more likely to live in lower income communities which may have low availability of fresh, affordable fruits and vegetables (Ghosh-Dastidar et al., 2014; Mari Gallagher Research & Consulting Group, 2006; Office of Disease Prevention and Health Promotion, 2015; M. Smith, 2015).

Health Coverage

Not only do African-Americans experience significant health disparities but they also experience significant health care disparities (Health Affairs, 2011). African-Americans are significantly more likely to be uninsured than Whites. The insurance rate for African-Americans is 13% as compared to 9% for Whites. Thirty-seven percent of African-Americans receive Medicaid or other public insurance as compared to 20% of Whites and 50% of African-Americans receive employer or private health coverage compared to 71% of Whites (Kaiser Family Foundation, 2013). African-Americans have lower rates of health care because they may experience less access to employer-sponsored insurance. The individual market may not be affordable especially with consideration to the fact that African-American families are found to earn lower incomes than their White counterparts (Kaiser Family Foundation, 2013).

The Patient Protection and Affordable Care Act (ACA) of 2010 aimed to increase health insurance enrollment by enforcing an individual mandate that all citizens must have some insurance coverage. The ACA also expanded Medicaid for low-income individuals and provided subsidies for individuals who are 400% below the federal

poverty line in order to increase enrollment. Health coverage is specifically important for those with chronic conditions such as diabetes, high blood pressure, and heart disease (Kaiser Family Foundation, 2013). Chronic conditions are not only associated with increased health care costs but also with further health complications and conditions in the future. Individuals with these conditions are high-cost, both individually and on a systems level (Health Affairs, 2011). The lack of health insurance creates extreme financial barriers to obtaining and receiving medical care. With the lack of health insurance, physicians are less likely to offer specific preventive services such as screening tests for heart disease or various cancers.

Dietary Habits and Chronic Conditions

The literature has called for the need to address disparities within the African-American community to prevent the high rates of chronic conditions with regard to dietary habits (Bower et al., 2014; James, 2004, p. 200). Barriers to healthy eating have been found in all socioeconomic levels among African-Americans in the United States (Ames et al., 2016). African-Americans and racial and ethnic minority populations often receive a poorer quality of care and experience increased barriers in seeking preventive care or chronic disease management, which highlights the importance of the effective dissemination of health information in alternative settings (Centers for Disease Control, 2016b). These disparities are not only an injustice, but they also exacerbate chronic conditions and increased health care costs.

Diet

The 2015-2020 United States Department of Agriculture's Dietary Guidelines for Americans ''emphasize the importance of creating a healthy eating pattern to maintain

health and reduce the risk of disease" (Office of Disease Prevention and Health Promotion, 2015). The United States Department of Agriculture's Dietary Guidelines (USDA) offers a tool, My Plate introduced in 2011, which is a simple visual offering information on main food groups and portion size. MyPlate replaces the food pyramid previously known as the visual representing the USDA's Dietary Guidelines for Americans. The MyPlate recommended plate should be half filled with vegetables, consist of fruits, half of the grains should be whole grains, dairy should be low fat, and protein should be varied. It also enforces the reduction of drinking and eating sodium, saturated fat, and added sugars (Office of Disease Prevention and Health Promotion, 2015). These updated guidelines focus more on eating patterns rather than specific food groups and nutrients. The Dietary Guidelines are an important tool because they are the foundations for many educational, political, and nutritional programs on the federal, state, and local level.

Diet has proven to play a significant role in prevalence of various chronic conditions, risk factors, and cancers (Office of Disease Prevention and Health Promotion, 2015). Dietary habits are adopted through availability, accessibility, and cultural practices that are transferred from generation to generation. Therefore, dietary habits are a complex issue that not only provide insight into lifestyle behaviors but also history, socioeconomic factors, and social and cultural environments (Centers for Disease Control, 2016b).

The CDC reported that 33% of American adults meet the recommendations for fruit consumption and only 27% of American adults meet the vegetable recommended consumption per day (Fruits & Veggies More Matters, 2017). Only 14% of American adults consume at least 2 servings of fruit and 3 servings of vegetables per day.

According to the USDA's Dietary Guidelines, Americans should be consuming 5-9 servings of fruits and vegetables per day. On average, Americans are consuming 1.1 cups of fruit and 1.6 cups of vegetables per day, a total of 2.7 cups of fruits and vegetables per day. The minimum consumption per day should equate to 2 cups of fruits and 2.5 cups of vegetables (Stewart, 2016). African-American men and women, on average, consume 3.3 - 3.5 servings of fruits and vegetables per day which is below the USDA's recommended 5-9 servings of fruits and vegetables per day (Watters, Satia, & Galanko, 2007). However, it was found that African-Americans consume more fruit (may include fruit juice) but less vegetables than Whites. A 2014 report calculated the annual eating per capita for fruit and vegetable consumption by race. For fruits, it was found that African-Americans consumed 306 servings annually versus Whites with only 289. For vegetables, it was found that African-Americans consumed 390 servings annually compared to Whites at 401 (Produce for Better Health Foundation, 2015). The recommended annual fruit intake is approximately 730 minimum servings and 912 minimum servings for vegetables (Produce for Better Health Foundation, 2015). Foods that aid in preventing obesity, such as whole grains, vegetables, fruits, and lean proteins, may reduce risk of chronic conditions. Low-fat diets are not enough to reduce obesity rates and improve overall health (Sacks et al., 2009). It is more specifically the variety, type, and portion of foods that influence these risk factors significantly. Studies have found that those who eat more red and processed meats are at risk for weight gain, chronic disease, and cancer than those who consumed leaner meats such as poultry, fish, or beans (Alexander & Cushing, 2011; Pan et al., 2011).

Food Environment

The USDA has a map titled the Food Access Research Atlas which compiles the various factors that comprise food desert communities (United States Department of Agriculture Economic Research Service, 2017). These factors include low income and low access areas. The maps also look into vehicle ownership in each community as well as distance to supermarkets. The atlas then provides the level of food accessibility based on these multiple factors.

Although, African-Americans comprise about 13% of the total United States population, they account for 25% of the United States low income population (U.S. Census Bureau, 2016; Bovell-Benjamin, Dawkins, Pace, & Shikany, 2010). African-American communities have approximately half the number of chain grocery stores as compared to White communities (Robert Wood Johnson Foundation, 2015b). African-Americans are most likely to live in low-income communities which are often classified as 'food desert' communities. Food desert communities are communities vapid of healthy, affordable foods (American Nutrition Association, 2011). African-Americans have the highest likelihood of living in food desert communities, regardless of income (The Food Trust for the Healthy Corner Stores Network, 2012).

In 2016, it was found that approximately 12.3% of Americans experienced low food security, equivalent to 15.6 million Americans (United States Department of Agriculture - Economic Research Service, 2017). This was measured by the United States Department of Agriculture. To measure food security, families filled out a ten-item questionnaire asking whether they may not have eaten for a full day, had to skip meals, or had trouble accessing or paying for food. Food insecure classification would be assigned

if three of the ten questions were answered in the affirmative. If six or more questions were answered in the affirmative, the individual or household would be considered very low food secure (Missouri Foundation of Health, 2015; United States Department of Agriculture - Economic Research Service, 2017). Approximately 7.4% of U.S. households were low food secure in 2016 and 4.9% were very food secure at some time in the year. African-Americans experience the highest rate of food insecurity with 22.5% low food secure in 2016 compared to 9.3% of non-Hispanic Whites (United States Department of Agriculture - Economic Research Service, 2017).

Low food access or food desert communities not only have limited access to healthy, affordable foods but are deliberately targeted by corporations' advertising of foods and beverages with little nutritional value. These advertisements are more prevalent in predominantly African-American communities as compared to White communities (Jones & Rudd Center, 2015). The literature has documented the corporate targeting of commercial food advertisements in racial and ethnic communities, which may impact the disparities in the risk of obesity as well as obesity related chronic disease morbidity and mortality (Fleming-Milici & Harris, 2016; Jones & Rudd Center, 2015; Ogden, Carroll, Kit, & Flegal, 2012). It has been shown that foods and beverages associated with poor health such as sugar sweetened beverages and sugary candy products have more frequent targeted advertisements in African-American communities (Robert Wood Johnson Foundation, 2015b). Minority children have increased exposure to media than their White counterparts and media is found to influence short-term food consumption, food preferences, and caloric intake. Children who had higher levels of exposure to commercial television were associated with increased calorie consumption, higher body

mass index, and reduced fruit and vegetable consumption five years later (Harris & Graff, 2011). If these communities are being targeted by corporate food advertisements then children are developing poorer diet habits at younger ages which may increase their risk for developing diet related chronic conditions as adults (Robert Wood Johnson Foundation, 2015b).

In 1996, the Food and Agriculture Organization of the United Nations identified four components of food security including availability, access, utilization, and stability (Food and Agriculture Organization of the United Nations, 1996). Availability refers to the quantity of consistent food; access refers to people having adequate resources to gain healthy, affordable foods; utilization refers to the types and quantities of food people are consuming and; stability refers to the access to adequate food at all times (Food and Agriculture Organization of the United Nations, 1996). These components of food security may help explain the reason that African-Americans disproportionately experience food insecurity in their communities. Structural racism may contribute through historical events such as the post-World War 2 rise of suburbs when White families left urban areas into newly developed suburban neighborhoods. Housing discrimination, policies, and employment became vehicles for racial segregation and geographically isolated black neighborhoods (Missouri Foundation of Health, 2015; Voborníková, 2016). This deliberately left African-American communities depleted of availability and access to resources, businesses, employment, housing and ultimately with poor health outcomes.

Food desert or low food access communities have created their own food retail environments and are, therefore, overwhelmingly concentrated with small businesses

such as corner stores. These stores often stock foods high in sodium, fat, and sugar content which are associated with chronic conditions (Gittelsohn et al., 2010; The Food Trust for the Healthy Corner Stores Network, 2012). These foods are typically stocked because they are affordable, are not perishable, and are easy for store owners to access at low cost.

Due to the high rates of chronic conditions among African-Americans, dietary habits should be further assessed. African-Americans tend to consume high fat diets which are low in vegetable consumption. However, it is important to note and consider historical implications of slavery on African-American dietary habits. Current dietary habits may reflect the historically available foods and practices. Multiple studies have found that the types of foods and preparation techniques were similar to those of enslaved persons based on the availability of foods (Bovell-Benjamin, Dawkins, Pace, & Shikany, 2010; Eugeni, Baxter, Mama, & Lee, 2011).

Dietary Measures

There are various tools utilized to measure dietary habits. Twenty-four-hour recalls assess dietary consumption within the last day. This tends to be a relatively brief measure requiring short-term memory of the participant. This is often used in low-income or low literacy populations because the recall does not require reading or writing to complete the assessment. The 24-hour recall method is limited because it only captures one day's worth of dietary consumption and it is unclear whether that day's dietary consumption is reflective of the participants' typical dietary habits (Johnson, 2002).

Diet records are another dietary assessment tool. Diet records require participants to record all foods and beverages consumed over three consecutive days. The analysis is

conducted through trained staff using software such as the Nutrition Data System for Research. Diet records require trained staff and a literate population. Completing the diet record may change the eating behaviors of the participants (UC Denver, 2017).

Food frequency questionnaires are often used when assessing dietary habits among large groups of research participants and place food groups into broad categories of nutrient intake. They inquire about specific foods or food groups and the frequency of consumption. Food frequency questionnaires must be culturally relevant to the population and are often tailored for different populations (Johnson, 2002).

The dietary intake tool used in this study was Prime Screen, an 18-item questionnaire that measures frequency of various foods and food groups. PrimeScreen measured fruit and vegetable intake, dairy products, whole grains, red and processed meats, fried foods, baked foods, and salt intake (Rifas-Shiman et al., 2001). Frequency categories were based on six categories from never to twice or more per day. A study of 160 multi-ethnic men and women compared a 131-item semi quantitative food frequency questionnaire with PrimeScreen. The mean correlation coefficient was 0.70 for reproducibility and 0.61 for comparability with the semi quantitative food frequency questionnaire (Rifas-Shiman et al., 2001). PrimeScreen was found to be a quick, efficient way to assess diet quality among adults and was found to compare well with longer food frequency questionnaires and biomarkers (Davis, Shearrer, Tao, Hurston, & Gunderson, 2017; Rifas-Shiman et al., 2001).

Stress

Stress is the physical or emotional reaction that the body experiences in response to a challenge or demand (MedlinePlus Medical Encyclopedia, 2017). Stress can manifest

in various health problems such as digestive disorders, headaches, or other symptoms. African-Americans experience racism more than any other ethnic group and report that they experience stressors related to racism or discrimination that manifest intrapersonally or institutionally (Hayman et al., 2015; LeBron et al., 2014; Williams et al., 1997). African-American women experience higher levels of stress than African-American men (Bacon et al., 2017; Sims et al., 2008). Racism can be overt, however, it can also be indirect and subtle (Hayman et al., 2015). This makes it difficult for people of color and researchers to gauge experiences and the experiences' contribution to stress levels. Living in low-income communities may also exacerbate stress due to chronic, psychosocial stressors (Moore & Cunningham, 2012).

There are various types of stress including acute or physical stressors as well as psychosocial stressors. Physical stressors can lead to a decrease in dietary consumption. These physical stressors last for a short period and may be triggered by feeling ill or some type of threat. The body is able to cope and return to homeostasis when it experiences these stressors (Moore & Cunningham, 2012). However, chronic stress is long-term and continues over an extended period of time. This consistent state of instability of the body disrupts the body's homeostatic state. Chronic stress has been found to be associated with obesity and metabolic illnesses (McEwen, 1998). Stress not only influences quality of life but was also found to modify food intake (Fanelli Kuczmarski et al., 2017; Weinstein, Shide, & Rolls, 1997).

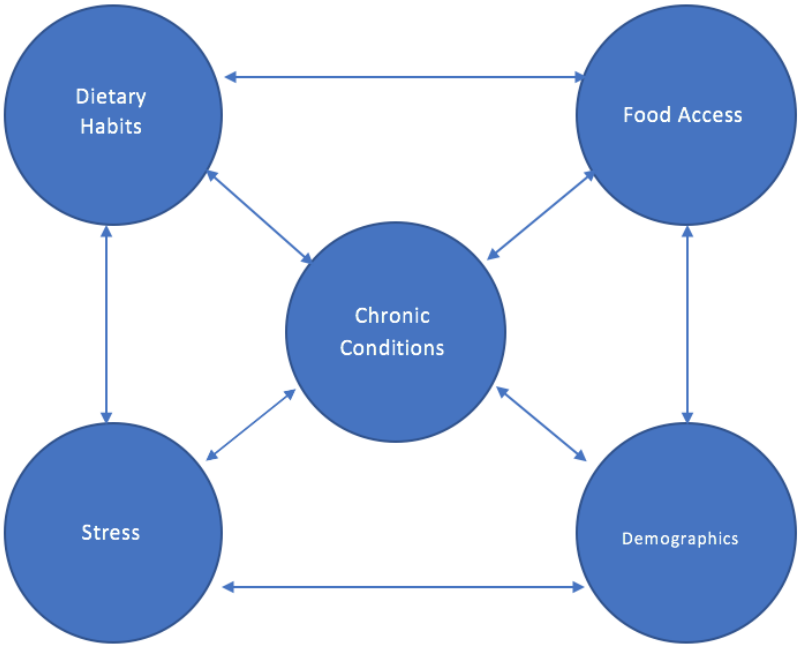
Self-reported and greater perceived stress were found to be associated with unhealthy dietary habits with regard to emotional eating (Sims et al., 2008). Chronic stress was associated with consumption of energy dense foods which include foods with

high fat and sugar content that may lead to weight gain (Bacon et al., 2017; Fanelli Kuczmarski et al., 2017). Higher levels of stress were found to be associated with lower fruit and vegetable intake, lower compliance with national dietary guidelines, and higher levels of snacking (Moore & Cunningham, 2012).

Conceptual Framework

The following framework, Figure 1.1, illustrates the interconnectedness between the different variables mentioned in the literature review. The model includes demographic variables, dietary habits, food access, stress, and chronic conditions. The lines drawn between each variable represents the interconnectedness of the variables and how they factor into chronic conditions. Dietary habits influence chronic conditions but are also associated with food access, stress, and demographics. Food access is also tied to demographics, dietary habits, and stress which all influence chronic conditions. Demographics such as age, race, income, gender, marital status, interact with food access, stress, and dietary habits to influence chronic conditions. Stress is also associated with dietary habits, demographics, and food access which then influence chronic conditions. This secondary analysis aims to understand the relationships between these variables to further understand how they may influence each other.

Figure 1.1.: *Conceptual Framework*



Chapter 3 – Methods

Overview

This investigation is a secondary data analysis of a longitudinal study evaluating the effectiveness of a family health history intervention to promote colorectal cancer screening. Participants were recruited from barbershops and salons primarily located in low-income urban neighborhoods in the Washington, D.C. metropolitan area. An analysis of baseline data (n=164) is presented on participants' demographic variables, body mass index, stress, dietary habits, food access, and chronic conditions. This secondary data analysis assesses how chronic conditions (i.e. obesity, diabetes) are associated with demographics (i.e. gender, education, marital status, income, education, employment), stress, lifestyle behaviors (i.e. physical activity, smoking), dietary habits, and food access. The analysis also explored variables that are predictors for food access and dietary habits.

Study Design: Health Advocates in-Reach and Research

The data for this secondary data analysis was retrieved through the Health Advocates in-Reach and Research (HAIR) Promoting Colorectal Cancer Screening study conducted by Dr. Mary A. Garza. The research team aimed to reduce colorectal cancer disparities to achieve health equity through the mobilization of African-American barbershops and salons. African-American barbershops and salons are considered portals to the community that can provide health education and delivery of public health and medical services. The HAIR study focused on colorectal cancer. African-Americans experience a disproportionate burden of colorectal cancer compared to Whites. During Phase 1, 40 barbers and stylists were recruited across ten shops to participate in the

Health Advocate training workshop. Phase 2 study participants (n=164) were recruited from each of the ten shops to participate in the Family Health History Intervention recruited through flyers and convenience sampling. In Phase 3, a subset of the barbers and stylists from Phase 1 participated in interviews to evaluate the process and implementation of the intervention (n=10). For the purpose of this thesis, baseline data of Phase 2 study participants Family Health History intervention (n=164) was used.

Study Sample

Recruitment

Each participant was guided through the informed consent process by the research team, The informed consent process occurred prior to any activities (e.g., intervention and interviews) and was conducted in a private/semi-private location away from other participants and team members. Participants received a copy of the consent form for their records and were compensated for their time and participation.

Eligibility

Clients participating in the family health history intervention had to be English speaking, self-identify as African-American, and 45 years of age or older to meet eligibility criteria. Study participants were not required to be clients of the barbershop or salon in order to participate especially as some may have been recruited from word of mouth or flyers in the community. Barbers and stylists were also eligible to participate.

HAIR Study Data Collection

This research project was conducted in three phases: In Phase 1, barbershops and salons were recruited for the intervention and barbers and stylists were trained as Health Advocates. Barbershops and salons were identified through geographic information

system (GIS) mapping and meetings organized by the research team's community outreach coordinator. Once shops owners agreed to participate in the study, four barbers/stylists were identified from each shop to participate in Health Advocate Training Workshops. During Phase 2, the trained health educators implemented the Family Health History Intervention. The Family Health History Intervention participants were asked to complete a baseline pre-and post-survey. Abbreviated surveys were also completed at 1-3, 6, and 12 months post intervention. A subset of the barbers and stylists (n=10) were interviewed during Phase 3 to provide data to evaluate the intervention and the process and implementation. For the purpose of this thesis, baseline data of Phase 2 study participants Family Health History intervention (n=164) was used.

Measures

Demographic Variables

Demographic variables measured included gender, age, marital status, education, income, employment, and health coverage. All variables were self-reported by the participants. Gender was measured as male=1, female=2. Age was categorized as 45-50=1, 51-59=2, ≥60=3. Participants selected marital status from 6 response categories; single or never married, married, divorced, separated, widowed, or living with a partner. Marital status was recoded into 3 categories with single or never married=1, married=2, other=3. Participants were asked to select their highest earned degree from 10 response categories ranging from general education development (GED), high school diploma, some college, associate degree-junior college, bachelor's degree, master's degree, doctorate, professional, other, none of the above (less than high school. Education was recoded into three categories; high school graduate or less=1, some college=2, and 3=4-

year degree or above. Participants who selected that they received a GED, did not complete high school, or selected 'other' were included in the 'high school graduate or less' recoded category. Participants who selected 'other' were also asked to write-in their educational attainment since the response categories did not reflect their education. The 5 participants who selected 'other' were recoded into the 'high school graduate or less' category as they completed cosmetology or apprenticeship programs. The second recoded category was 'some college' which included associate's degree or junior college. The third recoded category, 'college degree or more' included bachelor's degrees, master's degrees, doctorate, or professional degrees (MD, JD, etc.). Participants were asked to report income (before taxes) from all sources (wages, rent from properties, social security, disability and/or veteran's benefits, unemployment benefits, workman's compensation, help from relatives, etc.). There were 12 response categories for income from below $5,000 to $100,000 or higher. Once the frequencies were conducted, it was found that there were too few cases in each income category to produce meaningful results, therefore, income was recoded into two categories; ≤$49,999=1, ≥$50,000=2. Participants selected their occupational status from 11 categories; employed full-time, employed part-time, self-employed in the home, self-employed outside of the home, retired, student, unemployed, laid off, disabled, other. After conducting frequencies to determine the distribution of responses per occupational status, occupational status was recoded into two categories; employed=1, unemployed=2. The employed category included; full-time and part-time employment, self-employment in and outside of the home. The unemployed category included; retired, student, unemployed, laid off, disabled, and other. Participants were asked if they had any kind of health care coverage,

including health insurance, prepaid plans such as HMOs, or government plans such as Medicare or Indian Health Services. Response categories were yes=1, no=2. Participants were also asked if they have one person that they consider their personal doctor or health care provider. Response categories were yes=1, no=2.

Dietary Habits

The 18-item PrimeScreen questionnaire was used to measure participant dietary habits. The 18 PrimeScreen food items included; dark green leafy vegetables, cruciferous vegetables (broccoli, cabbage, brussel sprouts), carrots, other vegetables, citrus fruits, other fruits, whole milk dairy foods, low-fat dairy foods, whole eggs, stick margarine, whole grain foods, pasta, rice, noodles, baked products, beef, pork, or lamb (main dish), processed meats, fish/seafood (not fried), deep fried foods, added salt. Dietary habits were assessed through three different methods; frequencies, adherence to dietary habits based on USDA recommendations, and a global diet quality index.

PrimeScreen Frequencies

Participants responded with the frequency of consumption for each item. Survey response categories were never, less than once per week, once per week, 2-4 times per week, nearly daily, twice or more per day. Each item was analyzed based on frequency of consumption. To analyze and assess each PrimeScreen item based on frequency of consumption, responses were recoded into three categories; ≤1/week=1, 2-4/week=2, ≥5/week=3. Categories were recoded after assessing the distribution of responses per frequency of consumption category. Previous studies have recoded PrimeScreen in the same categories, except one study added a category for ‘never’ (Davis et al., 2017). There

were too few cases who responded 'never' to any of the 18 PrimeScreen items, therefore, 'never' was recoded into the ≤1 time/week category.

Adherence to USDA Dietary Recommendations

Diet was also assessed based on participant adherence to USDA dietary recommendations for vegetables, fruits, whole grains, and fish. These four categories were included because the USDA has the strongest recommendations for dietary consumption of these primary, healthy food groups. Vegetable, fruit, whole grain, and fish consumption also tend to be the most indicative food groups of overall diet quality. The recommendations vary for each category and therefore each variable was recoded differently. The PrimeScreen questionnaire does not associate serving or cup size with the frequency of consumption responses (times per day/week), therefore, it was determined that a cup would be the equivalent of each time a participant responded that they consumed a certain item. Cup size was associated with frequency of consumption and related to cups of fruits and vegetables consumed. For example, if participants responded that they consumed vegetables twice or more per day, this was considered two or more cups per day. The variable was recoded into two groups; meets USDA dietary recommendations=1, does not meet USDA dietary recommendations=2.

Table 1 displays how the adherence to USDA dietary recommendations was calculated as well as the USDA dietary recommendations for each category; all vegetables, all fruits, whole grains, and fish. The USDA recommends that Americans consume 2-3 cups of vegetables per day. Computing all four PrimeScreen vegetable categories into one resulted in a scale ranging from 0-20 which represented frequency of consumption of vegetables. A score of 16-20 equated to consumption of vegetables twice

or more/day and, therefore, met USDA Dietary recommendations for vegetables. The fruit variable was computed by adding two PrimeScreen fruit categories; citrus fruits and other fruits. For fruits, any participant who scored 8-10 for the computed all fruit category met USDA fruit consumption recommendations which equated to consuming fruit twice or more/day. The USDA recommends two servings of whole grains per day for Americans. Only participants who selected twice or more/day=5 were coded into the meets dietary guidelines category. Participants who selected 0-4 did not meet USDA recommendations for whole grain consumption. In regard to fish consumption, the USDA recommends Americans consume fish at least twice per week. Participants who responded a 3, 4, or 5 in the PrimeScreen item for fish consumption were coded into the meets USDA recommendation category. Participants who selected 1 or 2 for fish were coded into the does not meet USDA recommendations.

Table 1: Adherence to USDA Dietary Recommendations Recoding

Category	PrimeScreen # of categories	USDA recommendations	Range of scores	Scores that meet recommendations
Vegetables	4 categories	2-3 cups/day	0-20	16-20
Fruits	2 categories	1.5-3 cups/day	0-10	8-10
Whole Grains	1 category	2+ cups/day	0-5	5
Fish	1 category	Twice/week	0-5	4-5

Global Diet Quality Index

A global diet quality index was created as an additional measure to assess the diet quality of the participants (Delichatsios et al., 2001). To create this index, all PrimeScreen items were utilized to create the scale, except for 'how often do you add salt to the table?'. This item was excluded as many studies have excluded the question and it is not reflective of the salt consumption of participants. The global diet quality index was on a scale from 0-85 which was calculated from the 0-5 PrimeScreen response categories

and multiplied by the 17-items. The PrimeScreen scale was never=0, less than once/week=1, once/week=2, 2-4 times/week=3, nearly daily=4, 2 times or more/day=5. Unhealthy PrimeScreen items such as; 'whole milk dairy foods', 'whole eggs', 'stick margarine', 'pasta, rice, noodles', 'baked products (donuts, cookies, etc.)', 'beef, pork, or lamb as a main dish', 'processed meats', and 'deep fried foods', were reverse recoded on their 0-5 scale. Therefore, participants who consumed the unhealthy item twice or more per day, which originally equated to a score of 5 was now equated to a score of 0. Participants who consumed higher frequencies of unhealthy items received lower points for that item and participants who more frequently consumed healthy PrimeScreen items received higher scores for that item. Healthy PrimeScreen items included; 'dark green leafy vegetables', 'broccoli, cauliflower, cabbage, Brussel sprouts', 'carrots', 'other vegetables', 'citrus fruits', 'other fruits', 'low-fat dairy foods', 'whole grain foods', 'fish/seafood (not fried).' For example, a participant who never consumed fruits would receive a score of 0 but if they consumed fruits twice or more/day then 5 points was factored into their total diet quality score.

The global diet quality index scores for each participant were then recoded into three categories; unhealthy diet=1, low-moderately healthy=2, moderately healthy=3. Based on the distribution, no participants would be classified as having a healthy diet. However, after conducting the univariate and bivariate analysis, too many cells were found with few cases for the global diet quality variable. Therefore, the global diet quality index was recoded into two categories; unhealthy/low-moderately healthy=1 and moderately healthy=2.

Additional Dietary Survey Questions

Participants were asked five additional diet related questions. Participants were asked to rate the health of their overall diet. Response categories were; excellent, very good, good, fair, and poor. Responses were recoded to three categories; excellent/very good=1, good=2, fair/poor=3. However, after the bivariate analysis was conducted, some cells for the self-rated diet variable had too few cases. Self-rated diet was then recoded as; excellent/very good/good=1, fair/poor=2. Participants were asked in the past 7 days, how many meals (breakfast, lunch, and dinner) they consumed that were prepared away from the home in places such as restaurants, fast food places, food stands, grocery stores, or from vending machines. Responses were recoded into three categories; 1-5 meals=1, 6-10 meals=2, and 11 or more meals=3. Participant responses were recoded based on the average meal consumption away from home per week for Americans which is approximately 4-5 meals per week. This was the upper limit for the first category of meals. Recoding was also based on the overall distribution of responses. MyPlate, the national nutritional guidelines for Americans, awareness was assessed and was coded as yes=1, no=2. If participants were aware of MyPlate, they were asked if they tried to follow the recommendations. Responses were coded as yes=1, no=2.

Chronic Conditions

Participants were asked if they had been diagnosed by a health professional with chronic conditions (diabetes). Response categories were yes=1, no=2.

Body Mass Index (BMI)

Participants self-reported their height and weight. Body mass index was computed by weight in kilograms divided by height in meters. Body mass index was coded into three

weight categories, normal ≤24.99=1, overweight 25-29.99=2, and obese ≥30. These categories were created according to the Centers for Disease Control classifications on weight status of body mass index (Centers for Disease Control and Prevention, 2018).

Food Access

Participants' zip codes were used to analyze community food access using the USDA Economic Research Service which provides a Food Access Research Atlas that analyzes the level of food access by zip code. Neighborhoods are classified according to neighborhood income, distance to supermarkets, vehicle ownership, and whether the area is urban or rural. This analysis specifically analyzed income and access. Neighborhoods classified as low-income were tracts with a poverty rate of 20% or higher, or tracts with a median family income less than 80% of median family income for the state or metropolitan area. Low-access neighborhoods at 1 mile are tracts in which at least 500 people or 33% of the population live farther than 1 mile from the nearest supermarket. Low-access neighborhoods at ½ mile are tracts in which at least 500 people or 33% of the population live father than ½ mile from the nearest supermarket. Neighborhoods, according to the USDA's Food Research Atlas, are classified by color including: blue=low-income**,** pink=low access at 1 mile, dark green=low access at ½ mile, green=low-income census tracts where a significant number or share of residents is more than 1 mile to a supermarket, orange=low-income census tracts where a significant number or share of residents is more than ½ mile to a supermarket. Supermarkets also included super centers and large grocery stores in the United States. The USDA used a published directory of these stores and merged that data with the 2015 STARS directory of stores authorized to accept Supplemental Nutrition Assistance Program (SNAP)

benefits and the 2015 Trade Dimensions of TDLinx directory of stores. This information provides insight into how living in an area with limited access to healthy foods or a food desert neighborhood is associated with dietary habits, stress, and chronic conditions.

Participants came from 64 zip codes that were input into the USDA Food Research Atlas to examine food access and income status. Participant zip codes were initially categorized as low-income=1, low access=2, and low-income and low access=3. Four participants had zip codes outside of Maryland and the District of Columbia. These four participants were excluded because this study aimed to analyze residents of the D.C. Metropolitan Area. Additionally, three participants did not disclose their address or zip code during data collection. The majority of participants in low access communities were classified by the USDA as low access at ½ mile. Only two participants had zip codes that were low access at 1 mile. Therefore, low access participants at both ½ mile and 1 mile away from a supermarket were coded into one general low access category. Three participants did not fall into any of the categories and were not low-income or low access. However, these three zip codes were on the border of low access communities and were therefore coded into the low access category. This was done to ensure meaningful interpretation of the variable. Categorizing a 'neither low-income or low access' category resulted in too few cases per cell for meaningful interpretation.

After conducting the bivariate analysis for food access, some cells had too few cases to provide a meaningful analysis. Food access was then recoded into two groups; low-income/low access=1, low-income and low access=2. Low income and low access were combined as they are the lower risk groups since they are not both low-income and low access.

Stress

Participants were asked 'how would you rate the amount of stress in your daily life at work and at home?' Participants responded on a scale of 1-4 with minimal, light, moderate, and severe, unemployed, and retired. Responses were recoded to minimal/light=1 and moderate/severe=2. Unemployed and retired participants were excluded from rating their stress at work.

Smoking

Participants were asked if they have ever smoked cigarettes, even a puff or two, in their lifetime. Response categories were yes=1, no=2. If yes, participants were asked if they have smoked a total of 100 cigarettes or more in their lifetime. Response categories were yes=1, no=2. Participants were then asked if they smoke cigarettes currently. Response categories were everyday=1, some days=2, not at all=3. As these were a conditional series of questions, the three questions were computed into a single new variable. Participant smoking status was recoded as non-smoker=1, former smoker=2, current smoker=3.

Physical Activity

Participants were asked questions about their physical activity. They were asked to rate their general activity level from inactive, moderately inactive, moderately active, very active. Responses were recoded into three categories; inactive/moderately inactive=1, moderately active=2, very active=3.

Analysis Plan

Overview

This secondary data analysis consisted of univariate, bivariate, and multivariate analysis to examine the relationships of participant dietary habits, food access, and chronic conditions with demographics, stress, and lifestyle behaviors using Statistical Software SPSS 24.0 (SPSS Inc., 2017). An application was submitted to the Institutional Review Board (IRB) for approval. This thesis received a Letter of Determination of Not Human Subject Research from the IRB (Appendix 3).

The analysis plan includes the following research questions:

(1) How are food access and dietary habits associated with chronic conditions (obesity and diabetes), demographics (i.e. gender education, marital status, income, education, employment), stress, and lifestyle behaviors (i.e. physical activity, smoking)?

(2) What are the predictors of dietary habits?

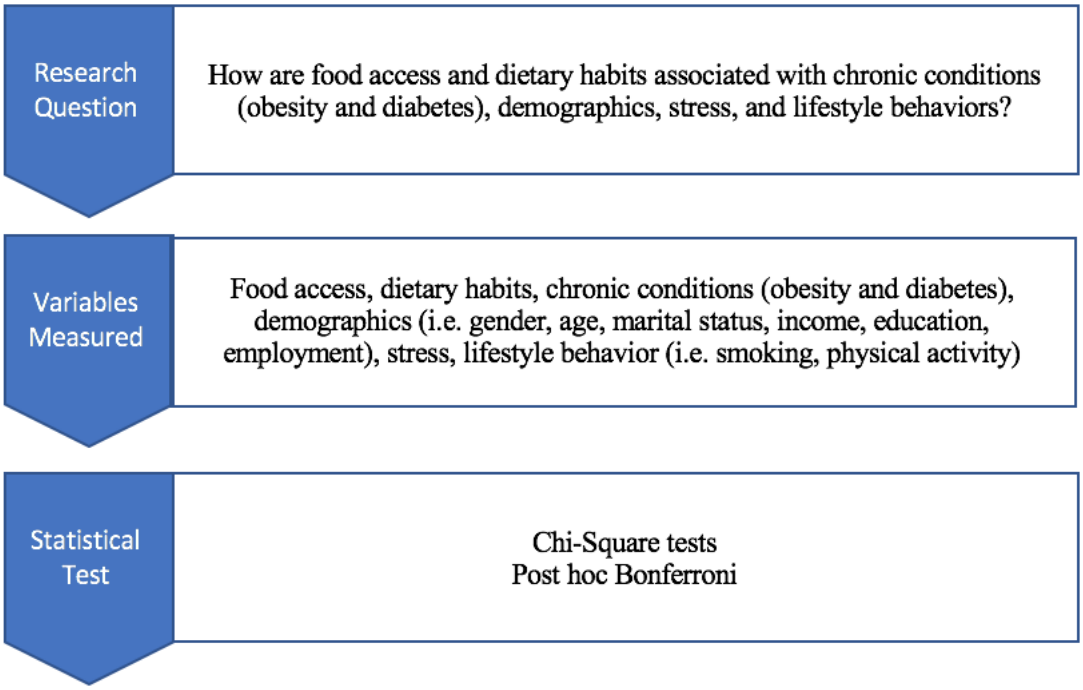
(3) What are the predictors of food access?

Univariate Analysis

The first step analyzed the descriptive statistics for each variable to better understand the sample. Frequency tables were created to display participant demographics for variables including gender, age, marital status, education, income, employment, and health coverage. Frequency tables displaying chronic conditions (obesity and diabetes) and food access were created. Tables including dietary habits, and variables such as lifestyle behaviors and health indicators were also created. The frequency analysis determined the distribution and participants' responses for each variable which guided how variables were recoded.

Bivariate Analysis

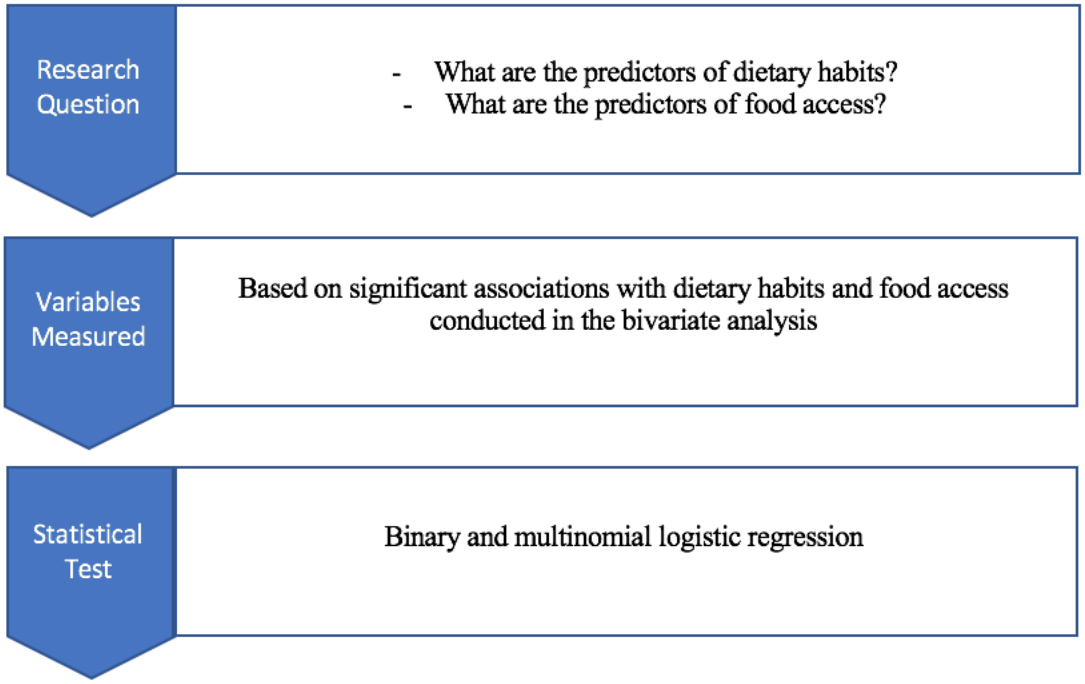
Bivariate analysis was used to assess the first research question:



For the bivariate analysis, chi-square tests were conducted to assess variables in relationship to each other and to determine associations between variables. As stated in the methods, the global diet quality index and BMI were continuous variables that were dichotomized to conduct cross-tabulations. Of the three methods to assess dietary habits, only the global diet quality and the USDA dietary adherence variables were utilized in the bivariate analysis. Bivariate tables were created for food access and the global diet quality index comparing to the remainder of the variables. Bivariate analysis was also conducted for body mass index to determine associations with other variables. Body mass index was later included because of the larger number of participants that were overweight and obese as compared to normal.

Multivariate Analysis

The second and third research questions were explored through multivariate analysis.



Multivariate logistic regression models were used to determine predictor variables of food access and dietary habits. Variables that were found to be significantly associated with food access, dietary habits, and BMI in the bivariate analysis were included in the multivariate analysis. Binary logistic regression analysis was used to assess the global diet quality variable with variables that were significant from the bivariate analysis. The variables included in the binary logistic regression for global diet quality were awareness of MyPlate, self-rated stress at work, self-rated stress at home, and self-rated physical activity. Multinomial logistic regression analysis used the significant variables that were associated with BMI. The variables included were gender, income, employment, meals prepared away from home, and self-rated diet. No variables were found to be significant

with food access in the bivariate analysis, therefore, no multivariate analysis for food access was conducted.

Chapter 4: Results

Sample Demographic Characteristics

The sample for this analysis consisted of 164 participants, representing those who completed a baseline survey for the initial study. The sample characteristics are shown in Table 2. All participants were African-American and just over half were female (54.3%). Participants were aged 45-50 years (54.3%), 51-59 years (29.3%), ≥60 years (15.2%). Participants were married/living with partner (40.9%), employed (73.2%), earned ≥$50,000 (57.3%).

Table 2: Sample Demographic Characteristics

	N (%)		N (%)
Gender		Employment status	
Male	74 (45.1)	Employed	120 (73.2)
Female	89 (54.3)	Unemployed	42 (25.6)
Age		Income	
45-50	89 (54.3)	≤$49,999	60 (36.6)
51-59	48 (29.3)	≥$50,000	94 (57.3)
≥60	25 (15.2)	Personal doctor or provider?	
Marital status		Yes	132 (80.5)
Single, never married	44 (26.8)	No	29 (17.7)
married/living with partner	67 (40.9)	Health insurance	
Other	51 (31.1)	Yes	149 (90.9)
Education		No	12 (7.3)
High school graduate or less	57 (34.8)		
Some college	49 (29.9)		
College degree or higher	56 (34.1)		

Univariate Analysis

Univariate Analysis: Diet-related Health Indicators

Table 3 displays the univariate analysis for diet-related health indicators including; BMI, diabetes, and food access. Of the 164 participants, 85 were obese (51.8%) and 49 were overweight (29.9%). Twenty-five participants (15.2%) had diabetes. Over half of the study's participants (n=94, 57.3%) lived in both low-income and low food access communities, 38 participants (23.2%) lived in low access communities, and 25 participants (15.2%) lived in low-income communities.

Table 3: Diet-related Health Indicators

	N (%)
BMI	
Normal (≤24.99)	25 (15.2)
Overweight (25-29.99)	49 (29.9)
Obese (30+)	85 (51.8)
Diagnosed Diabetes	
Yes	25 (15.2)
No	134 (81.7)
Food access	
Low income	25 (15.2)
Low access	38 (23.2)
Low income and low access	94 (57.3)

Univariate Analysis of Dietary Habits

The univariate analysis was focused on describing the dietary habits of the participants through three different methods based on the PrimeScreen questionnaire. The first method was frequencies of responses for the recoded PrimeScreen food groups, which shows how often participants consumed a certain food. The second method was a categorical variable, which was created to determine if participants adhered to USDA dietary recommendations for vegetables, fruits, whole grains, and fish. The third method was a global diet quality index. Participants each received a score based on the quality of their overall diet which was based off of their responses from the PrimeScreen

questionnaire. This score was then categorized as unhealthy, low-moderately healthy, or a moderately healthy diet.

PrimeScreen Frequencies

Table 4 is the frequency table for participant responses to the 18-item PrimeScreen questionnaire. The majority of participants reported they consumed dark green leafy vegetables 2-4 times/week (36.0%), cruciferous vegetables ≤1 times/week (43.9%), carrots ≤1 times/week (67.1%), and other vegetables 2-4 times/week (35.4%). Sixty-nine participants (42.1%) reported they consumed citrus fruits only ≤1 time/week but almost half of participants (40.9%) reported they consumed other fruits ≥5 times/week. The majority of participants reported that they consumed all dairy products ≤1 time/week; whole milk dairy products (52.4%), low-fat milk products, (56.7%), whole eggs (50.6%), and margarine (66.5%). Participants also reported that they consumed whole grain foods ≤1 time/week (42.1%) as well as pasta, rice, and noodles ≤1 time/week (51.8%). Participants responded that they consumed baked products such as cookies, cakes, and doughnuts ≤1 time/week (55.5%). Forty-three participants responded that they consumed baked products 2-4 times/week (26.2%) and ≥5 times/week (17.1%). Eighty-eight (53.7%) participants responded that they consumed red meats (beef, pork, and lamb as a main dish) ≤1 time/week, followed by 2-4 times/week (28.7%). Over half of the participants consumed processed meats ≤1 time/week (61.6%), followed by 2-4 times/week (29.3%). Fish/seafood (not fried) was consumed the most at 2-4 times/week (41.5%), followed by ≤1time/week (36.0%), and ≥5 times/week (21.3%). The majority of participants consumed deep fried foods ≤1 time/week (70.1%) and added salt to the table ≤1 time/week (73.8%).

Table 4: PrimeScreen Frequencies

	N (%)		N (%)
Dark green leafy vegetables		Margarine	
≤1 time/week	34 (20.7)	≤1 time/week	109 (66.5)
2-4 times/week	70 (42.7)	2-4 times/week	26 (15.9)
≥5 times/week	59 (36.0)	≥5 times/week	20 (12.2)
Broccoli, cabbage, Brussel sprouts		Whole grain foods	
≤1 time/week	72 (43.9)	≤1 time/week	69 (42.1)
2-4 times/week	50 (30.5)	2-4 times/week	53 (32.3)
≥5 times/week	41 (25.0)	≥5 times/week	39 (23.8)
Carrots		Pasta, rice, noodles	
≤1 time/week	110 (67.1)	≤1 time/week	85 (51.8)
2-4 times/week	35 (21.3)	2-4 times/week	48 (29.3)
≥5 times/week	18 (11.0)	≥5 times/week	29 (17.7)
Other veggies		Baked products	
≤1 time/week	54 (32.9)	≤1 time/week	91 (55.5)
2-4 times/week	58 (35.4)	2-4 times/week	43 (26.2)
≥5 times/week	49 (29.9)	≥5 times/week	28 (17.1)
Citrus fruits		Beef, pork, lamb as main dish	
≤1 time/week	69 (42.1)	≤1 time/week	88 (53.7)
2-4 times/week	39 (23.8)	2-4 times/week	47 (28.7)
≥5 times/week	55 (33.5)	≥5 times/week	28 (17.0)
Other fruits		Processed meats	
≤1 time/week	45 (27.4)	≤1 time/week	101 (61.6)
2-4 times/week	51 (31.1)	2-4 times/week	48 (29.3)
≥5 times/week	67 (40.9)	≥5 times/week	12 (7.3)
Whole milk dairy foods		Fish/seafood (not fried)	
≤1 time/week	86 (52.4)	≤1 time/week	59 (36.0)
2-4 times/week	37 (22.6)	2-4 times/week	68 (41.5)
≥5 times/week	40 (24.4)	≥5 times/week	35 (21.3)
Low fat milk products		Deep fried foods	
≤1 time/week	93 (56.7)	≤1 time/week	115 (70.1)
2-4 times/week	33 (20.1)	2-4 times/week	36 (22.0)
≥5 times/week	37 (22.6)	≥5 times/week	12 (7.3)
Whole eggs		How often do you add salt to the table?	
≤1 time/week	83 (50.6)	≤1 time/week	121 (73.8)
2-4 times/week	44 (26.8)	2-4 times/week	14 (8.5)
≥5 times/week	32 (19.5)	≥5 times/week	28 (17.1)

Adherence to USDA Dietary Recommendations

Four key healthy food categories were combined and assessed to determine whether or not participants adhered to USDA dietary recommendations for their respective category. The categories assessed were vegetables, fruits, whole grains, and fish (See Table 5). Participants did not meet USDA dietary recommendations for vegetables (88.4%), fruits (72.6%), and whole grains (92.9%). The only category participants met guidelines for was fish (72.6%).

Global Diet Quality Index

The global diet quality index consisted of three categories; unhealthy diet, low-moderate healthy diet, and moderately healthy. None of the participants had healthy diets. Half of participants had moderately healthy diets (50.6%), low-moderate healthy (26.2%), followed by unhealthy diet (22.6%) as shown in Table 5.

Table 5: Dietary Habits

	N (%)
Adherence to USDA Recommendations	
Vegetables	
Meets	16 (9.8)
Does not meet	145 (88.4)
Fruits	
Meets	44 (26.8)
Does not meet	119 (72.6)
Fish	
Meets	103 (62.8)
Does not meet	59 (36.0)
Whole Grains	
Meets	7 (4.3)
Does not meet	154 (92.9)
Global diet index	
Unhealthy	37 (22.6)
Low moderate healthy	42 (26.2)
Moderate healthy	83 (50.6)

Univariate Analysis of Diet-related Questions

Participants were also asked a series of questions on dietary habits outside of specific food consumption (See Table 6). Over half of the participants had 1-5 meals prepared away from their homes in the last 7 days (54.9%) from when they completed the survey. This rate aligns with the national averages of meals prepared away from home per week. Only 17.7% of participants had heard of MyPlate, USDA's main visual to showcase dietary recommendations for Americans. Of the 29 (17.7%) participants who had heard of MyPlate, 20 (12.2%) participants responded that they have tried to follow MyPlate recommendations. Participants also self-rated their diet. The majority responded that their diet was good (39.0%), followed by fair/poor (34.1%), and excellent/very good (25.0%).

Table 6: Additional Diet Related Questions

	N (%)
# Meals prepared away from home in the past 7 days	
1-5	90 (54.9)
6-10	25 (15.2)
11+	17 (10.4)
Heard of MyPlate	
Yes	29 (17.7)
No	135 (82.3)
If yes, have you tried to follow MyPlate recommendations?	
Yes	20 (12.2)
No	8 (4.9)
Self-rated diet	
Excellent/very good	41 (25.0)
Good	64 (39.0)
Fair/poor	56 (34.1)

Univariate Analysis of Lifestyle Habits and Health Indicators

Table 7 displays other lifestyle behaviors and health indicators including; self-rated stress at work, self-rated stress at home, self-rated health, self-rated physical

activity, and smoking status. Participants experienced minimal/light stress at work (48.2%) and moderate/severe stress at work (28.7%). Twenty-seven participants (16.5%) selected that they were unemployed or retired and, therefore, did not rate their stress at work. In regard to stress at home, over half of the participants experienced minimal/light (64.0%), followed by moderate/severe (28.0%). Two participants (1.2%) responded that they were unemployed/retired. These participants should have still provided a self-rated assessment of their stress at home, however, did not. Eleven participants (6.7%) did not respond to either of the stress questions.

Participants self-rated their health as excellent/very good (44.5%), good (39.6%), and fair/poor (15.9%). Participants self-rated their level of physical activity as moderately active (56.7%), very active (25.0%), and inactive/moderately inactive (17.7%). Over half of the participants were nonsmokers (60.4%), followed by former smokers (20.7%), and current smokers (18.9%).

Table 7: Lifestyle Behaviors and Health Indicators

	N (%)
Self-rated stress at work	
Minimal/light	79 (48.2)
Moderate/severe	47 (28.7)
Self-rated stress at home	
Minimal/light	105 (64.0)
Moderate/severe	46 (28.0)
Self-rated health	
Excellent/very good	73 (44.5)
Good	65 (39.6)
Fair/poor	26 (15.9)
Self-rated physical activity	
Inactive/moderately inactive	29 (17.7)
Moderately active	93 (56.7)
Very active	41 (25.0)
Smoking status	
Non-smoker	99 (60.4)
Former smoker	34 (20.7)
Current smoker	31 (18.9)

Bivariate Analysis

Bivariate analyses were conducted to determine participant associations by dietary habits (global diet quality index), food access, and BMI with stress, diet-related questions, diabetes, and lifestyle behaviors. Cross tabulations were conducted with BMI, food access, and dietary habits as the outcome variables with all the variables previously presented. One asterisk (*) indicates a significance level at $p \leq 0.10$, two asterisks (**) indicates a significance level at $p \leq 0.05$, and the bolded fonts indicates Bonferonni correction significance between categories.

Bivariate Analysis of BMI

Body mass index and gender were found to be marginally associated ($p=0.092$). Of the obese, participants, over half were female (61.9%), however, over half of the overweight participants were male (57.1%). Body mass index was also significantly associated with income ($p=0.006$). Participants who earned ≥$50,000 were more overweight (65.2%) and obese (65.9%) than participants who earned ≤$49,999 ($p=0.006$). Participants who were obese were more likely to live in low-income and low food access communities (N=55, 65.5%), however, this relationship was not statistically significant ($p=0.577$) (See Table 8).

Table 8: Bivariate Analyses: BMI with Demographics and Diet-related Health Indicators

	BMI		
	Normal N (%)	Overweight N (%)	Obese N (%)
Gender*			
Male	10 (40.0)	28 (57.1)	32 (38.1)
Female	15 (60.0)	21 (42.9)	52 (61.9)
Age			
45-50	10 (40.0)	29 (59.2)	46 (55.4)
51-59	8 (32.0)	13 (26.5)	26 (31.3)
≥60	7 (28.0)	7 (14.3)	11 (13.3)
Marital status			
Single, never married	10 (40.0)	16 (33.3)	16 (19.0)
married/living with partner	9 (36.0)	19 (39.6)	39 (46.4)
Other	6 (24.0)	13 (27.1)	29 (34.5)
Education			
High school graduate or less	9 (36.0)	13 (27.1)	33 (39.3)
Some college	10 (40.0)	18 (37.5)	20 (23.8)
College degree or higher	6 (24.0)	17 (35.4)	31 *36.9)
Income**			
≤$49,999	**16 (69.6)**	**16 (34.8)**	28 (34.1)
≥$50,000	**7 (30.4)**	**30 (65.2)**	54 (65.9)
Employment status*			
Employed	14 (56.0)	36 (75.0)	65 (77.4)
Unemployed	14 (44.0)	12 (25.0)	19 (22.6)
Personal doctor or provider?			
Yes	18 (72.0)	39 (81.3)	73 (86.9)
No	7 (28.0)	9 (18.8)	11 (13.3)
Diagnosed Diabetes			
Yes	3 (12.5)	6 (12.8)	16 (19.3)
No	21 (87.5)	41 (87.2)	67 (80.7)
Food Access			
Low income	4 (18.2)	9 (19.1)	12 (14.3)
Low access	6 (27.3)	14 (29.8)	17 (20.2)
Low income and low access	12 (54.5)	24 (51.1)	55 (65.5)

p≤0.1*, p≤0.05**, **bold**=Bonferonni

Table 9 presents the bivariate analysis with BMI and dietary habits and additional dietary questions. It was found that number of meals prepared away from home and BMI were significantly associated (p=0.023). It was found that the majority of obese (73.0%) and overweight (70.0%) participants consumed only 1-5 meals away from home in the

past 7 days. Almost half (46.4%) of the participants who rated their diets as fair/poor were obese (p=0.005). Of the obese participants, 88.0% did not meet recommendations for vegetable consumption, fruit consumption (69.4%), fish consumption (32.9%), and whole grain consumption (94.1%). These were not significant relationships and some cells did have <5 cases making them not as meaningful for interpretation.

Table 9: Bivariate Analyses: BMI with Dietary Habits and Dietary Questions

	BMI		
	Normal N (%)	Overweight N (%)	Obese N (%)
Global diet quality			
Unhealthy	3 (12.0)	9 (18.8)	22 (25.9)
Low moderate healthy	7 (28.0)	11 (22.9)	24 (28.2)
Moderate healthy	15 (60.0)	28 (58.3)	39 (45.9)
Adherence to USDA recommendations			
Vegetables			
Meets	4 (16.0)	2 (4.2)	10 (12.0)
Does not meet	21 (84.0)	46 (95.8)	73 (88.0)
Fruits			
Meets	7 (28.0)	9 (18.8)	26 (30.6)
Does not meet	18 (72.0)	39 (81.3)	59 (69.4)
Fish			
Meets	15 (60.0)	29 (61.7)	57 (67.1)
Does not meet	10 (40.0)	18 (38.3)	28 (32.9)
Whole Grains			
Meets	0 (0.0)	2 (4.3)	5 (5.9)
Does not meet	25 (100.0)	44 (95.7)	80 (94.1)
# Meals prepared away from home in the past 7 days**			
1-5	**6 (40.0)**	**28 (70.0)**	**54 (73.0)**
6-10	3 (20.0)	8 (20.0)	13 (17.6)
11+	**6(40.0)**	**4 (10.0)**	7 (9.5)
Heard of MyPlate			
Yes	3 (12.0)	7 (14.3)	19 (22.4)
No	22 (88.0)	42 (85.7)	66 (77.6)
If yes, have you tried to follow MyPlate recommendations?			
Yes	2 (66.7)	5 (83.3)	1 (68.4)
No	1 (33.3)	1 (16.7)	6 (31.6)
Self-rated diet**			
Excellent/very good/good	**18 (72.0)**	**38 (80.9)**	**45 (53.6)**
Fair/poor	**7 (16.0)**	**9 (19.1)**	**39 (46.4)**

$p \leq 0.1$*, $p \leq 0.05$**, **bold=**Bonferonni

Table 10 showcases the bivariate analysis for BMI with lifestyle behaviors and health indicators. There was a significant relationship between smoking and BMI ($p=0.012$). Non-smokers were more likely to be obese (64.7%). A significant association between normal and overweight current smokers was detected. Participants, regardless of

BMI, were most likely to rate their physical activity as moderately active. No significant associations were observed with self-rated physical activity, self-rated health, self-rated stress at work and home.

Table 10: Bivariate Analyses: BMI with Lifestyle Behaviors and Health Indicators

	BMI		
	Normal N (%)	Overweight N (%)	Obese N (%)
Self-rated health			
Excellent/very good	13 (52.0)	25 (51.0)	32 (37.6)
Good	7 (28.0)	18 (36.7)	39 (45.9)
Fair/poor	5 (20.0)	6 (12.2)	14 (16.5)
Self-rated stress at work			
Minimal/light	10 (62.5)	21 (55.3)	45 (67.2)
Moderate/severe	6 (37.5)	21 (44.7)	22 (32.8)
Self-rated stress at home			
Minimal/light	17 (68.0)	31 (67.4)	53 (70.7)
Moderate/severe	8 (32.0)	15 (32.6)	22 (29.3)
Self-rated physical activity			
Inactive/moderately inactive	3 (12.0)	6 (12.2)	20 (23.5)
Moderately active	14 (56.0)	30 (61.2)	47 (55.3)
Very active	8 (32.0)	13 (26.5)	18 (21.2)
Smoking status**			
Non-smoker	11 (44.0)	29 (59.2)	55 (64.7)
Former smoker	3 (12.0)	12 (24.5)	19 (22.4)
Current smoker	**11 (44.0)**	**8 (16.3)**	11 (12.9)

$p \leq 0.1$*, $p \leq 0.05$**, **bold**=Bonferonni

Bivariate Analysis for Food Access

Table 11 presents the bivariate analysis for demographics and diet-related health indicators with level of food access. Gender and food access were found to be marginally significantly associated (p=0.08). Over half of females (60.2%) and almost half of males (39.8%) resided in low-income and low access communities. Income was also significantly associated with food access (p=0.032). The majority of participants who had been diagnosed with diabetes also resided in low-income and low access communities; however, several cells had <5 cases, therefore, findings cannot be interpreted accurately.

Table 11: Bivariate Analysis: Food Access with Demographics and Diet-related Health Indicators

	USDA Food Access Category		
	Low-income	Low access	Low income & low access
	N (%)	N (%)	N (%)
Gender*			
Male	16 (64.0)	15 (39.5)	37 (39.8)
Female	9 (36.0)	23 (60.5)	56 (60.2)
Age			
45-50	13 (52.0)	24 (63.2)	47 (51.1)
51-59	8 (32.0)	10 (26.3)	28 (30.4)
≥60	4 (16.0)	4 (10.5)	17 (18.5)
Marital status			
Single, never married	7 (28.0)	9 (23.7)	25 (27.2)
married/living with partner	11 (44.0)	21 (55.3)	34 (37.0)
Other	7 (28.0)	8 (21.1)	33 (35.9)
Education			
High school graduate or less	10 (40.0)	10 (26.3)	35 (38.0)
Some college	6 (24.0)	10 (26.3)	29 (31.5)
College degree or higher	9 (36.0)	18 (47.4)	28 (30.4)
Income**			
≤$49,999	**14 (56.0)**	**8 (22.9)**	**34 (38.6)**
≥$50,000	**11 (44.0)**	**27 (77.1)**	**54 (61.4)**
Employment status			
Employed	18 (72.0)	31 (81.6)	67 (72.8)
Unemployed	7 (28.0)	7 (18.4)	25 (27.2)
Personal doctor or provider?			
Yes	20 (80.0)	33 (86.8)	76 (82.6)
No	5 (20.0)	5 (13.2)	16 (17.4)
BMI			
Normal (≤24.99)	4 (16.0)	6 (16.2)	12 (13.2)
Overweight (25-29.99)	9 (36.0)	14 (37.8)	24 (26.4)
Obese (30+)	12 (48.0)	17 (45.9)	55 (60.4)
Diagnosed Diabetes			
Yes	3 (12.5)	3 (8.3)	18 (19.6)
No	21 (87.5)	33 (91.7)	74 (80.4)

p≤0.1*, p≤0.05**, **bold**=Bonferonni

Of those who lived in low-income and low food access communities, 52.1% had moderately healthy diets, low-moderately healthy diets (25.5%), and unhealthy diets (22.3%). However, this was not significant. Those who primarily lived in low income and low access communities were found to not adhere to USDA dietary recommendations for

consumption of fruits (72.3%) and whole grains (93.5%) (See Table 12). However, adherence to USDA recommendations and food access were not statistically significant.

Table 12: Bivariate Analysis: Food Access with Dietary Habits and Dietary Questions

	USDA Food Access Category		
	Low-income N (%)	Low access N (%)	Low income & access N (%)
Global diet quality			
Unhealthy	5 (20.8)	9 (23.7)	21 (22.3)
Low moderate healthy	5 (20.8)	13 (34.2)	24 (25.5)
Moderate healthy	14 (58.3)	16 (42.1)	49 (52.1)
Adherence to USDA recommendations			
Vegetables			
Meets	4 (16.7)	2 (5.4)	10 (10.8)
Does not meet	20 (83.3)	35 (94.6)	83 (89.2)
Fruits			
Meets	5 (20.8)	9 (23.7)	26 (27.7)
Does not meet	19 (79.2)	29 (76.3)	68 (72.3)
Fish			
Meets	16 (66.7)	26 (68.4)	59 (63.4)
Does not meet	8 (33.3)	12 (31.6)	34 (36.6)
Whole Grains			
Meets	0 (0.0)	1 (2.7)	6 (6.5)
Does not meet	24 (100.0)	36 (97.3)	87 (93.5)
# Meals prepared away from home in the past 7 days			
1-5	15 (78.9)	24 (66.7)	48 (67.6)
6-10	4 (16.7)	5 (20.8)	15 (62.5)
11+	0 (0.0)	7 (19.4)	8 (11.3)
Heard of MyPlate			
Yes	4 (16.0)	5 (13.2)	19 (20.2)
No	21 (84.0)	33 (86.8)	75 (79.8)
If yes, have you tried to follow MyPlate recommendations?			
Yes	4 (100.0)	2 (50.0)	13 (68.4)
No	0 (0.0)	2 (50.0)	6 (31.6)
Self-rated diet			
Excellent/very good	15 (65.2)	24 (64.9)	60 (62.8)
Fair/poor	8 (34.8)	13 (35.1)	34 (36.2)

$p \leq 0.1$*, $p \leq 0.05$**, **bold**=Bonferonni

Table 13 represents the bivariate analysis for lifestyle behaviors and health indicators with food access. No significant associations were observed. Low-income and low food access participants reported the most stress at work and at home as compared to just low-income or low access individuals. Of the low-income and low access participants, 40.8% reported moderate/severe stress at work and 27.6% reported moderate/severe stress at home. Low-income (72.0%), low access (47.4%), and low-income and low access (56.4%) participants most often rated their physical activity level as moderately active. However, these findings were not significant.

Table 13: Bivariate Analysis: Food Access with Lifestyle Behaviors and Health Indicators

	USDA Food Access Category		
	Low-income N (%)	Low access N (%)	Low income & access N (%)
Self-rated health			
Excellent/very good	11 (44.0)	20 (52.6)	41 (43.6)
Good	10 (40.0)	15 (24.2)	37 (39.4)
Fair/poor	4 (16.0)	3 (7.9)	16 (17.0)
Self-rated stress at work			
Minimal/light	13 (72.2)	22 (68.8)	42 (59.2)
Moderate/severe	5 (27.8)	10 (31.3)	29 (40.8)
Self-rated stress at home			
Minimal/light	14 (63.6)	24 (68.6)	63 (72.4)
Moderate/severe	8 (36.4)	11 (31.4)	24 (27.6)
Self-rated physical activity			
Inactive/moderately inactive	2 (8.0)	11 (28.9)	16 (17.0)
Moderately active	18 (72.0)	18 (47.4)	53 (56.4)
Very active	5 (20.0)	9 (23.7)	25 (26.6)
Smoking status			
Non-smoker	15 (60.0)	28 (73.7)	54 (57.4)
Former smoker	3 (12.0)	8 (21.1)	22 (23.4)
Current smoker	7 (28.0)	2 (5.3)	18 (19.1)

$p \leq 0.1$*, $p \leq 0.05$**, **bold**=Bonferonni

Some cells in the bivariate analysis for food access were found to have too few cases and minimal associations were observed amongst food access. Therefore, an

additional bivariate analysis with food access with only two categories was conducted. The recoded food access variable created two categories; low-income or low access and low-income and low access. Once the bivariate analysis was conducted with the recoded food access variable, no significant associations were found. Results are shown in Appendix 4.

Bivariate Analysis for Dietary Habits: Global Diet Quality Index

Table 14 presents the bivariate analysis for global diet quality with demographics and diet-related health indicators. The global diet quality was marginally significantly associated with gender ($p=0.055$) and Bonferroni was found to be significant among all groups. Among both men (45.1%) and women (54.9%), about half of each group were classified as having moderately healthy diets. However, more women (67.4%) were found to have low-moderately healthy diets as compared to men (32.6%) and men were more often classified as having unhealthy diets (59.5%) as compared to women (40.5%). Those whose diets were classified as moderately healthy earned ≥$50,000 income (65.4%). Of those who were moderately healthy, 41.5% were married or living with partner. However, income and marital status with diet were not significantly associated.

Table 14: Bivariate Analysis: Global Diet Quality Index with Demographics and Diet-related Health Indicators

	Global Diet Quality Index		
	Unhealthy N (%)	Low moderate healthy N (%)	Moderate healthy N (%)
Gender*			
Male	**22 (59.5)**	**14 (32.6)**	**37 (45.1)**
Female	**15 (40.5)**	**29 (67.4)**	**45 (54.9)**
Age			
45-50	21 (56.8)	25 (59.5)	42 (51.2)
51-59	11 (29.7)	13 (31.0)	24 (29.3)
≥60	5 (13.5)	4 (9.5)	16 (19.5)
Marital status			
Single, never married	7 (19.4)	14 (32.6)	23 (28.0)
married/living with partner	15 (41.7)	18 (41.9)	34 (41.5)
Other	14 (38.9)	11 (25.6)	25 (30.5)
Education			
High school graduate or less	18 (50.0)	16 (37.2)	23 (28.0)
Some college	9 (25.0)	13 (30.2)	26 (31.7)
College degree or higher	9 (25.0)	14 (32.6)	33 (40.2)
Income			
≤$49,999	16 (48.5)	16 (41.0)	28 (34.6)
≥$50,000	17 (51.5)	23 (59.0)	53 (65.4)
Employment status			
Employed	26 (72.2)	35 (81.4)	58 (48.7)
Unemployed	10 (27.8)	8 (18.6)	24 (29.3)
Personal doctor or provider?			
Yes	28 (82.4)	35 (81.4)	69 (83.1)
No	6 (17.6)	8 (18.6)	14 (16.9)
BMI			
Normal (≤24.99)	3 (8.8)	7 (16.7)	15 (18.3)
Overweight (25-29.99)	9 (26.5)	11 (26.2)	28 (34.1)
Obese (30+)	22 (64.7)	24 (57.1)	39 (47.6)
Diagnosed Diabetes			
Yes	6 (16.7)	6 (14.0)	13 (16.5)
No	30 (83.3)	37 (86.0)	66 (83.5)
Food Access			
Low income	5 (14.3)	5 (11.9)	14 (17.7)
Low access	9 (25.7)	13 (31.0)	16 (20.3)
Low income and low access	21 (60.0)	24 (57.1)	49 (62.0)

p≤0.1*, p≤0.05**, **bold**=Bonferonni

Global diet quality index was significantly associated with self-rated diet. Participants with moderately healthy diets most often rated their diets as excellent/very good/good (82.7%). Participants with low-moderately healthy diets most often rated their diets as fair/poor (48.8%) (See Table 15). This was found to be statistically significant.

Table 15: Bivariate Analysis: Global Diet Quality Index with Additional Diet Questions

	Global Diet Quality Index		
	Unhealthy N (%)	Low moderate healthy N (%)	Moderate healthy N (%)
# Meals prepared away from home in the past 7 days			
1-5	22 (64.7)	22 (64.7)	46 (71.9)
6-10	9 (26.5)	6 (17.6)	10 (15.6)
11+	3 (8.8)	6 (17.6)	8 (12.5)
Heard of MyPlate*			
Yes	3 (8.1)	6 (14.0)	20 (24.1)
No	34 (91.9)	37 (86.0)	63 (75.9)
If yes, have you tried to follow MyPlate recommendations?			
Yes	2 (66.7)	2 (33.3)	16 (84.2)
No	1 (33.3)	4 (66.7)	3 (15.8)
Self-rated diet**			
Excellent/very good/good	16 (43.2)	**22 (51.2)**	**67 (82.7)**
Fair/poor	21 (56.8)	**21 (48.8)**	**14 (17.3)**
Self-rated health			
Excellent/very good	14 (37.8)	22 (51.2)	36 (43.4)
Good	17 (45.9)	14 (32.6)	34 (41.0)
Fair/poor	6 (16.2)	7 (16.3)	13 (15.7)

$p \leq 0.1$*, $p \leq 0.05$**, **bold**=Bonferonni

Table 16 presents the bivariate analysis for global diet quality index with lifestyle behaviors and health indicators. The global diet quality index was significantly associated with stress at home ($p=0.012$) and marginally significantly associated with physical activity ($p=0.056$). Over half of the participants who were classified as having a moderately healthy diet also rated their physical activity as moderately active (59.0%). Of the unhealthy participants, 50.0% reported they had minimal stress at home and 50.0%

reported they experienced moderate/severe stress at home. It was also found that participants with minimal/light stress were more often classified into the moderately healthy category (59.6%). Of those with moderately healthy diets, 78.5% reported minimal/light stress (p=.012). Bonferonni was significant for all cells for self-rated stress at home.

Table 16: Bivariate Analysis: Global Diet Quality Index with Lifestyle Behaviors and Health Indicators

	Global Diet Quality Index		
	Unhealthy N (%)	Low moderate healthy N (%)	Moderate healthy N (%)
Self-rated stress at work			
Minimal/light	15 (50.0)	20 (58.8)	43 (70.5)
Moderate/severe	15 (50.0)	14 (41.2)	18 (29.5)
Self-rated stress at home**			
Minimal/light	**16 (50.0)**	**26 (66.7)**	**62 (78.5)**
Moderate/severe	**16 (50.0)**	**13 (33.3)**	**62 (21.5)**
Self-rated physical activity*			
Inactive/moderately inactive	**11 (30.6)**	**9 (20.9)**	**9 (10.8)**
Moderately active	16 (44.4)	27 (62.8)	49 (59.0)
Very active	9 (25.0)	7 (16.3)	25 (30.1)
Smoking status			
Non-smoker	19 (51.4)	25 (58.1)	54 (65.1)
Former smoker	10 (27.0)	12 (27.9)	12 (14.5)
Current smoker	8 (21.6)	6 (14.0)	17 (20.5)

p≤0.1*, p≤0.05**, **bold**=Bonferonni

Some cells in the bivariate analysis for global diet quality contained less than 5 cases, therefore, the global diet quality variable was recoded into two categories. The recoded categories were; unhealthy/low-moderately healthy and moderately healthy. Similar results were found. These results are reported in Appendix 5.

Multivariate Analysis

Binary and multinomial logistic regressions were conducted to assess the predictors of global diet quality and BMI respectively. No significant associations were found in the

bivariate analysis with food access, therefore, the multivariate analysis was not conducted for the food access variable.

Multivariate Analysis: Body Mass Index

The logistic regression for BMI is presented in Table 17. After conducting the multinomial logistic regression, males were significantly more likely to be overweight than females (p=0.025). Income and obesity were marginally significantly associated. Participants who earned lower incomes (≤$49,999) were less likely to be obese (p=0.054). Those who consumed greater than 11 meals away from the home were significantly less likely to be overweight (p=0.036) and obese (p=0.012). Those who consumed 6-10 meals away from the home were marginally significantly less likely to be overweight (p=0.087) and were significantly less likely to be obese (p=0.031). Current smokers were significantly less likely to be obese (p=0.002) and overweight (p=0.011) than non-smokers.

Table 17: Multivariate Logistic Regression with BMI

	Overweight	Obese
	OR (95% CI)	OR (95% CI)
Gender		
Male	8.494 (1.301, 55.469)**	3.705 (0.597, 23.008)
Female	1.000	1.00
Income		
≤$49,999	0.313 (0.054, 2.803)	0.192 (0.036, 1.031)*
≥$50,000	1.000	1.000
Employment		
Unemployed	0.313 (0.054, 1.803)	0.857 (0.105, 6.973)
Employed	1.000	1.000
Self-rated diet		
Fair/poor	0.412 (0.068, 2.489)	3.326 (0.644, 17.188)
Excellent/very good/good	1.000	1.000
# Meals away from home		
11+	0.132 (0.020, 0.878)**	0.095 (0.015, 0.592)**
6-10	0.149 (0.017, 1.322)*	0.101 (0.013, 0.810)**
1-5	1.000	1.000
Smoking status		
Current	0.080 (0.012, 0.559)**	0.052 (0.008, 0.339)**
Former	2.101 (0.132, 33.359)	2.253 (0.156, 32.454)
Non-smoker	1.000	1.000

p≤0.1*, p≤0.05**

Multivariate Regression: Dietary Habits - Global Diet Quality

Binary logistic regression was conducted with the global diet quality variable which is shown in Table 18. It was found in the bivariate analysis that gender, income, employment, meals prepared away from home in the past 7 days, and smoking were significantly associated with global diet quality. Therefore, these variables were input into the binary logistic regression. It was found that those who earn ≤$49,000/year are less likely to have a moderately healthy diet than those who earn ≥$50,000 (p=0.056). It was also found that those who self-rated their diet as fair/poor were less likely to have a moderately healthy diet than those who rated their diet as excellent, very good, or good (p=0.000). No significant associations were found between global diet quality and gender, employment, meals prepared away from home, and smoking.

Table 18: Multivariate Logistic Regression with Global Diet Quality

	Global Diet Quality (reference moderately healthy)
	OR (95% CI)
Gender	
Male	1.354 (0.583, 3.141)
Female	1.000
Income	
≤$49,999	0.401 (0.157, 1.022)*
≥$50,000	1.000
Employment	
Unemployed	1.823 (0.560, 5.933)
Employed	1.000
# Meals away from home	
11+	0.682 (0.213, 2.185)
6-10	1.182 (0.388, 3.597)
1-5	1.000
Self-rated diet	
Fair/poor	0.197 (0.081, 0.481)**
Excellent/very good/good	1.00
Smoking status	
Current	0.478 (0.156, 1.461)
Former	2.194 (0.688, 6.991)
Non-smoker	1.000

p≤0.1*, p≤0.05**

Chapter 5: Discussion

Central Findings and Implications

Overview

The aim of this secondary data analysis was to determine if there were associations between food access, dietary habits, and chronic conditions (obesity and diabetes) with demographics, stress, and lifestyle behaviors. The second aim of this analysis was to determine the predictors of food access, dietary habits, and BMI. The data for this analysis is specific to participants located in the Washington D.C. metropolitan area. The analysis focused on food access, which coded participant zip codes by food access level using the USDA Economic Research Service's Food Research Atlas Map, and dietary habits, which were coded using three different methodologies; PrimeScreen frequencies, adherence to USDA recommendations, and the global diet quality index. Only the global diet quality index was used in the bivariate analysis as it was the variable that provided an overall diet score based on all the PrimeScreen items. Body mass index was also included as a focus of the analysis because of its important role in health outcomes and the large number of overweight and obese participants in this study; several significant associations in the bivariate analysis with BMI were observed as well. This secondary analysis examined these variables to further understand the associations between them.

Bivariate Analysis

The literature finds associations between food access and dietary habits with obesity, diabetes, demographics, and stress (Centers for Disease Control, 2011; Lee et al., 2011; Sims et al., 2008; Williams et al., 1997). However, the bivariate analysis for food access did not result in many significant associations, due to the limited variation within

the food access variable. In regard to food access, participant zip codes were all classified as either low-income, low access, or both low-income and low access; therefore, there was no reference category, which would have served as a low risk category that would not have been classified as either low access or low-income by the USDA.

The global diet quality was marginally associated with self-rated stress at work ($p \leq 0.10$) and significantly associated with awareness of MyPlate, self-rated stress at home, and self-rated physical activity level ($p \leq 0.05$). Those who are aware of MyPlate may have a greater understanding of how to eat healthily and may have been categorized as having a healthier diet; however, the number of participants who were aware of MyPlate was only 29 (17.7%). Stress at work and physical activity being significantly associated with global diet quality is consistent with the literature on stress and physical activity (Gillan, Naquin, Bowers, Brewer, & Russel, 2013; Stults-Kolehmainen & Sinha, 2014). Those who have minimal stress are more likely to have regular and balanced dietary habits. Those who are physically active practice healthful behaviors and may be more conscious of the benefits of healthy behaviors such as balanced diets and regular physical activity.

According to the frequency analysis, over half of the participants were obese (51.8%) and approximately one-third were overweight (29.9%). As obesity was recently classified as a chronic condition and there was a high number of obese and overweight participants in the sample, a bivariate analysis with BMI as the outcome was conducted (Advisory Board, 2013). Body mass index and income were found to be significantly associated. However, this study found that those with income ≤$49,999 had a lower rate of obesity (34.1%) than those who earned above $50,000. It has been found that obesity

disparities by income have been decreasing among U.S. adults. Research has found that among Black men, those who earned a higher income were significantly more likely to be obese than those who earned a lower income (Food Research and Action Center, 2018).

Of those who consumed meals away from the home in the past 7 days, this analysis found that the majority of overweight (70.0%) and obese (73.0%) participants only consumed 1-5 meals away from the home. The literature finds that typically obese and overweight individuals consume higher rates of meals prepared away from the home such as quick, convenient, energy-dense foods (ex. snacks, fast food) (Ayala et al., 2008). The HAIR baseline question on meals prepared away from the home includes meals from restaurants, fast food places, food stands, grocery stores, or vending machines. However, participants may not consider small purchases as meals even though they are consumed as or in place of meals. Local communities have different retail food environments; therefore, it is important that survey questions are tailored to the local language of the retail environment in the geographic area. For example, using terms such as 'mom and pop shops,' 'corner stores,' or 'bodegas' are important to utilize in questions on purchasing habits because these terms may be specific to the population. These terms are used in reports on Prince George's County and Washington, D.C. food environments (DC Hunger Solutions, 2010; Urban Studies Planning Program, 2010). Consumption may have been underreported as the settings used as examples in the question on meals away from home (i.e. fast food, restaurants, vending machines, etc.) may not have triggered a sense of familiarity and memory of consumption. The obesity rates among those who consume fewer meals away from the home may also reflect unhealthy cooking methods in the home (L. P. Smith, Ng, & Popkin, 2013).

Of those that were classified as obese, 45.9% had a global diet quality index of moderately healthy. Diet and BMI are typically significant associations; however, this was found to be statistically non-significant. One study found that participants with BMIs classified as normal had lower fruit and vegetable consumption than those that were overweight or obese, which is consistent with the results of this analysis (Energin, 2014).

Multivariate Analysis

BMI

In this analysis, participants who consumed more meals away from the home were less likely to be overweight or obese. The literature finds that meals consumed away from home are higher in sodium and fat content which can lead to chronic conditions (Gorgulho, Fisberg, & Marchioni, 2013; Seguin, Aggarwal, Vermeylen, & Drewnowski, 2016). Research has also shown an association between number of meals prepared away from home and increased rates of BMI (Seguin et al., 2016). The multivariate regression with BMI found that those who earned less income were found to be less likely to be obese than those who earned more. Recent studies have shown that the link between obesity and income is declining (Food Research and Action Center, 2018). According to national data, obesity rates tend to increase with lower incomes among women and men; however, this trend was only significant among non-Hispanic White women. Among African-American men and women, those with higher incomes were significantly more likely to be obese than those with lower incomes (Food Research and Action Center, 2018).

This analysis also found that those who were current smokers were less likely to be both overweight and obese. However, this is inconsistent with literature that counters

the myth that smoking controls weight by curbing appetite (Audrain-McGovern & Benowitz, 2011). Smoking is associated with additional unhealthy lifestyle behaviors and may also serve as a stress reliever contributing to the increased likelihood of having a higher BMI.

Global Diet Quality

It was found that those who earned less income were less likely to have moderately healthy diets than those who earned more. These results are consistent with the literature of the link between income and diet. One study found that as an individual's income decreases, food choices switch from fruits and vegetables to more energy-dense foods such as starches (pasta, canned corn, potatoes, etc.) (Drewnowski & Eichelsdoerfer, 2010). Former smokers were found to be less likely to have moderately healthy diets than non-smokers; however, there was no statistically significant association for current smokers even though there was significant association for BMI and current smokers. The literature finds that smoking is associated with other unhealthy habits such as diet and the prevalence of diabetes, a diet-related chronic condition (Nishiyama, Muto, Minakawa, & Shibata, 2009; Pesa, 1998).

It is important to highlight these differences since diet and BMI may not be directly related, and there are a variety of diverse factors that contribute to an individual's BMI. Previous research has found that age, education, marital status, smoking status, and even sleep duration is associated with BMI (Asil & et al., 2014).

Limitations

There were several limitations of this study including the population, self-selection bias, and the measurements and scales created to assess BMI, dietary habits, and food access.

Population

This study's sample was all African-American, both a strength and a limitation. Because the population was all African-American, it was difficult to find associations among variables. The statistical analysis of this study compared a majority homogenous sample, resulting in less observed associations, which would be more evident if there was a comparison group. A comparison group would have been important as disparities and associations between groups could then have been analyzed. The HAIR study's sample was also recruited at barbershops and salons where participants self-selected if they wanted to participate; therefore, selection bias may be present in the sample that would have not been present if this was a randomized sample.

Body Mass Index

Body Mass Index (BMI) is a tool used to classify a person by weight category (normal, overweight, obese) by the CDC; however, BMI as an effective measure varies among racial and ethnic minorities. BMI is found to be a most reflective measure for non-Hispanic Whites (Centers for Disease Control, 2017). This study sample consisted of all African-Americans. Therefore, the classification of participants into the weight categories, normal, overweight, or obese, should be analyzed with the awareness of the research on BMI among racial/ethnic groups.

Dietary Habits

PrimeScreen questionnaire response categories include frequency of consumption with no mention of cup or serving size. Participants may vary in their understanding of what constitutes a serving or cup. The HAIR study research assistants did not provide any reference image or physical cup for the participants to reference as they answered the

PrimeScreen questionnaire at baseline. Had the researchers provided a visual of a serving or cup at the initial data collection, the PrimeScreen data for this analysis may have been more meaningful as all the participants would have had the same reference. With the lack of a serving or cup size reference provided to participants, each frequency of consumption was classified as one cup. Cup size is a more accurate reflection of what most Americans believe a serving size constitutes. As PrimeScreen frequencies were attributed to cup size, USDA recommendations were assessed by cup size with participant PrimeScreen responses. The representation of dietary habits and measures in this analysis provide a general overview of participant diets but more specific measures and scales should be utilized in the future to precisely depict dietary habits. Frequency questions used to assess diet are complex to interpret. Some researchers suggest using questionnaires that ask yes-no for each food item and then follow-up with portion size questions for accurate results (Coulston, Boushey, Ferruzzi, & Delahanty, 2017). This strategy makes it easier for the participant to recall dietary habits and allows for the researcher to gain more accurate results on specific food items.

Participants also had limited variation in the scores for the global diet quality index. Raw scores were interpreted and then recoded and categorized into unhealthy, low-moderate healthy, and moderately healthy diets. None of the participants' raw scores of the global diet quality index reflected an overall healthy diet. If participants had higher scores, there would have been a healthy diet category which could have served as a reference to the other categories. The lack of a meaningful reference category (healthy diet category) resulted in minimal significant associations.

Food Access Variable

This secondary analysis assessed zip codes to determine the level of food access for participant neighborhoods. Definitions of food access varies across organizations, health departments, as well as the USDA. This analysis interpreted income and access to food (distance to supermarkets) as the factors contributing to the level of food access per zip code. However, more layers or factors could have been assessed to provide a more complete depiction of each community. For example, transportation or vehicle ownership would be a useful measure to contribute to the assessment of neighborhood food access level. Communities with high vehicle ownership interact differently with grocery shopping than communities with low vehicle ownership. The access or distance to supermarket variable may have varied if transportation or vehicle ownership was layered.

Assessing the neighborhood racial and ethnic composition would be an important measure especially when interpreting data among a diverse sample. This information would determine differences among food access level by racial/ethnic groups, which the literature reports (Bower et al., 2014; The Food Trust for the Healthy Corner Stores Network, 2012). However, even among a racially homogenous sample, assessing racial/ethnic composition by zip code could be an effective measure to determine food access variation among participants and neighborhoods in selected communities.

In this study's sample, all participants were found to have some risk of food insecurity. Risk of food insecurity was classified as low-income, low food access, or both low-income and low access, according to the USDA's Food Research Atlas Maps. If the sample had a larger number of participants who lived in communities classified as neither low-income nor low food access, assessing the overall racial/ethnic composition of those

neighborhoods would be an effective tool to determine if there was a difference in the overall racial/ethnic composition of a community associated or not associated with food (in)security.

Future Recommendations

Future research studies that aim to analyze dietary habits should use measures with specific quantification of dietary habits (i.e. servings or cups) to ensure the accuracy of analysis. Future use of the PrimeScreen questionnaire should be paired with a visual representation of either serving or cup size to ensure consistent reporting, results, and interpretation. The research assistants should provide this visual as the participant takes the survey.

Adding more than two factors to the analysis of food access would provide a greater understanding of participants' access to food. This study examined income and food access as distance to supermarket; however, future studies could examine population density, racial/ethnic composition, and vehicle ownership, among others. Research around food access in urban and rural areas is established; however, future studies should assess local food environments in specific geographic areas. The culture of food as well as food environments vary from community to community; therefore, researchers who focus on food access research should seek national as well as local data and information to guide their research which may include engaging the community prior to data collection. Engaging the community prior to the study could include surveying the physical food environment, researching local history, speaking with community residents, and identifying local leaders.

Future research studies on dietary habits and food access should focus on community engaged research methods to ensure that communities are part of the research process in order to create a more relevant research design and potential intervention. Establishing partnerships with local leaders and residents also helps ensure that the local data collection accurately reflects the environment and habits of the participants. Engaging local leaders to find effective solutions to food access is essential to combat diet-related health disparities. These strategies ensure that studies are tailored to the population and also ensure community buy-in to the study.

Strengths

Population

The study sample was an all African-American sample (n=164) from Prince George's County and Washington D.C. area. Although the sample was a limitation, it also is a strength. An all African-American sample was recruited for the HAIR study because of the cancer and chronic disease disparities that African-Americans experience. It is important that studies analyze food access, habits, and health outcomes among specific populations who experience a disproportionate burden of morbidity and mortality in order to guide appropriate and effective intervention. Because data was collected in a specific geographic area, findings can be translated into relevant intervention for the specific population studied.

Community-Based Research

The HAIR researchers identified barbershops and salons for baseline data collection. They also developed relationships with local leaders, community residents, and barbershop/salon owners in order to create a sense of community buy-in.

Barbershops and salon owners and managers were trained around the original purpose of the study; colorectal cancer screening promotion. Barbershops and salons were not only used as the setting for data collection but also used a space for intervention. In the African-American community, barbershops and salons are found to be a cornerstone of the community because they are community-owned, serve as hubs for news and information, as well as a place of gathering. Studies have shown that barbershops and salons are an effective community setting for research (Holt & et al., 2010; Releford, Frencher, Yancey, & Norris, 2010).

Conclusion

This secondary data analysis investigated food access, dietary habits, and BMI with chronic conditions, stress, and lifestyle behaviors to better understand associations and predictors of food access, dietary habits, and BMI. The results presented in this thesis can be used to guide the literature in the field on diet-related disparities and the factors associated with them (i.e. food access, chronic conditions, dietary habits, stress, lifestyle behaviors).

These findings contribute to the literature on food access and diet because of the population focus on a specific geographic area and the diversity of variables analyzed. The strengths and limitations of this study are important to inform future research on the best methods to assess variables, specifically food access and dietary habits. Additional research is needed to understand the predictors of food access, dietary habits, and chronic conditions by specific geographic area. The literature has established the relationships between food access, diet, and chronic conditions. However, in order to address these diet-related disparities, both systems-based issues (i.e. food access) and lifestyle habits

and behaviors (i.e. dietary habits, stress, chronic conditions) need to be analyzed conjointly in order to address diet related health disparities. Implementing a program that only focuses on improving dietary habits without the structural change will likely result in an unsustainable solution; the same exists vice versa. If structural changes are implemented (ex. more healthy grocery stores) without the education and engagement, then the program will likely be unsuccessful. This research and future studies will promote the creation of tailored and effective behavioral and systems-based interventions to address diet-related disparities.

Appendix 1: Definition of Terms

Body Mass Index (BMI)	A measure of body fat that is ratio of the weight of the body in kilograms to the square of its height in meters (Centers for Disease Control and Prevention, 2018)
Chronic Conditions	Among the most common, costly, and preventable of health problems. Examples include obesity, heart disease, stroke, cancer, type 2 diabetes ("Chronic Disease Overview: Chronic Disease Prevention and Health Promotion|" 2017). Obesity was previously categorized as a risk factor is now considered a chronic condition by the American Medical Association (Advisory Board, 2013).
Dietary Habits	Habitual decisions an individual or group eats when choosing what foods to eat. Implies to the specific types and quantities of foods which play a significant role in the quality of life, health and longevity. However, not simply an individual choice but are also based on culture, population, and systems (Collins, 2017; USDA - Center for Nutrition Policy and Promotion, 2015; World Health Organization, 2017).
Food Access	The level of availability to sources of healthy, affordable foods to have a healthy diet. Indicators of access include: accessibility to sources of healthy food (measured by distance to a store or by number of stores), individual-level resources that may affect accessibility (ex. Family income or vehicle availability), neighborhood-level indicators of resources, (ex. Average income of the neighborhood and availability of public transportation) (USDA - Economic Research Service, 2017).
Food Desert	parts of the country vapid of fresh fruit, vegetables, and whole foods, usually found in impoverished communities. (American Nutrition Association, 2011)
Food Security	Access by all people at all times to enough food to meet their dietary needs and live an active, healthy lifestyle (Coleman-Jensen, Rabbitt, Gregory, & Singh, 2017)
Health Disparities	" a particular type of health difference that is closely linked with social, economic, and/or environmental disadvantage. Health disparities adversely affect groups of people who have systematically experienced greater obstacles to health based on their racial or ethnic group; religion; socioeconomic status; gender; age; mental health' cognitive, sensory, or physical disability; sexual orientation or gender identity; geographic locations; or other characteristics historically linked to discrimination or exclusion." (U.S. Department of Health and Human Services, n.d.)
'MyPlate'	a nutritional guide created in 2011 by the United States Department of Agriculture which establishes minimum dietary guidelines for Americans (Office of Disease Prevention and Health Promotion, 2015)
Stress	"the psychological demand placed on the body when one must adapt, cope, or adjust" (American Psychological Association, 2017)
Chronic Stress	long term form of stress, derives from unending feelings of despair/hopelessness, as a result of factors such as poverty, family dysfunction, feelings of helplessness and/or traumatic early childhood experience (American Psychological Association, 2011)

Appendix 2: Abbreviated HAIR Baseline Survey for Noora Kanfash's Thesis

GH3. Now I'm going to ask you if you've ever had or have some common medical conditions. Please answer YES only if you've been told by a health professional that you have the disease. If you have any of these conditions, I'll ask you to tell me at what age you were diagnosed.

Has a doctor or other certified health professional ever told you had…

	YES	NO	Age at Diagnosis
a. High blood pressure	1	0	
b. Diabetes	1	0	
c. Heart disease	1	0	

The next set of questions will cover risk factors that are associated with diseases.

BEHAVIORAL RISK FACTORS

RF1. How tall are you?	_____ ft _____inches
RF2. How much do you weigh?	_____ lbs
RF3. What would you say is your general activity level?	Very active.....4 Moderately active.....3 Moderately inactive.....2 Inactive.....1
RF4. Now I'd like to ask you some questions about your activities. During the **past 7 days**, on how many days were you physically active for a total of **at least 60 minutes per day**? Add up all the time {you/he/she} spent in any kind of physical activity that increased {your/his/her} heart rate and made {you/him/her} breathe hard some of the time.	0 days..... 0 1 day..... 1 2 days..... 2 3 days..... 3 4 days..... 4 5 days..... 5 6 days..... 6 7 days..... 7 REFUSED ..... 77 DON'T KNOW 99
RF5. I have opportunities to engage in regular physical activity (e.g. gym, neighborhood)	1. YES 2. NO

SMOKING HISTORY

Now I have some questions about smoking.

B1. Have you ever smoked cigarettes, even a puff or two, in your lifetime?
YES ..... 1 **(Skip to B3)**
NO ..... 0 **(Go to B2)**

B2. IF NO CLARIFY...so, you've never even had a single puff of a cigarette?
YES, smoked at least once 1
NO, never smoked ..... 0 **(Skip to ST1)**

B3. Have you smoked a total of 100 cigarettes or more over your lifetime?
YES ..... 1**(Go to B4)**
NO ..... 0 **(Skip to ST1)**

B4. Do you smoke cigarettes now?
Everyday.....1
Some days.....2
Not at all,.....3

Now, I am going to ask you questions about stress in your life.
ST1. How would you rate the amount of stress in your daily life at work and at home?

	Retired	Unemployed	Severe	Moderate	Light	Minimal
a. Work	0	0	4	3	2	1
b. Home	6	5	4	3	2	1

NUTRITION

Now I'm going to ask you some general questions about eating habits.

NU1. In general, how healthy is your overall diet? Would you say . . .

Excellent……1

Very Good……..2

Good……3

Fair……..4

Poor……5

Don't Know……6

Next I'm going to ask you about meals. By meals, I mean **breakfast, lunch and dinner**.
NU2. During the **past 7 days**, how many meals did you get that were **prepared away from home** in places such as restaurants, fast food places, food stands, grocery stores, or from vending machines?

Exact Number_____
None……1
Don't Know……2

NU3.How many of those meals did you get from a fast-food or pizza place?

Exact Number_____
None……1
Don't Know……2

NU4.For each question, mark the circle indicating how often **on average** you have eaten the item(s) **during the past year**. Remember to include things you cook with. These questions are not intended to assess your total diet, and you may not find all the foods you eat listed.

	NEVER	Less than Once per week	Once per week	2-4 times per week	Nearly daily	Twice or more per day
1. Dark Green Leafy Vegetables (spinach, romaine lettuce, kale, turnip greens, bok choy)	0	1	2	3	4	5
2. Broccoli, Cauliflower, Cabbage, Brussel Sprouts	0	1	2	3	4	5
3. Carrots	0	1	2	3	4	5
4. Other Vegetables (e.g., peas, corn, green beans, tomatoes, squash)	0	1	2	3	4	5
5. Citrus Fruits (e.g., orange juice or grapefruit juice, oranges, grapefruit)	0	1	2	3	4	5
6. Other Fruits (e.g., fresh apples or pears, bananas, berries, grapes, melons)	0	1	2	3	4	5
7. Whole Milk Dairy Foods (whole milk, hard cheese, butter, ice cream)	0	1	2	3	4	5
8. Low-fat Milk Products (e.g., low-fat/skim milk, yogurt, cottage cheese)	0	1	2	3	4	5
9. Whole Eggs	0	1	2	3	4	5
10. Margarine (stick-type not tub)	0	1	2	3	4	5
11. Whole Grain Foods (e.g., whole grains, breads, brown rice)	0	1	2	3	4	5
12. Pasta, Rice, Noodles	0	1	2	3	4	5
13. Baked Products (donuts, cookies, muffins, crackers, cakes, sweet rolls, pastries)	0	1	2	3	4	5
14. Beef, Pork or Lamb as Main Dish	0	1	2	3	4	5
15. Processed Meats (sausages, salami, bologna, hot dogs, bacon)	0	1	2	3	4	5
16. Fish/Seafood (not fried, but broiled, baked, poached, canned)	0	1	2	3	4	5
17. Deep Fried Foods (deep fried chicken, fish or seafood; French fries, onion rings)	0	1	2	3	4	5
18. How often do you add salt to food at the table?	0	1	2	3	4	5

Next I'm going to ask a few questions about the nutritional guidelines recommended for Americans by the federal government.

NU5.Have you heard of **My Plate**?

1 Yes
2 No

NU6.If yes, have you tried to follow the recommendations in the My Plate plan?

1 Yes
2 No

SOCIODEMOGRAPHICS:

SD0. Gender ____1.Male ____ 2. Female

SD1. What is your current age? _____

SD4. What is your marital status?

____ 1.Single, never married ____ 4. Separated

____ 2.Married ____ 5. Widowed

____ 3.Divorced ____ 6. Living with a partner

SD5. What is the highest grade (or year) of regular school you have completed?

Elementary School	High School
01____	09____
02____	10____
03____	11____
04____	12____
05____	
06____	
07____	
08____	

SD6. What is the highest degree you earned?

_____1.GED
_____2.High School diploma
_____3.Some college
_____4.Associate degree-junior college
_____5. Bachelor's degree
_____6.Master's degree
_____7. Doctorate
_____8.Professional (MD, JD, etc.)
_____9. Other specify_____
____10. None of the above (less than high school)

SD8. Income can sometimes make a difference in issues related to health such as access to medical care. Look at the income categories and what category best describes your total combined family income **for the past 12 months**? This should include income (before taxes) from all sources [wages, rent from properties, social security, disability and/or veteran's benefits, unemployment benefits, workman's compensation, help from relatives (including child support and alimony), and so on.

___ below $5,000	___ $50,000 to 59,999
___ $5,000 to 9,999	___ $60,000 to 69,999
___ $10,000 to 19,999	___ $70,000 to 79,999
___ $20,000 to 29,999	___ $80,000 to 89,999
___ $30,000 to 39,999	___ $90,000 to 99,999
___ $40,000 to 49,999	___ $100,000 or higher

Now, I have a few questions about health insurance.

SD9. Do you currently have any kind of health care coverage, including health insurance, prepaid plans such as HMOs, or government plans such as Medicare or Indian Health Services?

1 Yes
2 No **(Go to SD10)**
99 Don't know / Not sure

Now I'll ask you some questions about how you get your health care.

SD 11. Do you have one person you think of as your personal doctor or health care provider?

1 YES
2 NO

Appendix 2: Thesis Timeline

Task	8-17	9-17	10-17	11-17	12-17	1-18	2-18	3-18	4-18
Literature review – where are gaps? – August									
Draft Chapter 1 – Introduction (research problem, questions, hypothesis, definition of terms, significance) –									
Draft Chapter 2 – Background (theoretical model, framework, literature review) – September 17									
Draft Chapter 3 – Methods (sample, design, measurement, variables defined, analysis plan)									
Choose committee and reach out									
Schedule thesis defense meeting with committee – email graduate studies director									
Prepare proposal presentation – mid December									
Prepare IRB Proposal – send out by December 25									
Defend thesis proposal – by December 14									
Revise proposal									
Submit IRB Application									
Submit University Nomination of Thesis Form/Approved Program Form by March 1									
Schedule final defense									
Complete methods w/recoding information									
Final frequencies to Dr. Garza (3pm – March 28) w/tables RQ1 – frequencies								28th	
Bivariate analyses to Dr. Garza (9pm – March 28) w/tables RQ2 – associations								28th	
Multivariate analyses to Dr. Garza (9pm – March 29) w/tables RQ 3 – predictors of dietary habits and food access								29th	
Chapter 4 – results									
Draft Chapter 5 – discussion (summarize findings, implications, limitations, conclusions)									
Draft Chapter 6 - Appendices									
Final document w/updated methods, Ch.4 and 5 to Dr. Garza (Apr 2nd)									2nd
Send thesis to committee									9th
Send Dr. Garza defense presentation – April 11th									11th
Defend thesis – April 16th									16th
Make any changes as needed, submit paperwork for graduation to UMD – file with University by April 23									23rd

Appendix 3: IRB Letter: Determination of Not Human Subject Research

UNIVERSITY OF MARYLAND
INSTITUTIONAL REVIEW BOARD

1204 Marie Mount Hall
College Park, MD 20742-5125
TEL 301.405.4212
FAX 301.314.1475
irb@umd.edu
www.umresearch.umd.edu/IRB

DATE:	December 18, 2017
TO:	Noora Kanfash
FROM:	University of Maryland College Park (UMCP) IRB
PROJECT TITLE:	[1161135-1] Examining the role dietary habits play with food access, stress, obesity, and chronic conditions among African-Americans
SUBMISSION TYPE:	New Project
ACTION:	DETERMINATION OF NOT HUMAN SUBJECT RESEARCH
DECISION DATE:	December 18, 2017

Thank you for your submission of New Project materials for this project. The University of Maryland College Park (UMCP) IRB has determined this project does not meet the definition of human subject research under the purview of the IRB according to federal regulations.

We will retain a copy of this correspondence within our records.

If you have any questions, please contact the IRB Office at 301-405-4212 or irb@umd.edu. Please include your project title and reference number in all correspondence with this committee.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within University of Maryland College Park (UMCP) IRB's records.

Appendix 4: Bivariate Analysis with Recoded Food Access

Appendix 4: Bivariate Analysis with Recoded Food Access		
	Food Access	
	Low-income OR low access N (%)	Low income & access N (%)
Gender		
Male	31 (49.2)	37 (39.8)
Female	32 (50.8)	56 (60.2)
Age		
45-50	37 (58.7)	47 (51.1)
51-59	18 (28.6)	28 (30.4)
≥60	8 (12.7)	17 (18.5)
Marital status		
Single, never married	16 (25.4)	25 (27.2)
married/living with partner	32 (50.8)	34 (37.0)
Other	15 (23.8)	33 (35.9)
Education		
High school graduate or less	20 (31.7)	35 (38.0)
Some college	16 (25.4)	29 (31.5)
College degree or higher	27 (42.9)	28 (30.4)
Income		
≤$49,999	22 (36.7)	34 (38.6)
≥$50,000	38 (63.3)	54 (61.4)
Employment status		
Employed	49 (77.8)	67 (72.8)
Unemployed	14 (22.2)	25 (27.2)
Personal doctor or provider?		
Yes	53 (84.1)	76 (82.6)
No	10 (15.9)	16 (17.4)
BMI		
Normal (≤24.99)	10 (16.1)	12 (13.2)
Overweight (25-29.99)	23 (37.1)	24 (26.4)
Obese (30+)	29 (46.8)	55 (60.4)
Diagnosed Diabetes		
Yes	6 (10.0)	18 (19.6)
No	54 (90.0)	74 (80.4)
Global diet quality		
Unhealthy/low-moderately healthy	32 (51.6)	21 (22.3)
Moderate healthy	30 (48.4)	49 (52.1)
Adherence to USDA recommendations		
Vegetables		
Meets	14 (22.6)	10 (10.8)

	Low-income OR low access N (%)	Low income & access N (%)
Does not meet	48 (77.4)	83 (89.2)
Fruits		
Meets	5 (20.8)	26 (27.7)
Does not meet	19 (79.2)	68 (72.3)
Fish		
Meets	42 (67.7)	59 (63.4)
Does not meet	20 (32.3)	34 (36.6)
Whole Grains		
Meets	1 (1.6)	6 (6.5)
Does not meet	60 (98.4)	87 (93.5)
# Meals prepared away from home in the past 7 days		
1-5	39 (70.9)	48 (67.6)
6-10	9 (16.4)	15 (62.5)
11+	7 (12.7)	8 (11.3)
Heard of MyPlate		
Yes	9 (14.3)	19 (20.2)
No	54 (85.7)	75 (79.8)
If yes, have you tried to follow MyPlate recommendations?		
Yes	6 (75.0)	13 (68.4)
No	2 (25.0)	6 (31.6)
Self-rated diet		
Excellent/very good/good	39 (65.0)	60 (63.8)
Fair/poor	21 (35.0)	34 (36.2)
Self-rated health		
Excellent/very good	31 (49.2)	41 (43.6)
Good	25 (39.7)	37 (39.4)
Fair/poor	7 (11.1)	16 (17.0)
Self-rated stress at work		
Minimal/light	35 (31.8)	42 (59.2)
Moderate/severe	15 (30.0)	29 (40.8)
Self-rated stress at home		
Minimal/light	38 (66.7)	63 (72.4)
Moderate/severe	19 (33.3)	24 (27.6)
Self-rated physical activity		
Inactive/moderately inactive	13 (20.6)	16 (17.0)
Moderately active	36 (57.1)	53 (56.4)
Very active	14 (22.2)	25 (26.6)
Smoking status		
Non-smoker	43 (68.3)	54 (57.4)
Former smoker	11 (17.5)	22 (23.4)
Current smoker	9 (14.3)	18 (19.1)

Appendix 5: Bivariate Analysis with Recoded Global Diet Quality

Appendix 5: Bivariate Analysis with Recoded Global Diet Quality		
	Unhealthy/low-moderate N (%)	Moderately healthy N (%)
Gender		
Male	36 (45.0)	37 (45.1)
Female	44 (55.0)	45 (54.9)
Age		
45-50	46 (58.2)	42 (51.2)
51-59	24 (30.4)	24 (29.3)
≥60	9 (11.4%)	16 (19.5)
Marital status		
Single, never married	21 (26.6)	23 (28.0)
married/living with partner	33 (41.8)	34 (41.5)
Other	25 (31.6)	25 (30.5)
Education		
High school graduate or less	34 (43.0)	23 (28.0)
Some college	22 (27.8)	26 (31.7)
College degree or higher	23 (29.1)	33 (40.2)
Income		
≤$49,999	32 (44.4)	28 (34.6)
≥$50,000	40 (55.6)	53 (65.4)
Employment status		
Employed	61 (77.2)	58 (48.7)
Unemployed	18 (22.8)	24 (29.3)
Personal doctor or provider?		
Yes	63 (81.8)	69 (83.1)
No	14 (18.2)	14 (16.9)
BMI		
Normal (≤24.99)	10 (13.2)	15 (18.3)
Overweight (25-29.99)	20 (26.3)	28 (34.1)
Obese (30+)	46 (60.5)	39 (47.6)
Diagnosed Diabetes		
Yes	12 (15.2)	13 (16.5)
No	67 (84.8)	66 (83.5)
Food Access		
Low income or low access	32 (41.6)	14 (17.7)
Low income and low access	45 (58.4)	49 (62.0)
# Meals prepared away from home in the past 7 days		
1-5	44 (64.7)	46 (71.9)
6-10	15 (22.1)	10 (15.6)
11+	9 (13.2)	8 (12.5)
Heard of MyPlate**		

	Unhealthy/low-moderate N (%)	Moderately healthy N (%)
Yes	**9 (11.3)**	**20 (24.1)**
No	**71 (88.8)**	**63 (75.9)**
If yes, have you tried to follow MyPlate recommendations?**		
Yes	**4 (44.4)**	**16 (84.2)**
No	**5 (55.6)**	**3 (15.8)**
Self-rated diet**		
Excellent/very good/good	**38 (47.5)**	**62 (82.7)**
Fair/poor	**42 (52.5)**	**14 (17.3)**
Self-rated health		
Excellent/very good	36 (45.0)	36 (43.4)
Good	31 (38.8)	34 (41.0)
Fair/poor	13 (16.3)	13 (15.7)
Self-rated stress at work*		
Minimal/light	35 (54.7)	43 (70.5)
Moderate/severe	129 (45.3)	18 (29.5)
Self-rated stress at home**		
Minimal/light	**42 (59.2)**	**62 (78.5)**
Moderate/severe	**29 (40.8)**	**62 (21.5)**
Self-rated physical activity**		
Inactive/moderately inactive	**20 (25.3)**	**9 (10.8)**
Moderately active	43 (54.4)	49 (59.0)
Very active	16 (20.3)	25 (30.1)
Smoking status		
Non-smoker	44 (55.0)	54 (65.1)
Former smoker	**22 (27.5)**	**12 (14.5)**
Current smoker	14 (17.5)	17 (20.5)

$p \leq 0.1$*, $p \leq 0.05$**, **bold**=Bonferonni

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