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A 10-Year Longitudinal Analysis of Family Composition and Its Impact on Body Mass Index Among African-American Women

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A 10-Year Longitudinal Analysis of Family Composition and Its Impact on Body Mass Index

Among African-American Women

A dissertation submitted in partial satisfaction of the

requirements for the degree Doctor of Philosophy

in Public Health

by

Sharlene Jackson

2014

ABSTRACT OF THE DISSERTATION

A 10-Year Longitudinal Analysis of Family Composition and Its Impact on Body Mass Index

Among African-American Women

by

Sharlene Jackson

Doctor of Philosophy in Public Health

University of California Los Angeles, 2014

Professor Gail Harrison, Chair

The African-American family has experienced changes in composition since the involuntary migration from Africa to the Americas. This pivotal change in family composition has affected every aspect of life for African Americans.

Using body mass index (BMI) as a proxy for eating patterns and physical activity, this study examines the changes in family composition and its impact on BMI for African-American women. To examine the relationship between changing family composition and BMI over a 10-

year period (2001–2011), this study uses publicly available data from the Panel Study of Income Dynamics. A series of bivariate correlational analyses and ordinary least-squares regressions via a mixed effects panel regression model were performed to examine women living in Traditional Households (married or cohabiting greater than or equal to1 year) and Non-Traditional Households (female headed households no husband or cohabitor) and changes in BMI over time.

Obesity increased by 45.9% for women in Traditional Households versus 42.9% for women in Non-Traditional Households from 2001 – 2011.

The dissertation of Sharlene Jackson is approved.

Robert Cooper

William J. McCarthy

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Gail G. Harrison, Committee Chair

University of California Los Angeles

2014

Dedication

This dissertation is dedicated to my loving and eternally supportive husband, AJ Jackson, II, PharmD. You are the rock that keeps me solid. I love you . . . more than words can express. To my children, Armahn Seth and Aeiress Sivahn Emily, what a gift you are. I am overwhelmed with the purest of love for you. You are a reflection of God's perfect love!

To my parents, Otha and Emma O'Neal, I am here because of what you taught me as a little girl growing up in South Florida by way of the Deep South, Mississippi. I am my father and mother's daughter.

Table of Contents

List of Tables

Acknowledgements

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My interest in overweight issues and obesity among African-American women and how history, culture, involuntary migration, federal policies, and the politics of education intersect to impact the present-day health of African-American women is a reflection of being mentored by all of the great intellectual scholars mentioned above, all of whom I have had the privilege to learn from. Thank you all. I am sincerely grateful. You have been a great doctoral committee.

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nothing is impossible. It has carried me through the highs and lows of life thus far. I hope that you will be proud of the work that I do because of the work that you have done. To God be the glory for the great things He has done! I love you Mom and Dad, dearly.

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Biographical Sketch

1991   Atlantic Community High School
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CHAPTER ONE

Introduction

This dissertation examines how changes in family composition over time have affected eating and physical activity patterns of African-American women. The dissertation consists of seven parts: (a) statement of the problem and its significance; (b) a description of the specific aims of the proposed research; (c) a review and critique of the literature; (d) a discussion of the methods used to collect and analyze data; (e) analysis and results of the data; (f) discussion of the results; and (g) an evaluation of the strengths and limitations of the research. Initially, this research emerged from the notion that the heritage of slavery took root in America has influenced the contemporary African American family composition and their dietary patterns by foodways up to the present day, encouraging the consumption of "soul food." Such a diet is high in fat, sugar, salt and calories, and thereby contributes to the disproportionate weight gain found in African-American women. Upon further exploration of the existing literature it became evident that a host of other influences such as exposure to prepared foods, reduced time for scratch cooking, price of food, and the environment, are equally or even more important influences on African-American women's food choices than their cultural heritage from the days of slavery.

In an evocative reflection, Counihan and Van Esterik (1997) stated that: "Food remains one of the Black woman's self-concept expressions. Through her mysterious, spiritual self-confidence and through her arrogance in food preparation, the Black woman gains a sense of pride as she watches her extended family . . . enjoy the soulful tastes and textures prepared by her skillful hands" (p. 273). At its core, this study wishes to know how this traditional food

dynamic has held up against, or perhaps even been reinforced by, the changes in family composition in African-American families over the past decade.

Statement of the Problem

There have been many changes in family composition as lived and experienced by African-American women over the past several generations. There is extensive sociological, economic, and culturally centered research on different aspects of these changes. For example, sociologists have examined how the dynamics of relationships and roles have been altered over time in African-American families. Economists have analyzed the effect of increasing education and income on African-American family composition and structure.

There is, however, a gap in the literature when it comes to a longitudinal focus on understanding how changes in African-American family composition have led to changes in eating and physical activity patterns resulting in higher rates of obesity, especially with the delimitation of women. Given the mounting burden of disease among the poor, who are disproportionately African-American (Muennig, Fiscella, Tancredi, & Franks, 2010), it is necessary to examine all of the independent variables that lead to ill health resulting from obesity. While scholars have thoroughly examined the impact of general economic and sociological factors on African-American eating and exercise patterns, the independent variable of African-American family composition has been left mostly unexamined. In all families, family composition has a significant impact on health outcomes. As a determinant of health outcomes it is impacted by the interactions of determinants: genetics, the environment, behavior patterns, and our social and cultural experiences. Our genetic predispositions are influenced by behavioral patterns and environmental exposures. Our socio-cultural experiences, environment and behaviors affect our access to healthcare or the lack of care received (McGinnis, et al. 2002).

Families' behavior patterns and environmental exposures are affected by their social-cultural experiences and can either navigate or deter families and their members toward healthy eating and physical activity.

Aims of the Research

Before delineating the main aims of the research, it would be helpful to set the general context of the study. As the literature review details, the past few decades have been turbulent times for African-American women. As more African-American women transitioned off public assistance because of higher income and better education (Juon, Green, Fothergill, Kasper, Thorpe, & Ensminger, 2010), family dynamics have also changed in numerous ways. African-American women are at home less frequently, and the prevalence of two-parent households in all families, including African-American families has declined (Taylor, Larsen-Rife, Conger, Widaman, & Cutrona, 2010). There are strong pressures on the African-American family to eat less nutritiously even though the quantity of calories eaten may be greater and lifestyles more sedentary.

Aim 1: To understand the relationship between the changing dynamics of family composition and BMI in African-American women.

Aim 2: To weigh family composition dynamics alongside other independent variables, such as, education, income, and regional geographic location as predictors of the dependent variable BMI in African-American women.

Significance of Study

This study adds to the current limited body of existing literature on African-American families, African-American women and their relationship with obesity risk, providing an essential contribution. It focuses on African-American women within family composition. The

3

findings will contribute to the development of a more comprehensive framework for the examination of environmental and political influences on obesity involving the historical and cultural experiences of African-American women within the context of family composition and relation to BMI. Such findings may be used to develop culturally appropriate obesity treatments for African women and the families they nurture, accounting for their cultural and physical activity environments. This work is also an opportunity to incorporate public health, urban planning and policies, and education in an effort to lead a proactive charge to create a system in which the global and the local intersect and complement each other. The long-term policy implications include potential revisions and modifications in the urban food environment.

CHAPTER TWO: LITERATURE REVIEW

This literature review consists of the components of theory and empirical studies. The first section of the literature review reviews and assesses theories of eating and physical activity, focusing on two questions: (a) Why do people eat and physically move in specific manners? (b) How does family composition determine why people eat and physically move in a specific manner? The second section of the literature review will evaluate and assess empirical studies of eating and physical activity patterns among populations of African-American women in particular. The literature review will also make an effort to explain how and why theories of eating, physical activity, and family dynamics apply to empirical studies of African-American populations.

According to Goodpaster, Katsiaras and Kelly (2003) the sedentary body tends to be physiologically dysregulated (Goodpaster et al., 2003) Most African-Americans are sedentary and hence their metabolic systems are likely to be dysregulated, not subject to the homeostatic regulation that governs the physiology of most animals (Goodpaster et al., 2003). Eating and

physical activity patterns differ markedly among humans (Cassell & Gleaves, 2006), requiring some theoretical explanation beyond biology. The first important theory in this regard is environmental in nature (USDA: Dietary Guidelines, 2010). It stipulates that diet is partly a function of the type of food that is available to a specific population. Activity patterns are also determined by limitations of the environment. People in pre-modern environments, without access to mechanized transportation, relied more on walking, boats, and animal-powered transportation. Another theory is economic. It stipulates that people's incomes and political factors that determine incomes, such as the economic privileging of White Americans over African American, determine how they eat and move (Larson, Story, & Nelson, 2009).

Recently, a number of economic studies have demonstrated that in the industrialized world income correlates closely with access to nutritious food and free time for healthy exercise. Wealthier people have an advantage in terms of nutrition and health (Marmot & Wilkinson, 2005) by having greater access to fruits, vegetables and opportunities to be physically active that the *Dietary Guidelines for Americans* says contribute to successful weight control. However, many wealthy individuals do not take advantage of that access and they become obese. Yet another theory is mainly social psychological in nature, stipulating that children mimic what they see others in their family and social circle do, such that children will grow up with similar food and activity preferences to their parents (Fildes et al., 2014).

These theories are not mutually exclusive. They merely illuminate the same phenomenon involved in eating and activity patterns, from different perspectives. Researchers have pointed out that, in studying how people eat and move about, it is necessary to recognize the explanatory power of several theories working simultaneously rather than assuming that one theory can explain the entire phenomenon (Rimer & Glanz, 2005). A number of qualitative case studies of

eating and activity patterns have demonstrated that environmental, sociological, and economic influences blend together in determining subjects' eating and physical activity behaviors (Ridder, Heuvelmans, Visscher, Seidell, & Renders, 2010). Based on these studies, it would be a mistake to construct an explanatory model that focused only on a theory of eating and behavior. Instead, it is necessary for researchers to be aware of how history, environmental, economic, and sociological influences work together.

That said certain groups of people are impacted by environmental, economic, and sociological factors in different ways. This fact is true of African-American populations, including African-American women. For example, research has demonstrated that African-American families eat in ways that demonstrate the environmental, sociological, and economic effects of slavery and after slavery, and the long period of institutionalized poverty that characterized African-American life from the period of the Civil War to the Civil Rights era (Opie, 2010). The past four centuries have played an important role in determining what African American individuals eat. However, it has been the past four decades of African-American history that African-American families have had a seat at the American table. During this time, most of the increase in obesity risk in African-Americans has occurred, as is the case for other Americans. African-Americans have been more subject to these increases than other groups because of their disproportionate poverty.   As regards to physical activity, African Americans are impacted by underlying factors such as environmental (neighborhood safety), economic (recreational facilities) and sociological (social structure). Specifically, African Americans have been impacted over the past century by the increasing technological advances, movement away from agriculture towards manufacturing and, later, a service-oriented economy. These have all combined to create a more sedentary environment and lifestyle for all Americans, not just

African Americans. The effects of this lifestyle have more recently involved African Americans, because, until recently, African Americans were disproportionately engaged in heavy labor and other forms of physical activity that have been dwindling among the White-American population. Since the 1960s, it has become clear that African-American and White-American populations have both been become more sedentary. However, there is consensus that African Americans are less physically active than Whites (Bopp et al., 2006).

Family Composition

Today, the face of the American family is much more diverse than in the past. The very meaning of family has drastically changed since the 1950s. A family used to mean a married couple with their children, generally, a couple of the same race and heterosexual orientation. This historical ideal is quite different, very different from the faces in the American-family composition today for most ethnic groups; not just African-Americans. Increasingly, couples choose to marry outside of their race due to because of changes in laws and attitudes. Gay and lesbian couples are forming households, bringing children into the relationship or choosing to adopt (Gates, 2013; Goldberg, 2010). More and more couples are forgoing marriage and starting their families first (Fry, 2013; Gibson-Davis, 2014; Sonfield, Hasstedt, Kavanaugh, & Anderson, 2013). Married couples get divorce and divorced couples then become single parents. Divorced couples then become single parents. Divorced parents remarry and step-families are formed and blended. In a 2010 Pew Research Center survey, 60 percent of African-Americans, 46% of Hispanics and 39% of Whites reported having step families. These are some of the most obvious changes in the organization of the American family today. Today, family composition consists of traditional families (father, mother, and children), single parent families (mother or father and children), blended families (stepmother/father or adoptive parent and children), extended

families (aunt/uncle, grandparents and children), fictive families (foster parents and kinship caregivers and children), and same-sex families (male/male, female/female and children).

For the purpose of this study, family composition will be defined as one person living with at least one additional person in the household where the cohabitants believe that love, trust, and mutual commitment to helping the other are the basis for the relationship. This shall include married couples and cohabitating couples: two people who have decided to live together for any period of time in an intimate relationship that is emotional and sexual in nature where the presence of love, trust, and mutual commitment is assumed. Such relationships may or may not include children.

In consideration of today's norms the definition of family will also include couples who have children and live apart, are related by marriage or "through affection, obligation, dependence, or cooperation" (Rothausen, 1999), and are committed to providing for their children, securing their safety and survival, as well as, women who live with their children without a spouse or a cohabiting partner. Lastly, family will also be defined as persons living together across generations where family members provide social and economic support for each other by pooling their resources (Edin & Lein, 1997; Edin & Lein, 2000), assist with nurturing, disciplining, and rearing children (Scott & Black, 1989; Wilson, 1986; Wilson, 1989) and help each other cope with societal challenges (Arnold, 1995; Crosbie-Burnett & Lewis, 1999).

The past few decades have witnessed a change in the family structure. The value placed on the traditional family has weakened over time as individuals have become less willing to devote the necessary time, money, and energy into maintaining the traditional family structure and more willing to invest in their personal interests while not necessarily abandoning the importance of family support via social media. Lapierre, Piotrowski and Linebarger (2012)

found that children living in single parent households were exposed to more TV watching per day than children of married parents. In the past families with children sent their children outside for play and social interaction. Today, children are babysat by televisions. Obesity risk, in turn, is dose-response related to hours of TV watching. This change in the traditional family is cause for alarm especially as it relates to the consequences for overweight and obesity, which results in increasing BMIs.

The decade of the 1950s was a period of high birthrates, high marriage rates, low divorce rates, and general family stability.   However, since the 1950s, the situation for families, far from being the focus of national concern, has grown progressively worse (Zill & Coiro, 1992). Since the 1960s, we have observed fundamental challenges to the family: traditional role expectations, forms and ideals that have historically defined family for the past century have changed (Mintz & Kellogg, 1989).

Major fundamentals of the traditional family have almost become outdated. First, and in some ways foremost, marital roles associated with the traditional family have changed. From a cultural perspective, the standard in which women are expected to be full-time homemakers and mothers with the husbands as sole breadwinners is now a minority situation. According to the U.S. Department of Labor, 42% of families had a male breadwinner exclusively in 1960; by 1988, it was15 percent. In the same year, 1960, only 19 percent of married women with children under the age of 18 participated in the labor force. In 1980, nearly 57 percent and in 1990 nearly 67 percent. In 2000 over 72 percent of women with children under 18 participated in the labor force (U.S. Department of Labor, 2004). A May 2013 report by Wang, Parker and Taylor (2013), analyzing data from the US Census Bureau reported that 40 percent of all households

9

with children under the age of 18 include mothers who are the only or primary source of their family's income.

The number of single-parent families increased, doubling between 1966 and 1986, with the largest increase occurring between 1976 and 1981. In most cases, single-parent households were created because of separation, divorce, or the death of a spouse and were predominantly female-headed. Women who divorce suffer disproportionately in terms of reduced income relative to their husbands. Some of the negative consequences of single parenthood come not from the death or absence of the other parent but from the increased poverty that is associated with single parenthood. Single parents, predominantly women who are mothers, are caught between competing demands and a crunch for time. There is little or no time at all for healthy meal planning and preparation. In 2000, women headed 20 percent of all families, which was twice their representation in 1970. In 2011, African-American women were most likely to be women headed households (27.5 percent), while White women were the least likely (9.4 percent) (Lofquist, Lugaila, O'Connell & Feliz, 2012). They typically must work as many hours as possible to provide for their families, while being less likely to have the added support and benefit of a partner's help in meeting the demands and nutritional needs of themselves as well as their children.

This dramatic social, demographic, and economic change during the past 40 years has changed the American family. The consistency of the family 40 years ago was one of the father working to monetarily provide, mother at home keeping house, and children in school. Mother cooked most of the meals and everyone was at the dinner table eating together. The caloric intake was moderate, activity levels for children was high because they were encouraged and engaged in outside play and childhood games. There were few computers, no big screen

televisions; cable television was relatively new and quite expensive for the average household and technology not as advanced.

Contrast the above family model with the changes observed in the 80s, 90s, and today. We began to see huge changes in the social, demographic, and economic makeup of the American family. Marital status, age, and socioeconomic status are well-established determinants of health and they continue to promote greater understanding as to why obesity is so very different today from four to five decades ago within the context of family. Socially, the family began to see both the father and the mother working outside of the home. Another change within families is the age of first parenthood. Women have been progressively delaying their first baby over time so that they are older, more educated and have higher income by the time the first baby arrives, all of which helps the baby's development (Mill, Rindfuss, McDonald & te Velde, 2011). The traditional family dinner began to disintegrate with the introduction of fast food chains. Fifty years ago, fast food was still in its beginning stages and for those who could afford to eat it, it was an indulgence, a treat. Today, there is an abundant supply of fast food restaurants on just about every corner and in close proximity to most neighborhoods. Five decades ago, families typically prepared food for themselves and their families that contained meaningful calories, instead of driving up to a window and handed "empty" calories as a meal. Historically the adherence to the Dietary Guidelines for Americans was easier because of the absence of fast food. Fast food is calorie-rich and nutrient poor and sometimes referred to as "empty" calories because of the dearth of essential nutrients (Bowman, Gortmaker, Ebbeling, Pereira, & Ludwig, 2004). With improving economics of the household, families had broader access to resources and luxuries, which translates into the ability to eat out more. Between 1977-78 and 1994-96, consumption of food prepared away from home increased from 18% to 32% of

11

total calories. Away from home food was higher in cholesterol, salt, total and saturated fat (Guthrie, Lin, & Frazao, 2002). Additionally, the social structure that includes working mothers has potentially contributed to an increased single head of household. With these changes came less nutritious and well balanced diets, an increase in poverty rates, access to computers, cable television and an increased sedentary lifestyle, and the creation of an overweight and obese nation (Guthrie et al., 2002).

Five decades ago, cooks in the school cafeteria prepared meals that were nutritious and well balanced; fruits and vegetables were less processed, contained more fiber and water, than today; prepared foods are calorie dense and nutrient poor (Guthrie et al., 2002) . For those children bringing their lunch to school, their parents did the same. Today, however, it is quite different. Vending machines offer high-calorie and low-nutritional value convenience food, coupled with a standard lunch menu consisting of everyday selections such as pizza, hamburgers, tacos and French Fries. These meals are calorically dense, offer less nutritional value and are deficient in roughage or fruits.

Five decades ago, when mothers traditionally packed their children's lunches, it consisted of a sandwich made from unprocessed meat and fruit. As the makeup of the family changed over the years, convenience foods made it much easier and less time consuming to pack lunches. In 1980, the juice box began entering the U.S. market, chocolate milk bottles were being miniaturized to fit compactly into school lunch boxes, sodas were becoming the beverage of choice, and multiple flavors of potato chips were mass-produced (Zimmerman, 2011).

The literature does not adequately address causes and consequences of the change in family structure as they relate to obesity. However, the changes in family composition has had extremely harmful effects on family roles and on the relationships between fathers, mothers, and

children and the relationship between families and their communities, all of which are interconnected and affect overweight and obesity risk. These changes have had largely harmful effects on health and the long-term consequences of overweight and obesity. The changes in family composition over the past several decades are much more problematic than any prior family change and contribute significantly to the increasing trend toward overweight and obesity, particularly for the African-American woman.

African-American Family Changes

Many social theorists have argued that the effects of slavery resulted in African-American families becoming disorganized in ways in which other Americans have not experienced by (DuBois, 1899; Elkins, 2013). This interpretation of African-American family disorganization concluded with Moynihan's 1965 report. In his report, Moynihan asserted that the problems and conditions of the African-American community could be traced back to the decline and deterioration of the African-American family (Ruggles, 1994; Moynihan, 1965). Other theorists attribute cultural differences between Whites and Blacks that originated in slavery to explain Black family composition (Nobles, 1978; Scanzoni, 1971).

The history of African-American family has always been characterized by change. African Americans have experienced several major historical changes and each change has significantly transformed all aspects of their lives. The first major change involved the involuntary migration of Africans in which they were captured, shackled, and imprisoned against their will and transported to America as slaves. This sudden transition for enslaved Africans resulted in their loss of freedom and their relegation to plantation agriculture. The result of these changes was the creation of a new people: African-Americans. Another pivotal change for African-American families involved the emancipation of African Americans from slavery. The

change from slavery to freedom resulted in a status change and redefined African Americans by placing them into a caste system in society. Going from slavery to a caste status resulted in geographic, socioeconomic, and cultural changes for African-American families in America, from a predominantly Southern, rural, agrarian folk society to a Northern, Western, and Midwestern industrial society. In four generations, African-American families have moved from slavery into the industrial and urban areas of the United States. They had to combine the heritages of their African family experiences and their American family experiences.

The third major change for African-American families involved the desegregation of U.S. society. This change was most notably signified by presidential orders and Supreme Court decisions banning racial segregation in public, such as the 1949 presidential order desegregating the military and the 1954 Court decision banning segregation in public schools. Remnants of these past disadvantages and constant discrimination continue to impact and restrict African American equality today (Baum-Snow, 2001; Billings, Deming & Rockoff, 2014).

The effect of slavery on African-American families was the initial path toward the decline of the African-American family. The present day misfortune in which the African-American father is temporarily or permanently absent can be traced back to the slave family unit that kept, at best, the mother-child relationship (single parent). The lack of a strong, present and stable father figure for young slave children played a major part in the development of the cultural psychology of abandonment often present today in African-American families. In a classic work, sociologists Frazier and Glazer (1996) argued that slavery established a pattern of family and marital instability among African Americans resulting from the constant separation of males and older children from women and siblings. There are many damaging effects attributable to slavery that deeply influence African-American family composition, but there are

other, more current forces at work, both cultural and economic. The percent of African-American families that are headed by single parents is an alarming 67%; versus 25% for Whites, and 17% for Asians/Pacific Islanders (Annie E. Casey Foundation, 2012).

Igbo

Nearly 40% of African slaves imported into Virginia were brought from the Bight of Biafra. A large number of those slaves were Igbo people who lived North of the Bight of Biafra, present-day Nigeria. Captured slaves were sold, kidnapped, or bought from Igbo villages. Africans from the Bight of Biafra, Igbos, were most numerous in the slave trade to the Chesapeake Bay region, which included the colonies of Virginia and Maryland (Chambers, 1997).

Igbo's accounted for about 1.3 million of the 1.7 million people exported from the Bight of Biafra during the era of the Atlantic slave trade and constituted the majority of enslaved Africans in Maryland (Chambers, 1997). According to Chambers, out of 37,000 Africans that arrived in Virginia from Calabar in the 1700s, 30,000 were Igbo (Chambers, 1997). Chambers argued that the significance of this slave trade pattern between Calabar and Virginia is that the increased exportation of enslaved Igbo from their homeland to the Chesapeake region coincided with the expansion of colonial settlement from the Upper Tidewater to the fertile Central Piedmont. This was an era when the transatlantic trade transformed the region into a slave society that was dominated by the Igbo and their culture.

Between the 16th and the 19th century, the Bight of Biafra was the scene of extensive slave trading operations, based mainly on the ports of Brass, Bonny, Opobo, and Calabar in Nigeria. Beginning in the early 1700s, Virginia tobacco farmers imported increasing numbers of

captive Africans to work their plantations. As settlement expanded westward, enslaved Africans were among the settlers in backcountry areas. Many of these captives were Igbo.

Igbo-land was the epicenter of yam agriculture because Igbo people were the best yam growers in West Africa (Chambers, 1997). In addition to the yam, the oil from the African palm was of great importance. It was used for frying, flavoring soups and stews and for making yam foo-foo: made by boiling the yam and pounding it into a doughy consistency and soaked in palm oil. Also, the kola nut, which is bitter tasting, containing caffeine and often served ceremonially to welcome guests. Other Igbo staples included rice, millet, and okra, which were used to thicken soups and stews. The Igbo also cultivated greens, watermelons, black-eyed peas, pumpkins, and gourds and raised domesticated animals for the consumption of milk and meat (Chambers, 1997).

Using yam foo-foo as bread and the palm tree to prepare a variety of foods is characteristic of Igbo cooking. After the arrival of foreign traders, Igbos began raising and using corn, manioc, and sugar. These crops complemented their yam-based diet. In 1796, the explorer Joseph Hawkins recalled that Igbo fields had plenty of millet, manioc, sugarcane, maize and sheep and goat grazing in rich pastures for miles of sight, along with goats and sheep grazing in rich pastures as far as the eye could see.

The subsistence farming done by Igbo in their tropical climate provided an ample amount of regular physical activity. For instance, women worked in the fields, made yam foo-foo, physically pounded grains into flour, hauled water for cooking and spent hours in the kitchen preparing meals. The men tilled the soil, sowed and reaped crops and performed physically strenuous work such as cutting wood, killing and cleaning animals, and preparing foods. The Igbo communities along the mouth of the Gambia and Niger Rivers engaged in hours of physical

activity by maneuvering boats, casting, and hauling in fishing nets and preparing their catch for eating. Hence, when it came to arriving in America, Igbos did not have much adapting to do relative to agriculture.

West African Food Patterns

Mendes (1971), author of *The African Heritage Cookbook* has argued that between the sixteenth and eighteenth century West African cooking remained unchanged by European influences. Frederick Opie, on the other hand argues differently. Opie (2010) argued that African cooking was significantly influenced and indeed changed as a result of the African slave trade. The involuntary migration of West Africans to America as slaves was massive, transferring historical dietary patterns along with culture and agricultural practices. Crops such as sorghum, pearl millet, African rice, cowpea, yams, okra, watermelon, and pumpkin were native to Africa and thus familiar (Opie, 2010). Yams were cultivated as early as 17,000–18,000 years ago on the African continent (Opie, 2010).

According to Opie (2010), Iberians introduced Africans to maize, manioc, and domesticated animals, and this introduction resulted in Africans eating more fowl and more pork, leaving a permanent imprint on the health and diet. July and Bennett (1976) argued that African societies used corn and sweet potatoes, foods not originally a part of their diet to support and replace their basic diet. They further argued that Arab traders, Indonesian islanders, and European slave traders introduced new foods to Africans and they became a part of the African diet.

The limited literature available does not confirm whether deep-frying as a method of cooking originated in West Africa. However, it is clear that the method of deep frying food transferred with Africans to America. For example, akara, a fritter deep-fried in palm oil and

made from peeled cow peas (black-eyed peas) and rolled in flour represents the movement of crops and cooking methods from Africa. In West Africa, women gathered greens: spinach, collards, mustards, and the leaves of root vegetables yams. They used them raw or in cooked vegetable dishes. The preference by some African Americans for fried foods, chicken, pork, and sweet potatoes/yams has firm origins in West African cuisine. Using flavorfully rich herbs and seasonings, heavy measurements of salt and pepper, meats such as bacon and ham hock, and cooking oil or lard has its roots in West Africa, where it was customary to liberally use palm oil for cooking.

Harvest such as sweet potatoes, peanuts, and manioc (cassava) were brought into Africa by the Portuguese and these crops eventually became essential to their agriculture.   Harvest such as squash, cashew nuts, pumpkins, lima beans, maize, tomatoes, pineapples, guavas, avocadoes, and papayas (Sokolov, 1991). Several studies cited foods such as yams, millet, maize, and sorghum as the top energy suppliers (Banea-Mayambu, Tylleskar, Tylleskar, Gebre-Medhin, & Rosling, 2000; Luke, Cooper, Prewitt, Adeyemo, & Forrester, 2001; Ross, Etkin, & Muazzamu, 1996). The most glaring characteristic of the West African diet was the monotony of the diet: amount of raw food and the way in which the food is prepared. Transitioning from West Africa to the United States, dietary data shows higher percentages of energy from fat. The African American tradition of eating corn bread with meals can be traced back to West Africans, who began regularly eating different types of corn bread after the 1600s. The Southern tradition of eating dishes like grits and hot water corn bread can be traced back to West Africa, where they frequently ate porridges made with millet and grains.

<div align="center">**Slavery Dietary Patterns**</div>

Dietary Patterns During Slavery

Historians and archaeologists have discussed and intensely debated the diet of slaves in American for hundreds of years. However, there has been no consensus about the quality of their diet. More than a century ago, the diet of slaves was debated by abolitionists claiming that slaves were underfed and undernourished (Sydnor, 1965). Based on plantation records and travelers' accounts, some historians have claimed that slaves suffered very little from the lack of food, arguing that it was to the master's advantage to feed slaves well in order to get more work out of them and to discourage thieving (Flanders, 1993). Some support their arguments by citing documents indicating that on smaller plantations slaves and masters actually ate from the same frying pan (Stampp, 1965; Sydnor, 1965). Yet some historians recognize that not all masters could provide adequate quantities of food. Even if slaves were given enough food, it has been argued that their diet was not properly balanced and they still suffered from dietary and nutritional deficiencies (Hilliard, 1988; Stampp, 1965). This probably was due to the ignorance of the masters, who lacked knowledge about the principles of nutrition, even for themselves, rather than because of any cruelty or intentional withholding of food on their parts (Stampp, 1965).

Many accounts of the slave diet in the South exist (Blassingame, 1972; Genovese, 1976; Genovese, 1989; Hilliard, 1988; Yetman, 1970), and virtually all of them mention corn and pork as staple food items. Plantation records throughout the South report that in addition to corn and vegetables, each slave was given anywhere from one-half to five pounds (0.23-2.27 kg) of meat (usually pork) per week. Some records show that women and children may have been given less. Agreement at the core of most historical accounts is that there did not exist just one slave diet as slaves lived on different plantations during different periods in time. However, some historians (Blassingame, 1972; Sydnor, 1965) acknowledged that there were separate classes of slaves, and

that house servants were better off than field servants, there are few qualitative accounts of how the diets of the various slave classes may have differed.

Introduced by Native Americans, maize was an intrinsic part of the West African diet. At the peak of the slave trade, the harvesting of maize served as a solution for feeding the massive number of slaves in holding cells on the Middle Passage. During this time, captors needed a crop that could be harvested quickly while providing a high-energy yield per acre. Harvesting maize was the solution. The term "Middle Passage" originated during the slave voyage as part of the triangular voyage from the west coast of Africa through to the Americas and terminating in Europe. This second stage of the triangular trade involved shipping slaves to the Americas. Chronologically, the triangular voyage, which included the Middle Passage, was used from 1450–1899. Once in North America, maize continued to be part of the diet but from hominy grits, corn pone, corn fritters, and corn bread. Unfortunately, unlike Native Americans, slaves were not educated regarding the importance of alkali treatment of the grain and how significant such treatment was when consumed as a staple food item that could result in niacin deficiency (Kenneth & Kipple, 1977).

Slave ships brought crops directly from Africa to North America for slaves to consume during their journey to North America. These crops included essentials to the African diet: rice, okra, black-eyed peas, cassava, yams, and kidney, and lima beans. Other crops included peanuts, millet, sorghum, guinea melon, licorice, watermelon, and sesame. Citrus fruits, such as limes and lemons, hot chili peppers, herbs, and spices were provided during the Middle Passage for medicinal purposes (Egerton & Egerton, 1987). Archeological evidence shows that in some cases hunting small game and fishing provided additional resources such as possums, raccoons,

rabbits, wild birds and freshwater drum, gar, catfish, sunfish, and mackerel (Covey & Eisnach, 2009; Gibbs, Cargill, Lieberman & Reitz, 1980).

Yams without question were the staple food item fed to African slaves aboard ships en route to North America. As far as meat, the slave master consumed the better parts of hogs, chickens, and cattle and fresh milk, butter, and cheese. They passed on to slaves the feet, necks, ears, and tails of hogs; hog chitterlings, kidneys, livers, and brains; chicken and pig feet, livers, and gizzards; and buttermilk (Covey & Eisnach, 2009). Slaves were allotted cornmeal, salt, pork, molasses, and herring, because these foods could be stored in bulk (Gibbs et al., 1980). Because most of the foods available to slaves were passed on to them by their owners, the tastes the slave cooks (usually women) created made them their personal dietary delicacies. Slaves used foods native to North America but resembled African foods, such as the American sweet potato which resembled the African yam, and foods imported from Africa and cultivated in America like peanuts, which are known as guba on the west coast of Africa, watermelon, and okra. Slaves created a new cuisine with the cornmeal and cured pork that became part of the daily staples on the plantation. Slaves also supplemented their diet when they could by growing some of their own vegetables, such as American leafy greens that resembled African ones, turnips, cabbage, eggplant, cucumbers, tomatoes, onion, garlic, and hot peppers, all of which had been cultivated in West Africa (Poe, 1999).

As a rule, breakfasts were large, to fortify workers for a day of hard labor in the field. Lunch was made of breakfast leftovers. Dinners were boiled or one-pot meals where preparation began in the morning and were ready and served once slaves returned home at the end of the day. Larger plantations provided a cooking staff of slaves to do all of the meal preparation where

meals were prepared for the entire group. On other plantations, slave women cooked for their own families during their time off.

Dietary Patterns Post-Slavery

Knowledge of what African Americans ate during post slavery is primarily limited to what can be accounted for in cookbooks, memoirs, and diaries. In their book *Ethnic and Regional Foodways in the United States: The Performance of Group Identity*, Brown and Mussell (1984) do not include any contributions on African-American foodways but include in detail the foodway contributions of several other groups of Americans: Jewish Americans, Italian Americans, Russian Americans, Mexican Americans, Cajun Americans, Hindu Americans, and Florida Seminole Indians (Brown & Mussle, 1984). Vital statistics (name, birthdates, gender) rarely lasted past the Middle Passage, so the survival or account of dietary patterns definitely did not. When comparing African Americans to other migrant groups, little attention has been dedicated to the historical accounts of their dietary patterns and practices and the role that these patterns and practices have contributed to food preferences in the United States.

The first quantitative study of a Southern diet was conducted by Atwater and Woods (1897) of the USDA's Office of Experiment Stations. It was a project conducted by researchers at Tuskegee Institute. It took place in the spring of 1895 and the winter of 1896. All subjects were African Americans and made their living as tenant farmers and plantation laborers. However, in many ways, their lives resembled that of slaves of the previous generation.

The diet documented by the Tuskegee researchers had changed slightly from slavery. The main staple foods found in more than half of all households were sugar, flour, cornmeal, lard and bacon. Other foods found in 25 to 50% of households were sweet potatoes, milk, molasses, butter, buttermilk, greens, and pork. Nutrition, on average, was severely protein deficient unless

22

pork intake was high, but more than adequate or at least adequate, in terms of energy and fat

intake (Dirks & Duran, 2001; Dirks, 2003; Dirks, 2009). The average protein intake among

Tuskegee's tenant farmers and plantation laborers was the lowest ever recorded in the United

States and the lowest known worldwide in the late 19th century. Atwater reported that the diet of

Italian street beggars contained more protein on average (Atwater & Woods, 1897).

Nonetheless, the Tuskegee sample documents that tenant farmers and plantation laborers

managed to survive for weeks on protein intakes far below their yearly average. Diet

histories/diaries obtained taken in December just before the onset of winter revealed a protein

intake averaging just 50 g/m/d from all sources and an insufficient 7 g/m/d from animal sources.

In Dickins's (1928) work, a generation later, just as the Great Depression was beginning,

African Americans in the cotton fields of the South were barely any better off. Dickins's sample

consisted of collected diaries: 80 Mississippi households, mostly sharecroppers, taken between

February and March, which was the transition between winter and the planting season. Dickins

found they liberally ate nine foods: flour, corn meal, rice, pork, fish, cabbage, cane syrup, salt,

and lard. A typical menu for winter, which was the laying-off season, consisted of three items

per week: rice, peas, and cornbread. For most families, it was rice and cornbread or peas and

cornbread, twice a day for most of the winter season. In Dickins's study, she found an average

energy intake of 3046 kcals/m/d at the beginning of the planting season and an average protein

intake of 66 g/m/d. Nearly 25% of Dickins's sample took in less than 50 g/m/d, and pellagra, a

disease caused by niacin deficiency, existed throughout the region (Dickins, 1928). Pellagra,

also known as "black Tongue," was widespread among the slave population, with four general

symptoms: loss of appetite, digestive problems, acute dementia, and death. Unfortunately, little

if any medical knowledge existed among undertrained antebellum doctors about pellagra. They often regarded as typhoid fever or diphtheria (Kenneth & Kipple, 1977).

The Tuskegee dietaries illustrated the magnitude of energy fluctuations with average energy intakes in early December of 2811 kcals/m/d to early spring increasing to 3882 kcals/m/d. Protein intake, especially animal protein, increased dramatically as well, from 7 g/m/d to 23 g/m/d. These increases came from families purchasing more bacon, doubling their use of molasses, increasing their use of sugars and syrups by nearly 75%, and purchasing wheat at a fourfold increase. In addition, most tenant farmers had one or two cows, and these cows benefited from the spring grass, resulting in more milk produced and consumption increasing by more than 400%.

Over time, these foods became staples of the Southern diet and carried over to a number of generations. The same foods that were cultivated during slavery continued to be cultivated or grew wild, thus continuing their same food behaviors, the only exception was they no longer received rations from their slave masters (Gibbs, Cargill, Lieberman, & Reitz, 1980). They raised many of the vegetables and legumes they consumed during slavery. They continued to hunt and fish. Hogs and chickens were inexpensive to raise because they ate practically everything. Meats and other foods were fried, and most vegetables were stewed with pork fat. The foods brought to the American South became linked to the history of slavery.

Jim Crow Laws

Byrd and Clayton (2012) provided a broad, thought-provoking and intellectual assessment of Jim Crow policies and the resulting consequences on African-American health. Their work illustrates 382 years of African-Americans in the United States; more than 246 years in slavery, 100 years of reconstruction and Jim Crow, and the passage of the Civil Rights Act.

Byrd and Clayton asserted that Jim Crow public policies affected slaves, free men, and African American citizens and had a direct impact on the their health (Byrd & Clayton, 2012), specifically in relation to heart disease, stroke, and diabetes. Jim Crow laws originated between 1876 and 1965 and were enacted in Southern states of the former Confederacy. The term "Jim Crow" is primarily attributed to "Jump Jim Crow," which was a song-and-dance caricature of African Americans performed by White actor Thomas D. Rice in blackface. As a result, the phrase "Jim Crow" became a derogatory term referencing "Negro" (McFeely, 2001). These laws segregated, adamantly and forcefully prohibited Black America access to schools, education, healthcare, railways and streetcars, public waiting rooms, water fountains, boarding houses, theaters, public parks, libraries, cemeteries, and restaurants and as a result created and continued the slave health deficit.

Poverty

In 1864, when "formal" slavery was abolished, the economic and political conditions of the plantation did not end. Sharecropping and tenant farming were the only means of viable employment available to most African Americans; thus, the cycle of poverty and the marginal status of African Americans continued. The means by which African Americans acquired and obtained food continued and remained significant: gardening, hunting, and fishing. With the exception of receiving rations from their former slave masters, plantation owners, or landlords (Gibbs et al., 1980), the same foods remained available. They harvested much of the same foods they consumed during slavery, such as white and sweet potatoes, vegetables, and legumes.

Poverty, coupled with the environment of the region continued to influence the African American traditional core diet from slavery. Although they still received food from their plantation owners, they now had to pay for it with cash or credit. Typically, this translated into

handing over the majority of their income received from crops (Gibbs et al., 1980). Some foods could be purchased on the plantation or from stores in town. However, it was typically with a line of credit payable to the landlord, resulting in further decreases in their incomes and living on little to no money, thereby continuing the cycle of their impoverished plight (Cussler & de Give, 1970).

Restaurant Dining

Jim Crow policies forced African American parents to ensure at an early age that their children clearly understood the rules and customs of buying food and dining out. Ironically, the restaurants they wished to obtain food from were segregated and owned by Whites. Their kitchens were over-crowded with African American cooks while refusing service to African American customers. So, the most common strategy for coping with the humilities suffered under Jim Crow was to buy food only from African-American owned and operated restaurants and cafés.

Jim Crow policies made certain that African American restaurants remained separate eating spaces from Whites. In Opie's (2010) book, *Hog and Hominy: Soul Food from Africa to America*, an interviewee recalls finding good food and service prior to the passage of the 1954 landmark Supreme Court Case *Brown v. Board of Education*. Opie's interviewee, Eugene Watts reports the limitations of eating out:*"You didn't just walk into a White establishment…you stood in front until somebody came out and typically said, boy are you lost"* (p. 101). The interviewee clearly showed an understanding of the traditions and customs of buying food at White-owned restaurants during the Jim Crow era. It was by word of mouth that African Americans created and shared mental road maps of where African-American communities and restaurants existed that were safe to dine in. In most African-American neighborhoods, interviewees in Opie's book

reported that there was always some type of café or cafeteria serving fried fish and fried chicken in the form of a sandwich or barbeque sandwiches, appealing to the taste preference of its customers (Opie, 2010). Dining spaces owned and operated by African Americans provided relaxing dining experiences void of the stress of racial discrimination imposed by Jim Crow policies (Opie, 2010). The hostility African Americans experienced in segregated dining spaces contributed to their culinary traditions surviving. In their own environments and establishments customers could expect and receive good palatable foods that reminding them of their culture that were inexpensive and unaccompanied by the hassle of Jim Crow racism (Goings & Mohl, 1996; Kelley, 1993). Food was attached to memories of family and friends and could be served without Jim Crow restrictions.

In the 1960s, African American cooks working at segregated restaurants, helped facilitate consumer demand for what became known as "soul" (Opie, 2010). According to Opie, local mom-and-pop restaurants, bus-stop lunch counters, and bars and grills established the definition of what was a good soul food menu that specialized in foods that African Americans enjoyed eating. The variety was limited, typically consisting of fried fish, barbecued or stewed meat and rice, and smothered fried chicken and rice, rather monotonous and lacking a selection of healthy raw foods. Regardless, these foods on the menu were some of the only dishes many small, Southern restaurants offered (Opie, 2010).

The Great Migration

The "Great Migration" of millions of African Americans moving from rural Southern states and relocating to industrial Northern cities, the Midwest, and even the West was one of the most significant demographic occurrences that occurred in the United States between 1910 and the mid 1970s. The South, primarily Mississippi, Louisiana, Alabama, and Texas, lost a huge

percentage of their African-American population to Northern cities in search of work and opportunity. The Great Migration redistributed the African-American population between 1910 and 1920; New York's African-American population increased by 66%, Chicago's by 148%, Philadelphia's by 500%, and Detroit's by 611% (Smith, 1966; U.S. Census Bureau, 1969). Although, more than 80% of African Americans lived in cities, 40% of African Americans lived in the North and approximately 7% lived in the West; more than 53% remained in the South.

Many African Americans left due to economic and non-economic injustices.   The most frequently mentioned reasons for migrating were racial violence, policies of Jim Crow laws, political disenfranchisement, and the hope for better educational opportunities for themselves and their children (Tolnay & Beck, 1992). In addition, the U.S. adoption and enforcement of more restrictive immigration policies coupled with World War I gave African Americans incentive to migrate and forced employers in the North to hire Southern African Americans to replace European workers. African Americans were a source of cheap labor and they took advantage of the labor shortages. Although, inequitable, this was profitable to African-American immigrants because it created economic opportunities they had not experienced in the South. On one hand, Jim Crow policies helped to integrate African American immigrants from the South into their own identities. On the other hand, Jim Crow policies created concentrated Black spaces, urban Black communities all over the country.

Although African Americans migrated, took advantage of the labor shortage, and created new urban Black communities, most brought their Southern culture and traditions with them. Grossman (1989) stated that Black migrants did not leave "their cultural baggage at the train station". Their food traditions and their religion also migrated, and both affected their dietary practices and patterns (Whitehead, 1992). Upon migrating, African Americans continued to eat

breakfasts that were large: ham, fried fish, eggs, sausage, bacon, grits, red eye gravy, corn bread, and molasses. Likewise, much like breakfast, lunch and dinner remained the same and large, consisting of corn bread, greens, and pork. The influence of the South remained culturally important because African Americans had family members who did not migrate but remained in the South. The meeting and gathering of families for celebrations involved cultural traditions at church, home for holiday celebrations, and a multiplicity of other occasions and celebrations all of which are centered on festive eating. Also, migrants still returned home to the South to visit their relatives and friends and during those visits would enjoy cooking that was reminiscent of times past also referred to as "down home cooking." Although their culinary skills and traditions may not have been lost after migrating, some found it extremely difficult to maintain while adapting to their new city life, competing demands, and time constraints. The time required for Southern-prepared, home-cooked meals competed with the pace of the city, its new demands, and survival expectations (Opie, 2010). Time constraints did not allow preparation of traditional meals. Although the greatest weigh gain has been in the South, African-American diets changed as they adapted to living outside of the South and as a result of socializing with other cultural groups, thereby contributing to eventual weight gain (Opie, 2010).

The Emergence of Soul Food

During the 1960s and 1970s, African-American intellectuals argued that soul food was uniquely part of African-American culture and therefore the intellectual capital of African Americans. On the other hand, White intellectuals argued that soul food was a Southern regional food that belonged to Southerners. According to Taylor and Egerton (2008), the differences in cuisine are more regional than ethnic, with greater eating differences between Southerners and Northerners of any race than between African American and White Southerners.

The emergence of soul food was part of a cultural renaissance resulting from the expression of cultural pride many African Americans expressed in 1960s. As ethnic diversity increased in urban areas post Great Migration, "soul" became linked with African American culture. Although "soul" isn't formally defined in the literature, those with it had a "down home style" that migrants related to. It was intuitiveness about what was good, a collective consciousness that came from African Americans with limited resources and who were forced to adapt to poor urban environments (Blauner, 1970). For this working class, which mainly consisted of poor, underemployed urban dwellers, "soul" made them members of an exclusive culture group and it emerged as another culture that undermined the larger society's definitions of acceptability (Guillory & Green, 1998).

Academically, soul food is difficult to describe because it is wrapped in emotional feelings relative to family and memories among African Americans. For assimilated African Americans who were educated, wealthy and upwardly mobile, soul food helped them maintain a connection to their roots after the migration to suburban White communities. According to Mendes (1971), soul food unites African Americans and provides a link to their African past. According to African American cooks, soul food is a unique experience that results from a concentrated experience in the African-American community mixed with an intimate relationship with the Southern experience. Originating in the slave quarters of Africans in the 16th to 19th centuries, it is a unique mixing and blending of many cooking traditions that Africans across the Americas seasoned with their knowledge of culinary herbs gained from their ancestors. Soul food was also spiritual food because some food was served only on Sundays and other special occasions during slavery and post-slavery (Bass, 1988). It was simple food, but often complex in its preparation. It required a cook with a good sense of timing of when to

season, how long to stir, mix, fry, boil, sauté, bake, grill, dry, or smoke an ingredient and how to cut, skin, dip, batter, or barbecue. It was food that tasted good and helped African Americans survive during difficult times. The oral history of recipes was transferred from one generation to the next ensuring the survival of African foodways through time.   Recipes and cooking techniques developed out of a common Black cultural experience. Soul food was an expression of pride. After years of looking down upon and mocking African-American women who received free discarded parts of the hog: ears, feet, spare ribs and chitterlings (pronounced "chitlin" among African-Americans) from butchers and slaughterhouses, in the late 1960s, the food industry began recognizing the popularity of soul food and began capitalizing on soul food with marketing labels such as "guaranteed authentic … Soul Housekeeping seal of approval" (Opie, p. #132). Not long thereafter, members of the Nation of Islam, natural food advocates, and college- and university-educated African Americans began arguing that soul food was killing African Americans and it should not be embraced and celebrated.

The Decline of Soul Food

Toward the end of the Great Migration, challenges to soul food were emerging, with initial opposition from college educated African Americans and natural food advocates such as Dr. Alvenia M. Fulton, Dick Gregory, and the Nation of Islam (Opie, 2010). In the absence of medical professionals, these advocates contributed to many African-Americans reconsidering the nutritional content of their traditional yam based diet. However, the yam-centered diet was not the nutritional issue, the issue centered on the high content of refined carbohydrates, oil, and salt in the diet. Advocates questioned for the first time the role of nutrition in soul food and encouraged African-Americans to reconsider the health qualities of soul food by examining the cooking history of their slave and Southern ancestors. The cookbook, *Natural Diet for Folks*

31

Who Eat: Cookin' with Mother Nature by Gregory (1974) was a collaboration with naturopathic Dr. Alvenia Fulton. Gregory, with assistance from Fulton, boldly criticized and condemned soul food for causing things such as bloated stomachs, bald heads, varicose veins, swollen ankles, high blood pressure, heart problems, and nervous tension in the Black community. According to Gregory, all these illnesses were caused by the traditional diets of African Americans resulting from heavy starch, cooked food, greasy fried food, sugar, and salt (Gregory, 1974).

As the Great Migration came to an end in the 1970s, there were a few African-American doctors speaking out against the diets of African Americans. In the 1970s, Dr. Therman E. Evans was keenly aware that African Americans could not experience long life consuming their traditional yam-based diet on a daily basis. He recognized the need for healthy eating and exercise. He understood the relationship between food and health. In March 1977, Dr. Evans wrote an article for *Ebony* magazine, "On the Health of Black Americans", arguing that African Americans could not continue to disregard what they ate as if diet had no effect on health status because both directly and indirectly relate to every major illness, including heart disease, high blood pressure, cancer, diabetes, and infectious disease (Evans, 1977).

In May 1977, *Ebony* magazine published the article "Did Your Mother Make You Fat?" Tufts University President Jean Mayer warned African Americans that the main diseases and the main causes of death were directly influenced by nutrition. It was impossible to deny the correlation between nutrition and obesity (Evans, 1977).   In the same issue, Dr. Keith W. Sehnert, director of the Center for Continuing Health Education at Georgetown University, recommended banning sugar and salt from the table completely, not adding any salt or sugar when meals are served, reserving cakes and pastries made with sugar for special occasions only, becoming a frugivore, and increasing the consumption of raw fruits and vegetables.

Additionally, Sehnert also encouraged African Americans to cook and bake with polyunsaturated vegetable oils instead of high-cholesterol saturated fats such as butter, lard, and meat fat, to substitute skim milk for whole milk, limit to eating only three eggs per week and to eat more fish, fowl, beans, nuts, and new soya-meat extenders and substitutes (*Ebony*, 1977).

In 1978, *Ebony* magazine published another health-related article, interviewing seven medical school directors on their prime areas of concern: "The Ten Worst Things You Can Do to Your Health." Their sixth area of concern was overeating calories and under eating fruits and vegetables (Ebony, 1978). Of those interviewed, Dr. Lemah of Meharry Medical College in Nashville said that African Americans needed to reduce the amount of sugar or refined carbohydrates in their diets. All physicians at that time were advocating food reforms and transitioning to heart-healthy meals (*Ebony*, 1978).

Whitehead and Blanks performed separate studies in North Carolina in the 1970s and 1980s focusing on the formation of African Americans subsistence patterns and their impact on contemporary African American nutrition and health, documenting that most African American households were still regularly eating traditional foods (Blanks, 1984; Whitehead, 1992; Whitehead, 1992). Their conclusion was that the yam-based diet of African Americans had endured over several generations but some foods in the core diets of their study's families were not a regular part of slave diets, according to historical accounts. Some foods that were not a part of the core diets included pork products such as hams, ribs, chops, loins, and shoulders; beef products such as ground beef, roasts, and steaks; whole chickens, chicken breasts, thighs, legs, and wings; fresh fruit; desserts such as fruit pies, cobblers, cakes, and cookies; and beverages such as sweet milk, coffee, tea, and lemonade. According to historical accounts, most African Americans did not eat these types of foods often during slavery. In contrast to the Whitehead

and Blanks studies in the 1970s and 1980s, Popkin, Siega-Riz, and Haines (1996) published a study that found that between 1965 and 1991 many foods in the African-American, traditional yam-based diet such as sweet potatoes, greens, and black-eyed peas had decreased significantly in the diets of poorer African Americans (Popkin et al., 1996). Among all socioeconomic classes, what changed was the increased consumption of fast food, defined as prepared foods high in calories and low in nutrients (Bowman & Vineyard, 2004).

Special Dietary Occasions

Slocum (2010) has argued that for African Americans and other races, the choice of food ingredients, preparation, and consumption styles is a self-conscious affirmation of identity (Slocum, 2010). Thus, in families that see themselves specifically as African Americans, it is likely that there will be some adherent to traditional African Americans foodways. Whereas African-American families that defined themselves more generically, not in race-based terms, were not as likely to assert their identity via eating. Frey (2010) has defined foodways as "an act by which identity is performed". As such, it is necessary to be aware of the close connection between African-American family identity, and food consumption patterns and how this relationship has transcended time.

The dietary practices of African Americans have been deeply rooted in history, culture, traditions, holidays, and celebrations. Gatherings centered on food have been occasions where the history, wealth, spirit, creativity, resilience, and collective ethnic identity of the community is carried on (Liburd, 2003). These gatherings usually are ritualistic, occurring at home or church and connected to food and warm memories. Liburd (2003) explored the cultural meanings and determinants of body size among a group of African American men and women and found that rituals performed year after year and generation after generation translated enduring messages,

34

values, and sentiments into observable actions (Liburd, 2003). Airhihenbuwa et al. (1996) examined cultural aspects of eating patterns among low- and middle-income African Americans and found that cultural attitudes about where and with whom food is eaten are equally as important as attitudes about certain foods. Cayton (1970) asserted that many African-American eating traditions may have been modified because of the demands of living in larger Northern cities. Yet migrants did not abandon their traditions but tried to maintain them as best they could, particularly on Sundays and special occasions.

Racial Residential Segregation

Racial residential segregation is the uneven distribution and separation of racial groups by space across a geographic region. Many minority groups are segregated. However, the segregation levels of African Americans are significantly higher than those of other groups (Johnston, Poulsen, & Forrest, 2007). African Americans are more likely than other minorities to reside in mostly African-American neighborhoods that are surrounded by similar neighborhoods in the centers of cities (Wilkes & Iceland, 2004). Approximately 70% of the African-American population resides in segregated African-American neighborhoods, and 40 to 50% reside in hyper-segregated neighborhoods (Wilkes & Iceland, 2004; Osypuk & Acevedo-Garcia, 2008). The social and economic consequences of this racial residential segregation for African Americans have been well documented (Charles, 2009; Massey & Denton, 1988; Massey & Denton, 1993; Massey & Gross, 1991).

The Great Migration from the South to the North created social, economic, and political changes in Northern cities in the U.S. with over 2.5 million African Americans living outside of the South by 1950 (Tolnay, 2003) and over 4 million by 1980 (Tolnay, 2003). After the Great Migration, African Americans continued to move in search of better employment and economic

opportunities; some moving to suburbs or better neighborhoods. The Great Migration produced a geographic redistribution of the African-American population.

The places to which African Americans migrated were influenced by several factors. In an attempt to incorporate the characteristics of possible places to which African Americans would migrate, quantitative studies of the Great Migration by Price-Spratlen (1998, 1999a, 1999b) showed that African American migrants were more attracted to areas that offered stronger "ethnogenic" support for the African-American community and eased the adjustment of living in a new territory. Price-Spratlen's examples of ethnogensis included the presence of an NAACP chapter in the community, a well established National Urban League, African-American churches, and African-American newspapers. The impact of ethnogenesis diminished over time as the stream of migration attained a momentum of its own. Other researchers examined this phenomenon (Ballard, 2004; Lemann, 2011) and described it as the tendency for later migrants to follow their family members and friends who had migrated previously.

Even before finding jobs, Southern migrants had to find a place to live. Many migrants moved in with relatives or friends who had previously migrated. Others rented rooms or small kitchenette apartments that were usually overcrowded (Cayton, 1970; Grossman, 1989). Regardless of the specific housing alternative, it was likely to be located in a neighborhood that was occupied predominantly by other African Americans. These African-American neighborhoods were often in the least desirable areas, dilapidated and with substandard facilities (Broussard, 1993; Cayton, 1970). Using historical tract-level data for Cleveland, Ohio, from 1910 through 1990, Price-Spratlen & Guest (2002) found that the population density within African-American neighborhoods increased substantially during the early stages of the Great Migration and did not begin to decline until after 1950 (Price-Spratlen & Guest, 2002).

Social scientists have also explained several potential long-term impacts of the growing African-American population on the social organization and structure of Northern cities. Most commonly mentioned in the literature are discriminatory responses by White communities to the rapidly increasing African-American populations in their cities. Lieberson and others have argued that Northern Whites intensified their efforts to restrict the residential and occupational opportunities available to African Americans after 1920, as more Southern migrants arrived in the North (Cutler, Glaeser, Vigdor, 1999; Lieberson, 1980; Massey, 1993; Philpott, 1978; Wilson, 2012). This phenomenon is often explained by using Blalock's threat models of race relations (Blalock, 1967), which describe an increasing motivation for majority groups to discriminate against minority groups proportionately to the less desirable group's growth. Although the neighborhoods of Northern cities had been racially segregated before the Great Migration, the White community was forced to resort to even stronger measures to maintain segregation as the African-American population grew. They were able to do this by restricting the residential options of African Americans through several measures: targeted violence, restrictive covenants, redlining, and racial steering (Goering and Wienk, 1996; Massey, 1993; Munnell, Tootell, Browne, & McEneaney, 1996; Philpott, 1978, Squires, 1994; Yinger 1997). Because of these efforts, the levels of residential segregation in Northern cities were even higher at the conclusion of the Great Migration than they had been at its commencement (Cutler et al., 1999; Lieberson, 1980; Denton, 1993).

The racial residential segregation in Northern inner cities is largely due to the flood of African American migrants from the South. However, other factors include the transformations in the racial organization and economic vitality of Northern cities. Following World War II, the GI Bill, highway expansion, affordable mortgages from the Federal Housing Administration and

Veterans Administration, and suburban development made it possible for Whites to live outside

of the central city but to continue to work there. Although this was probably not completely

racially motivated, the outcome was widespread "White flight" from central cities to the suburbs,

which led to further neglect and deterioration of African-American neighborhoods (Frey, 1979).

The residential disengagement of Whites from inner cities further contributed to the deterioration

of the inner-city infrastructure by shifting the urban tax base and the balance of political power

so that they favored the predominantly White suburbs (Jackson, 1985, Massey, 1993; Sugrue,

2005). According to Wilson, well-paying, blue-collar jobs strategically soon followed the lead

of White residents, gravitating from Northern inner cities to the suburbs, nonmetropolitan areas,

Southern states, and even abroad (Wilson, 1987; Wilson, 2011). Consequently, this economic

restructuring led to increased unemployment and underemployment among African-American

populations, food deserts/food swamps poverty, violence, family decline, lack of economic

investment in inner city communities, and inadequate accessibility to quality supermarkets

(Fielding & Simon, 2011).

Food Deserts

The 2008 Farm Bill defined a food desert as an area in the United States with limited

access to affordable and nutritious food, particularly an area composed of predominantly lower

income neighborhoods and communities (Johnson & Becker, 2008). A clear single definition of

a food desert does not exist. Recent studies have identified socially distressed neighborhoods

with poor access to healthy food as food deserts (Larsen & Gilliland, 2008; Weinberg, 2000). As

supermarkets have vacated these communities in the United States, low-income, minority

dominated urban neighborhoods are often considered food deserts (Eisenhauer, 2001; Morland,

Wing, & Diez-Roux, 2002; Morland, Wing, Diez-Roux, & Pool, 2002; Weinberg, 2000).

Food deserts are described as poor urban areas with scarce and insufficient access to quality, healthy and affordable food (Cummins & Macintyre, 2002). Although there is plenty of debate in the literature regarding a comprehensive definition of food deserts, this definition concentrates on the type and quality of foods available versus the number, type, and size of the store. There are several theories on the formation of food deserts in the United States. One theory asserts that the growth of large chain supermarkets on the outer regions of the inner city in more desirable and affluent areas offer consumers better quality, more variety, and competitive pricing options (Walker, Keane, & Burke, 2010). These larger stores are able to provide consumers with business hours that are conducive to work schedules and better parking (Alwitt & Donley, 1997; Guy, Clarke, & Eyre, 2004). According to Guy et al. (2004), larger chain stores forced smaller neighborhood grocery stores to close, creating areas where affordable, varied food was accessible to those with access to a car or those able to afford public transportation (Guy et al., 2004). Another theory is related to U.S. demographic changes between 1970 and 1988. During this time, researchers have asserted, the economic segregation of the population increased, with more affluent families leaving the inner city for the suburbs (Bianchi, Farley, & Spain, 1982; Danziger & Gottschalk, 1987; Nyden, Luekhart, Maly, & Peterman, 1998; Wilson, 2012). This shift caused the median income in the inner city to decrease and caused almost half of the supermarkets in three of the largest U.S. cities to close during this time (Alwitt & Donley, 1997). This resulted in fewer retail outlets in inner cities and low-income areas.

Economic Disinvestment

Economic disinvestment is the sustained and systemic withdrawal of capital investment from the built environment. Economic disinvestment leads to building deterioration and decay,

boarded store fronts, trash filled lots, broken windows, conversion of single-family homes to multi-family units, abandonment housing stock, deterioration of inner-city infrastructure, and outmigration. As capital quietly shifts from these neighborhoods, social changes become more apparent in the form of crime, violence, drug addiction, homelessness, welfare dependency, high ratios of single-parent families, and ill health. Research clearly documents the contribution of neighborhood effects on health status (Geronimus, Bound, Waidmann, Hillemeier, & Burns, 1996; Haan, Kaplan & Camacho, 1987; Robert, 1998; Schulz et al., 2000), linking economic disinvestment to neighborhood conditions, which in turn may shape future health outcomes. Economic disinvestment, which often occurs concurrently with race-based residential segregation, contributes to the isolation of residents from economic resources, institutions that support community life, and opportunity structures (Massey, 1993; Sugrue, 2005; Wacquant & Wilson, 1989).

Origins of Economic Disinvestment

Inner-city commercial properties started declining in nearly all U.S. cities in the 1950s. As the wealthier population flocked to the suburbs, housing was left behind for low-income families. In the 1960s, the increasing focus on downtown urban renewal brought an even sharper distinction between central businesses and the outlying areas of the inner city with deteriorating housing, warehouses, and untrustworthy retail establishments. After World War II, commercial inner-city properties were highly devalued. As the economic crisis deepened, businesses followed residents to the suburbs. Demand for commercial space in the inner city fell dramatically.

Spatial Limitations

The other side of disinvestment is that spatial limitations can prevent supermarkets from remaining or relocating in overcrowded urban neighborhoods. When assessing the market demand for supermarkets in a given area, the median income and population density of the area are considered. However, unfortunately for poverty dense areas, a high median income has a stronger correlation to store location (Winne, 2008). Supermarkets primarily base their location decisions on profit projections and the number of targeted customers they can reach within a targeted area.

Research documents several reasons why supermarkets disinvest in inner city neighborhoods. According to Gottlieb, Fisher, Dohan, O'Connor, and Parks (1996), the shopping patterns of inner city residents are not consistent, because residents tend to shop at specific times of the month because of a high rate of dependence on food assistance programs. The shopping patterns of suburbanites are more even. Eisenhauser (2001) found that although cities in the United States experienced a net loss of supermarkets in the 1980s because urban populations reduced purchasing power and decreased densities, nationally, supermarket store openings exceeded closings (Eisenhauser, 2001). Suburban areas provided sites which were favorable for much larger stores thereby increasing sales volume. Building larger stores in suburban affluent areas allowed retailers to buy and sell in bulk to customers who could also afford to do the same. Building larger stores requires expansive land parcels that are not often available in inner city neighborhoods. Urban stores are also often limited because of minimal loading docks that do not accommodate larger tractor-trailers. The additional architectural design costs to compensate for such problems on top of already high costs for rent, insurance, and security because of higher crime rates in urban areas led to grocery disinvestments in inner cities (Dreier, Mollenkopf, & Swantstrom, 2004). Inner city residents were limited by transportation

because decreased vehicle ownership, thus residents in lower-income areas often took shopping carts home with them as a means of transporting their goods, costing stores up to $67,000 per store per year in replacement and retrieval (Gottlieb et al., 1996). Additionally, Cameron documented that inner city retailers that left, placed their former sites under restrictive covenants, restricting future uses of the sites to prevent a competitive retailers from using the site (Cameron, Amrhein, Smoyer-Tomic, Raine, & Chong, 2010).

Without valid options to finance small businesses, Baker reported, inner city neighborhoods found themselves without basic services such as supermarkets, creating an environment of fast food restaurants, liquor stores, and convenience stores specializing in the sale of alcohol, tobacco, lottery tickets and prepackaged and canned foods high in salt, fat, and sugar (Baker, Shootman, Barnidge & Kelly, 2006; Beaulac, Kristjansson & Cummins, 2009), ergo, "food swamps". Block, Scribner, and DeSalvo (2004) found that the density of fast food restaurant locations positively correlated with economic disinvestment and African-American population in New Orleans. Kwate (2008) reported that racial residential segregation has created a higher concentration of fast food restaurants in Black residential neighborhoods than White neighborhoods (Kwate, 2008). Research has demonstrated that residents of poor neighborhoods pay more for the same healthful items than residents of more affluent areas (MacDonald & Nelson, 1991).

Issues of Accessibility

The current condition of spatial mismatch is a reflection of past historical policies and social and economic trends that have impoverished older urban neighborhoods. In a study using geographic information systems to measure spatial accessibility of chain supermarkets with respect to neighborhood racial composition and poverty in Detroit, Zenk et al.(2005) found that

the most impoverished neighborhoods in which African Americans resided were 1.1 miles farther from the closest supermarket compared with the most impoverished White neighborhoods (Zenk et al., 2005). These neighborhoods had 2.7 fewer supermarkets within a three-mile radius compared with the most impoverished White neighborhoods. However, this could be entirely due to economics, because the most impoverished White neighborhood still had more money per capita than the most impoverished African American neighborhood. Additionally, 76% of these areas had a high proportion of African-American residents (Zenk et al., 2005). They also reported that 28% of residents in the most impoverished neighborhoods did not own a personal vehicle which means that even if a supermarket were in the area, it may still not be accessible to those residents without cars.

Researchers have included measures of public transit in studies of neighborhood walkability (Hoehner, Ramirez, Elliot, Handy, & Brownson, 2005) and of physical activity and weight status (Li et al., 2008; Rundle et al., 2007; Wener & Evans, 2007). Larsen and Gilliland (2008) incorporate public transit into spatial accessibility measures. Points within a 500-meter walk and a 10-minute bus ride of a supermarket were classified as having accessibility by bus. Among residents of the most urbanized part of London, Ontario, 35.1% lived within 1 kilometer of a supermarket, and 86.5% had accessibility by bus (Larsen & Gilliland, 2008). As these results indicate, public transit can substantially expand access to grocery stores. In locations with infrequent or unreliable transit service, however, use of transit is costly, time-consuming, and inefficient (Clifton 2004; Shaw, 2006).

Using Detroit as a U.S. example, it had one of the highest unemployment rates in the country, 22.7% (Michigan Department of Technology, 2010). In 2009, 54% of children in Detroit under the age of 18 and 46% of all families with children under the age of 18 lived below

the poverty line (Annie E. Casey Foundation, 2012; U.S. Census Bureau, 2011). Detroit has a

median household income of $25,787 compared with the U.S. median household income of $50,

046 (U.S. Census Bureau, 2011). Comparatively, Bloomfield Hills, an affluent suburb of Detroit

had a 2005–09 median household income of $123, 409 and a poverty rate of 1.1% (U.S. Census

Bureau, 2010). Bloomfield Hills is 89.1% White and 4.3% African American (U.S. Census

Bureau, 2010). In 2010, the Detroit metropolitan area ranked ninth among U.S. cities with the

most millionaires, with over 92,000 millionaires (Capgemini, 2011).

However, in 2008, using long-term trends of unemployment, population loss, and

economic output, Forbes magazine ranked Detroit as one of the 10 fastest dying cities (Zumbrun,

2008). It is the oldest, largest, and severest food desert in America (Weatherspoon, Oehmke,

Dembe'le, Coleman, & Satimanon, 2012). It contains 40 square miles of vacant and abandoned

land (Gallagher, 2009). It is the fifth most obese city in the U.S. (Centers for Disease Control

and Prevention, 2010). It has an 82.7% African-American population (U.S. Census Bureau,

2011). Approximately one- half of its residents live in a food desert (Gray, 2008).

Researchers report that neighborhoods with higher income levels and higher proportions

of White residents tend to have greater access to supermarkets or large chain food stores. Poorer

neighborhoods and those with higher proportions of African-American or Hispanic residents

have greater access to small grocery stores (Alwitt & Donley, 1997; Block & Kouba, 2006;

Moore & Diez, 2006; Morland & Filomena, 2007; Morland, Wing, & Diez-Roux, 2002; Powell,

Slater, Mirtcheva, Bao, & Chaloupka, 2007; Small, & McDermott, 2006; Sloane et al., 2003;

Zenk et al., 2005).

Some studies considered access to convenience stores, with most finding that low-income

or predominantly minority neighborhoods were more likely to have access to such stores (Sloane

et al., 2003). Research on the accessibility of fast food restaurants revealed more mixed results. Low-income neighborhoods and schools tend to have more fast food restaurants nearby (Block et al., 2004; Powell, Chaloupka, & Bao, 2007; Sturm, 2008; Zenk & Powell, 2008) but a few studies found that middle-income areas more likely to have access to fast food restaurants (Austin et al., 2005; Wang, Kim, Gonzalez, MacLeod, & Winkleby, 2007). Some studies found that predominantly African-American neighborhoods have more access to fast food restaurants (Block et al., 2004; Kwate, 2008; Kwate, Yau, Loh, & Williams, 2009; Lewis et al., 2005) while others do not (Morland et al., 2002; Zenk & Powell, 2008).

Research relating the food environment to health outcomes posited that better access to supermarkets would be associated with a healthier diet, lower BMI, and lower risk of being overweight or obesity, while access to outlets such as convenience stores, small grocery stores, and fast food restaurants would be associated with poor diets, higher BMI, and higher weights. Access to supermarkets was positively associated with consumption of a healthy diet in some studies (Laraia, Siega-Riz, Kaufman, & Jones, 2004; Moore, Diez Roux, Nettleton, & Jacobs, 2008; Morland et al., 2002; Morland, Diez Roux, & Wing, 2006; Rose & Richards, 2004;) but not all (Bodor, Rose, Farley, Swalm, & Scott, 2008; Jago, Baranowski, Baranowski, Cullen & Thompson, 2007; Pearce, Hiscock, Blakely, & Witten, 2008). Access to convenience stores was associated with poorer diets (Jago et al, 2007; Pearce et al., 2008; Timperio et al., 2008). Some studies found that access to fast food restaurants was associated with poorer diets (Jago et al., 2007; Timperio et al., 2008) while others did not (Jeffery, Baxter, McGuire, & Linde, 2006; Burdette and Whitaker, 2004).

Most studies typically use food outlet type as a proxy for the availability of healthy food in urban neighborhoods with a greater concentration of small food stores. Bodor et al. (2008),

45

however, directly measured in-store food availability or shelf space devoted to fruits and vegetables in small grocery stores. They found that proximity to stores stocking more fresh produce was associated with vegetable consumption. Most studies found that supermarket access was associated with lower BMI and lower risk of being overweight or obesity (Morland et al., 2002; Morland et al., 2006). However, Wang a et al. (2007) found that living in poor urban neighborhoods in which healthy food was not easily accessible was associated with an increased obesity risk. However, a positive association between living close to supermarkets and reduced obesity risk was not found.

States and counties with higher density of fast food restaurants have tended to have higher obesity rates, (Maddock, 2004; Morland & Evenson, 2009), but there has been little evidence that neighborhood-scale variation in fast food access has been associated with weight status (Burdette and Whitaker, 200; Jeffrey et al., 2006; Pearce et al., 2008; Powell et al., 2007). Access to convenience stores has been associated with poorer weight status (Galvez et al., 2009; Morland and Evenson, 2009; Morland et al., 2006), but evidence about the effects of non-fast food restaurants is inconclusive (Jeffrey et al., 2006; Powell et al., 2007; Sturm and Datar, 2005).

Determinants of Obesity

Obesity results from an energy imbalance: chronic caloric consumption in excess of what is expended by the body. The causes of this imbalance are multi-factorial and arise from a complex interaction between genetic susceptibility, health status, societal and environmental factors, and behavior with regard to diet and physical activity. While it has been suggested that between 25 to 40% of BMI is attributable to genetics, most researchers agree that the rising prevalence rates of obesity, especially among genetically stable African-American populations, suggests that genetics is not the major contributor to the current epidemic. What is more likely is

an extremely complex interaction between the above-mentioned factors and other major determinants of obesity.

Price

Changes in the food environment over the past several decades have been dramatic, permanently contributing to the rising rates in obesity for all ethnic/racial groups and the increasing difficulty for regular folks in making healthy food choices. Since the 1970s, there has been a decline in the real price of food. Lakdawalla and Phillipson (2009) have attributed 40% of the rise in weight to lower food prices (Lakdawalla & Phillipson, 2009). Moreover, the price of natural foods has been exceeding inflation; whereas the cost of manufactured food products has been stable or in some cases declining relative to inflation (McCrory et al., 1999).

According to Phillipson and Posner (1999), reductions in the cost of producing food because of technological improvements in combination with reductions in the amount of time required for preparing and consuming food have been crucial changes in the food environment. Food production technology improvements have significantly reduced the costs of producing food (Philipson & Posner, 1999). Finklestein, Ruhm, and Kosa (2005) used consumer price index data to show that food prices rose 3.4% each year between 1980 and 2000. This increase was slower than the 3.8% average rise in inflation over the same time period, implying that the relative price of food during this time period fell 14% (Finklestein et al., 2005).

During this time period, in the early 1980s, the price of foods and beverages made from added sugars and fats decreased. However, the price of fresh fruits increased by 118%, the price of fresh vegetables increased by 77%, and the price of dairy products increased by 56% between 1985 and 2000 (Finklestein et al., 2005). The price of sugars and sweets, fats and oils, and

carbonated drinks increased at much lower rates: 46%, 35%, and 20%, respectively (Putnam, Allshouse & Kantor, 2002; Finklestein et al., 2005).

Increased Consumption

Relative to food consumption, Putnam and Gerrito (1999) found that technological advancements created changes in the food supply, specifically a significant increase in the consumption of high fructose corn syrup and soda. Corn syrup consumption increased 28% between 1982 and 1997, with much of it going into the manufacture of soda beverages. French, Lin, and Guthrie (2003) found that soft drink consumption among youth ages 6 to 17 more than doubled, from 5 fluid ounces to 12 fluid ounces per day between 1977/1978 to 1994/1998. This was a 48% increase: 37% (1977/1978) and 56% (1994/1998) (French et al., 2003). The increase in carbonated beverages occurred concurrently with the decrease in milk consumption. Milk was consumed at much higher rates than carbonated beverages until the mid 1970s. Consumption of carbonated beverages began to surpass milk in the mid 1970s, remained stable into the 1980s, and dramatically increased thereafter. The availability of soda in the United States now exceeds that of milk. However, there was a shift toward adding sugar and flavoring to milk consumed in schools. By 2010, 57% of milk consumed by school aged children was flavored (Poti, Slining, & Popkin, 2013).

Fast Food

Fast food and full-service restaurants and their use have significantly increased in number since the 1970s (French, Harnack, & Jeffrey, 2000). The number of fast-food outlets increased from approximately 30,000 in 1970 to 140,000 in 1980, and fast-food sales increased by about 300% (French et al., 2000). According to Austin et al. (2005), this increase may have been driven by an increased demand for their products. Food consumption in fast-food and full-

service restaurants increased from 6.5% in 1977–1978 to 16.7% between1989–1991 (Austin et al., 2005).

Portion Sizes

With the increased availability of fast food restaurants and the convenience they offer, more and more Americans began eating food away from home. Nielsen and Popkin (2003) reported that between 1977 and 1996 overall portion sizes for all SoFAS (solid fat, added sugar) (Poti et al., 2013) foods other than pizza increased. Young and Nestle (2002) reported that portion sizes began to increase in the 1970s, significantly increased in the 1980s, and now exceed federal standards. Guthrie, Lin and Frazao (2002) documented an increase in the number of calories eaten away from home to have risen from 18% in 1970 to 34% in 1995. Chou, Grossman, and Saffer (2004) examined data from the Behavioral Risk Factor Surveillance Survey and found that up to 67% of the increase in obesity is attributable to the per capita jump in fast food and full service restaurants over the same time period because food eaten away from home tends to be high in solid fats, added sugars and excessive salt (Guthrie et al., 2002).

The Environment

Societal and lifestyle changes began shifting in the 1960s. It was the beginning of a period of societal change for women's issues and the start of significant changes in the roles of women. Specifically, an important change was the dramatic increase in the number of married women with children participating in the work force. According to the U.S. Census Bureau, employment rates for married women with children under six years old increased from 19% in 1960 (Johnson & Waldman, 1960) to 60% in 2005 (Cohany & Sok, 2007). Anderson, Butcher, and Levine (2003), calculated that an increase in mothers' average weekly hours of work may be related to between 12 and 35% of the increase in the prevalence of childhood obesity in high

socioeconomic status families (Anderson et al., 2003), suggesting that mothers' time constraints make it more difficult to model and monitor healthy eating and exercise of her children. With more women working outside of the home because of economic necessity or personal desire, it leaves less time for meal preparation, higher and more frequent consumption of processed and fast foods, and fewer opportunities to eat meals together.

Scholder examined the importance of the timing of employment, whether maternal employment at different ages of the child had different effects on the child's weight later in life and found that the timing of employment mattered, and mid-childhood versus earlier or later maternal employment significantly affected weight status later in life (von Hinke, 2008).

Fertig, Glomm, and Tchernis (2009) examined the number of hours of maternal employment on a child's risk of being overweight and obesity using time series data and interview responses from the Child Development Supplement of the Panel Study of Income Dynamics and found that nutrition and supervision play small but important roles in the relationship between maternal employment and obesity. It is likely that with the increase in women's employment, children are engaged in more screen time and less outside activities.

The Built Environment

The built environment includes aspects of a place's surroundings that are human made or modifiable such as residential or commercial buildings, transportation infrastructure, and parks or other open spaces (Papas et al., 2007; Srinivasan, O'Fallon, & Dearry, 2003). The built environment plays an important role in influencing obesity. It can create a climate that promotes increased energy consumption and reduced energy expenditure or vice versa.

Small and McDermott (2006) analyzed national zip code-level data and reported that poorer neighborhoods had less access to supermarkets but more access to small grocery stores

and convenience stores in which produce is usually poorer in quality and more expensive (Small

& McDermott, 2006). Morland et al. (2002) and Powell et al. examined limited geographic data

and documented that poorer African-American neighborhoods had fewer supermarkets and more

convenience stores, consistent with the national findings of Small and McDermott (Zenk et al,

2006; Zenk et al., 2011). Other researchers documented that the built environment of African

Americans contain 2–4 times more fast food restaurants and convenience stores (Block et al.,

2004; Kwate, et al., 2009; Powell et al., 2007), and three times fewer supermarkets that sell fresh

fruits and vegetables (Baker et al., 2006; Morland & Filomena, 2007; Morland et al., 2002;

Powell et al., 2007).

How individuals perceive crime and public safety affect their day-to-day decisions, for

example, the decision to use parks, walk in the neighborhoods, or access public transit. Several

studies have explored the relationship between neighborhood safety and physical activity. In a

national telephone survey, neighborhood safety was shown to be a barrier to physical activity,

particularly in low-income households (Addy et al., 2004; Brownson, Baker, Housemann,

Brennan, & Bacak, 2001; Gomez, Johnson, Selva, & Sallis, 2004). In a qualitative study by

Eyler et al. (1998), minority women reported safety as a barrier to physical activity. Analysis of

data from the 1996 Behavioral Risk Factor Surveillance System in five states, documented that

higher levels of "perceived" neighborhood safety were associated with a lower prevalence of

inactivity (Weinstein, Feigley, Pullen, Mann, & Redman, 1999). In a national study of women

with preschool children, Lovasi, Hutson, Guerra, and Neckerman (2009) examined the

relationship between obesity and "perceived" neighborhood safety and found that women who

"perceived" their neighborhoods as safer had a lower BMI and were less likely to be obese.

In contrast to these studies, others have shown that safety is not associated with physical activity. Burdette and Whitaker (2004) found in an examination of urban low income preschoolers, that being overweight was not associated with proximity to playgrounds and fast food restaurants or with the level of neighborhood safety. In a cross-sectional study of 1800 U.S. adults, Brownson et al. (2001) documented that high crime in a neighborhood was not significantly related to physical activity. In a study of 2900 women, King et al. (2000) found that perceived crime or lack of safe places to exercise was associated with physical activity.

Residential Segregation

Research has documented that the differences in the concentration of fast food restaurants in poor and African-American neighborhoods is partially explained by differences in race and income (Baker et al., 2006; Morland et al., 2002). Residential segregation has played a significant role in maintaining differences in the built environment because of differences in socioeconomics by race and by limiting economic opportunity. Nationally, 60–70% of African Americans reside in predominantly African-American neighborhoods, and 60–70% of Whites reside in predominately White neighborhoods. The built environments of segregated African-American neighborhoods typically are separate and unequal (Block et al., 2004; Morland et al., 2002; Powell et al., 2007). According to Zenk et al. (2005), residential segregation disproportionately places African Americans in more impoverished neighborhoods and consequently reduces their access to supermarkets. Corral et al. (2012) examined the relationship between residential segregation, healthful eating, and physical activity and obesity among African American adults in the 2000 Behavioral Risk Factor Surveillance System and found that segregation coupled with poverty contributed to unhealthy eating patterns; poverty

alone contributed to inactivity; and segregation alone contributed to obesity. Lopez and Hynes (2006) argued that the problems of the built environment in segregated African-American neighborhoods are rooted in the complex interaction of land use, infrastructure, and social factors and may be explained by problem land use issues, infrastructure maintenance and investment issues and social realities such as crime. The built environment of African Americans indicates that racial residential segregation has created a distinct ecological environment that is distinctively unsupportive of the high-satiation lifestyle recommended by the Dietary Guidelines for Americans (e.g., more fruits and vegetables, more whole grains, more walking, less junk food, less sweetened beverages).

Family Composition and Obesity

The historical impact of the institution of slavery helped form the cultural traditions and roles of African-American men and women within their families. Slavery disorganized African-American families by separating and selling family members to slave masters but it did not destroy it. When slaves endured the Middle Passage from Africa to the Americas, African-American families were changed in ways that resulted in African-Americans altering their familial roles to fit their new environment. In a study by Cowdery (2009), African-American married households where both parents were present were found to ignore the traditional roles of husband and wife to maximize the overall household objective. In Cowdery's study, couples jointly engaged in making decisions for the family, shared an equal weight of power, and were equally expected to assist in whatever was necessary for the family's survival. According to Cowdery both husband and wife were wage-earners and economically responsible for contributing for the well-being of the family. In another study conducted by Faustina Haynes (2000) findings conclude that African-American married couples tended to share duties and

African-American men expected their wives to participate in the labor market, working harder than them or just as hard.

In a study conducted by Ziol-Guest, DeLeire, and Kalil (2006), they found that families in which the husband and wife both worked, a large percentage of the family's budget allocated for food was spent on food eaten and prepared away from home and a smaller percent of the food budget was spent on fruits and vegetables. Using time-use data, Cawley and Liu (2012) found that women participating in the labor force spent less time cooking or eating meals with their children than women who do not participate in the labor force. This was not offset by their husbands increased contributions to the family. In another study, Fertig (2009) provides evidence that the maternal number of hours worked is associated with poorer nutrition (Fertig et al., 2009).

In addition to the number of hours worked and the combined income of both husband and wife, it is important to note that African-Americans and an increasing number of working mothers are more likely to work nonstandard schedules (Han, 2005; Polivka, 2008), schedules which require evening, night, weekend and/or rotating shifts (Presser 2003). Studies show a negative association between women's nonstandard work and their home environment (Heymann & Earle, 2001), poorer family functioning (Strazdins et al., 2006), and less regularity in family mealtimes (Hsueh & Yoshikawa, 2007). Dammann and Smith (2009) found in a qualitative study of primarily, overweight and obese low income African-American women that many women desired to regularly eat healthful foods such as fresh fruits and vegetables but perceived it as unaffordable. Many women in the study discussed the stress of living in poverty and the multiplicity of roles being played: mother, wife (if married), household head, wage

earner, food purchaser and meal preparer and fasting to ensure that their children had something to eat; thereby compromising their own nutritional status.

There are clear connections between obesity, stress, and eating behavior (Dallman, 2010 and Warne, 2009). The role of stress in promoting eating and obesity has been well documented in the literature. Stress has been shown to promote both obesity (Dallman, 2010, McEwen, 2008 and Wardle et al., 2010) and food consumption (Born et al., 2010, and Rutters et al., 2009) and the consumption of highly palatable, energy-dense foods high in sugar, salt and fat (Adam and Epel, 2007, Torres and Nowson, 2007).   Zellner et al. (2006) found that of the women reporting an increase in food consumption, 71% were restrained eaters. Tomiyama, Dallman and Epel (2011) found that in response to acute lab stressors, women in the high stress group had a significantly higher BMI and reported greater emotional eating of comfort foods.

Conceptual Framework

Considering the above literature review, assessing obesity among African-American women is certainly complex and multidimensional. As previously stated, this research began with a different notion. The result upon further exploration is a perspective that attributes less influence and importance to the heritage of slavery and the traditional soul food diet and more influence to the increasing proportion of African-American female headed households with children who work outside of the home out of economic necessity coupled with exposure to prepared foods, reduced time for scratch cooking, the price of food, and the built environment. It is not enough to merely assume that culture is the primary agent responsible for African-American women's individual health choices and behaviors. The simplistic use of demographic variables as a measure to assess obesity in African-American women in the United States fails to capture the

impact of variables outside of her scope that have significance, such as historical and cultural experiences that have formed and transformed African-American women's eating patterns and physical activity. Public health researchers with training in other fields such as urban planning, medical, and cultural anthropology recognize the importance of understanding African-American women's eating patterns and physical activity in the context of a multiethnic society.

Health behavior theories help facilitate an understanding of the interactions among individual behavior and environmental, social, cultural, and political forces on obesity. The bio-medical model of health promotion centers on connecting individual behaviors that have been linked through epidemiological research to poor health outcomes. Historically, studies related to weight control are regarded either in a traditional medical model, with the health professional prescribing behavioral changes to an individual, the patient, who is trying or interested in losing weight or as a matter of individually controlled behavioral patterns influenced by interventions designed around concepts that rely on cognitive decision making theory (Jeffrey, 2004). Such an approach has tended to view certain behaviors as dysfunctional, and therefore in need of change, failing to see the possible functional roles the behaviors in question plays (e.g. role of soul food in maintaining cultural identity) or how changing single behaviors might have a negative impact on the larger cultural system.

Recent analyses of the determinants of physical activity and eating patterns recognize the vital roles of the socio-cultural, environmental, individual, and political factors that influence behaviors and argue for a theoretical approach based on a social ecological model (Robinson, 2008; Sallis et al., 2006). Acknowledgement of the severe limitations of the biomedical model, combined with a growing awareness of the influence of historical, social, cultural, political, and environmental influences on obesity have led many public health researchers and

practitioners to recognize the importance of the environment on individual health. Health behavior is complex. It is more often than not, multidimensional. It occurs within the context of culture, which is embedded in the larger socio-political context. Recognizing that most public health challenges are too complex to be adequately addressed on a single level, researchers and practitioners move toward developing a more comprehensive approach that integrates the social ecological model and its multiple levels of influence to affect behavior and health outcomes.

The social ecological model of obesity in African-American women provides a useful framework for guiding this research project. Fleury and Lee (2006) argued that the obesity in African-American women involves a complex set of factors from multiple contexts that interact with each other: friends, family, work, schools, churches, neighborhood associations, and formal and informal organizations. This multifaceted system can be conceptualized using the social ecological theory, which posits that individual health behavior is influenced by the interrelations among social and physical surroundings. It highlights the importance of the contexts in which a person is located to understand the emergence of a particular characteristic. In the case of African-American women, the ecological context includes history, culture, and the family, which is rooted in larger social contexts including the community and society at large. According to this model, African-American women's eating patterns and physical activity can place them at risk for obesity. These factors are referred to as African-American women risk factors. The impact of African-American women risk factors on the development of obesity is moderated by characteristics such as age and genetics. The development of African-American women risk factors is shaped by family characteristics, such as types of food available in the home, meals eaten away from home, and food-stamp program participation and screen time. Characteristics

of the home environment, such as activity periods and the dietary quality of meals, and community, demographic, and larger environmental factors influence African-American women's risk for obesity. Overall, the interactions within and between these contexts affect health behavior.

This framework highlights the need to address characteristics of African-American women and the family and societal contexts in which they are rooted to understand the process by which obesity develops.

I have adapted the social ecological model to include Whitehead's cultural systems paradigm (Whitehead, 1992) to understand African-American women within the context of their families and their food habits. The cultural systems paradigm coupled with the ecological model emphasizes the socio-cultural context of historical processes that have formed and transformed African-American dietary patterns.

A primary issue in African American research on eating patterns is the lack of comprehensive, multidisciplinary approaches that consider the cultural meaning of food as well the biomedical consequences. The Cultural Systems Paradigm (Whitehead, 1992) uses the idea that culture is part of a larger ecological system, that is created as a result of lived out historical experiences that are reproduced to meet one's fundamental biological and cultural needs. The cultural systems paradigm helps to explain food behavior as part of a cultural system. With regard to dietary patterns, it identifies categories of activity: acquisition, preparation, preservation, distribution, and consumption. Each of these categories has a range of possible socio-cultural characteristics (Whitehead, 1992).

Culture constantly changes and continues to evolve with time. For African Americans, the institution of slavery did not eliminate African culture. After emancipation, the Great Migration

by African Americans contributed to new forms of intra-ethnic American cultural diversity. The

culture of African-Americans has been greatly influenced by the integrating of industrial and

communication industries which also includes the food marketing and advertising industry.   The

adaptation of this model provides improved and better understanding of African-American

culture and dietary patterns.   Whitehead concluded that food for African Americans is shaped

through the following cultural processes (Whitehead, 1992).

1. African foods brought by slave ships and foodways.

2. The integration of African, European and Native American foodways. .

3. The historical rural environment which shaped traditional foodways of the African-
   American diet which became a part of the traditional Southern foodway.

4. Economic and political poverty.

5. Preferences for traditional Southern foodways.

6. The tendency for food to meet other needs that are not based on nutrition related.

Public health researchers and practitioners today recognize the complex setting in which

obesity exists: the historical and cultural environment that shapes and cultivates human

experiences, the physical environment of dietary patterns and physical activity, and the social

environment in which cultural norms and beliefs influence behaviors and practices. General

consensus among researchers and practitioners is that traditional caloric restriction approaches

to treatment of overweight African-American women alone is ineffective. Ledikwe and

colleagues (2007) showed that the adoption of the Dietary Approaches to Stop Hypertension

(DASH) diet where one-third of trial subjects were African-Americans was effective in reducing

excess body weight. Prevention through careful attention to both diet and physical activity and

factors influencing behaviors, is the more viable, effective public health strategy. The

importance of the physical and social environment in influencing health-related behaviors has become increasingly recognized as public health researchers and practitioners develop strategies to deal with the obesity epidemic. The social ecological model coupled with the cultural systems paradigm recognizes that history, culture, and the environment collectively influence behavior that occurs within it, that the same individual will behave differently given a different set of historical and cultural experiences, and that changing environmental variables result in the modification of behavior (Green, 1999). There is great potential for advancing a social ecological framework that is inclusive of culture in obesity research that is centered on African-American women with the use of quantitative methods design.

CHAPTER THREE: DATA SOURCE & ANALYSIS PLAN

Study Population

Few would argue that the rate of obesity among African-American women is a critical public health challenge, requiring immediate attention. Recent national data show that 82.1% of African-American women are overweight or obese versus 59.5% of White women (Flegal, Carroll, Kit & Ogden, 2012). In addition, over half (58.5%) of African-American women are obese versus 32.2% of White women (Flegal et al., 2012). Extreme obesity, BMI greater than or equal to 35, continues to be higher among African-American women who have more than doubled the rates of extreme obesity as White women (17.8% for African-American women versus 7.1% for White women) (Flegal et al., 2012).

The lives of African-American women provide insight into the complex etiology of obesity. The influences of family, race, gender, income inequality and the demands of the African-American woman's lives place them at risk for obesity. What must not be ignored are the economic, racial, and work-family stressors that take a toll on African-American women's

bodies as well as their psyche. African-American women often manage limited resources (time, energy, money, health insurance, social support, and transportation) to care for those they love with little attention to themselves, especially their health. The prevention and treatment of obesity for African-American women is a difficult and massive challenge. Efforts targeting African-American women must confront the factors of family composition, environmental barriers, social inequality, race and gender, and income inequality on their lives and well-being.

The ecologies of African-American women's lives that impact healthy weight, including food deserts/swamps, the availability of cheap, calorie-dense foods, the time/convenience/financial cost of quality whole foods, and access to recreational facilities and safe environments in which to live and exercise must be examined. The main premise of this study is that African-American women's family composition influences their eating patterns and physical activity.

Source of Data

The data source for this study is the Panel Study of Income Dynamics (PSID). Following is a description of the methodology used in this dissertation,, the sample drawn from these data for the study, the independent and dependent variables that will be used to explore the theoretical arguments through quantitative analyses, and the analysis plan.

The longitudinal design of the PSID allows for same-person tracking over time. The PSIDS's unique generational design allows one to track time "t" and follow that same individual through to time "t_x". The advantage of the longitudinal nature of the PSID is its ability to study the changes in the independent variable, family composition, and its relationship to BMI and to model the differences among subjects. By tracking repeated observations on a subset of women, one can examine the duration of being overweight and obesity on an individual using this

dataset. The researcher can more accurately document and explore what effect family composition may have on obesity. By tracking individuals over time, we may model subject behavior. In many data sets of interest, subjects are different across time; comparisons across time are problematic because of their heterogeneity. In contrast, the use of the PSID for this study provides the opportunity to model uniqueness and changes in family composition and BMI.

Data Source and Sample

Overview of the Panel Study of Income Dynamics

The Panel Study of Income Dynamics is the longest running multi-generational household survey in the world. It is a nationally representative, longitudinal survey of U.S. individuals: men, women, and children and the families of which they are part (Hill, 1992). It has been ongoing since 1968 and has consistently achieved unprecedented response rates: 96.9 to 98.5% (Andreski, McGonagle, & Schoeni, 2009). As a consequence of the success in following young adults as they form their own families, the sample size has grown from 4,800 families in 1968, to 7000 families in 2001, to 7400 families in 2005, and to more than 9,000 families as of 2009. As of 2009, the PSID had information on over 70,000 individuals, spanning as many as four decades.

Since the national sample of approximately 4,800 U.S. households in 1968, PSID has tracked individuals from those households and maintains information on original household members, whether or not they are living in the same household or with the same people. Adults have been followed as they have aged and children have been observed as they advanced through childhood into adulthood, forming their own families or "split offs". Each year, information is collected about the PSID's sample members (members of the PSID's 1968 sample families or their offspring) and their current co-residents (spouses, cohabitors, children, and others living with them) even if those co-residents were not part of the original sample families.

In the PSID, there is a surprising amount of family composition change from year to year. According to PSID, nearly 25% of the PSID family's experience some change year to year. Only 1 in 20 has remained completely unchanged for the first 18 years of the study. Changes include death, separation, birth and adoption, false starts (children leaving and

returning), separation and reuniting, divorce and remarrying each other years later; grandchildren, aunts, nephews, uncles, or other relatives move into or out of the family unit, as well as, children born to children outside of wedlock still live in the home.

Overall Design of the PSID

The PSID gathers information about families and all individuals in those families through its biennial interviews. A single primary adult, usually the male adult head if there is one, serves as the sole respondent in the interview. Sometimes the wife (or co-habitor, referred to as "wife") of the head agrees to grant an interview when the head does not. The single household respondent provides information about him or herself and about all other family members (Hill, 1992).

Sample Frame of the PSID

To maintain a representative sample of families at any point in time and across time, the PSID tracks members of its wave 1 families, including all those leaving to establish separate family units. Starting in 1968, each individual was assigned a "68 family number" and a "person number." These two numbers, used in combination, identify and track "68" family members and split-offs throughout their lives. After the 1968 wave, sharing the same "68 family number" does not necessarily mean living in the same household. If a person leaves the original family and forms a new family, the original "68 family number" for identification purposes is maintained. Individuals who join the PSID sample after 1968 are given the same "68 family number" of the person they are associated with (spouse, parents). Every individual in PSID has a "68 family number" regardless of the year of entry. This is one of the most unique features of the PSID. Unlike other surveys that stop following respondents once they leave a household, the PSID continues to follow split-offs if they are connected by blood or adoption to the original family.

Because the PSID has followed the original study's families continuously since 1968, it has become one of the best sources of longitudinal and nationally representative data collected from individuals and family members. If a sample member 18 or older moves to an institution such as a prison, a college dormitory, or the military, the PSID records this fact and attaches an institutional status data record to the family he or she left. The PSID keeps track of the location of sample members living in institutional housing. Interviews are attempted with them if and when they leave the institution to set up their own households. (Hill, 1992).

Characteristics of the PSID Sample

The PSID contains substantial detail on family compositional changes. Information gathered in the survey applies to circumstances of the family unit as a whole and to individual persons within the family unit. Family composition, as defined by the PSID, is the total number of adults and children living in the household. Some data are collected about all individuals in the family unit, but the most extensive data are gathered for the family head (who is male in married couple families but female or male otherwise) and wife.

When the PSID study was designed in 1966–1967, it was common for household or family economic surveys to ask financial and income-related questions about the household head or "breadwinner."   This was typically a male in a married or cohabiting couple. If no husband or significant male partner was present, the household head/breadwinner would be the economically active adult female. This restrictive practice carried over even though the economic role of women had broadened since the 1970s, with more information about the wife in a cohabiting couple being asked. Presently, information is obtained for both adults in a married couple. However, the basic head-wife structure has been preserved for data consistency.

Because the PSID has been following families since t=1968, the data allow for distinction among nuclear families, and allow for generational study (children, parents, and grandparents). Although the PSID specifies these other adults, the focus of this study remains the African American female in the family who is the head (never married, divorced, separated, widowed) or the married spouse of the head including cohabitor; thus, limiting data on other members for purposes of the current study. For example, if the grandmother identifies as the head or is the spouse of the head, she is included in the dataset for analysis. The original 1968 sample was drawn from two independent samples: an over-sample of 1,872 low income families from the Survey of Economic Opportunity (the "SEO sample") and a nationally representative sample of 2,930 families designed by the Survey Research Center at the University of Michigan (the "SRC sample") (Hill, 1992). The oversampling of families who were poor in the late 1960s resulted in a sizable subsample of African Americans. These two samples combined represent a national probability sample of U.S. families as of 1968.

Over time, the representativeness of the original sample became more and more out of line with the overall U.S. demographic. The original core sample (SRC and SEO) was reduced and two additional samples were added to alleviate potential bias. A sample consisting of Latinos was added; and in 1997 an immigrant sample was added to better represent changes in the immigrant population.

Data Collection of the PSID

The PSID data are collected by the national interviewing staff of the Survey Research Center at the University of Michigan. The primary instruments include the questionnaire (approximately 100 pages), cover sheets which record confidential information such as names and relationships of family members, and persons to contact in case there is difficulty locating

66

the family, and an interviewer instruction manual (Hill, 1992). The data collection for a given

wave extends from March through September with approximately 115 interviewers working

each year.

In 1973, the PSID transitioned from face-to-face interviewing to telephone interviewing

and went from annual waves of interviewing and to biennial waves in 1998. It began to adopt

computer-assisted telephone interviewing in 1993, with full implementation in 1994. In 2004,

PSID integrated the use of a 2-year computerized event history calendar interviewing

methodology with the traditional standardized question-list approach.

Sample Used in this Study

The sample created for use in this study is based on multiple data files of the PSID and

links data for African-American women to that of their immediate families. The sample was

drawn from the PSID main family data file, the PSID individual data file, and the summary data

file. This data file is publicly available through the PSID website for data downloads:

http://simba.isr.umich.edu.

The PSID began collecting necessary information for BMI calculations in 1986. They

were collected again in 1999 and each interview year thereafter. These are all self-reported

measures of height and weight. The sample used is based on data for all women, 18 to 55 years

old, surveyed in 2001, 20 to 57 years old in 2003, 22 to 59 years old in 2005, 24 to 61 years old

in 2007, 26 to 63 years old in 2009, and 28 to 65 years old in 2011. Data from these years were

pooled to create the sample for this study.

The geographic scope of the study is the continental United States. The public release

files contain geographic information such as region, state of residence, and size of largest city in

the county of residence. This study includes data on four geographic regions of the continental

United States: (a) Northeast, (b) North Central, (c) South, and (d) West.

Data

The study sample was restricted to women, some of whom are female heads and some of

whom are spouses in families with a male head.   Only records with balanced data on BMI

measurements, i.e., only records for women who had a BMI measurement across all six study

years were included in the study. A total of $N = 2,878$ records included BMI measurements for

all study years. It is possible that data will be missing for women on variables other than BMI

across the various years of study. The SPSS MIXED procedure was used to analyze the panel

data of the study. Parameters estimated by the MIXED procedure are robust in the face of data

missing completely at random (MCAR) and missing at random (MAR), eliminating the need for

imputation of missing data. Missing values were not a concern for the panel analysis of the

study.

The race or ethnicities of White and Black were well represented in the dataset.

However, the percentages of women claiming other race/ethnicities were much smaller, and

some respondents did not know or refused to state their race/ethnicity (see Table 1). Because the

variable of race/ethnicity was an important element in this study, the data was further restricted

to exclude records in which respondents answered 'Don't know' or 'Refused' on the

race/ethnicity question. This exclusion resulted in a total of $N = 2,836$ records for study.

Additionally, because of minimal representation in the data, the race/ethnicity groups of (a)

Native American, (b) Asian, Pacific Islander, (c) Mentions Latino origin or descent, (d)

Mentions color other than Black or White, and (e) Other were aggregated into a race/ethnicity

variable level of "Other". Thus, a total of three race/ethnicity groups will be included; White,

Black, and Other. Table 2 presents the frequency counts and percentages of the race/ethnicity

variable levels that were used in this study.

Table 1
Levels of Race/Ethnicity Variables Prior to Removal of Records Classified as
"Don't Know" and "Refused" (N = 2878)

Race/Ethnicity	Frequency	Percentage
White	1633	56.7
Black	947	32.9
Native American	13	0.5
Asian, Pacific Islander	46	1.6
Mentions Latino origin or descent	157	5.5
Mentions color other than Black or White	1	<.01
Other	39	1.4
Don't Know	1	<.01
Refused	41	1.4

Table 2
Levels of Race/Ethnicity Variable Used for Study (N = 2836)

Race/Ethnicity	Frequency	Percentage
White	1633	57.6
Black	947	33.4
Other	256	9.0

Table 3 presents the mean ages, mean BMI measurements, and the BMI weight status percentages for the women of the study according to race/ethnicity. Average BMI for African-American women in the study was 28.9 in 2001 and 31.1 in 2011. Of the African-American women in the study, a higher percentage was classified as obese in 2001 (35.9%). Over one-half of the African-American women in the study were classified as obese in 2011 (52%). Although the mean BMI measurements and the percentage of women classified as obese increased for all three race/ethnicity groups from 2001 to 2011, the mean BMI measurements and obese classifications were greater for African-American women than for women of White and Other race/ethnicities in both 2001 and 2011.

Table 3

Comparison Between the Years 2001 and 2011 of Mean Age, Mean BMI Measurement, and BMI Weight Status Percentages for the Women of Study, According to Race/Ethnicity (N = 2836)

	2001			2011		
Variable	White (*N* = 1633)	Black (*N* = 947)	Other (*N* = 256)	White (*N* = 1633)	Black (*N* = 947)	Other (*N* = 256)
Age (Mean)	38.6	37.7	37.9	48.6	47.7	47.9
BMI (Mean)	25.0	28.9	26.2	27.1	31.1	28.3
BMI Weight Status (%)						
Underweight (0 – 18.4)	3.4	1.4	2.7	2.3	1.3	2.0
Normal (18.5 – 24.9)	58.3	30.0	46.9	44.0	18.9	31.6
Overweight (25 – 29.9)	22.4	32.7	30.5	26.6	27.9	30.1
Obese (greater than or equal to 30)	15.9	35.9	19.9	27.1	52.0	36.3

Spearman's rank order correlations were performed on the preliminary data to determine if there were bivariate associations between BMI measurements, age in years, and the family composition variables of (a) total number of people living in the household, and (b) total number of children in the household, for the African-American women ($N = 947$). Cohen (1988) defined strength of association defined by correlation coefficients (effect size) as small (+/− .10 − .29), medium (+/− .30 −.49) and large (+/− .50 to 1.0). Table 4 presents the correlation coefficients. The effects of the correlation coefficients between BMI measurements and the age and family composition variables were small, with many correlation coefficients close to zero. The very small correlational effects suggest that associations between the variable pairs were weak, indicating that there is no tendency for BMI measurements to either increase or decrease in value when age or family composition variables increase or decrease in value.

Table 4.

Correlations for Bivariate Relationships of BMI, Age, and Household Variables (N = 2836)

	Variable	1	2	3	4	5	6	7	8	9
1.	BMI 2001									
2.	BMI 2011	.757								
3.	BMI Classification 2001	.927	.700							
4.	BMI Classification 2011	.708	.944	.671						
5.	Age 2001	.108	-.033	.096	-.027					
6.	Age 2011	.108	-.033	.096	-.027	1.000				
7.	Number of Persons in Household 2001	.069	.010	.072	.012	-.020	-.020			
8.	Number of Persons in Household 2011	-.009	.017	-.005	.017	-.438	-.438	.414		
9.	Number of Children in Household 2001	.077	.049	.079	.048	-.189	-.189	.807	.431	
10.	Number of Children in Household 2011	-.054	.003	-.052	.000	-.612	-.612	.212	.751	.324

The number of obese African-American women rose between 2001 and 2011. Being overweight and obesity are evident in some minority groups, especially with lower incomes and less education. Preliminary data provided a glimpse that suggests an upward temporal trend of obesity and its concentration in certain demographic groups. The data suggest a life course pattern with more body weight by end of study.

Here, the 2001 PSID data was compared to the 2011 PSID data for the sample as relates to ethnicity, age, and family composition. From Table 3, it is clear that BMI has been rising for African-American women over time. Data from PSID 2001 shows 30% of African-American women are of normal weight, while only 19% are of normal weight at the conclusion of the study in 2011. The data from the PSID 2001 indicates that 36% of African-American women were obese, a percentage increase of over 40% during the 10-year period of study. It is apparent that the BMI of African-American women is increasing over time. Preliminary work suggests this is not simply attributable to bivariate relationships between BMI and changing age distributions, family composition, or number of children (see Table 4). The phenomenon of BMI increase warrants further investigation and understanding. There is a moderate amount of mobility for weight across time and enough transition upward to suggest that women do not necessarily lock into weight patterns on a singular variable.

A number of possible factors come to mind as explanations for this upward drift in BMI. At a basic level, obesity results from an energy imbalance. However, the processes by which African-American women experience cultural and structural changes affects their everyday living, economic status, and geographic location. By including contextual variables of African-American community and family life, and comparing African-American women with women of White and \other races, this study investigates the combination of variables of age, marital status,

73

family composition, economic status, education, and geographic location in an exploratory panel data model. The model follows the same group of women over a decade to determine how the variables as a whole accounted for changes in BMI. Additionally, the model allows the researcher to assess individual effects of each of the variables while controlling for the other variables in the equation.

Data Analysis Plan

Research Questions

1. What is the association between the family composition of African women and their body mass index?

2. If family composition is shown to be a meaningful independent variable in the prediction of body mass index for African-American women, what is the relative importance of family composition when controlling for variables of income, education, and geographic region of residence?

Study Hypotheses:

1. (a) African-American women living in non-traditional households are associated with having a lower BMI than non-African-American women living in traditional households.

   (b) African-American women living in non-traditional households are associated with having a higher BMI than non-African-American women living in non-traditional households.

   (c) African-American women living in traditional households are associated with having a higher BMI than non-African-American women living in traditional households.

2. Controlling for income and education, geographic region of residence will affect body mass index for African-American women regardless of family composition. Women

74

living in the Southern region of the US will have a higher body mass index than women

living in the Northeast, North Central, and Western regions of the US.

3. Controlling for geographic region of residence and education, income will be a

significant determinant of BMI among African-American women such that there will be

an inverse relationship between African-American women's income and BMI. Family

composition of higher income will be associated with lower BMI; family composition of

lower income will be associated with higher BMI.

4. Controlling for income and geographic region of residence, education will be a

significant determinant of BMI among African-American women. There will be an

inverse relationship between African-American women's education and BMI. Family

composition of higher educated women will be associated with lower BMI; family

composition of lower educated women will be associated with higher BMI.

Quantitative Analysis

The study is a panel study utilizing secondary data encompassing a 10-year frame (2001–

2011). The study is non-experimental and is a review of existing PSID data with no direct

contact with or manipulation of the population of study. SPSS v.22 was used for all descriptive

and inferential analyses. All inferential analyses were set at a 95% level of significance. A

series of correlational analyses and an ordinary least-squares mixed effects model (using SPSS

MIXED) were performed to test the five study hypotheses.

Power Analysis. Pearson's Product Moment Correlations, Spearman's rank order

correlations and an ordinary least squares (OLS) mixed-effects model was used to test the

hypotheses of this study. A priori power analyses were performed to determine the required

sample size needed. GPOWER 3.0.10 software (Faul, Erdfelder, Lang & Bucher, 2007) was used

in this determination. Power is defined as (1-β), where β is the chance of Type II error (i.e., one accepts the null hypothesis when it is, in fact, false). At a power of .80, one has an 80% chance of seeing significance that is truly in the data. Power was set at 80% and the alpha level was set at .05. A power analysis was performed for a multiple linear regression with 11 independent variables. For a bivariate correlation with a medium effect size of $r = .30$, 84 participants were required to achieve 80% power. A power analysis for an ordinary least squares mixed effects model with 11 independent variables and a medium effect size of $f = .15$ indicated that a sample of 123 records is required to achieve power at 80%. The sample collected for this study contains a total of 2,836 records and 10 years, and therefore adequate to observe a medium effect size for the correlational and multiple regression analyses.

Operationalization of Variables

Dependent variable.

Body mass index (BMI). BMI is the dependent variable in the ordinary least-squares mixed-effects model. BMI was constructed from self-reported height and weight measures and calculated as [(weight in pounds) divided by (height in inches squared) multiplied by 703]. Implausible observations with self-reported height under four feet or over seven feet and self-reported weight under 80 pounds will not be included. BMI is a continuous variable.

Respondents were asked: "About how much do you weigh?" 1) "Fifty pounds or less?"; 2) "Actual number of pounds?"; 3) "Four hundred pounds or more?"; 4) "Don't know?"; 5) "Not applicable; refused?".

Independent variables.

Race/ethnicity. Race/ethnicity includes three levels: (a) White, (b) African American, and (c) Other. The levels were dummy-coded into two indicator variables representing (1)

76

African American and (2) Other. Both of the variables were coded such that 1 indicates the

woman is of the race represented by the indicator variable and 0 indicating the woman is not of

the race represented by the indictor variable. White is the reference category for the

race/ethnicity variable. The two race/ethnicity indicator variables were nominal and

dichotomous.

Respondents were asked, "What is your/your wife's race? Are you 1) White; 2) Black,

African American, or Negro; 3) American Indian or Alaska Native; 4) Asian; 5) Native

Hawaiian or Pacific Islander; 6) Other; 7) Don't Know/Not applicable; or 8) Inapplicable.: no

wife/ cohabitor?"

Family Composition—Household Type. The family composition household variable

includes three levels of (a) traditional households (currently is a wife or cohabiting greater than

or equal to 1 year) and (b) non-traditional households (not a wife or cohabitor; female headed

household) and (c) single woman households (lives alone with no children or spouse). The

levels will be dummy-coded into two indicator variables representing (1) non-traditional

households and (2) single-woman households. Both of the variables will be coded such that 1

indicates the woman is of the household type represented by the indicator variable, and 0

indicating the woman is not of the household type represented by the indictor variable.

Traditional households will be the reference category for the family composition-household

variable. The two family structure-household indicator variables are nominal and dichotomous.

Respondents were asked, "What is the relationship of the Head or (Wife/'Wife') of the

first other family unit sharing the household to the Head (or Wife/'Wife' of this family . . . 1) the

parent of the head (or wife/'wife') of this family unit?"; 2) "the child of the head (or wife/'wife')

of this family unit?"; 3) "the grandparent of the head (or wife/"wife") of this family unit?"; 4)

"the grandchild of the head (or wife/ 'wife') of this family unit?"; 5) "the sibling of the head (or wife/'wife') of this family unit?"; 6) "other?" or 7) "Inapplicable.: no other panel family shares the household?"

Family Composition--Number of persons in household. The number of persons in the household was computed by summing the PSID variables representing the "number in family unit" and "number of non-family unit members sharing the household unit" variables. The number of persons in the household is a count variable.

For the variable, number of persons in family unit at the time of the interview, respondents were asked to give the actual number. The range was 1–20.

For the variable, number of non-family unit members sharing the household, respondents were asked to give the actual number. The range was 0–20.

Family Composition—Number of children in household. The number of children in the household was derived from the PSID variable "number of children in [family unit]. The number of children in the household is a count variable."

Respondents were asked the number of persons now living in the family unit under the age of 18. The actual numbers were given, ranging from 0 to indicate none to 1-18.

Geographic Region. A total of four geographic regions were represented; (a) Northeast, (b) North Central, (c) South, and (d) West. The levels were dummy-coded into three indicator variables representing (1) North Central, (2) South, and (c) West. The three indicator variables will be coded such that 1 indicates the woman lives in the geographic region represented by the indicator variable and 0 indicates the woman does not live in the geographic location represented by the indictor variable. Northeast will be the reference category for the geographic region variable. The three geographic region indicator variables are nominal and dichotomous.

The Northeast region consists of NINE states: Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. The North Central region consists of 12 states: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. The Southern region consists of 17 states: Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, Washington DC, and West Virginia. The Western region consists of 11 states: Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming. Hawaii was not included.

Income. The variable representing income is a measure of the actual dollar amount per year earned by the household. Income is a continuous variable.

The total family income variable represents income reported for the previous tax year. The total family income variable is the sum of seven variables: 1) Head and Wife/"Wife" Taxable Income; Transfer Income; Taxable Income of Other Family Unit Members; Transfer Income of Other Family Unit Members; and Social Security Income for the years2000, 2002, 2004, 2006, 2008, and 2010.

Education Level. The education level variable is measured as the number of years the woman attended school (0 to 17 years). The categories for educational level were 1) less than high school; 2) high school diploma (completed 12 years of education); 3) some college/bachelor's degree (13 – 16 years of education); and post-graduate work (17 years or more of education). The education level variable is an ordinal variable.

Statistical Analyses

Descriptive Statistics were performed prior to the inferential tests to examine the distributions of the variables of interest. Measures of central tendency such as means and standard deviations were presented for continuous variables. Frequency counts and percentages were presented for ordinal and nominal variables.

OLS regression is a statistical technique that uses sample data to estimate the true population relationship between a set of independent or predictor variables and one continuous outcome variable (dependent variable). OLS uses a linear model to find the best fitting straight line for a dependent variable "regressed" onto the independent variables. The independent variables in the model can be continuous or ordinal. Categorical predictors can be partitioned into a series of dummy coded dichotomous variables for use in the model. OLS regression requires the dependent variable to be continuous. For this study, the dependent variable is BMI, which will be a direct measurement from the weight and height of each woman, and will be a continuous measure. OLS allows for testing of various hypotheses including but not limited to the following:

H_0: $\beta1 = \beta2 = \ldots = \beta k = 0$ (All regression coefficients equal 0, a test of overall significance.)

H_0: $\beta1 = \beta2 = \ldots = \beta k$ (All regression coefficients are equal in value, a general F test.)
In addition, nested models can be derived and compared to a saturated model (all variables included). Time periods using the same variables can be compared for structural change in the model via techniques such as the Chow test (Gujarati, 2003).

Panel regression via OLS techniques was chosen for this study because the focus of the study is to determine the relationship between a dependent variable (BMI) and the independent variables, while controlling for effects of the independent control variables over time. The

method has the capability to minimize the sum of the squared residuals and finds the straight line that best summarizes the linear association between predictors and outcomes.

A mixed effects approach was used for this study to investigate individual effects over time. Investigating individual country and time effects in a fixed effects approach would necessitate the need for an additional nine dummy variables representing study years, in addition to the 11 variables already included in the model. A need for parsimony in the number of variables is needed to preserve degrees of freedom for estimation of parameters and to adequately power the study to detect statistical significance that is present in the data. A fixed-effects model would also be time-invariant, meaning the effects for the women would be held constant over time. Some of the variables included in the models for this study are expected to change over time, therefore a mixed effects model is a better choice.

The mixed-effects model is also more parsimonious than a fixed-effects model because the intercept term is treated as a random variable with a common mean value representing a much larger population of women. The individual differences in the intercept (mean value of BMI) for each individual of the study can then be reflected in the error term ε_i.

Prior to the OLS panel regression, a series of Pearson product moment correlational analyses were performed to investigate bivariate relationships between mean values for all years of the study combined for each of the 11 variables. The correlational analysis was performed to investigate possible issues with multi-collinearity between the independent variables.

CHAPTER FOUR: RESULTS

The purpose of this quantitative non-experimental study was to explore the relationship between a combination of variables (age, race, family composition, marital status economic status, education, and geographic location) and the BMI of African-American women over a 10-

year period in an exploratory panel data model. The following research questions and study
hypotheses guided the study:

Research Questions

1. What is the association between the family composition of African women and their body
   mass index?

2. If family composition is shown to be a meaningful independent variable in the prediction
   of body mass index for African-American women, what is the relative importance of
   family composition when controlling for variables of income, education, and geographic
   region of residence?

Study Hypotheses:

1. (a) African-American women living in non-traditional households are associated with
    having a lower BMI than non-African-American women living in traditional households.
    (b) African-American women living in non-traditional households are associated with
    having a higher BMI than non-African-American women living in non-traditional
    households.
    (c) African-American women living in traditional households are associated with having
    a higher BMI than non-African-American women living in traditional households.

2. Controlling for income and education, geographic region of residence will affect body
   mass index for African-American women regardless of family composition. Women
   living in the Southern region of the US will have a higher body mass index than women
   living in the Northeast, North Central, and Western regions of the US.

3. Controlling for geographic region of residence and education, income will be a
   significant determinant of BMI among African-American women such that there will be

an inverse relationship between African-American women's income and BMI. Family

composition of higher income will be associated with lower BMI; family composition of

lower income will be associated with higher BMI.

4. Controlling for income and geographic region of residence, education will be a

significant determinant of BMI among African-American women. There will be an

inverse relationship between African-American women's education and BMI. Family

composition of higher educated women will be associated with lower BMI; family

composition of lower educated women will be associated with higher BMI.

The results in chapter four are divided into five sections (a) demographic findings, (b)

presentation of variables used for analysis, (c) investigation of assumptions as relates to

multivariate analysis, (d) multivariate analysis results, and (e) tests of hypotheses. SPSS v.22.0

and STATA v.12 were used for the descriptive and multivariate analyses. All multivariate tests

were performed at the 95% level of significance.

Population and Demographic Findings

Tables 5, 6, and 7 present the demographic and descriptive findings for the women

included in the study for each of the 6 years investigated. The majority of women in the study

were White ($n = 1{,}633$ women, 58%). One-third of the women were African-American ($n = 947$,

33%) and the remainder of the women were classified as "Other" ($n = 256$, 9%). The ages of the

women at the start of the study in 2001 ranged from 18 to 55 years ($mean = 38.23$ years) and

ranged from 28 to 65 years ($M = 48.23$) at the end of the study in 2011.

Tables 6 and 7 present measures of central tendency for the continuous variables of

study, body mass index and income. The BMI measurements of the women in the study are

presented for each race/ethnicity group and each of the six study years (Table 6). The BMI

measurements increased for all groups over the 6 year study period. The average BMI in 2001 was 26.41(overweight) for all women in the study and increased to 28.51 (overweight) by the end of the study year in 2011. For African-American women, the average BMI in 2001 was 28.91 and increased to 31.09 in 2011. For White women in 2001 their BMI was 24.99 in 2001 and increased to 27.05 in 2011. For Other women, their average BMI measurement in 2001 was 26.24 and increased to 28.28 in 2011.

Table 5

Demographic Characteristics by Race/Ethnicity, 2001 and 2011

	2001		2011	
	White	African-American	White	African-American
Age	38.6	37.1	48.6	47.7
Education (%)				
Less than High School	151 (9.2)	229 (24.2)	126 (7.7)	207 (21.9)
High School Diploma	449 (27.5)	330 (34.8)	479 (29.3)	357 (37.7)
Some College/Bachelor's Degree	762 (46.7)	305 (32.2)	730 (44.7)	300 (31.7)
Some post graduate work	191 (11.7)	31 (33)	186 (11.4)	39 (4.1)
Income (%)				
$0-20K	144(8.8)	33 (35.1)	97 (5.9)	258 (27.2)
$20 - 40K	273 (16.7)	277 (29.3)	172 (10.5)	244 (25.8)
$40 - 60K	349 (21.4)	158 (16.7)	227 (13.9)	162 (17.1)
$60 - 80K	286 (17.5)	83 (8.8)	270 (16.5)	95 (10)
$80 - 100K	204 (12.5)	47 (5)	233 (14.3)	70 (7.4)
Over $100K	377 (23.1)	50 (5.3)	634 (38.8)	118 (12.5)
Family Composition Household Type (%)				
Traditional Households	1251 (76.6)	328 (34.6)	1390 (85.1)	423(44.7)
Non-Traditional Household	135 (8.3)	481 (50.8)	68 (4.2)	251 (26.5)
# of Children	0 (47.2)	2 (29.1)	0 (58.1)	0 (52.3)
# Persons in Household	2 (31.3)	3 (25.7)	2 (38.8)	2 (27.9)

Table 6

Measures of Central Tendency for Continuous Variable Body Mass Index for Each
Race/Ethnicity According to Study Year

Variable/Year	*N*	*Mean*	*SD*	*Median*	Range
Average BMI for African-American women					
2001	947	28.91	6.70	28.13	12.93 – 64.68
2003	947	29.72	6.97	28.50	12.80 – 64.68
2005	947	30.19	7.17	29.18	12.93 – 66.36
2007	947	30.57	7.31	29.18	15.83 – 64.01
2009	947	30.96	7.34	29.76	15.83 – 70.30
2011	947	31.09	7.20	30.23	14.82 – 70.30
Average BMI for White women					
2001	1633	24.99	5.54	23.56	14.09 – 53.14
2003	1633	25.60	5.91	24.03	14.88 – 56.68
2005	1633	26.11	6.20	24.37	14.09 – 56.68
2007	1633	26.59	6.44	25.01	14.09 – 60.46
2009	1633	26.84	6.52	25.50	12.87 – 59.51
2011	1633	27.05	6.66	25.60	12.53 – 62.72
Average BMI for Other women					
2001	256	26.24	5.48	25.09	17.68 – 54.86
2003	256	27.11	5.69	26.40	17.75 – 54.86
2005	256	27.49	5.72	27.03	17.51 – 54.86
2007	256	27.99	6.41	27.34	17.16 – 57.61
2009	256	27.89	6.03	27.43	17.16 – 54.86
2011	256	28.28	6.07	27.46	16.95 – 54.86
Average BMI for All women					
2001	2836	26.41	6.21	24.96	12.93 – 64.68
2003	2836	27.11	6.55	25.75	12.80 – 64.68
2005	2836	27.60	6.76	26.25	12.93 – 66.36
2007	2836	28.05	6.98	26.61	14.09 – 64.01
2009	2836	28.31	7.02	26.82	12.87 – 70.30
2011	2836	28.51	7.04	27.41	12.53 – 70.30

Note. SD = Standard Deviation.

Table 7

Measures of Central Tendency for Continuous Variables of the Average Income for Each Race/Ethnicity Group According to Study Year

Variable/Year	N	Mean	Standard Deviation	Median
Average Income for African American women				
2001	947	39070.33	40665.61	28800.00
2003	947	40465.42	35644.50	32000.00
2005	947	45201.27	41849.31	34076.00
2007	947	48088.18	42948.90	37000.00
2009	947	52114.82	44203.62	40184.00
2011	947	49903.38	43845.04	37480.00
Average Income for White women				
2001	1633	80853.23	95668.61	63639.00
2003	1633	86302.04	114918.74	67500.00
2005	1633	93864.56	121181.09	74000.00
2007	1633	104127.93	133794.50	79815.00
2009	1633	113334.27	191888.47	85824.00
2011	1633	107808.05	131976.03	85150.00
Average Income for Other women				
2001	256	52739.49	51544.69	36836.50
2003	256	57871.96	50930.56	41000.00
2005	256	63867.46	54428.42	48690.00
2007	256	71838.15	62847.27	56500.00
2009	256	79832.84	85764.26	59500.00
2011	256	80255.98	79236.10	56000.00
Average Income for All women				
2001	2836	64363.27	80262.36	48663.50
2003	2836	68429.90	93353.71	52000.00
2005	2836	74907.09	99081.58	57000.00
2007	2836	82500.34	109320.41	63000.00
2009	2836	89867.70	152684.446	68000.00
2011	2836	85985.39	109293.38	66104.00

Table 8 shows the percentage of women in each BMI category. From 2001 to 2011, nearly 45% of African-American women were obese. In 2001, 30% of African-American women were of normal weight, 32.7% were overweight and 35.9% were obese. Each subsequent year of the study, the percentage of normal weight African-American women decreased, while their percentages in the overweight and obese categories increased. At the end of the study in 2011, 52% of African-American women were obese, 27.9% were overweight and 22.9% were of normal weight. For White women, from 2001 to 2011, nearly 50% of White women were of normal weight. In 2001, 58.3% of White women were of normal weight, 22.4% were overweight, and 15.9% were obese. At the end of the study, 44% of White women were of normal weight, 26.6% were overweight and 27.1% were obese. Women of other races/ethnicities, from 2001 to 2011, nearly 37% were of normal weight, 32.9% were overweight and 28.4% were obese. At the start of the study, nearly 47% of Other women were of normal weight, 30.6% were overweight and 20% were obese. At the end of the study year, nearly 32% were of normal weight, 30.1% were overweight and 36.3% were obese.

Average household income also increased over the time frame of the study, from $64,363 in 2001 to the highest average of $89,868 in 2009, for all women in the study. The variance of the household income also increased yearly from years 2001 through 2009, indicating a wider range of income levels between the households for the women of the study. Some households suffered losses in their income for the reporting years of 2001 through 2007. No actual losses to income were reported in the last two years of the study, 2009 and 2011. However, it is imperative to note that this study did not control for the Great Recession of 2007 – 2009. There was an overall decrease in reported income from 2009 to 2011 ($85,985) for all women in the study.

The average income in 2001for African-American women was $39,070 while White women earned $80,853 and Other women totaled $52,739. At the end of the study year in 2011, average income for African-American women was $49,903; for White women it was $107,808; and for Other women it was $80,256. Although all three groups experienced increases in their income from 2001 to 2009, all groups except Other women showed decreases between 2009-2011. White women had the greatest increases in their average income over the entire study period. However, Other women experienced the greatest percentage increase (52%), while White women showed an increase of 33% and African-American women showed a 28% increase from 2001 to 2011.

Table 8

Percentage of Women According to BMI category by Race/Ethnicity and Study Year

Variable/Year		Underweight	Normal	Overweight	Obese
			Body Mass Index		
White	2001	3.4	58.3	22.4	15.9
	2003	3.7	54.1	22.1	20.1
	2005	2.9	51.6	23.7	21.9
	2007	3.1	46.4	26.2	24.3
	2009	2.9	43.5	27.9	25.7
	2011	2.3	44.0	26.6	27.1
African-American	2001	1.4	30.0	32.7	35.9
	2003	1.1	25.1	32.3	41.5
	2005	1.3	22.8	32.0	43.9
	2007	1.0	21.2	32.3	45.5
	2009	.7	19.5	31.0	48.8
	2011	1.3	18.9	27.9	52.0
Other	2001	2.7	46.7	30.6	20.0
	2003	2.4	37.8	36.2	23.6
	2005	2.3	35.5	32.8	29.3
	2007	1.2	34.8	33.6	30.5
	2009	1.2	34.4	34.0	30.5
	2011	2.0	31.6	30.1	36.3
All Women	2001	2.7	47.8	26.6	23.0
	2003	2.7	42.9	26.8	27.6
	2005	2.3	40.5	27.3	29.9
	2007	2.2	37.0	28.9	32.0
	2009	2.0	34.7	29.5	33.9
	2011	1.9	34.5	27.4	36.2

In 2001, the majority of African-American women, 35.1%, reported an income of $0 to $20,000 (BMI = 29.45) (Table 9) while five percent reported an income of $80,000 to $100,000 (BMI = 28.09). There appears to be a sustained increase in BMI and income $0 to $20,000 (BMI = 29.45), year 2001 to BMI =30.69, year 2011) and $20,001 to $40,000 (BMI = 29.35, year 2001 to BMI =32.23 in year 2011). This holds true for both the African-American and Other women study groups. This is not seen in higher incomes among the study years just beyond the poverty level in years 2001 to 2011 for any study group.

Table 10 through 10e presents the percentages of women in each BMI category by income specific categories. In study year 2001 Whites with incomes above the poverty level were greater than 51% to 70% more likely to be at normal BMI compared to African-Americans who reported 28% to 44% normal BMI. That percentage drops to a low of 39.3% and a high of 64.7% for Whites and a low of 19.3% and high of 27% for Blacks during study year 2005. In 2005 White and Other women report less than 20% overweight and obesity rates while African-American women report 31.5 to 41.6% overweight and obesity rates. African-American women at or below the poverty level report less percentage overweight when compared to White or Other women, however the percentage of obese African-American women is significantly higher across all remaining income levels as compared to other groups of women.

Table 9

Average Body Mass Index Measures for Income Categories According to Race/ Ethnicity Group and Study Year

Variable/Year	$0.00 to $20,000	$20,001 to $40,000	$40,001 to $60,000	$60,001 to $80,000	$80,001 to $100,000	Over $100,000
African American women						
2001	29.45	29.35	28.80	27.51	28.09	26.31
2003	30.16	29.93	29.57	29.18	29.94	27.72
2005	30.78	30.83	28.91	29.84	29.63	29.32
2007	31.09	31.16	30.50	30.07	29.95	28.71
2009	31.52	31.70	31.11	29.60	30.53	29.78
2011	31.69	32.23	30.60	30.04	30.20	29.48
White women						
2001	26.49	25.81	25.26	25.40	24.54	23.52
2003	26.42	27.27	26.35	25.45	25.58	23.84
2005	27.65	27.70	27.32	26.09	26.07	24.38
2007	28.51	28.45	28.20	26.97	26.18	24.96
2009	28.12	29.47	28.80	27.46	26.35	25.29
2011	28.54	28.39	28.69	28.09	26.83	25.50
Other women						
2001	27.19	27.10	26.02	25.73	23.77	23.56
2003	28.82	28.66	26.86	26.13	25.23	24.01
2005	29.40	28.77	27.56	27.56	25.25	24.75
2007	29.59	30.09	28.52	28.30	26.37	24.68
2009	27.79	29.09	28.97	28.66	27.72	25.61
2011	27.90	30.97	29.61	26.75	28.05	26.27
All women						
2001	28.42	27.52	26.33	25.87	25.15	23.83
2003	29.12	28.64	27.31	26.31	26.41	24.34
2005	29.86	29.34	27.85	27.03	26.68	25.10
2007	30.34	30.07	29.03	27.88	26.96	25.42
2009	30.48	30.57	29.69	28.15	27.48	25.91
2011	30.60	30.68	29.50	28.45	27.64	26.13

Table 10

Percentage of Women per BMI Category According to Income Race/Ethnicity and Study Year 2001

Year	Ethnicity	Body Mass Index	$0-$20K	$20,001 - $40K	$40,001 - $60K	$60,001 - $80K	$80,001 - $100K	Over $100K
					INCOME			
2001	White	Underweight	3.5	2.9	4.3	3.5	2.9	3.2
		Normal	48.3	51.6	55.6	56.6	58.8	70.3
		Overweight	21.0	26.4	22.6	19.9	27.9	18.6
		Obese	27.3	19.0	17.5	19.9	10.3	8.0
	African-American	Underweight	2.4	.7	1.3	1.2	0	0
		Normal	27.7	28.2	29.1	42.2	23.4	44.0
		Overweight	28.6	37.2	31.6	27.7	44.7	36.0
		Obese	41.3	33.9	38.0	28.9	31.9	20.0
	Other	Underweight	1.9	0	4.5	6.5	9.1	3.6
		Normal	38.5	36.0	45.5	61.3	63.6	75.0
		Overweight	34.6	37.1	38.6	16.1	18.2	10.7
		Obese	25.0	27.0	11.4	16.1	9.1	10.7
	All Women	Underweight	2.7	1.6	3.4	3.3	2.7	2.9
		Normal	34.3	39.3	47.2	54.0	52.7	67.7
		Overweight	27.1	32.6	26.5	21.3	30.5	20.0
		Obese	35.9	26.6	22.9	21.5	14.1	9.5

Table 10a

Percentage of Women per BMI Category According to Income Range, Race/Ethnicity and Study Year 2003

					INCOME			
Year	Ethnicity	Body Mass Index	$0-$20K	$20,001 - $40K	$40,001 - $60K	$60,001 - $80K	$80,001 - $100K	Over $100K
2003	White	Underweight	4.5	3.4	4.1	4.2	2.2	3.7
		Normal	50.9	41.2	49.0	54.5	53.6	67.2
		Overweight	17.9	25.5	24.5	20.3	25.4	18.7
		Obese	26.8	30.0	22.3	21.0	18.8	10.3
	African-American	Underweight	2.0	0.4	0.7	1.1	0	1.5
		Normal	24.3	22.3	26.2	30.5	25.0	30.8
		Overweight	30.6	33.7	29.7	30.5	37.5	38.5
		Obese	43.1	43.6	43.4	37.9	37.5	29.2
	Other	Underweight	0	1.3	3.5	7.1	0	2.4
		Normal	28.2	24.4	31.6	42.9	60.0	71.4
		Overweight	35.9	39.7	47.4	32.1	20.0	21.4
		Obese	35.9	34.6	17.5	17.9	20.0	4.8
	All Women	Underweight	2.4	1.8	3.1	3.7	1.7	3.3
		Normal	31.2	30.6	40.7	48.5	48.3	63.0
		Overweight	27.9	30.9	28.5	23.3	27.6	21.4
		Obese	38.5	36.7	27.7	24.5	22.4	12.3

Table 10b

Percentage of Women per BMI Category According to Income Range, Race/Ethnicity and Study Year 2005

Year	Ethnicity	Body Mass Index	$0-$20K	$20,001 - $40K	$40,001 - $60K	$60,001 - $80K	$80,001 - $100K	Over $100K
					INCOME			
2005	White	Underweight	2.9	3.8	2.9	3.1	1.8	2.8
		Normal	45.2	39.3	43.2	51.2	49.3	64.7
		Overweight	21.2	25.5	24.8	23.5	30.9	19.4
		Obese	30.8	31.4	29.1	22.1	17.9	13.0
	African-American	Underweight	2.7	0.7	1.3	0	1.7	0
		Normal	21.7	19.3	28.2	24.4	22.4	27.0
		Overweight	28.1	32.8	35.3	34.4	34.5	31.5
		Obese	47.5	47.2	35.3	41.1	41.4	41.6
	Other	Underweight	6.1	0	3.2	0	4.3	2.6
		Normal	21.2	19.7	33.3	39.4	47.8	68.4
		Overweight	15.2	47.0	38.1	30.3	34.8	15.8
		Obese	57.6	33.3	25.4	30.3	13.0	13.2
	All Women	Underweight	3.0	1.8	2.4	2.2	2.0	2.4
		Normal	27.8	27.4	37.2	44.4	44.1	59.6
		Overweight	25.3	31.4	29.8	26.5	31.9	20.9
		Obese	44.0	39.3	30.6	26.9	22.0	17.1

Table 10c

Percentage of Women per BMI Category According to Income Range, Race/Ethnicity and Study Year 2007

			INCOME					
Year	Ethnicity	Body Mass Index	$0-$20K	$20,001 - $40K	$40,001 - $60K	$60,001 - $80K	$80,001 $100K	Over $100K
2007	White	Underweight	4.3	1.7	3.4	2.1	3.9	3.3
		Normal	38.7	39.4	35.1	45.2	47.0	55.4
		Overweight	18.3	25.7	28.2	24.3	28.9	26.5
		Obese	38.7	33.1	33.2	28.4	20.3	14.9
	African-American	Underweight	1.6	0.8	0.6	0	1.5	1.1
		Normal	21.0	17.8	21.7	23.2	18.5	30.1
		Overweight	25.0	31.7	38.6	36.6	38.5	33.3
		Obese	52.4	49.8	39.2	40.2	41.5	35.5
	Other	Underweight	4.3	0	1.8	0	0	1.9
		Normal	17.4	26.2	25.5	41.9	36.4	55.8
		Overweight	30.4	31.1	38.2	30.2	45.5	30.8
		Obese	47.8	42.6	34.5	27.9	18.2	11.5
	All Women	Underweight	2.4	1.0	2.3	1.3	3.1	2.9
		Normal	25.3	26.5	29.4	39.4	40.4	52.1
		Overweight	23.6	29.5	32.9	28.0	32.0	27.7
		Obese	48.6	43.0	35.4	31.3	24.5	17.3

Table 10d

Percentage of Women per BMI Category According to Income Range, Race/Ethnicity and Study Year 2009

				$20,001 - $40K	$40,001 - $60K	$60,001 - $80K	$80,001 - $100K	Over $100K
						INCOME		
Year	Ethnicity	Body Mass Index	$0-$20K					
2009	White	Underweight	5.4	.6	2.7	2.5	2.6	3.5
		Normal	33.8	29.8	31.4	40.2	44.1	53.4
		Overweight	28.4	26.8	30.9	29.5	29.5	25.8
		Obese	32.4	42.9	35.0	27.8	23.8	17.3
	African-American	Underweight	1.8	0.8	0	0	1.2	0
		Normal	19.6	17.5	18.0	22.3	19.5	22.5
		Overweight	28.0	28.0	34.2	37.2	30.5	32.4
		Obese	50.7	53.7	47.8	40.5	48.8	45.0
	Other	Underweight	0	0	2.1	0	4.3	1.5
		Normal	36.4	23.8	25.5	30.6	34.8	52.3
		Overweight	31.8	34.9	34.0	38.9	26.1	33.8
		Obese	31.8	41.3	38.3	30.6	34.8	12.3
	All Women	Underweight	2.5	0.6	1.6	1.6	2.4	2.9
		Normal	24.0	22.6	25.7	34.5	37.3	49.2
		Overweight	28.3	28.5	32.5	32.4	29.5	27.3
		Obese	45.2	48.2	40.2	31.5	30.7	20.6

Table 10e

Percentage of Women per BMI Category According to Income Range, Race/Ethnicity and Study Year 2011

					INCOME			
Year	Ethnicity	Body Mass Index	$0-$20K	$20,001 - $40K	$40,001 - $60K	$60,001 - $80K	$80,001 - $100K	Over $100K
2011	White	Underweight	3.1	1.2	1.3	2.2	3.0	2.5
		Normal	37.1	36.0	36.1	38.1	42.5	53.0
		Overweight	28.9	29.7	28.2	26.7	26.6	24.9
		Obese	30.9	33.1	34.4	33.0	27.9	19.6
	African-American	Underweight	3.1	0.4	0.6	2.1	0	0
		Normal	21.3	11.5	18.5	20.0	27.1	23.7
		Overweight	18.6	31.6	34.6	25.3	27.1	33.9
		Obese	57.0	56.6	46.3	52.6	45.7	42.4
	Other	Underweight	3.3	3.9	0	0	4.3	1.4
		Normal	26.7	11.8	23.5	43.8	26.1	50.7
		Overweight	26.7	35.3	29.4	34.4	34.8	24.6
		Obese	43.3	49.0	47.1	21.9	34.8	23.2
	All Women	Underweight	3.1	1.1	.9	2.0	2.5	2.1
		Normal	25.7	20.6	28.2	34.3	38.0	48.6
		Overweight	21.8	31.3	30.7	27.0	27.3	26.2
		Obese	49.4	47.1	40.2	36.8	32.2	23.1

Poverty Guideline measures per Race/Ethnicity the percentage of women by year living at the poverty guideline were examined (table not shown). In 2001, there were 31.4 percent of African-American women (BMI = 29.27) at or below the Poverty Guideline of $17,650. Among White women 7.3 percent (BMI = 26.24) 7.3 and 17.2 % of Other women (BMI = 27.05) were at or below the income Poverty Guidelines. In study year 2011, there were 31% of African-American women (BMI =31.84) at or below the 2011 Poverty Guideline of $22,350 compared to 6.6% percent of White women (BMI = 28.42) and 13.7% percent of Other women (BMI =28.49).

With respect to the Poverty Guidelines for each study year, African-American women continued to show greater increases in weight irrespective of income than Whites, with increases from 1.7 to 2.5 times the likelihood of transitioning from normal weight to obese between 2001 to 2011. Over the study timeline of interest, impoverished White women showed a lesser tendency to be of increased BMI than more affluent White women.

Table 11 presents the BMI categories for the South geographic region for each study year. The South group represents the most drastic BMI category increase. African-American women and White women showed an inverse BMI relationship. In 2001, 55% of White women living in the South had a normal BMI, decreasing to 44.2% by study year 2011. African-American women showed a BMI of 36.4% in study year 2001 increasing to 53.3% in study year 2011.

Table 11

Percentage per BMI Category According to Geographic Region-South by Race/Ethnicity and Study Year

		Body Mass Index			
Year	Ethnicity	Underweight	Normal	Overweight	Obese
2001	White	3.9	55.0	23.9	17.2
	African-American	1.0	29.9	32.7	36.4
	Other	1.8	40.4	31.6	26.3
	All Women	2.2	40.4	29.1	28.2
2003	White	4.3	51.6	23.1	21.0
	African-American	0.6	25.3	31.2	42.9
	Other	0	33.3	43.3	23.3
	All Women	2.0	36.2	28.6	33.2
2005	White	2.8	49.9	23.8	23.4
	African-American	0.9	22.4	30.7	46.0
	Other	0	33.3	36.7	30.0
	All Women	1.6	34.0	28.2	36.2
2007	White	3.6	44.8	25.3	26.3
	African-American	0.7	20.8	31.6	46.9
	Other	0	29.5	32.8	37.7
	All Women	1.9	30.8	29.1	38.2
2009	White	2.6	41.6	27.3	28.5
	African-American	0.4	19.6	30.6	49.3
	Other	0	31.7	28.6	39.7
	All Women	1.3	29.1	29.2	40.4
2011	White	2.4	44.2	25.6	27.8
	African-American	0.7	17.6	28.3	53.3
	Other	1.5	27.7	26.2	44.6
	All Women	1.4	28.9	27.1	42.5

Table 12 presents the BMI per educational level. African-American women were overweight to obese throughout all study years. Most groups showed an increase in BMI year over year with education remaining relatively unchanged.

Table 12

Average Body Mass Index According to Educational Level by Race/Ethnicity and Study Year

Variable/Year	Less than 12 years	High School Diploma	Some college/Bachelor's Degree	Some post graduate work	Unspecified
African American women					
2001	29.19	29.45	28.25	26.36	29.65
2003	30.06	30.25	29.12	27.88	29.00
2005	30.64	30.66	29.58	28.32	29.54
2007	30.81	31.26	29.80	29.00	30.29
2009	30.96	31.17	30.35	28.82	31.23
2011	31.16	31.67	30.45	29.38	31.95
White women					
2001	26.83	25.82	24.35	23.87	25.73
2003	28.07	26.50	25.09	24.17	24.55
2005	28.37	27.04	25.53	24.95	25.18
2007	29.40	27.49	26.01	25.32	25.45
2009	29.56	27.85	26.15	25.74	25.87
2011	29.57	28.25	26.27	25.85	26.11
Other women					
2001	27.71	26.04	24.35	24.68	24.63
2003	28.80	27.36	25.59	25.64	23.91
2005	29.04	27.89	26.25	25.77	23.90
2007	29.57	28.54	27.18	25.34	23.60
2009	29.26	28.44	27.18	26.21	23.43
2011	29.55	28.60	27.95	26.31	23.99
All women					
2001	28.13	27.27	25.40	24.24	27.09
2003	29.21	28.06	26.17	24.84	25.66
2005	29.63	28.55	26.64	25.52	26.18
2007	30.13	29.05	27.09	25.92	26.42
2009	30.17	29.41	27.36	26.26	26.87
2011	30.33	29.63	27.51	26.45	27.29

Note. High School Diploma = 12years; Some college/Bachelor's Degree = 13-16 years; Some post graduate work =

The specific BMI categories for each level of education are shown in Table 12 and Table 13. The level of education for White women is inversely related to obesity. The lack of education fosters a consistent 2-fold likely hood of being obese if you are White. African-American women from 2001 to 2011 showed a decreased percentage in the overweight category (6.1 percent). However, there was a significant increase in the obese category (16.4 percent) leading to an overall final obese rate of 55% for those with 12-years of education. As well, for African-American women the obesity rate climbed as the education level increased to 50 percent obesity rates in all groups of education by 2011 except the some college/bachelors degree (48%).

Table 13
Percent BMI According to Educational Level by Race/Ethnicity and Study Year White

	Year	Body Mass Index	Less than High School	HS Diploma	Some college/bachelor's degree	Some post grad work	Not specified
White	2001	Underweight	2.7	2.9	4.5	1.6	2.5
		Normal	44.0	52.3	63.1	67.0	51.3
		Overweight	26.7	23.8	19.9	23.6	26.3
		Obese	26.7	20.9	12.5	7.9	20.0
	2003	Underweight	5.6	2.7	3.7	4.0	5.0
		Normal	40.5	46.9	57.2	65.9	61.2
		Overweight	19.8	25.1	22.4	15.6	19.8
		Obese	34.1	25.3	16.6	14.5	14.0
	2005	Underweight	4.0	2.5	3.4	1.7	1.7
		Normal	39.7	43.7	54.9	61.2	61.5
		Overweight	21.4	28.0	22.9	20.8	17.1
		Obese	34.9	25.9	18.7	16.3	19.7
	2007	Underweight	4.8	2.7	3.2	3.4	1.7
		Normal	29.8	39.6	49.7	58.1	54.7
		Overweight	23.4	28.7	26.0	21.8	26.5
		Obese	41.9	29.1	21.2	16.8	17.1
	2009	Underweight	2.4	2.3	3.4	2.7	2.6
		Normal	24.2	39.3	47.4	49.7	47.8
		Overweight	34.7	27.1	27.0	28.1	28.7
		Obese	38.7	31.3	22.2	19.5	20.9
	2011	Underweight	1.6	1.9	2.7	3.2	0
		Normal	28.6	37.0	48.8	49.5	50.9
		Overweight	31.0	27.6	25.6	24.7	27.7
		Obese	38.9	33.6	22.9	22.6	21.4

Table 14
Percent BMI According to Educational Level by Race/Ethnicity and Study Year

	Year	Body Mass Index	Less than High School	HS Diploma	Some college/bachelor's degree	Some post grad work	Not specified
African-American	2001	Underweight	2.6	1.5	0.7	0	0
		Normal	25.3	26.4	37.0	41.9	25.0
		Overweight	35.8	33.3	29.8	38.7	28.8
		Obese	36.2	38.8	32.5	19.4	46.2
	2003	Underweight	1.9	.5	1.4	0	0
		Normal	24.5	20.3	29.3	38.2	30.8
		Overweight	31.5	34.7	28.6	35.3	36.5
		Obese	42.1	44.4	40.6	26.5	32.7
	2005	Underweight	2.8	1.4	0.4	0	0
		Normal	19.8	19.9	26.6	34.3	28.0
		Overweight	32.1	34.1	29.8	22.9	36.0
		Obese	45.3	44.7	43.3	42.9	36.0
	2007	Underweight	1.9	0.8	0.7	0	0
		Normal	22.1	18.7	22.7	28.9	21.7
		Overweight	27.2	32.3	34.7	34.2	39.1
		Obese	48.8	48.2	41.9	36.8	39.1
	2009	Underweight	1.9	0.8	0	0	0
		Normal	18.8	16.7	22.9	23.7	18.2
		Overweight	28.8	30.1	32.3	36.8	34.1
		Obese	50.5	52.4	44.8	39.5	47.7
	2011	Underweight	3.4	1.1	0.3	0	0
		Normal	18.8	16.5	22.7	20.5	11.4
		Overweight	25.1	27.2	29.0	28.2	38.6
		Obese	52.7	55.2	48.0	51.3	50.0

African-American women represented the highest percentages of women living in non-traditional households, homes with children but without a husband / partner (50.8 percent in 2001 and decreasing to 26.5 percent in 2011). White women were the least likely to report living in non-traditional households with 8.3 percent in 2001 and 4.2 percent in 2011. Other women represented 16.0 percent in 2001 and 8.6 percent in 2011 of non-traditional households. In 2001, 76.6 percent of White women (BMI=24.65) and 75.4 percent of Other women (BMI=26.01) lived in traditional households, homes with a husband/ partner versus 34.6 percent of African-American women (BMI=28.29). The percentages of women for all groups in a traditional household continued to increase each year of the study, from 34 percent in 2001 to 44.7 percent in 2011 (African-American); from 76.6 percent to 85.1 percent (White); and from 75.4 percent to 82.0 percent (Other).

Table 15 shows the percentage of women in each BMI category for Family Composition-Traditional Household. For each year of the study White women in traditional households had a normal BMI 60.4% in 2001 and 45.4% in 2011. For African-American-American women in traditional households there appeared to exist an extreme opposite. Each year of the study, African-American women in traditional households were in the obese category with 34.1% in 2001 and a 15.5% increase by 2011, resulting in 49.6%. Other women were of normal BMI in 2001 (46.9%) through 2005 and in 2007 and 2009 normal and overweight BMI were equal. In 2011, the majority of Other women were in the obese BMI category (35.2%).

Table 15

Percentage per BMI Category According to Family Composition-Traditional Household by Race/Ethnicity and Study Year

Year	Ethnicity	Body Mass Index			
		Underweight	Normal	Overweight	Obese
2001	White	3.5	60.4	21.7	14.4
	African-American	0.3	33.5	32.0	34.1
	Other	2.6	46.9	31.3	19.3
	All Women	2.8	54.0	24.6	18.6
2003	White	3.7	55.5	22.2	18.6
	African-American	0.3	27.2	31.5	41.0
	Other	2.0	38.4	36.9	22.7
	All Women	2.9	48.1	25.6	23.4
2005	White	2.8	53.0	23.5	20.7
	African-American	1.0	23.6	30.4	45.0
	Other	1.4	36.2	34.3	28.1
	All Women	2.3	45.2	26.1	26.4
2007	White	3.1	47.6	26.7	22.6
	African-American	0.7	21.7	36.2	41.4
	Other	0	35.2	35.2	29.6
	All Women	2.3	41.0	29.6	27.1
2009	White	3.0	45.1	28.1	23.7
	African-American	0.5	20.4	32.4	46.7
	Other	0.5	35.5	35.5	28.4
	All Women	2.2	39.1	29.8	28.9
2011	White	2.2	45.4	26.8	25.6
	African-American	0.7	20.6	29.1	49.6
	Other	1.4	32.9	30.5	35.2
	All Women	1.8	38.9	27.6	31.6

From 2001-2007 the majority of White women in non-traditional households (Table 16) remained in the normal BMI category; 49.6% in 2001 and 37.2% in 2007. This contrasts with study years 2009-2011, where the majority of White women were clinically obese; 38% in 2009 and 36.8% in 2011. African-American women in non-traditional households remained in the obese category for all years of the study; 38.5% in 2001 and 55% in 2011.

Table 16

Percentage per BMI Category According to Family Composition-Non-Traditional Household by Race/Ethnicity and Study Year

Year	Ethnicity	Body Mass Index			
		Underweight	Normal	Overweight	Obese
2001	White	3.0	49.6	28.1	19.3
	African-American	2.1	27.2	32.2	38.5
	Other	2.4	34.1	39.0	24.4
	All Women	2.3	32.3	31.8	33.6
2003	White	3.7	45.4	26.9	24.1
	African-American	.9	25.2	32.2	41.6
	Other	3.3	26.7	36.7	33.3
	All Women	1.6	29.2	31.4	37.8
2005	White	4.3	38.3	30.9	26.6
	African-American	1.3	21.3	34.7	42.6
	Other	4.5	36.4	18.2	40.9
	All Women	2.0	25.2	33.3	39.5
2007	White	2.6	37.2	26.9	33.3
	African-American	1.1	18.0	31.7	49.1
	Other	5.3	36.8	21.1	36.8
	All Women	1.6	22.1	30.4	45.9
2009	White	2.8	29.6	29.6	38.0
	African-American	.6	19.2	28.8	51.3
	Other	0	36.8	21.1	42.1
	All Women	1.0	21.9	28.6	48.5
2011	White	4.4	32.4	26.5	36.8
	African-American	2.0	15.9	27.1	55.0
	Other	0	22.7	27.3	50.0
	All Women	2.3	19.6	27.0	51.0

The frequencies and percentages were fairly constant over the time of the study, with the majority of households including one to three persons for all years. African-American women reported an average of three persons in the household over the time of the study: 25.7 percent in 2001 and slowly decreasing to 23.4 percent in 2011. White women reported an average of two persons living in the household: 31.3 percent in 2001 and 38.8 percent in 2011. Other women reported an average of four persons living in the household: 24.2 percent in 2001 and 28.1 percent in 2011.

A significant finding was the percent of change over the entirety of the study as regards the reporting of Other women and the overweight category. For study year 2001 the BMI for a household of one was 70% normal, 20% overweight and 10% normal. However, for study year 2003, the same group reports an increase in normal weight of 37.5% and 62.5% overweight with no report within the underweight or obese categories. By the 2005 reporting year, the categories of overweight had dropped by 29.2% to an astounding 33.3 % for normal and overweight with 16.7% in each the underweight and obese categories.

Continuing to report the Other women group for reporting years of 2007-2011 in the overweight category drop even further to 20% and remain not higher than 22.2%. It is worth nothing that among households in the category of one is the 2009 reporting year when 44% tip the scale as obese and drops again to 33.3% in 2011. All other groups are unremarkable.

The frequencies and percentages of the number of children in the household were fairly constant over the time of the study. The percentage of households with no children was slightly higher in the final year of study for each group. African-American women began the study with an average of two children in 2001 (29.1 percent), one child in 2003 (25.7 percent) and for each additional year of the study reported no children living in the household. By the end of study

period in 2011, there were 52.3 percent of African-American women reporting no children living in the household. The majority of White women reported no children living in the household for each year of the study.

The number of children in the household was consistent across all categories of BMI. However, beginning in study year 2003, African-American women begin to show increased rates of obesity ranging from 40.5% to 65.9% when there were zero to two children in the household and greater than four children in the household. Several years (2005, 2009 and 2011) there were obesity rates greater than 50%. Study year 2011 reported the highest obesity rates ranging from 50.9% to 65.9% with children in the household from zero to four or more.

Multivariate Analysis

   Operationalization of multivariate analysis variables. The variables used in the

correlational and regression analyses were operationalized as follows:

   Body mass index (BMI). BMI was used as the dependent variable in the OLS mixed

effects model. BMI was constructed from self-reported height and weight measures and

calculated as [(weight in pounds) divided by (height in inches squared) multiplied by 703].

Implausible observations with self-reported height under four feet or over seven feet and self-

reported weight under 80 pounds were not included. BMI was a continuous variable.

   Race/Ethnicity. Race/ethnicity was coded as either (a) White, (b) African-American, and

(c) Other. The levels were dummy coded into two indicator variables representing (1) African-

American and (2) Other. Both of the variables were coded such that 1 indicated the woman was

of the race represented by the indicator variable, and 0 indicating the woman was not of the race

represented by the indictor variable. White was the reference category for the race/ethnicity

variable. The two race/ethnicity indicator variables were nominal and dichotomous. The

race/ethnicity variables were used as fixed-effects independent variables in the OLS mixed-

effects model

   Family Composition – Household Type. The family composition household variable

was coded as either (a) traditional households (married or cohabiting greater than or equal to 1

year), (b) non-traditional households (female headed household, no husband/cohabitor) or (c)

single woman households. The levels were dummy coded into two indicator variables

representing (1) non-traditional households, and (2) single woman households. Both of the

variables were coded such that 1 indicated the woman was in the household type represented by

the indicator variable, and 0 indicating the woman was not in the household type represented by

the indictor variable. Traditional households were the reference category for the family

structure-household variable. The two family structure-household indicator variables were

nominal and dichotomous. The variables were used as random-effects independent variables in

the OLS mixed-effects model

Family Composition- Number of persons in household. The number of people in the

household was computed by summing the PSID variables representing the "# in [family unit]"

and "# non [family unit] sharing [household unit]" variables. The number of persons in the

household was an ordinal variable. The variable was used as a random-effects independent

variable in the OLS mixed-effects model.

Family Composition - Number of children in household. The number of children in the

household was derived from the PSID variable "number of children in family unit. The number

of children in the household was an ordinal variable. The variable was used as a random-effects

independent variable in the OLS mixed-effects model.

Geographic Region. A total of four geographic regions were represented; (a) Northeast,

(b) North Central, (c) South, and (d) West. The levels were dummy coded into three indicator

variables representing (1) North Central, (2) South, and (c) West. The three indicator variables

were coded such that 1 indicated the woman lived in the geographic region represented by the

indicator variable, and 0 indicated the woman did not live in the geographic location represented

by the indictor variable. The geographic area of Northeast was the reference category for the

geographic region variable. The three geographic region indicator variables were nominal and

dichotomous, and were used as random-effects independent variables in the OLS mixed-effects

model.

Income.　Three variables representing income were used: income range between $0 and $100,000; poverty guideline measures for each year of the study and total household income. The variable representing total income was used as a measure of the actual dollar amount per year earned by the household.　Income was a continuous variable, and used as a random-effects independent variable in the OLS mixed-effects model.

Educational Level.　The education level variable was measured as the number of years the woman attended school (0 to 17 years).　The categories for educational level were 1) less than high school; 2) high school diploma (completed 12 years of education); 3) some college/bachelor's degree (13 – 16 years of education); and post-graduate work (17 years or more of education).　The education level variable was an ordinal variable, and was used as a random-effects independent variable in the OLS mixed-effects model.

Assumptions. Multivariate analyses included Pearson's Product Moment correlations, Spearman's Rank Order correlations, and OLS mixed effects regressions.　Assumptions for Pearson's product moment correlations and OLS regression include absence of outliers, normality, linearity, homoscedasticity, and/or absence of multicollinearity.　Prior to the assumptions check and the multivariate tests, the data for the $N = 2,836$ records were stacked according to year such that each woman was represented by six records (one record for each year measured in the study).　The sample with the stacked records included 17,106 rows of data.

Outliers in a dataset have the potential to distort results of a multivariate analysis.　A check of the boxplot for the dependent variable of BMI using the long format data was performed to visually inspect for outliers.　A total of 372 outliers (2.2%) were found.　The measurements of the BMI variable were standardized to check for the presence of extreme outliers (z-score of +/- 3.3).　A total of 151 extreme outliers (0.9%) were found for the BMI

variable. Further investigation of the outliers indicated that all outlying values were within

possible ranges of the BMI measurement (between the values of 12.53 and 70.30). Additionally,

mean (M = 27.66) and median (Mdn = 26.36) were close in value, further indicating that outliers

were not negatively impacting the data distribution of the BMI variable. Since the outliers were

within acceptable ranges of the variables and less than 1% of the data for the BMI variable were

as extreme outliers, it was determined that all records would be retained for analysis and that the

outlier assumption was not violated.

Normality for the BMI variable was investigated with SPSS Explore. The Kolmogorov-

Smirnov (K-S) test for normality indicated that the BMI variable did not have a normal

distribution ($p < .01$). However, the K-S test is sensitive to larger sample sizes (> 50) and will

return a significant value when in fact; the data is normally distributed (Tabachnick & Fidell,

2007; Hooper & Coughlan, 2008). A visual check of the histogram for the BMI variable

indicated a slight right skew. However, the normal Q-Q plot indicated normality or near-

normality within the middle and lower ranges for the BMI variable. The tests used for inference

in this study are robust to deviations from normality when most of the other assumptions are met.

Therefore, it was decided that the assumption of normality was not seriously violated and

parametric tests were used with the dependent variable of BMI during multivariate analysis,

without transformation of the variables.   Table 6 presents the measures of central tendency for

the BMI variable. Assumptions of linearity between continuous study variables and

homoscedasticity, requirements for correlational and multiple regression analysis, were checked

with scatterplots of the data. The assumptions of linearity and homoscedasticity were not

violated.

Multicollinearity diagnostics were performed using SPSS. Multicollinearity is assumed when a bi-variate relationship has a correlation of .90 or greater, indicating that the variables may be measuring the same concept (Pallant, 2005). None of the bi-variate relationships between the independent variables used in hypothesis testing indicated multicollinearity. Therefore the assumption of absence of multicollinearity was met.

Multivariate Tests. The study was a panel study utilizing secondary data obtained from the PSID database and encompassed 10-year time frame (2001 - 2011). The study was non-experimental and was a review of existing PSID data with no direct contact with, or manipulation of, the population of study. A series of bi-variate correlational analyses and two ordinary least squares regressions (OLS) via a mixed effects panel regression model were performed to test the five study hypotheses. The use of SPSS v.22 and the MIXED and GENLIN procedures were attempted for the regression analyses. However, the software would not complete processing to obtain the models. Therefore, the regression model was obtained using STATA v.12 and "xtgee" command. All multivariate analyses were set at a 95% level of significance.

Correlational Analysis. A series of bi-variate correlational analyses were performed to investigate associations between the variables of study (Table 17). Pearson's product moment correlations were performed for most of the bi-variate pairs. However, if either of the variables in a pair were ordinal in level, then Spearman's Rank Order correlation was used in lieu of Pearson's product moment correlations. Many significant relationships between variables were found. Cohen (1988) defined strength of association defined by correlation coefficients (effect size) as weak (+/- .10 - .29), moderate (+/- .30 - .49) and strong (+/- .50 to 1.0). Many significant findings between variable pairs were noted, even when the correlational effect was

quite small. The number of records included in the correlational analysis were quite large, $N =$ 17,016. The processes of frequentist statistical method are such that when a sample size is very large, significant findings will be found on even very small effects (Yuan, Marshall & Bentler, 2002). Additionally, strong and significant correlations were found for variable associations that were obvious. For instance, a strong inverse correlation was found between women who were White race/ethnicity and women who were African-American race/ethnicity (r = -.825, p < .0005). The bivariate relationships suggest that the correlations indicate a possible ambiguity when assigning black/white or black/other racial identity labels. Race/Ethnicity based on current choices in the data set may be lacking in terms of proper identities or how the current world view of self identity is defined. Thus, the multiplicity of combinations in today's world could provide room for misinterpretation by the interviewer leading to misclassification within the dataset. The same applies for the family composition variable – household type single and household type non-traditional. Table 19 presents a matrix of all of the correlational coefficients between the variable pairs.

A medium positive correlation was found between the variable of Race/Ethnicity = African-American and Geographic Region = South ($r = .403$, $p < .0005$), indicating a direct relationship between African-American women and living in the South. A medium negative correlation was found between the variables of Race/Ethnicity = African-American and Family Structure Household = Traditional ($r = -.417$, $p < .0005$), indicating an indirect relationship between African-American women and living in a traditional home with a husband or partner. However, a medium positive effect was found between the variables of Race/Ethnicity = African-American and Family Composition Household = Non-Traditional ($r = .407$, $p < .0005$), indicating a positive relationship between African-American women and living in a non-

traditional home with children, but no husband or partner. The race/ethnicity variable of African-American was also negatively correlated with income ($r = -.384$, $p < .0005$), indicating that African-American women were associated with lower household incomes.

Opposing findings were found for White women when compared to African-American women as relates to the geographic, family structure and income variables. A medium negative correlation was found between the variable of Race/Ethnicity = White and Geographic Region = South ($r = -.311$, $p < .0005$), indicating an indirect relationship between White women and living in the South. A medium positive correlation was found between the variables of Race/Ethnicity = White and Family Structure Household = Traditional ($r = .349$, $p < .0005$), indicating a direct relationship between White women and living in a traditional home with a husband or partner. However, a medium negative effect was found between the variables of Race/Ethnicity = White and Family Structure Household = Non-Traditional ($r = .354$, $p < .0005$), indicating an indirect relationship between White women and living in a non-traditional home with children, but no husband or partner. The race/ethnicity variable of White was positively correlated with income ($r = .391$, $p < .0005$), indicating that White women were associated with higher household income. A medium direct effect was also noted between White women and Education ($r = .313$, $p < .0005$) indicating that women who were White were associated with higher education levels.

A medium direct correlation was also found between the variables of Education and Income ($r = .477$, $p < .0005$) indicating that the education and income variables moved in a like manner, i.e. when a woman's level of education increased or decreased, so did her household income.

Table 17

Correlations for Bi-Variate Relationships of Variables Utilized for Multivariate Analysis

	Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	Body mass index (BMI)														
2.	Race/Ethnicity = White	-.251**													
3.	Race/Ethnicity = African-American	.268**	-.825**												
4.	Race/Ethnicity = Other	-.008	-.367**	-.223**											
5.	Family Structure-Household = Traditional	-.171**	.349**	-.417**	.084**										
6.	Family Structure-Household = Single	.076**	-.082**	.115**	-.047**	-.605**									
7.	Family Structure-Household = Non-Traditional	.140**	-.354**	.407**	-.060**	-.669**	-.186**								
8.	Family Structure-Number of persons in household	.026**	-.121**	.042**	.139**	.240**	-.454**	.128**							
9.	Family Structure-Number of children in household	.014	-.154**	.105**	.093**	.028**	-.422**	.359**	.790**						
10.	Geographic Region = Northeast	-.088**	.131**	-.126**	-.019*	.061**	-.012	-.065**	-.007	-.020**					
11.	Geographic Region = North Central	-.044**	.183**	-.145**	-.077**	.039**	-.014	-.035**	-.012	-.008	-.226**				
12.	Geographic Region = South	.137**	-.311**	.403**	-.127**	-.145**	.032*	.148**	-.022**	.004	-.343**	-.514**			
13.	Geographic Region = West	-.051**	.080**	-.247**	.269**	.089**	-.016*	-.095**	.048**	.021**	-.181**	-.271**	-.411**		
14.	Income	-.245**	.391**	-.384**	-.042**	.570**	-.300**	-.423**	.067**	-.078**	.150**	.020**	-.180**	.077**	
15.	Education Level	-.227**	.313**	-.225**	-.169**	.186**	-.025**	-.206**	-.089**	-.063**	.113**	.022**	-.104**	.011	.477**

* *p* < .05.   **p < .01.

OLS Mixed-Effects Model – All Races (White, African-American, Other). An ordinary least squares regression (OLS) via a mixed effects panel regression model was performed to investigate the relationship of the independent variables for race/ethnicity, family structure, geographic region, income, and education level as they relate to the dependent variable of BMI. STATA v.12 software and the "xtgee" command were used to model the regression. The model was specified as Gaussian, with an identity link and an autocorrelation structure of AR1. The autocorrelation structure of AR1 modeled the time series data of the panel such that each subsequent time in the series was correlated with the previous time's measurement. Table 19, presents the association between BMI and race/ethnicity, geographic region, income and education and describes how each of the measures vary and by how much with respect to each other. A total of 15,766 observations for 2,641 women were modeled in the regression. The model was statistically significant [Wald χ^2 (11) = 1205.88, $p < .0005$]. The Race/Ethnicity variable of African-American was statistically significant [$z = 20.16$, $p < .0005$; B = 5.67, 95% CI (5.11, 6.220)]. The direction and magnitude of the B coefficient indicates that BMI increases approximately 6 units for African-American women when compared to White women. The Race/Ethnicity variable of Other was statistically significant [$z = 3.60$, $p < .0005$; B = 1.62, 95% CI (0.74, 2.50)]. The direction and magnitude of the B coefficient indicates that BMI increases approximately 2 units for Other women when compared to White women.

The variable Family Composition – Single Household was statistically significant [$z = -27.85$, $p < .0005$; B= -4.42, 95% CI (-4.73, -4.11)]. The direction and magnitude of the B coefficient indicates that BMI decreases approximately 4 units for Single women with no children when compared to women from traditional households. The variable of Family Structure –Household = Non-Traditional was also statistically significant [$z = -26.22$, $p < .0005$;

B = -4.06, 95% CI (-4.36, -3.76)]. The direction and magnitude of the B coefficient indicates that BMI decreases approximately 4 units for women who live in households with children but without a husband or partner when compared to women from traditional households.

The variable of Geographic Region = South was statistically significant [z = 2.08, p = .038; B= 0.59, 95% CI (0.03, 1.15)]. The direction and magnitude of the B coefficient indicates that BMI increases by a factor of 0.60 when a woman lives in the South when compared to living in the Northeast. The variable of Geographic Region = West was also statistically significant [z = 2.09, p = .036; B= 0.70, 95% CI (0.04, 1.36)]. The direction and magnitude of the B coefficient indicates that BMI increases by a factor of 0.70 when a woman lives in the West compared to living in the Northeast.

For women living in non-traditional households and single households their family composition appears to reduce their vulnerability to large increases in BMI over time. Compared to women in traditional households, women in non-traditional households and single households, the composition of their families helps to reduce their obesity risk over time. However, geographic region of residence for women living in the South or the West was a risk factor for increases in BMI over time. As well, for African-American women, race alone does not effectively mitigate or eliminate their risk for increases in BMI over time but presents more of a risk factor for obesity development over time.

Table 18

OLS Panel Regression for BMI Regressed on Independent Variables of Study (N = 2641)

Variable	B	*SE* B	z	Sig.	95% CI for B Lower	Upper
Race/Ethnicity = African-American	5.67	0.28	20.16	<.0005	5.12	6.22
Race/Ethnicity = Other	1.62	0.45	3.60	<.0005	0.73	2.50
Family Structure-Household = Single	-4.42	0.16	-27.85	<.0005	-4.73	-4.11
Family Structure-Household = Non-Traditional	-4.06	0.16	-26.22	<.0005	-4.36	-3.76
Family Structure- Number of persons in household	-0.03	0.03	-0.93	.350	-0.09	.03
Family Structure - Number of children in household	-0.05	0.05	-0.99	.324	-0.15	0.05
Geographic Region = North Central	0.57	0.31	1.84	.065	-0.04	1.18
Geographic Region = South	0.59	0.29	2.08	.038	0.03	1.15
Geographic Region = West	0.70	0.34	2.09	.036	0.05	1.36
Income	< 0.001	<0.001	-0.79	.431	<0.001	<0.001
Education	0.01	0.03	0.32	.746	-0.05	0.07
Constant	26.45	0.51	---	---	---	---

Note. Reference category for Race/Ethnicity = White; Reference Category for Family Structure – Household = Traditional; Reference Category for Geographic Region = Northeast.

OLS Mixed-Effects Model – Comparing BMI Regressed on Interaction Terms of Independent Variables with Race/Ethnicity Classifications of African-American and White.

An ordinary least squares regression (OLS) via a mixed effects panel regression model was performed to investigate the relationship of the independent variables of family structure, geographic region, income, and education level, according to the women's race of White or African-American, as relates to the dependent variable of BMI. The race of Other was not included in the interaction term model because although the factor of Race = Other was significant for the main effects regression when compared to the reference category of Race = White, the Race = Other variable was not significantly correlated in the bi-variate relationship with BMI in the correlational analysis. Additionally, the interaction term of African-American/Geographic Region = West was omitted from the model due to multicollinearity. STATA v.12 software and the "xtgee" command were used to model the regression. The model was specified as Gaussian, with an identity link and an autocorrelation structure of AR1. The autocorrelation structure of AR1 modeled the time series data of the panel such that each subsequent time in the series was correlated with the previous time's measurement. Table 9 presents the findings of the regression, and includes the B coefficients, the standard errors of the coefficients, and the 95% confidence intervals of the coefficients. The table also includes the z-scores and associated p-values for the regression coefficients. Table 19 presents the addition of interaction terms to the model. The interaction of race/ethnicity and family composition-household type, income, geographic region and education enhances understanding of the relationships among the variables. Table 19 shows that BMI is not limited to race/ethnicity but also depends on household type, education, income and geographic region of residence.

Body Mass Index increased by approximately 3 units for African-American women from traditional households when compared to White women from traditional households [$z = 2.80$, $p = .005$; B= 2.71, 95% CI (0.81, 4.61)], African-American women's BMI increased by a factor of 0.15 for each year of education [$z = 3.18$, $p = .001$; B= 0.15, 95% CI (0.06, 0.24)].

When compared with White women from traditional households, single White women decreased in BMI by approximately 6 units [$z = -25.25$, $p < .0005$; B= -5.60, 95% CI (-6.04, -5.17)], and the BMI of White women from non-traditional households also decreased by approximately 6 units [$z = -22.36$, $p < .0005$; B= -5.78, 95% CI (-6.29, -5.27)]. When compared to White women living in the Northeast, White women living in the North Central geographic region increased in BMI by a factor of 0.93 [$z = 2.66$, $p = .008$; B= 0.93, 95% CI (0.25, 1.62)]. White women living in the West increased in BMI by a factor of 1.04 when compared to White women in the Northeast [$z = 2.70$, $p = .007$; B= 1.04, 95% CI (0.28, 1.79)]. White women living in the South increased in BMI by a factor of 0.78 when compared to White women in the Northeast [$z = 2.31$, $p = .021$; B= 0.78, 95% CI (0.12, 1.45)]. Higher levels of education for White women resulted in lower BMI, with a decrease in BMI of a factor of 0.09 for each year of education [$z = -2.93$, $p = .003$; B = -0.09, 95% CI (-0.14, -0.03)].

Table 19

OLS Panel Regression for BMI Regressed on Interaction Terms of Independent Variables with Race/Ethnicity Classifications of African-American and White (N = 2665)

Interaction Variable	B	*SE* B	z	Sig.	95% CI for B Lower	Upper
African-American/household = single	-0.35	0.98	-0.36	.722	-2.27	1.57
African-American/household = traditional	2.71	0.97	2.80	.005	0.81	4.61
African-American/household = non-traditional	-0.30	0.98	-0.30	.760	-2.23	1.63
African-American/geographic reg. Northeast	-0.05	0.87	-0.06	.951	-1.76	1.66
African-American/geographic reg. North Central	-0.31	0.83	-0.38	.706	-1.93	1.31
African-American/geographic reg. South	-0.58	0.71	-0.08	.935	-1.45	1.33
African-American/income	<0.001	<0.001	-1.21	.225	---	---
African-American/education	0.15	0.05	3.18	.001	0.06	0.24
White/household = single	-5.60	0.22	-25.25	<.0005	-6.04	-5.17
White/household = non-traditional	-5.78	0.26	-22.36	<.0005	-6.29	-5.27
White/geographic reg. North Central	0.93	0.35	2.66	.008	0.25	1.62
White/geographic reg. West	1.04	0.38	2.70	.007	0.28	1.79
White/geographic reg. South	0.78	0.34	2.31	.021	0.12	1.45
White/income	<0.001	<0.001	-0.57	.569	---	---
White/education	-0.09	0.03	-2.93	.003	-0.14	-0.03
Constant	27.59	0.35	---	---	---	---

Note. Reference category for Family Structure – Household = White/Traditional; Reference Category for Geographic Region = White/Northeast.
The interaction term of African-American/West was omitted due to multi-collinearity.

Tests of Hypotheses as Relates to Multivariate Findings

1. (a) African-American women living in non-traditional households are associated with

    having a lower BMI than non-African-American women living in traditional households.

    (b) African-American women living in non-traditional households are associated with

    having a higher BMI than non-African-American women living in non-traditional

    households.

    (c) African-American women living in traditional households are associated with having

    a higher BMI than non-African-American women living in traditional households

Conclusion as relates to Study Hypothesis 1

The interaction term of African-American non-traditional households was not statistically

significant when compared to the reference classification of White traditional households,

in the interaction effects OLS mixed-effect model (B = -0.30, p = 0.760). African-

American women in non-traditional households had a lower BMI compared to African-

American women in traditional households (B = 2.71, p = 0.005). White women in non-

traditional households (B = -5.78, p < 0.0005) had a lower BMI than African-American

women in non-traditional households (B = -0.30, p = 0.760). However, African-

American women in traditional households (B = 2.71, p = .005) had a significantly higher

BMI than White women in traditional households (the reference category). The mean

BMI for the interaction regression model, which was the BMI of a White woman in a

traditional household in the Northeast, was 27.59. It can be determined from the model

that holding all other variables constant, when compared to the reference category of

White women living in a traditional households in the Northeast, an African-American

woman in a non-traditional households would have a BMI of 27.29, and a African-

American woman from a traditional households would have a BMI of 30.3, which is

clinically obese. It can also be determined that African-American women in non-

traditional households will have a higher BMI than White women living in non-

traditional households, 27.29 compared to 26.1 and African-American women living in

traditional households will have a higher BMI (30.3) compared to White women in

traditional households (27.6). Therefore Hypothesis 1 is supported.

2. Controlling for income and education, geographic region of residence will affect body

   mass index for African-American women regardless of family composition. Women

   living in the Southern region of the US will have a higher body mass index than women

   living in the Northeast, North Central, and Western regions of the US.

Conclusion as relates to Study Hypothesis 2

 None of the race/ethnicity interaction terms involving the race of African-American in

the OLS interaction regression were statistically significant for BMI outcomes when as

compared to the reference classification of White women from traditional households in

the Northeast. All of the coefficients for the interaction terms involving African-

American women with the four geographic areas were negative and smaller than 1.

Additionally, the interaction term for African-American women in the South would cause

a greater decrease in the mean BMI when compared with the African-American women

from the other geographic areas, had it been significant. Therefore, Study Hypothesis 2

is not supported.

3. Controlling for geographic region of residence and education, income will be a

   significant determinant of BMI among African-American women such that there will be

   an inverse relationship between African-American women's income and BMI. Family

composition of higher income will be associated with lower BMI; family composition of lower income will be associated with higher BMI.

Conclusion as relates to Study Hypothesis 3

The coefficient of the interaction variable of African-American/income in the OLS interaction regression approximated zero, and was not statistically significant. However, the bi-variate correlation between the variables of Race/Ethnicity = African-American and Income was significant ($r = -.384, p < .0005$). The negative correlation coefficient suggests that there is an association between African-American women and lower income levels. Additionally, the correlation coefficient for the bi-variate association of Income with BMI for all women of the study was significant and negative ($r = .245, p < .005$) indicating a small indirect relationship between SES and Income. Therefore Study Hypothesis 3 is supported.

4. Controlling for income and geographic region of residence, education will be a significant determinant of BMI among African-American women. There will be an inverse relationship between African-American women's education and BMI. Family composition of higher educated women will be associated with lower BMI; family composition of lower educated women will be associated with higher BMI.

Conclusion as relates to Study Hypothesis 4

The coefficient of the interaction variable of African-American/education in the OLS interaction regression was statistically significant (B = 0.15, p = .001) but indicated that higher levels of education resulted in higher BMI. This is in contrast to the correlation coefficient for the association between BMI and Education for all women of the study ($r = -.227, p < .005$) which suggested an inverse relationship between BMI and education.

As relates to African-American women in this study, Study Hypothesis 4 is not supported.

CHAPTER FIVE: DISCUSSION AND IMPLICATIONS

The relationship between family composition and BMI is complicated. However, when we add race/ethnicity and gender, it becomes even more complicated. In the previous sections, I highlight the differences in culture and eating patterns as they relate to the history of African Americans. This history may explain, in part, some of the differences in obesity between African American and White women, but they are less likely to explain substantial differences in BMI that we see in the present study from 2001-2011. Here, the study's focus is on an under explored area: the family composition of African American women and BMI.

The topic of this dissertation is how changes in family composition over time have affected the BMI of African American women. There have been many changes in family composition as lived and experienced by African American women over the past several generations. There is extensive sociological, economic, and culturally-centered research on different aspects of these changes. There is, however, a gap in the literature as regards to a longitudinal focus when it comes to understanding how changes in African American family composition have resulted in changes in BMI resulting in higher rates of obesity, especially involving women. While scholars have thoroughly examined the impact of general economic and sociological factors on African American eating and exercise patterns, the independent variable of African American family composition has been left relatively unexamined. There currently exists a scarcity of studies that examine longitudinally the relationship between BMI and family composition.

Research Hypothesis 1a: African-American women living in non-traditional households are associated with having a lower BMI than non-African-American women living in traditional households.

Research Hypothesis 1b: African-American women living in non-traditional households are associated with having a higher BMI than non-African-American women living in non-traditional households.

Research Hypothesis 1c: African-American women living in traditional households are associated with having a higher BMI than non-African-American women living in traditional households

I found that, among African-American women, both Traditional Households and Non-Traditional Households were marked by high levels of overweight and obesity. The findings indicate for African-American women in Traditional Households (married women or cohabiting greater than or equal to1 year) the percent who were obese grew by 45.9% from 2001-2011. African-American women in Traditional Households were more likely to be obese than any other group, resulting in BMIsgreater than or equal to30. This is consistent with research by Jeffrey and Rick (2002) who found that marriage was associated with weight gain (Averett, Sikora, & Argys, 2008). These finding support our hypothesis that African-American women in Traditional Households would have a higher BMI than non-African-American women.

The results can be interpreted as reflecting changes in marital and gender roles that are distinct for African-American women compared to other groups of women. Slavery as an institution did not destroy the African-American family; however, it did force African-American families into different roles that differed from the roles expected of families associated with other groups (Johnson & Staples, 2005). Historically, African-American men and women were both

disenfranchised and expected to work hard in the fields for little or no pay. Hence, African-American women have played a major economic role in their families over a long period of time. Marriage did not protect African-American women from the economic necessity of having to work outside of the home in the same way that it protected White women (Furdyna, Tucker, & James, 2008). Findings by Cowdery (2005) report that African-American couples typically both participate in the labor force and are equally expected to be wage earners to assist in whatever is necessary for the family's well-being (Haynes, 2000).

The reported family income of the African-American women in the sample may not accurately reflect the availability of resources to purchase food because a greater percentage of their income may also be allocated to other "*important*" things such as supporting children inside and outside of their home (children of spouses from previous relationships) as well as other family members. Additionally, prior research documents that in families where both families are wage earners, a large percentage of their budget is spent on eating meals prepared away from home, thereby increasing their obesity risk (Ziol-Gues et al., 2006). Furthermore, the marital role of all women living in traditional households often competes with their ability to balance work, family and their individual personal needs; thus shifting their needs to the bottom of the priority list, while placing everyone else's at the top (Blake, Wethington, Farrell, Bisogni, & Devine, 2011; Doumas, Margolin & John, 2003). This shift provides a behavioral context for the dietary choices and diet quality of women as the difficulty of managing daily life stressors, home, and work has been found to reduce the time and effort spent on at home from-scratch cooking; redefine family expectations for food; and establish priorities of eating against other more "important" needs for the well being of the family (Devine et al., 2006). A wife typically has greater parental responsibilities, is the primary care giver, the household maintainer, and is

responsible for the shopping/purchase and preparation of food (Thompson & Amoroso, 2014).

Being a married woman with children participating in the workforce due to economic need or

personal desire, leaves insufficient time for healthy meal preparation, higher and more frequent

consumption of unhealthy foods and fewer opportunities for eating healthy family meals together

(Bowman and Vinyard, 2004), which over time results in higher BMIs.

African-American women in Non-Traditional Households (female headed household

with no husband/cohabitor) were more likely to be obese than any other group in the study. The

results also indicate that there was a 42.9 percent rise in obesity from 2001-2011 for African-

American women in Non-traditional Households. This study hypothesized that women in Non-

Traditional Households would have a higher BMI than non-African-American women in Non-

Traditional Households.

The number of Non-Traditional Households in the United States is increasing and these

households are more likely to be poorer than Traditional Households (DeNavas-Walt, Proctor &

Smith, 2012; McMahon & Horning, 2013). In 2011, 8.8 percent of traditional households lived

in poverty compared to 33 percent of non-traditional households. In 2012, 67% of African-

American children lived in non-traditional households, compared to 25% for Whites and 17% for

Asian/Pacific Islanders (Annie E. Casey Foundation, 2012). Hence, the results can be

interpreted in terms of female headed households, poverty and its resulting economic hardships

on food purchase, choice and consumption. Poverty has consistently been associated with Non-

Traditional Households, headed by women (Youngblut, 2005). The mean income among

African-American women in Non-Traditional Households in the sample was $26,531 compared

with the 2014 federal poverty level for a family of four which was $23,850. Data from the US

Census Bureau show that the economic hardships associated with poverty continue to effect women and their households disproportionately.

Poverty among women in the United States continues to significantly increase over time disproportionately effecting women. Poverty increased from 8.3 percent in 2000 to 10.6 percent in 2011among White women and increased from 22 percent in 2000 to 25.9 percent in 2011 among African-American women. Among women living in female headed households with children, poverty rose from 24.6 percent in 2001 to 33 percent in 2011 among White women. African-American female headed households living in poverty increased from 41 percent in 2000 to 47.3 percent in 2011(US Census Bureau, Current Population Survey, 2012). Prior research suggests that Non-Traditional Households, regardless of employment status experience unique economic hardships (Cancian & Meyer, 2004). Non-Traditional Households are subjected to more restrictive household budgets (Bartfeld, 2003; Coleman-Jensen, 2011; Dinour 2007), time restraints (Devine et al., 2006), work in jobs that are low paying, short-term and provided insufficient benefits (Wu, Cancian & Meyer, 2008). All of these factors are likely to have an impact on the ability of women in Non-Traditional Household's to sustain access to healthy foods. Poverty complicates access to adequate healthier stores as most women living in poverty reside in poverty stricken, urban environments that are racially segregated and economically deprived, (Hilmers, Hilmers & Dave, 2012) and consist of a higher density of fast food restaurants, convenience and liquor stores that offer inexpensively prepared high calorie foods (Hendrickson, Smith & Eikenberry, 2006; Rose & Richards, 2004). These environments force women toward overconsumption of cheap high-calorie foods (Sallis & Glanz, 2009; Kwate et al., 2009); encourage the purchase of fast foods, restaurant dining, snacks and high sugared drinks and discourage the purchase and consumption of fruits and vegetables (Piernas & Popkin, 2011).

The decision of what and where to purchase food is generally based on the availability of food resources in the immediate environment (Furey, Strugnell, & McIlveen, 2001).

Non-Traditional Households are at an increased risk of food insecurity and associated obesity (Pan, Sherry, Njai & Blanck, 2012; Ramsey, Giskes, Turrell, & Gallegos, 2012). It is well documented that food insecurity and obesity are directly associated in low-income women (Dammann & Smith, 2011; Drewknowski & Specter, 2004; Dinour et al., 2007; Gibson, 2003; Franklin et al., 2012). The results of a survey by the Bureau of Labor Statistics indicated that fewer vegetables were purchased by Non-Traditional households compared to Traditional Households (Ziol-Guest et al., 2006). Women in Non-Traditional Households have less money allocated to food as there are competing costs associated with childcare and transportation which decreases total family income. The absence of time for the preparation of nutritious, home cooked meals is replaced with the purchase of foods that are cheap, high in fat, salt and sugar leading to overconsumption of calories (Carlson & Frazao, 2014). There are real cost associated with poverty for women in Non-Traditional Households that affects weight gain over time which means something different for women in Non-Traditional Households than women living in Traditional Households.

> *Research Hypothesis 2: African American women residing in the South will have a*
> *higher BMI than women living in the Northeast, North Central and Western region of the*
> *US, regardless of family structure.*

The multivariate analysis revealed no significant differences in BMI based on geographic region of residence between women in the each of the four regions. Prior studies found that persons living in the Southern region of the United States have higher prevalence rates of obesity

132

than those living in the Northeast, North Central and the West (Wang and Beydoun, 2007) This was inconsistent with the findings.

The PSID collects self-reported measures of height and weight. The literature indicates that findings such as ours may thus be underestimates as self-reported weight is usually under-reported in women (Huber, 2007). More recently Le et.al. (2014), using data from BRFSS (2003-2006), NHANES (2003-2008), and REGARDS (2003-2007) found that each of these large studies which used both direct measures for height and weight as well as self-reports along indicated that the prevalence of overweight and obesity based on self-reported height and weight may be misleading. We therefore conclude that it is essential to examine geographic regional difference in weight among African-American women as part of their migration experiences and lived histories relative to foodways.

> *Research Hypothesis 3: There will be an inverse relationship between income and BMI among African-American women. As African-American women's income increases, their BMI decreases.*

The multivariate analyses demonstrated no significant association between income and BMI. However, the bivariate analysis indicated a moderate negative income gradient in BMI for overweight and obese African-American women. The results imply that for African-American women at the overweight (BMI greater than or equal to25) and obese (BMI greater than or equal to30) tails of the BMI distribution, decreases in income are correlated with higher BMI values. Income and race/ethnicity are major determinants of obesity (Braveman, 2009; Drewnowski & Darmon, 2005; Zaninotto et al., 2009). This finding is consistent with prior research that has supported that the highest rates of obesity occur among low income women (Ogden et al., 2010, Flegal et al., 2012; Drewnowski, 2004; Richards & Smith, 2006).

133

At the individual level, higher BMIs are found among women with the lowest incomes. At the environmental level, the highest rates of obesity are typically found in the most economically deprived, racially segregated neighborhoods (Hilmer et al., 2012; Sallis & Glanz, 2009; Moore & Diez-Roux, 2006; Moore, Diez-Roux, Nettleton & Jacobs, 2008). Unfortunately, racial segregation is a reality in the world. It strategically and systematically challenges and impacts the socio-economic security of African-Americans in the US (Massey & Denton, 1993). By creating a hurdle to affordable healthy food options coupled with the economic disinvestment of supermarkets, a low tax base, high rates of unemployment, proliferation of crime, violence and non-traditional households, the gap and breakdown in educational attainment, neighborhood and social deterioration; it creates an environment that encourages and supports overweight and obesity. It is critical to understand how women living in these environments integrate at the individual and environmental levels which hugely contribute to an imbalance of energy over the life-course.

In this study, the association between income and overweight/obesity may be mediated somewhat by the price of energy-dense foods, which may encourage overconsumption. Energy density and the price of food are inversely related, such that the choice of energy-dense foods by poor women may represent a survival approach to saving money (Drewnowski & Specter, 2004). Similarly, in findings by Carlson et al (2007) when women are forced to limit their food budgets they will first start by purchasing foods that are cheaper and less nutritious to maintain caloric intake at less cost. In the real world, their choices relative to food price are economically sensible. This is relevant because poverty is associated with lower food expenditures, lower fruit and vegetable consumption and lower quality diets (Drewnowski & Darmon, 2005; Hendrickson et al., 2006; Zenk et al., 2006). In this study, the correlation between poverty and obesity may be

mediated, in part, by the low cost of calorie dense foods and may be reinforced by the preferred taste of salt, sugar and fat.

Overall, the findings show a disproportionate increase in obesity over the 10-year study period among women who are the poorest and does not show any decreases in BMI that are substantial enough to decrease morbidity and mortality from obesity related health conditions. Although the literature contains widespread documentation regarding lower income and higher obesity rates, we found that the racial disparity remained strong even when comparing African-American women with higher incomes with those from other racial groups at similar income levels.

Income influences every economic decision, access to resources and food choices. Income disparities determine every economic decision and have the ability to restrict access to resources and healthier food choices. This may help to explain why the highest rates of obesity (BMI greater than or equal to30) were found among African-American women who are disproportionately poor. If so, then encouraging low-income households to consume more costly foods is ineffective for public health. What is warranted is a more realistic and comprehensive policy approach that takes the economics of food choice and how such choices affect overconsumption of energy-dense foods.

Analyses of data of US adults in the National Health Interview Survey by the Centers for Disease Control and Prevention showed that the highest obesity rates were associated with the lowest incomes and low educational levels (Schiller, Lucas, Ward & Peregoy, 2012). Although obesity rates have continued to increase steadily in both sexes, at all ages, in all races, and at all educational levels, the highest rates occur among the most disadvantaged groups. (Flegal, Carroll, Kit & Ogden, 2012).

Research Hypothesis 4: There will be an inverse relationship between education and BMI among African-American women. As African-American women's years of education increases, their BMI decreases.

Educational level was not found to be inversely associated with BMI in this study. The majority of African-American women in the sample had an educational level equal to a high school diploma; whereas the majority of White women had some college or a bachelor's degree. The results predict as education increases, BMI also increases for African-Americans, whereas, an inverse association between education and BMI was found among White women. At matching levels of education for both African-American and White women, significant differences in overweight and obese remained. Overweight (BMIgreater than or equal to25) and obesity (BMIgreater than or equal to30) decreased with higher educational levels among White women, but increased with higher educational levels among African Americans at the highest level of education. Prior studies have found similar results for White women (Ruel, Reither, Robert & Lantz, 2010) documenting that as years of education increase, BMI decreases (Walls et al., 2011). The findings in this study suggest that other factors associated with education are at work: biological, social, cultural, and environmental. This study found that African-American women with only an educational level equivalent to a high school diploma had the highest rates of overweight and obesity at the start (2001) and end of the study (2011). This is inconsistent with the findings of Jackson and colleagues (2007) where the highest overweight/obesity prevalence rates were observed in African-American women with less than a high school education.

Data from the National Health and Nutrition Examination Survey (NHANES), 2005-2008, report that women with a college degree are less likely to be obese compared with less educated women. The present study shows that African-American women at each level of

education showed increases in overweight and obesity. Between 1988-1994 and 2007-2008 the prevalence of obesity using NHANES data increased in adults at all educational levels (Ogden, 2010). Among women, the prevalence of obesity increased from 15.3 percent to 23.4 percent in college graduates and from 31.7 percent to 42.1 percent in those with less than a high school diploma. Increases were also reported among women with a high school diploma and among those with some college. This is consistent with the present study's findings. Between 2001and 2011, the prevalence of obesity in all educational levels increased. The prevalence of obesity increased by 45.6% in the less than high school educational level; 42.3% (high school diploma), 47.7% (some college/bachelor's degree), and 164% in those with some post graduate work.

The results imply that the benefits of additional years of education have different meanings for African-American and White women and one cannot assume that educational attainment is equivalent for race/ethnic groups. There exist gaps in the literature as regards to the relationship between educational level, BMI, and race/gender specific outcomes over the life course. This study presents a sample with clear disparities between educational level, race and gender with African-American women consistently having higher BMI's in all levels of education over the course of study. Increase years of education may influence disparities in BMI over time as more years of education are associated with higher incomes (Jackson, Szklo, Yeh & Wang, 2013), better neighborhood selection and the purchasing of healthier foods and access to exercise and recreational activities (Gordon et al., 2003).

Strengths and Limitations

The PSID is a comprehensive longitudinal household panel survey providing a national representation of US families. The nature of its genealogical design presents opportunities for research that captures changes in BMI over the life course within families as well as across

multiple generations. The original focus of the initial sample in 1968 was on the dynamics of

poverty; hence, the PSID included a large sample of low income and African-American

households. This oversampling of low-income and African-American household's aids in

presenting research that attempts to understand the associations between family composition,

race, economics and BMI outcomes over the life-course.

Despite these strengths, the results should be interpreted carefully because of several

limitations. First, the data does not assert or determine a causal pathway between family

composition and obesity and can only imply an association between the variables of study. The

study did not track respondents from initial entrance into the PSID but only captures a time span

of ten years using six study points. For example, the start of overweight and obesity usually

starts at earlier ages. This sample began when most subjects were middle-age and some subjects

were beyond their child-bearing years. This limits the ability to draw inferences about causation.

Another limitation is that the bivariate correlations indicated that some subjects reported

that they were both White and African-American, or African-American and Other and not simply

mono-racial, reflecting the current racial/ethnic reality represented in today's society versus the

options available via PSID. Although, the PSID provides oversampling of African-Americans,

this study may not accurately reflect African-Americans who solely identify as African-

American. Similarly, the same was found relative to the classification of Family Composition-

Non-Traditional and Single Households. This challenges the findings as PSID may have

attempted to clarify the ambiguity when such answers were provided by the respondent.

Third, the PSID measures of height and weight are self-reported. Several studies

substantiate the bias of self-reported weight by race and gender (Shields, Gorber & Tremblay,

2008; Johnson, Bouchard, Newton, Ryan & Katzmarzyk, 2009; Santillian & Camargo, 2003;

Gillum & Sempos, 2005; Huber, 2007). Therefore, estimates of the prevalence of overweight and obesity based on self-reported measures for African-American women may be lower than those based on actual measures. The high prevalence of overweight and obesity in African-American women in Traditional and Non-Traditional Households compared to other groups lends credence to the findings. This study observes no indication of differentials in underreporting of weight as most African-American women in the sample were overweight or obese. However, with regard to previous studies the exact prevalence of obesity in the sample may be much higher than reported.

Lastly, using income and education as a measure of SES did not measure subjects' cultural beliefs and practices as regards to family composition, dietary patterns and physical activity. Income and education did not provide the same benefits to African-American women as it did for White women. Higher income did not protect African-American women in the study from obesity.

Nonetheless, the primary focus of this study was the impact of family composition on BMI and the model sufficiently tested this theory. Overall, despite the limitations, it can be concluded that the model was or was not consistent with the data but cannot be concluded that the data proves the model is correct. Additionally, the longitudinal nature of the data allows the assessment of trends over time with respect to family composition, other covariates and BMI. One consideration is that there may be changes in women's family's composition over time that vary as a result of marriage, death of a spouse or cohabitor, divorce, geographic relocation, increase/decrease in income, increased education and children entering and/or exiting the household which can positively or negatively impact BMI over time. The collection of data from

multiple study years is important in estimating BMI trends over the life-course of women relative to their family composition.

Implications for Future Research

The institution of slavery coupled with the history of African-Americans in America shaped many of the embedded cultural roles, norms, values and behaviors lived out by African-American women in their households today. Historically, the macro-level has always influenced micro-level decisions for African-Americans. Although primary and secondary interventions have been successful in reaching White women, the same success has not transferred to African-American and low income women. The significant difference in BMI for African-American women in Traditional and Non-Traditional Households brings attention to the need for improving public health policies and intervention programs personalized for African-American women.

Overeating calories and physical inactivity are largely influenced by economic, social and political forces not merely individual behavior. These forces are deep-rooted and play a major part in every day individual decision making and behaviors (Booth, Pinkston & Poston, 2005). It is imperative that interventions geared toward women not just African-American women, as most women, regardless of race/ethnicity deal with similar if not the same issues relative to their household positions and competing roles, that are family focused and not solely focused on individual behaviors relative to weight. Determining how women live, move and cope within the context of their families and how this relationship interacts with the environment is more sensible and practical than initiating interventions that are in direct opposition to their environment and immediate needs.

Interventions with the end goal of reducing overweight and obesity should focus on individual behaviors that are influenced by environmental factors that affect BMI (Kumanyika et al., 2007; Taylor, Poston & Jones, 2006). For example, interventions with an *underlying* goal of normal BMI should highlight factors that are more important than overweight and obesity since immediate needs trump long term health goals for low income women. Hence, focusing on the minimization and management of stress, depression, racism, life coping strategies, time management, goal setting, problem solving and the realities of the challenges of living in an economically deprived community that is biased toward unhealthy eating and physical inactivity and how to make better food choices relative to price, long term health and weight loss may prove more effective and holistic for daily survival as well as long term health . This intervention approach does not eliminate or deny the challenges that African-American women confront but acknowledges the true challenges of their total environment and individual choices. Thereby reaching the end goal of healthfully surviving in environments that challenge and conflict with healthy dietary patterns and physical activity. Using only a biomedical or individual model to tailor interventions for women with families, limits the ability for real, everyday women to sustain a normal weight that will benefit their health and the health of their families over the life-course.

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