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Walden University
2016

Abstract

Factors Affecting Body Mass Index Levels in African American

Women Living in North Carolina

by

Padmini Kirpalani

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Public Health

Walden University

August 2016

Abstract

The prevalence of obesity has doubled over the past 25 years in the United States, particularly in North Carolina. Obesity is influenced by biological, social, and environmental factors; its prevalence has been found to be higher among African American women and other racial ethnic minorities. Guided by the social ecological model, the purpose of this cross sectional study was to examine the relationship of the psycho-social, psycho-behavioral factors, and body mass index levels (BMI) in African American women living in North Carolina versus their Hispanic American and European American counterparts. A logistic regression model using secondary data from the Behavioral Risk Factor Surveillance System revealed a significant association in income levels, house hold size, dietary intake, physical activity, and increased BMI levels in African American women. African American women were significantly more likely to be obese ($r = 0.93$ $p > 0.05$) compared to European American and Hispanic American women. The association of each variable to BMI assessed for African American women was as follows: income ($r = 0.46$, $p = 0.001$), dietary intake ($r = 0.-17$, $p = 0.04$), household size ($r = 0.57$, $p = 0.001$), physical activity ($r = -0.16$, $p = 0.05$), depression ($r = 0.37$, $p = 0.001$), and alcohol consumption ($r = 0.39$, $p = 0.001$). A culturally sensitive weight loss model addressing the psycho-behavioral and psychosocial risk factors that negatively influence BMI and subsequently obesity is warranted for African American women living in North Carolina to promote social change and decrease the incidence of obesity in this ethnic group.

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Dedication

Dedicated to my parents Kamla and Shamdas Kirpalani; with profound gratitude, for all the sacrifices they made and values instilled in me that have made my journey successful.

For my son, Tarun Karnani, endeavoring to leave him a legacy of excellence and in gratitude to all the support and assistance he provided through this process of my becoming a scholar-practitioner.

Acknowledgments

With deep gratitude and appreciation to my chair and content expert; Dr. Scott McDoniel PhD for his time and support throughout this process, and Dr. Vasileios Margaritis, Committee Member and methodology expert. Thank you both for your rigorous mentorship and encouragement which has made it possible for me to successfully complete the most academically challenging milestone in my journey.

Table of Contents

List of Tables

List of Figures

Chapter 1: Introduction to the Study

Obesity is a condition of having a body mass index (BMI) greater than 30, and is

a universal epidemic with its greatest prevalence in the United States, particularly

amongst minorities such as African Americans and Hispanic Americans. Siahpush et al.

(2013) observed that there were marked inequities in body mass index (BMI) levels

across ethnic groups. In the case of North Carolina, 36.3% and 29.6% of the individuals

living in North Carolina were overweight (BMI = 25.0-29.9 kg/m^2) and obese (BMI $\geq$ 30

kg/m^2) respectively (Hoban, 2012). In addition, obesity rates were higher in racial

classes. Specifically, 40% of African Americans and 30% of Hispanic Americans living

in North Carolina were considered obese (Hoban, 2012). Siahpush et al. confirmed that

over one-third of the adult population of the United States were obese, asserting that

obesity is the second leading cause of preventable death and has been associated with

increased rates of cardiovascular disease, diabetes, and certain forms of cancer. Marked

inequalities have been reported in BMI levels across sociodemographic groups,

particularly that of non-Hispanic, African American women, whose BMI was remarkably

higher than that of non-Hispanic, European American women (Siahpush et al., 2013). Seo

and Sa (2008) indicated that preventative interventions targeting multiethnic and minority

adults are imperative given that the obesity epidemic affects minority populations more

than European Americans.

Disparities between physical activity and healthy eating in African Americans and

European Americans based on the Behavioral Risk Factor Surveillance System (BRFSS)

have been reflected, with 33.2% of African Americans reporting no participation in any

physical activity in the previous month compared to 22.0% of European Americans. This suggests a lack of physical activity which has the potential to provide a balance between energy consumption through energy expenditure. Casagrande et al., (2009) indicated that 38% of African Americans were less likely to meet dietary guidelines for fruit and vegetable consumption as compared to European Americans. Casagrande et al. (2009) established that obesity was a concern as its prevalence has doubled in the past 25 years. The impact of psycho-social factors (i.e., income level and household size) and psycho-behavioral factors (i.e., dietary intake, alcohol intake, physical activity, and depression) have influenced weight-related behaviors. These variables (i.e., dietary intake, alcohol intake, physical activity, and depression) in association with income, household size and (socioeconomic status (SES), place individuals at a higher risk of obesity (Kiely, Thornberry, Bhaskar, & Rodan, 2011). This suggests that African American women who are socially disadvantaged are particularly vulnerable to unhealthy diet and diet related diseases.

Women who are 31-48 years of age, who receive public assistance, and who have caused injury to themselves or others as a result of drinking were more likely to be in the high to moderate risk group for alcohol consumption. In addition, Lucan, Barg, and Long (2010) noted that low-income African Americans tend to have diets that promote obesity, morbidity, and premature mortality. The diets consumed by most African Americans are low in fruits and vegetables and high in processed and fast foods. Lucan et al. found that the factors that encourage disease-promoting diets are subject to individual tastes and preferences, cultural values, and heritage, as well as social and economic contexts (e.g.,

marketing campaigns). Lucan et al. (2010) conceded that previous researchers did not consider those aspects of cultural or ethical influence on dietary patterns among low-income African Americans; instead, most of the perspective has been external, overlooking community-relevant insights and ethnic considerations. In addition to individual or household SES, neighborhood SES may exert contextual influences on the health of the individual (Gallo, 2012).

Problem Statement

In the United States, health disparities in obesity and obesity-related illnesses have been the subject of growing concern (Lovasi, Hutson, Guerra, & Neckerman, 2009). Obesity rates are higher among persons of low SES, African Americans, and Hispanic Americans (Lovasi et al., 2009). Obesity has reached epidemic proportions in the United States, with 147 million adults classified as being obese (defined as having a BMI > 30 kg/m^2 or higher; Centers for Disease Control and Prevention, 2008). In the United States, 69% of the adults are either obese or overweight (Finucane et al., 2013). In addition, Turk et al. (2013) predicted, based on these indicators, that as many as 43% of adults in the United States will be obese by 2018.

The associated health care costs attributed to obesity are excessive. Turk et al. (2013) stated that $344 billon or 21 % of health care costs would be spent on obesity-related diseases. Specifically, health care costs in North Carolina have increased from $14.75 billion in 2006 to $16.4 billion in 2010; it has been suggested that if the current trends continue, health care cost in North Carolina can increase to $67.39 billion by 2015 by treating new cases of diabetes, heart disease, stroke, and cancer (Hoban, 2012).

Obesity is a condition characterized by an increase in body fat mass that leads to an increase in morbidity and mortality (Lara-Castro, Weinsier, Hunter, & Desmond, 2002). The central distribution of fat, and particularly visceral adipose tissue (VAT) accumulation, influences the associated deleterious effects of excess body fat (Lara-Castro et al., 2002). The precise mechanisms by which body fat preferentially accumulates in certain regions of the body are not completely understood. Factors affecting the deposition of VAT have been described as psycho-behavioral (i.e., dietary intake, alcohol intake, physical activity, and depression) and psycho-social (i.e., income and house hold sizes; Lara-Castro et al., 2002). Psycho-social indicators, such as income and house hold sizes, and psycho-behavioral influences, such as dietary intake, alcohol intake, physical activity and depression, can influence BMI (Lara-Castro et al., 2002). It is also important to note the context in which the psychosocial and psycho-behavioral factors promote an increase in the BMI levels of individuals. Rurality plays a role in the determination of health in the United States as rural areas are subject to disparities in health (Greder, Ihmels, Burney, & Doudna, 2014).

In this study I evaluated secondary data obtained from the BRFSS, a population-based telephone survey of health-related behaviors to assess the possible relationship between BMI (dependent variable) and race, dietary intake, frequency of alcohol intake, income, household size, physical activity, and depression (independent variables). The 2005 BRFSS data illustrated differences in the prevalence of obesity across states from the southeastern region of the United States, specifically North Carolina having a higher prevalence of obesity (Kushel et al., 2005). Although weight gain may be viewed

as an imbalance between energy consumption and energy expenditure, a number of

psycho-social and psycho-behavioral factors appear to be involved.

Purpose of the Study

The purpose of this study was to determine the level of the relationship, if any, of

the known psycho-social (i.e., income level and house hold size), psycho-behavioral (i.e.,

dietary intake, alcohol intake, physical activity, and depression) factors, and BMI levels

in African American women living in North Carolina versus their Hispanic American and

European American counterparts. Moreover, I assessed the level of influence that these

factors had on the BMI levels in African American women living in North Carolina.

Environmental factors, such as access to trails, parks, the presence of supermarkets with

healthy options, and its relationship to socioeconomic factors demonstrate a statistically

significant association with obesity (Casagrande et al., 2009). Because obesity increases

the risk of health conditions including hypertension, adverse lipid concentration, and

Type II diabetes, it is important to monitor its prevalence where levels of obesity are the

highest in the United States such as North Carolina.

Hoban (2012) established that based on the predicted increase in obesity rates in

North Carolina, new cases of diabetes, heart disease, stroke, and cancer were estimated to

rise substantially. According to the association between the environment, physical

activity, and dietary intake among African Americans, there is a need to address the

psycho-behavioral factors that present barriers to meeting the guidelines for fruit,

vegetable, total fat, and saturated fat intake (Casagrande et al., 2009). From a psycho-

social perspective, it was imperative to understand why African Americans make certain

food preferences that are different from their European American and Hispanic American counterparts. Understanding the cultural and ethnic differences was imperative in appreciating the origin of the problem that lead to increased BMI levels in African American women residing in North Carolina where the BMI levels are 13th highest in the United States (Hoban, 2012). Siahpush et al. (2013) questioned why African American women have a higher BMI compared to their European American counterparts and found that lifestyle factors and socioeconomic variables promote the inequality that exists between the two races. Sex and racial differences in the perception of body weight also contribute to the psycho-behavioral influence among African Americans and Hispanic women (Paeratakul et al., 2002).

Food insecurity is a broad definition for food deprivation. Insecurity influences weight gain as food cost becomes the most predictable factor of dietary choices making healthy eating habits challenging for those in the low-income brackets (Morland, Wing, Diez Roux, & Poole, 2002). For example, Morland et al. (2002) found that neighborhoods with a lower socioeconomic status had three times more places to consume alcoholic beverages compared to the wealthy areas. In addition, the locations of food service areas are associated with the racial makeup of neighborhoods (Morland et al., 2002). Moreover, fewer households in low-income and predominately African American neighborhoods have access to private transportation, which suggests that these neighborhoods experience greater difficulty in obtaining healthy food as they are disadvantaged by the food availability within their respective neighborhoods (Morland et al., 2002). Kaiser et al. (2004) found that, in a sample of low-income Latino women, food

insecurity was associated with a higher prevalence of obesity. African American women living in North Carolina may be influenced by food insecurity and the environmental influences that promote obesity due to the inaccessibility to healthy food options. Understanding the determinants of obesity is crucial for informing and developing effective prevention efforts that should be based on the scientific understanding of the multiple risk factors of obesity (Lee et al., 2013). Siahpust et al. (2013) emphasized the need to conduct research on the effect of psycho-social correlates of obesity and the effect of race differences in BMI of obesogenic factors, such as availability of healthy foods and access to physical activity. In addition, psycho-behavioral (i.e., dietary intake, alcohol consumption, physical activity, and depression) appear to influence obesity. However, further research is warranted to better understand the relationship and possible level of influence of these correlates in order to develop community prevention and treatment programs that could assist in reducing the overweight and obesity rate in North Carolina.

Nature of the Study

The nature of this study was a quantitative, cross-sectional approach and was based on identifying the psycho-social and psycho-behavioral factors from secondary data, which may be associated with BMI levels in African American women living in North Carolina. Secondary data obtained from the BRFSS were used to quantitatively identify these factors between African American women living in North Carolina and their European American and Hispanic American counterparts.

Research Questions

The following research questions guided this study:

1.   What association do psycho-social factors (i.e., income level and numbers in house hold) have on BMI levels between African American, Hispanic American, and European American women living in North Carolina?

$H_0$1: Psycho-social factors (i.e., income levels and household numbers) do not influence BMI levels between African American, Hispanic American, and European American women living in North Carolina.

$H_1$1: Identified psycho-social factors (i.e., income level and house hold numbers) influence BMI levels between African American, Hispanic American, and European American women living in North Carolina?

2.   What association do psycho-behavioral factors (i.e., dietary intake, alcohol intake, and physical activity and depression) have on BMI levels in African American, Hispanic American, and European American women living in North Carolina?

$H_0$2: Psycho-behavioral factors (i.e., dietary intake, alcohol intake, physical activity, and depression) do not influence BMI levels in African American, Hispanic American, and European American women living in North Carolina.

$H_1$2: Psycho-behavioral factors (i.e., dietary intake, alcohol intake, physical activity, and depression) do influence BMI levels in African American, Hispanic American, and European American women living in North Carolina.

3.   Is there a difference between African American, Hispanic American, and European American women living in North Carolina with the psycho-behavioral (i.e., dietary intake, alcohol intake, physical activity, and depression) factors?

$H_0$3: There is no difference between African American, Hispanic American, and European American women living in the North Carolina with the psycho-behavioral (i.e., dietary intake, alcohol intake, physical activity, and depression) factors.

$H_1$3: There is a difference between African American, Hispanic American, and European American women living in the North Carolina with psycho-behavioral (i.e., dietary intake, alcohol intake, physical activity, and depression) factors.

4.   Is there a difference between African American, Hispanic American, and European American women living in the North Carolina with the psycho-social (i.e., income level, ethnicity, and household numbers) factors?

$H_0$4: There is no difference between African American, Hispanic American, and European American women living in the North Carolina with the psycho-social (i.e., income level and household numbers) factors.

$H_1$4: There is a difference between African American, Hispanic American, and European American women living in the North Carolina with the psycho-social (i.e., income level and household numbers) factors.

Theoretical Framework

The ecological model of obesity, described as multilevel took the multi-structural components into consideration. The ecological approach includes interrelationships

among the influencing factors to better understand how psycho-social (i.e., income level, household size) and psycho-behavioral (i.e., dietary intake, alcohol intake, physical activity, and depression) factors contribute to an increase in BMI levels (Affenito, Franko, Striegel-Moore, & Thompson, 2012). The etiology of obesity is multifaceted and requires an in-depth analysis based on the multiple contexts and interactions between factors that are not yet well understood (Affenito et al., 2012). The psychosocial hypothesis based on increasing levels of BMI is associated with the concept that the social environment has the capability to generate adverse reactions and that repeated exposure to these factors has a cumulative impact on the individual (Heraclides, Chandola, Witte, & Brunner, 2012).

Definition of Terms

Behavioral Risk Factor Surveillance System (BRFSS): A health survey that investigates at behavioral risk factors and is conducted by the Centers for Disease Control and Prevention through individual state health departments. This survey is administered by telephone contact.

Obesity: Having a BMI over 30 kg/respectively (Hoban, 2012).

Psycho-behavioral factors: The interaction between the individuals perception of the way in which they respond to external influences, suggesting that there are aspects of behavior that are based on psychological causes. Psycho-behavioral determinants affect lifestyle, eating behavior, and physical activity (Hainer et al., 2008).

Psycho-social factors: The interaction between individuals as social beings living in society or a community that is divided in to classes based on the individual's income or social status, house hold size, and the individual's mind (Grant, 2013).

Assumptions

The following assumptions were made in this study: There were enough valid and reliable publicly available documentation and data to provide meaningful conclusions. Methodological assumptions were based on a quantitative assessment that was objective and was used to examine the associations between psycho-social and psych-behavioral factors that influence obesity. Theoretical assumptions made were based on the review of literature, which confirmed the relationship between socioeconomic factors such as income and the environment. Obesity was viewed as a modifiable factor, and individual accountability should be targeted while others promote behavioral change based on their view that many individuals may not perceive themselves as obese and as such require in-depth education and counseling. Several competing theories and assumptions exist. Flegal, Carroll, Kit, and Ogden (2012) found that obesity was prevalent primarily because of the obesogenic environment in which people are born. Acheampong and Haldeman (2013) found that nutrition knowledge is lacking or inadequate in individuals of lower socioeconomic status, especially minorities. Interventions should take into consideration cultural factors, such as the consumption of ethnic foods in tailoring efforts, to change behavior (Acheampong & Haldeman 2013). Grant (2013) questioned whether race predisposes an individual to obesity.

Limitations

The main limitation of this study was that the BRFSS is based on self-reported data, which may be subject to recall bias. The data collected were based on the 2013 questionnaires. The main limitation was that raking, also known as the iterative proportional fitting (a technique in which the survey data are weighted and are made more comparable to the characteristics of the target population) was not conducted. Raking improves the representativeness of states' estimates by including socioeconomic factors such as education and marital status in the final survey weights. The cross-sectional design of this study was carried out over a short period of time to provide an estimate of the prevalence of an outcome of interest, in this case obesity. It was limited because it were carried out at one point in time and provided no indication of the sequence of events that either preceded it or succeeded it. Associations between exposure to risk factors and the outcome of interest are valuable in generating a hypothesis for future research; however, it was not possible to infer causality (Levin, 2006). These associations between exposure to risk factors and the outcome of interest presented a prevalence incidence bias known as the Neyman bias, existing in the case of longer lasting diseases, as the risk factors that resulted in death was underrepresented among those with the disease (Levin, 2006).

The statistical significance of a result is the probability that the observed relationship between variables in the survey using telephones to access information occurred by pure chance from the population from which the sample was drawn or no

such relationship exists. A stronger relationship between variable, therefore, is more significant.

Delimitations

Only publicly available documents, including peer-reviewed studies and gray literature documents, were used as sources for analysis. Only English language documents were included. The data source was procured from BRFSS, and the source provided an average of 3 years of data for years 2010 to 2013. A sample size of 800 had been determined to provide the best indication of the relationship between the factors that promoted an increase in BMI levels in African American women living in North Carolina.

Significance of the Study

In keeping with the Healthy People (2020) objectives for increasing the quality of life and years of healthy life and eliminating health disparities (United States Department of Health and Human Services, (USDHHS) 2000), this study may contribute to the reduction of the number of people who are obese in North Carolina and increase the proportion of adults who engage in regular, moderate physical activity. From a socioecological perspective, the potential for behavioral change within population groups such as African American women residing in North Carolina is needed to provide an understanding of the interrelations among diverse personal and environmental factors in human health and illness (Sira & Pawlak 2010). This study represents scientific benefits for African American women living in North Carolina thereby impacting this group in a

positive way. Social change takes the form of contributing to the development of preventative measures and programs that target successful intervention and treatment.

Summary

As the prevalence of obesity continues to increase disproportionately among African American women in North Carolina, with an estimated rate of obesity of 50% among African Americans compared to their European American counterparts with a rate of 30%, the psycho-social and psycho-behavioral factors associated with obesity requires greater research. The influences (such as the sociocultural beliefs, unhealthy eating practices, lack of physical activity, and socioeconomic factors and attitudes that promote obesity) require further investigation. Based on the data from the State Health Department, physical inactivity remains high in North Carolina with the potential of obesity rates in North Carolina increasing to 58% by 2030 (as cited in Gustafson et al., 2011). *Healthy People* (2020) and the Institute of Medicine have identified public parks and recreational facilities, such as trials and bikeways, as being associated with greater physical activity. Access to food stores that stock fresh fruits and vegetables presents a barrier to healthy eating among lower-income African American women (Gustafson et al., 2011). It was, therefore, imperative that an integrative study be conducted in assessing the factors that promote obesity in a culturally sensitive and ethnically relevant method in North Carolina. Assessing and understanding the different racial perspectives that influence weight is essential in gaining an appreciation of the psycho-social and psycho-behavioral aspects that contribute to weight gain to develop prevention and treatment programs for African American women residing in North Carolina.

An in-depth review of the literature providing a synopsis from various journals and investigators on the subject of obesity and BMI is addressed in Chapter 2, as well as how these factors and the variables being investigated promote obesity in African American women living in North Carolina.

Chapter 2: Literature Review

Introduction

Obesity is a risk factor for a variety of chronic conditions including diabetes, hypertension, high cholesterol, stroke, heart disease, certain cancers, and arthritis. Agarwal (2012) confirmed that obesity is preventable and that obesity in African Americans resulted in much higher rates of obesity-associated diseases. An estimated four out of five African American women are either overweight or obese (Agarwal, 2012). Psycho-social factors, such as cultural acceptance, play a role in the justification of weight increase in African American women with the acceptance of larger hips and body sizes as compared to European American women (Agarwal, 2012). Dietary patterns of African Americans are not conducive to health promotion and are not consistent with current dietary recommendations. High calorie and low nutrient dense foods are highly palatable and less expensive, as the income of African American women influences their choices (Agarwal, 2012).

From a psycho-behavioral perspective, economic stress is an indicator for obesity in minority women. African American women are 10 times more likely to be living in poverty than European American women (Torres and Nowson, 2007). A lower socioeconomic status (compounded with racism) raises stress, which contributes to the metabolic syndrome and its associated obesity (Torres and Nowson, 2007). Torres and Nowson (2007) suggested that chronic life stressors may be causally linked to weight gain, as stress-induced eating may be a factor that contributes to the development of obesity. Everson, Maty, Lynch, and Kaplan (2002) further noted that individuals of lower

socioeconomic status suffer a disproportionate share of the burden and consequences of numerous diseases, relative to those who are of higher social economic status. Everson et al. (2002) found that there is a response relationship between SES and health status. Factors ranging from limited availability of affordable and nutritious foods to threatening neighborhoods to the greater stress that accompanies the economic uncertainties faced by low SES individuals may also contribute to the greater prevalence of higher alcohol consumption, poorer diets, and more sedentary lifestyles (Everson et al., 2002). In addition, African Americans find it difficult to lose weight and to engage in physical activity and are also less likely to engage in high levels of activity during leisure time as they tend to be engaged in work that requires long hours but low pay (Agarwal, 2012). The impact of these psycho-social factors may lead to social withdrawal and depression, driving them to use food as emotional comfort (Agarwal, 2012).

Obesity is the second leading cause of preventable death and has been linked to increased rates of cardiovascular disease, diabetes, and certain forms of cancer (Siahpush et al., 2013). Marked inequalities have been reported in BMI across socioeconomic groups; in particular, it has been observed that the BMI of African American women are higher than that of non-Hispanic, European American women (Agarwal, 2012). In 2009-2010, the prevalence of age-adjusted overweight and obesity (i.e., BMI>=25kg/m^2) for females aged 20 years or older was 82.1% while among African American women alone it was 59.5% (Siahpush et al., 2013). Gaining an in-depth appreciation of the basis of this inequality may provide some direction toward appropriate interventions to reduce obesity. Siahpush et al. (2013) stated that studies have not been conducted to ascertain the

role of social and behavioral factors in explaining the differences perceived between the BMI levels of African American women and their European American counterparts. Future researchers should address the contribution of other predictors of BMI (Siahpush et al., 2013). The effect of psychosocial correlates of obesity such as (income level and household size) psycho-behavioral influencers (such as dietary intake, alcohol intake, physical activity, and depression) need to be investigated.

Individuals of color have a higher prevalence of physical inactivity. African American women and Hispanic American women have a higher prevalence of physical inactivity compared to their male counterparts (Lee et al., 2011). Lee et al. (2011) revealed that 41% of African American women and 45.7 % of Hispanic American women are inactive compared to 23% of African American men and 29% of Hispanic American men. Several gaps exist in the literature regarding the assessment and the understanding of social and behavioral aspects that may contribute to successful interventions. The higher prevalence of physical inactivity among women in the minority groups, compounded with poor dietary habits, contributes to the health disparities that exist among populations of color, particularly women. The lack of understanding of individual level factors, such as weight status and ethnicity, may contribute to measurement inconsistencies and may hamper reliability and validity (Lee et al., 2011). Boggs et al. (2011) endorsed the prevalence of disparities by age, sex, and race-ethnicity with an increase in BMI being the highest among African American women; 50% of African American women are obese (i.e., BMI $\geq$30) as of 2007-2008. The health burden of obesity is severe among African American women.

The rates of obesity among people in the United States 20 years or older was more than twice as high as the 15% rate set by the Health People 2010 objective for obesity prevalence, confirming that 66% of African American women with a BMI of 24 to 25 kg/m2 in in their third decade of life were obese by the ages 35 to 37 years (Sira & Pawlak, 2010). Sira and Pawlak (2010) further confirmed that North Carolina had the 17th highest rate of obesity in the nation. According to the 2007 BRFSS report, in North Carolina 50% of individuals aged 18-24 years and 74.7% of adults aged 55-64 years had a BMI >25 kg/m2 (Centers for Disease Control and Prevention [CDC], 2010),. Moreover, African American women are less concerned about weight, body shape, dieting, or being thin. In fact, African American women and Hispanic American women consider larger body sizes as ideal and, consequently, report greater body satisfaction (Sira & Pawlak, 2010). Further research is needed to ascertain the reasons that these differences exist in order to establish goals for proactive measures to prevent a further increase in obesity among these women.

Literature Research Strategy

A number of articles related to obesity in African American women were obtained using Google Scholar, PUBMED, and the Walden University online library. A Boolean search was conducted using terms like *psycho-social*, *psycho-behavioral*, *obesity*, *socioeconomic factors*, *income*, *depression*, *dietary intake*, *African American women*, *North Carolina*, and *built environment*. Journals that were found to be the most applicable and related to the study articles were *Obesity Research, Nature, Journal of the American Medical Association, New England Journal of Medicine,* and *American*

Journal of Clinical Nutrition. Articles reviewed were those that were published within

the past 5 years. Certain articles provided deeper appreciation that was published 10 to 15

years ago were included to confirm the historic depth of the problem being studied.

Theoretical Framework

According to human ecological theory (Borgerhoff, Mulder, & Schacht, 2012),

individuals nested within families and other contexts, such as sociocultural environment,

constitute the characteristics of the population's values, attitudes, lifestyle, and

relationships. Humans built environments such as the sidewalks and food stores as well

as the natural physical-biological environment such as land and water. Individuals and

families, and the communities, in which they live as part of the system they are

interrelated, influence each other. Multiple changes at various system levels have resulted

in higher BMI levels in African American women living in North Carolina. The

ecological approach reflects the interrelationships among the factors that influence a

better understanding and measurement of the psychosocial and psycho-behavioral factors

that negatively influence weight and BMI levels in African American women living in

North Carolina.

Overview of Obesity in the United States

Obesity in African American women living in North Carolina represents a

multifactorial problem requiring a multilevel research approach that targets the

underlying causes. Although energy consumption and expenditure denotes the essential

energy balance equation, obesity is the medical manifestation of a complex interplay of

biological and social factors between the individual and the environment (Huang & Glass

2008). Within populations, interaction between the environment and the individual varies; the existing environment within a state (defined as the built environment, its transport system and recreational opportunities, and its food and culture) can moderate or modulate the effects of the factors that promote obesity or the BMI of the individual. These effects can explain the differences in the prevalence of obesity between populations. These drivers take the form of income and the size of the individual's household which are impacted by the socioeconomic determinants of food choices, physical activity, and body size perception. To appropriately evaluate the reason for the high prevalence of obesity in African American women living in North Carolina, an in-depth understanding of the changing sociocultural determinants of food choices and physical exercise needs to be assessed (Swinburn et al., 2011).

North Carolina is much more rural than the national average (see Appendix A). Twenty two counties are 100% rural and 25 counties are 67 to 99% rural while 20 counties are 51 to 66 % rural (Greder et al., 2014). The high percentage of individuals living in rural North Carolina is a factor that requires consideration because, geographically, the counties with the highest rates of poverty are located in the coastal plain and the mountains, which are almost entirely rural (Greder et al., 2014). Individuals living in rural communities are likely to earn much less than their urban counterparts. The per capita income for rural counties is $17,579 compared to $23,162 for urban counties (Greder et al., 2014). Minorities in the rural communities are more likely to live in poverty than European Americans (Greder et al., 2014). The poverty rate for female-headed households was higher in rural counties than in urban counties (Greder et al.,

2014). Rural areas are those in which the population density is lower than the typical

setting and in which access to basic health care services may require traveling great

distances (Greder et al., 2014).

Rural areas have a unique cultural background and heritage that can impact health

behaviors and outcomes, which is why it is imperative to consider the psychosocial and

psycho-behavioral factors that promote obesity in African American women living in

North Carolina. Rural areas have some of the highest rates of poverty and unemployment

that directly impact the health of their population (Greder et al., 2014). There are also

many health-related psycho-behavioral norms that impact individuals living in rural areas

as they are more likely to consume alcohol and not engage in physical activities such as

sports.

Obesity Trends

Trends in the rise in BMI in the United States have been established in studies,

and the propensity towards the increase in BMI levels continues to exceed 30% in most

age groups (Flegal et al., 2012). There has been an increase in the prevalence of obesity

among African American women and Hispanic American women primarily (Flegal et al.,

2012). From 2011 to 2012, the prevalence of obesity in the United States was 16.9% in

children and 34.9% in adults (Greder et al., 2014). During these years the prevalence of

obesity increased in women over the age of 60 years from 31.5% to more than 38%

(Ogden, Carroll, Kit, & Flegal, 2014). Yanovski and Yanovski, (2011) found that obesity

rates in the United States continue to rise. The 2009 BRFSS noted increases in the

reported prevalence of obesity among adults between 2007 and 2009. An increase in the

prevalence of obesity of 1.1% nationally, or an additional increase in prevalence of 2.4 million adults, was observed (Yanovski & Yanovski, 2011). These trends have led investigators to project that by 2030, 42% of people in the United States may be overweight or have a BMI above 25 kg/m2 (Slack, Myers, Martin, & Heymsfield, 2014)

Masters, Powers, and Link (2013) confirmed the widespread existence of a massive epidemic of obesity across the United States. Concern over the epidemic is further spurred by evidence of links between obesity and disability and between obesity and life-threatening diseases, such as diabetes, heart disease, stroke, and multiple forms of cancer (Masters et al., 2013). Every year, an estimated 300,000 adults in the United States die due to obesity-related causes generating exorbitant health care cost (Masters et al., 2013). Since 1991, the number of individuals who are obese has increased by 74% (Mokdad et al., 2003). This prevalence represents 21.4 million obese men and 22.9 million obese women while the percentage of adults with a BMI of 40 (kg/m2) or higher amounts to 2.3% (Mokdad et al., 2003).

The 2005 BRFSS data (CDC, 2005) illustrated differences in the prevalence of obesity across states with several states in the southeastern region of the United States having a higher prevalence rate than states on the West Coast or in the Midwest. Only four states (Colorado, Hawaii, Vermont, and Connecticut) had obesity prevalence rates less than 20% while 17 states had prevalence rates of 25 % or higher (Braveman, Cubbin, Egerter, Williams, & Pamuk, 2010). Several differences exist between North Carolina and Colorado that may explain the differences in rates of obesity and levels of BMI, namely, cultural and regional tastes and food preparation practices. Based on the data

provided by the BRFSS, in 2009, all states portrayed a high prevalence of obesity among adults, and although the prevalence varied geographically, no state met the *Healthy People 2010* target of 15% (Braveman et al., 2010). A total of nine states confirmed an increase in levels of BMI, from having levels of BMI≥30 (CDC, 2010). Colorado had the highest income level and the lowest percent of people below poverty, low unemployment rates, and the lowest percent of people receiving public assistance; these results were significantly different from the southern states (Akil & Ahmad, 2011).

Neighborhood SES contributes to obesity in several ways. Lower SES neighborhoods may have fewer food stores that offer healthy calories and may also hold limited opportunities for safe, low-cost physical activity. African American and Hispanic American neighborhoods have 50% to 70 % fewer chain supermarkets than European Amercian neighborhoods (Coogan et al., 2010). The availability of supermarkets has been associated with healthier diets, higher vegetable and fruit consumption, and lower rates of obesity (Coogan et al., 2010). In addition, minority population groups have less access to physical activity facilities associated with decreased physical activity and increased overweight. Higher rates of obesity have been found among the lowest income and least educated groups, particularly among women of certain ethnic groups (Coogan et al., 2010). The association between hunger and obesity may be explained by the relatively low cost of energy-dense foods and the high palatability of sweets and fats associated with higher energy intake (Coogan et al., 2010). Healthier foods are generally more expensive and less readily available in poorer communities (Coogan et al., 2010).

Ethnicity and Obesity

Minorities, particularly African Americans and Hispanic Americans have the highest incidence of obesity. African American women living in disadvantaged neighborhoods portray greater weight gain and are more likely to develop obesity (Coogan et al., 2010). According to Ries et al. (2014), 34.9% of non-Hispanic European Americans, 49.6% of non-Hispanic African Americans, 37.9% of Hispanic Americans, and 39.6% of Mexican Americans are obese with 58.6% of non-Hispanic African American women at the highest level of obesity (Ries et al., 2014). An additional factor that contributes to obesity is residential segregation, which refers to the uneven distribution in residential segregation of African Americans and European Americans. Nationwide, 60% to 70% of African Americans reside in mostly African American neighborhoods and are three times more likely to lack access to recreational facilities than neighborhoods with primarily European Americans (Ries et al., 2014). In addition, segregated African American neighborhoods contain 2-4 times more fast food outlets and convenience stores and three times fewer supermarkets that sell fresh produce (Corral et al., 2011). These neighborhood features contribute to health behaviors and health statuses promoting health disparities among African Americans.

African Americans have the worst health profile compared to their European Americans counterparts, while Asian Americans have the fewest health problems. Disparities in health status have been well-documented confirming that African Americans, Hispanic Americans, and Native Americans do not have the same access to health care and information as their European American counterparts (Corral et al.,

2011). Health is not equally enjoyed by all people in the United States. Poor health status

in the United States is associated with poverty, low educational attainment, and

socioeconomic status. Every person in the United States has a unique food culture

suggesting a particular way of selecting, preparing, and consuming food. Individuals use

food symbolically due to relationship, association, or convention. Culture is defined as

the values, beliefs, attitudes, and practices accepted by members of a group or community

(Kittler, Sucher, & Nahikian-Nelms, 2011). Culture is learned not inherited but passed

from generation to generation (Kittler, Sucher, & Nahikian-Nelms, 2011).

Childbearing is associated with permanent weight gain in some women, but the

relationship differs with BMI levels, number of births, and race and ethnicity. The

prevalence of overweight and obesity in Hispanic American and African American

women approaches 70% (Abrams, Heggeseth, Rehkopf, & Davis, 2013). Childbearing

has been associated with increased BMI over 10 years in women already overweight

(Abrams et al., 2013). BMI increases after child bearing, and this is a concern because

this increase in adiposity contributes to adverse outcomes in subsequent pregnancies

(Abrams et al., 2013).

As large health disparities continue to exist across racial and ethnic as well as

socioeconomic status groups in regards to obesity and various chronic diseases; a good

understanding of the determinants is imperative in addressing the needs of the African

American women living in North Carolina. Very few studies have explored race-specific

trends in overweight and obese African American women according to the levels of

educational attainment overtime. In an analysis conducted by Jackson et al. (2013) the

findings revealed that African American women had a consistently higher BMI level.

Educational attainment may specifically influence racial/ethnic disparities in overweight

and obese trends as it has been shown to shape an individual's SES and access to

resources (e.g., grocery stores and fresh produce) and opportunities (e.g., sidewalks for

physical activity) (Jackson et al., 2013).

Obesity in North Carolina

To the best of my knowledge, there is no data or literature that targets the direct

reasons for obesity in North Carolina or qualifies the degree and nature of the obesity

epidemic in North Carolina which makes this study, an original one. However there is

evidence that suggests that the southern states of the United States have been described as

the "stroke belt" (Jilcott et al., 2010). The states that have been included as part of this

definition are Alabama, Arkansas, Georgia, Indiana, Kentucky, Louisiana, Mississippi,

North Carolina, South Carolina, Tennessee, and Virginia. Strongly affected by

behavioral, cultural and environmental factors; the adult obesity prevalence in North

Carolina is 29.6 % in what year up from 24.0% in 2003. Based on current trajectories, by

2030 the obesity rate in North Carolina could reach 58.0 %. Two-thirds of all adults

(65.7%) in North Carolina are overweight or obese (Jilcott et al., 2010). In 2007, 64.6%

of adults in North Carolina were overweight or obese. Satia, Galanko and Siega-Riz

(2004) confirmed that American adults have experienced a 50% rise in the prevalence of

overweight and obesity from 24.4% during 1976 and 35.2% during the years 1988 to

1994. They found that the prevalence of obesity was higher among African Americans

compared to the general U. S. population. They also found that African Americans lag

behind other Americans in modifying their diets and activity levels in line with national recommendations. As such their findings revealed that 69% of African American women and 58% of African American men are either overweight or obese. African Americans have a greater potential for weight related conditions, such as diabetes, cardiovascular disease, and some forms of cancer (Satia et al., 2004).

North Carolina has an increasingly diverse population and a large group of African Americans which accounts for 25% of the population. Hispanics now comprise 10% and about 1% of North Carolinians are Native Americans. While the life expectancy for European Americans is 76.8 years the life expectancy for minorities is 72 years. In 2005, North Carolina had the eighth highest African American populations in the nation. African Americans in the state were considered more likely than whites to be obese, to have high blood pressure, to be physically inactive, and to have inadequate fruit and vegetable consumption (Satia et al., 2004).   Thirty eight percent of Native Americans and Alaskan Natives were reported as being obese. Many of the poor health outcomes for this population are related to the fact that they have one of the highest poverty rates (27%) of any racial group and a high rate of uninsured individuals (29.8%). In 2007, 56 % of North Carolina residents did not meet the recommendation for physical activity. North Carolina's obesity rate for 45-to 64-year-olds is 34.7% and the obesity rate for seniors (65+ years old) in North Carolina is 26.2 %. (Satia et al., 2004). Satia et al. (2004) found that a large number of African Americans residing in North Carolina ate at fast-food restaurants with a number of environmental factors encouraging over consumption, including the easy availability inexpensive energy-dense foods and the

large portion sizes of these foods. Eating at fast food restaurants clearly results in dietary patterns that increases the risk of obesity as a positive association of frequency of restaurant food consumption with total energy intake, percentage energy from fat, BMI and body fatness have been reported (Satia et al., 2004). Furthermore, Ries et al. (2014) found that the prevalence of obesity was highest among women living in the rural areas. In their study which involved a sample of low-income, rural women, the researchers found that more research was required to gain an understanding of the unique factors; individual, social and environmental factors that may have a unique impact on this group of women. Hence, this research may uniquely contribute to the body of literature by identifying the specific factors that contribute to the increase in obesity in African American women living in North Carolina.

Psycho-Social Factors and Obesity

The multiple risk factors associated with obesity in African American women include income, race, single-parent households and low education. Obesity has a sociocultural distribution, and varies based on the individual's culture and his or her socioeconomic position, which are complex and specific to age, sex, and ethnicity (O'Neil et al., 2010). This distribution also includes the type of society and the patterns of relationships observed and the physical environment. Wang and Chen (2011) found that disparities in obesity in the United States were not due to the individual but rather were influenced by the psychosocial differences and the environment.

Food Insecurity & Obesity

Food insecurity due to lack of income and other resources may hinder the individual's ability to maintain consistent access to nutritious foods. Low income, ethnic minorities and female-headed households exhibit the greatest risk for food insecurity which often results in a higher prevalence of diet-related diseases (Franklin et al., 2012). Numerous terms have been adopted to identify food insecurity, including food hardship, food insufficiency and hunger. Food insecurity also implies limited or uncertain availability of nutritionally adequate safe food for consumption (Franklin et al., 2012). Based on federal guidelines poverty rates for a family of four is estimated at or below $23,850 (Appendix Two). Low-income, single-headed female households, minority races, lower education levels with three or more children have been associated with this form of hardship. An individual with low-education (i.e., not having completed high school) is more likely to be food insecure and has been shown to have a greater association with a significantly higher BMI and a larger incidence of obesity (Franklin et al., 2012). Women with all levels of food insecurity were significantly associated with a higher BMI and overweight when compared to full food security (Franklin et al., 2012). Income has a direct impact on obesity as individuals are forced to prioritize purchases based on their salaries or wages.

Pan et al. (2012) established that obesity and food insecurity are both public health concerns that have influences on the individual and the environment. In 2009, approximately one in seven US households experienced food insecurity (Wang & Chen, 2009). Food insecure adults were more likely to have low nutrient intake, hypertension,

diabetes, depression and other mental health problems, both food insecurity and obesity

affect health, and factors are determined not only by behavior, physiology, or genetics but

also a range of social and environmental factors (Pan et al., 2012). Food insecure adults

may rely on low cost, high-energy foods, which can lead to overconsumption of energy

resulting in obesity (Pan et al., 2012). To successfully manage their households women

may adopt a variety of strategies including buying in bulk, shopping at different outlets to

get the best prices or using coupons. Other strategies include mothers skipping meals,

waiting to eat later in the day or eating less to spare their children from hunger and

nutritional deprivation (Martin & Lippert, 2012). Food insecurity based on household

size and the ability to manage the household may increase the risks of overweight and

obesity for mothers. The combined risks of childcare and household food insecurity are

particularly problematic for single mothers; there is an important cultural dimension as

well (Martin & Lippert, 2012).These are contributing factors that may influence the level

of obesity in African American women living in North Carolina.

Income and Obesity

According to Drewnowski (2003) there was an inverse relationship between

income and energy density (i.e., economic constraints are reflected in the choice of low

cost energy dense diets). Food insecurity may be caused by low levels of income or

inaccessibility to good food stores. Food deserts; neighborhoods with limited food stores,

presented another source or bases of elevated BMI levels. Zhang, Camhi, Shi and

Hayman, (2013) examined how the quality of diets affects obesity and found that income

and education were contributing factors. The investigators found that an association

existed between income, education and the quality of diet. The potential for obesity was greatly increased by the evidence of low income and education (Zhang, Camhi, Shi, & Hayman, 2013). The prevalence of obesity has increased in the United States from 15% to 34% among children and from 5% to 17% among adolescents. Differences in obesity have prevailed and have been persistent over time within various categories to family income with African American females having a higher prevalence of obesity than their European American counterparts (Freedman, 2011). These changes in obesity have been the result of the interaction of biologic, social and cultural factors including an environment characterized by limited opportunities for physical activity and an abundance of high-calorie foods. Substantial increases in the availability of processed and high calorie foods and in the number of meals eaten away from home have occurred during the 1980s and 1990s (Freedman, 2011).

Low income and minority populations are frequently at high risk for low physical activity and poor diet due to limited resources to purchase healthy foods and to engage in safe exercise. The environment of urban, low-income African-American women may not be conducive to maintaining activity levels or eating a healthy diet. In addition, overall consumption of foods away from home in the US has increased to the point that it accounts for 77% of sales, and has become increasingly central to the American diet (Groth & Morrison-Beedy, 2013).

Diet and Obesity

Although the diets of the vast majority of Americans have been poor compared to the recommendations, studies have shown that some subgroups are doing worse than

others, with the highest rates of adherence to food group recommendations among those in the highest income levels compared to the lowest and middle income groups (Kirkpatrick, Dodd, Reedy, & Krebs-Smith, 2012). In the context of the obesity epidemic and from the perspective of meeting nutrient needs and maintaining energy balance, a majority of the population in the United States but more so individuals of lower-income do not consume the recommended percentage of whole grains and dark green vegetables (Kirkpatrick, Dodd, Reedy, & Krebs-Smith, 2012). Wang and Chen (2011) demonstrated African Americans with higher BMI levels had low Healthy Eating Index (HEI) scores. The HEI is a measure of diet quality in terms of conformance to federal dietary guidelines. The HEI is used to monitor the quality of American diets and to examine the relationships between diet and health-related outcomes and between diet cost and diet quality (Guenther et al., 2013).

Most of the options available in retail outlets, restaurants, schools, worksites and health care facilities tend to offer high energy-dense packaged and processed foods (Kirkpatrick et al., 2012). At the neighborhood level the greater availability of less healthy choices and the restricted availability of nutrient dense foods (such as fruits and vegetables, whole grains and low-fat milk products and lean meats) require attention as this appears to be a problem in the minority and low income areas (Kirkpatrick et al., 2012). Healthier foods may be more expensive than less healthy items (Krukowski, West, Harvey-Berino, & Prewitt, 2010). A positive correlation was viewed between lower incomes and the likelihood of being overweight or obese, among women and food insecurity was highly correlated with poverty and occurred when a household faced

budgetary constraints that limited the quantity or quality of food that could be purchased (Martin & Lippert, 2012).

While obesity has a range of causes from genetic to environmental, the environment was perceived as a key influence in the rapid development of obesity. Increased portions size, consumption of high caloric foods that are inexpensive and processed, has been influenced by the growth of the food industry. Fast food is notably high in fat content and the researchers have found that an association exists between fast food intake and increased BMI. (Block, Scribner & DeSalvo, 2004). Fast food restaurants are geographically associated with predominately black and low-income neighborhoods, and fast food consumption has been associated with obesity. This relationship is strongest among low-income individuals. African Americans in low-income neighborhoods have increased exposure to fast food, evidence suggests that low-income and non-white individuals do consume more fast food and unhealthy food (Block, Scribner & DeSalvo, 2004), one explanation for these findings is that restaurants and stores adapt their selection to the food preferences of individuals living nearby (Block, Scribner & DeSalvo, 2004),

The growing availability of low-cost, calorie dense consumables from fast food restaurants is one of the factors implicated in the increase of BMI levels in the United States (Reitzel et al. 2014). Access to fast food restaurants is particularly relevant to the growing racial or ethnic disparities in BMI as have indicated a higher density of fast food restaurants among predominantly African American neighborhoods (Block, Scribner & DeSalvo, 2004, Reitzel et al., 2014).

Household Size and Ethnicity

Price is notably the most important factor when purchases are made by single family African American women (Martin & Lippert, 2012). Household size influences budgetary expenditure thereby influencing the choice of foods purchased. Individual dietary choices are primarily influenced by such considerations as taste, cost, convenience and nutritional value of foods. The current obesity epidemic has been linked to excessive consumption of added sugars and fat, as well as to sedentary lifestyles. Fat and sugar provide dietary energy at a very low cost. Individuals of lower socioeconomic status may place greater importance on perceived value, whereas those who are mainly concerned about health and nutrition may place greater importance on the nutritional quality of foods. As such food selection and purchase is based on income as well as the proportion of the income allocated to food purchase. This suggests that individuals of lower income are forced to purchase lower cost items which are frequently comprised of processed foods of lower nutritional value.

Food selection is highly associated with culture, and it is likely that the foods in the home differ in ethnically and socially distinct households (Martin & Lippert, 2012). The impact of household size on obesity has been established primarily in single income households with a low income and low SES as individuals earning a low income also have a lower level of education multiply (Martin & Lippert, 2012). Generally, individuals with a lower level of education tend to make poorer food choices since decisions are based on budgetary constraints such as paying bills (e.g., electricity, water and power bills) which are an imperative aspect of living while food choices are based on price not

nutritional value. Traditional discourses about family life and work exists suggesting that women are responsible for caring for their family members and managing household tasks. When children are present in the home these responsibilities multiply (Martin & Lippert, 2012).

As such single income families with a larger household size are forced to make choices that reflect their household budgets. This may involve purchasing cheaper quality foods that are not high in nutrition and protein content. North Carolina has the fifth highest rate of obesity among children; North Carolina also ranks fifth in the nation where food insecurity is concerned (Martin & Lippert, 2012). This attribute is further impacted by household size as it decreases the number of resources available to each member of the family. Household budgets are influenced by the number and size of the family as food purchases have to be designed based on the family's income. Cheaper food purchases to feed larger family forces individuals to buy less nutritious processed foods that are higher in fat and simple carbohydrates which promote weight gain.

Psycho-Behavioral Factors

The social, economic, and value systems that contribute to an individual's dietary intake, alcohol intake, physical activity and depression may be classified as the psycho-behavioral factors that impact obesity in African American women living in North Carolina. It can be inferred from the current trends in physical activity, that a decline in walking or cycling for transport has resulted in an increase in the number of individuals living in the suburbs and labor-saving devices have become commonplace in the household; specifically, dishwashers, electric garage door openers and television remote

controls reduce the amount of energy expended in domestic tasks (Ball & Crawford, 2010). Obesity is due in part due to low levels of physical activity which may be influenced by the built environment.

Physical activity may be classified into four domains to describe how people spend their time; leisure or recreational, transportation, occupation and household. Healthy People 2020 and the Institute of Medicine have identified public parks and recreation facilities as providing settings for diverse recreation activities for families (as cited in Sallis et al., 2012). Racial and ethnic minority and low socioeconomic status groups may be particularly sensitive to the built environment. Low socioeconomic status or high-minority neighborhoods appear to have less supportive environmental conditions for active transportation. Disadvantaged neighborhoods had poorer aesthetics and worse conditions related to traffic safety and crime safety (Sallis et al., 2012).

Depression leading to alcoholism has been viewed as one means by which individuals of low income deal with their environmental and socioeconomic condition. Psycho-behavioral correlates (i.e., dietary intake, alcohol consumption, physical activity and depression) appear to be influencers of obesity. Alcohol is a macronutrient with an energy density of 29kj per gram and an estimated average in take in most western countries constitutes 8-10% of total daily energy intake. Alcohol is also second to dietary fat in energy density. The regulation of appetite and energy balance is complex and the regulation of appetite and energy intake is fundamental to the control of energy balance and the maintenance of body weight. As such, alcohol may contribute to the development

and the maintenance of obesity in a number of ways including its high energy density, exertion of weak satiety signals and poor subsequent energy compensation.

Depression and Obesity

Numerous eating behaviors have been considered as variables that may influence the relationship between obesity and depression. According to Preiss, Brennan and Clarke (2013), dieting behavior was considered as a variable factor and it was found that it was significantly associated with obesity and depression symptoms. Overall, it was found that past and present dysfunctional eating behaviors appeared to consistently influence the obesity to depression relationship. Recent data indicates that the world wide prevalence of obesity more than doubled from 1980 to 2008, with 10% of men and 14% of women reported as being obese (Preiss, Brennan & Clarke, 2013). Eating is a highly reinforcing behavior that not only provides nutrients needed for survival but also induces feelings of gratification and pleasure. Feeding increases extracellular dopamine concentration in the nucleus of the cells, a process that is also believed to contribute to the reinforcing effect of euphoria similar to that of drugs (Wang et al., 2001).

Depression poses a similar public health problem as does obesity as it has become the leading cause of disability for both men and women. The prevalence of depression and its associated risk of poor health outcomes are elevated in an obese population and the overall elevated prevalence of depression in an obese population is concerning given the overall impairment to health and risk of chronic diseases associated with each of these disorders independently (Preiss, Brennan & Clarke, 2013). Consequently depression also negatively influences obesity and any treatment outcome. In a recent systematic review

and meta-analysis of longitudinal and cross sectional studies of obesity and depression, 80% of the studies suggest obesity is related to depression (Preiss et al., 2013). These results also highlight the bidirectional relationship between obesity and depression. Improved knowledge of the mechanisms underpinning this relationship and the conditions under which this relationship exists is imperative in understanding its complexity.

A broad range of biological, behavioral, cognitive and social factors are associated with obesity and its relationship with depression (Preiss et al., 2013). Three of these risk factors are; severity of obesity, gender and socioeconomic status. This model suggests that obesity leads to depression via the health and appearance pathway which includes constructs such as quality of life, physical activity, and experience of stigma, body image dissatisfaction and dieting behaviors. Depression leads to obesity via the direct physiological and indirect psychosocial pathways which include constructs such as elevated stress reaction, immunological dysfunction, hypothalamic-pituitary-adrenal axis, negative cognitions, eating dysregulation and poor adherence to treatment (Preiss et al., 2013). Further research is required to review the relationship of obesity with depression. The aim of the current review is to explore the relationship between the psychosocial variables associated with obesity and depression.

Longitudinal studies have established the existence of a relationship between obesity and depression with gender as a moderator. The findings revealed that depression significantly predicted waist-hip ratio especially in middle-aged females. A history of obesity was also found to be a significant moderating variable for depression. Finally,

alcohol was also found to be a mediator of the relationship between obesity and depression (Preiss et al., 2013). In addition, longitudinal studies have established the influence of ethnicity in the relationship between obesity and depression. Results of these studies also confirmed the existence of their relationship with ethnicity and gender; for instance, being African American and female increased the likelihood of depression and obesity. Moreover, it was confirmed that an association between lower income and the increased risk of obesity and depressive symptoms existed (Preiss et al., 2013).

Quality and frequency of interpersonal activities and relationships were also examined in several studies. The results of these studies concluded that distressing interpersonal interactions had a significant association across both genders while social activity was significantly associated with an increase in obesity (Preiss et al., 2013). Body image also contributed to depressive symptoms in obese women in several cross-sectional studies. Two of these studies considered body image dissatisfaction and found a relationship between obesity and depressive symptoms (Preiss et al., 2013). Severity of obesity was also constantly associated with depression as body image dissatisfaction is related to low self-esteem. The quality of social support an individual experiences mediates the depression to obesity relationship while individuals who are obese experience greater prejudice and discrimination, diminishing their access to social support and increasing their likelihood of experiencing depressive symptoms (Preiss et al., 2013).

In longitudinal studies conducted by Konttinen et al. (2013) the investigators found that obesity and depression were both prevalent conditions contributing to the

burden of disease worldwide, that depression was related to an increased risk of obesity and that a bidirectional model of depression and obesity was warranted. Depressive symptoms and obesity could be causally linked through direct physiological mechanisms such as those that were related to inflammation or stress responses as well as though indirect psychosocial and behavioral pathways with women in particular suffered from major depression or depressive symptoms and were more likely to experience increased appetite. Depressed women were viewed as being predisposed to obesity and vice versa. Depressive symptoms were also associated with less healthy dietary intake and a higher tendency for emotional eating and a decline in physical activity (Konttinen et al., 2013). Body dissatisfaction and lowered self-esteem resulting from stigma and prejudices against obese individuals are potential mechanisms through which excess body weight can lead to depressive symptoms. Women were viewed as being especially vulnerable in this respect with the ideal female body being characterized by slimness, leanness and low body weight while the norms concerning appropriate body shape and weight were less restrictive toward males (Konttinen et al., 2013).

Since depression and obesity conferred an increased risk for adverse health outcomes, the association between the two conditions deserved careful consideration (Preiss et al., 2013). Several plausible explanations for the association between depression and obesity exist. According to Pan et al. (2012) depression could be associated with poor health behaviors such as poor diet or overeating and physical inactivity or sleep disturbance which may increase the risk of obesity. Physical limitations may also be associated with weight gain and obesity. Depression was also

associated with a dysregulation of the hypothalamic-pituitary-adrenal axis which may be involved in the link between depression and obesity. In a recent Mendelian Randomization analysis of obesity and psychological analysis, it was found that fat mass and obesity associated FTO genotype were positively associated with obesity and common mental disorders and that long-term obesity was associated with the increased likelihood of symptoms of depression and anxiety (Pan et al., 2012).

Other plausible explanations for the association between obesity and future depression were based on the potential for stigmatization of individuals who were obese, causing them to suffer from lower self-esteem and negative images, and potentially leading to higher levels of depression (Pan et al., 2012). Results from a large, well-established, long-term cohort study conducted by Pan et al. (2012) confirmed that a bidirectional association existed between depression and obesity in middle-aged and elderly women. Given the fact that these elements are major risk factors for chronic diseases and premature death, findings of the study has major implications for public health. In related studies conducted by Xie et al. (2005) poor peer relationships were linked to a lack of perceived control, which in turn was known to increase depressive symptoms in individuals. In addition to peer influences, the social support available from family and peers was considered as being influential in the individual's coping with negative emotional experiences (Xie et al., 2005). Social network analyses revealed that overweight individuals were less central to their social networks and had fewer friendship ties than average weight individuals (Xie et al., 2005). This social marginalization may further reduce self-esteem and increase depressive symptoms among obese individuals.

The perception that others can and may provide necessary resources may attenuate the harm that is caused by the stigma of obesity. Being obese was related to negative effects on mental health and psychological functioning with this relationship being more pronounced in women (Xie et al., 2005). A possible explanation for the existence of gender differences may be that weight norms and body-shape beliefs differ between men and women (Xie et al., 2005). According to Xie et al. (2005) standards of slimness for women and men differ. Recent comparisons also suggest that women had a higher risk of eating disorders compared to men and this difference may be explained by the influence of peers, relatives, parent's media and other elements of the social environment and how the perceived availability of support from others ultimately affect the individual (Xie et al., 2005).

According to the report of the National Comorbidity Survey 46% of individuals in the United States have a lifetime history of mental disorders. It can be inferred from the growing body of evidence that obesity is associated with an increased risk of developing psychiatric disorders (Zhao, Ford, Dhingra, Strine & Mokdad, 2009). The investigators found that BMI was an independent predictor for depression and for developing mental disorders, and that women were more likely to develop depression if they were classified as obese. Their study confirmed that 17% to 53% of women who were obese were more likely to experience depression, a 20% to 60% likelihood of being depressed (Zhao et al., 2009). Moreover, Zhao et al. (2009) found that obese people are at a disadvantage in both their private and working lives as they have a lower socioeconomic status, enjoy less social support, have fewer peer relationships or opportunities for marriage, have lower

self-esteem and are more likely to be confronted with discrimination in gaining

acceptance to college, in finding employment opportunities or in achieving a promotion.

These factors may contribute to mood disorders or emotional stress, which may

accumulate over time and make the individuals more vulnerable to developing mental

disorders (Zhao et al., 2009).

In addition, obesity has been associated with multiple somatic conditions such as

hypertension, diabetes, dyslipidemia, joint problems or arthritis and the clusters of social

isolation may predispose people to impaired physical functioning and impaired health-

related quality of life which may also contribute to mental illness and depression. People

who are depressed are often more likely to overeat or have a binge-eating disorder and

are less likely to engage in physical activity of which contributes to weight gain. The use

of psychotropic medications such as antidepressants among people with depression may

also explain why these people gain weight and become obese as weight gain is a common

side effect of psychotropic mediations (Zhao et al., 2009).

Depression and Ethnicity

Major depression presents a disease for which African Americans have a lower

rate of illness but a prognosis that is considerably worse than European Americans.

National studies reveal that African Americans sustain a lower current and lifetime rates

of major depression than their European Americans counterparts however the cases of

depression among African Americans were more likely to be persistent, severe, disabling

and untreated (Williams, Mohammed, Leavell, & Collins, 2010). The data also revealed

that European Americans were more likely than African Americans to develop alcohol

dependence, however, once this dependence was established both African Americans and Hispanics were more likely than European Americans to persist in alcohol dependence. Studies have also revealed that some risk factors have a more adverse impact on African Americans than European Americans even when their overall levels are lower than or similar. This has been evident for alcohol consumption (Williams et al., 2010).

Psychological disorders, depression and stress can also influence appetite, can promote alcohol consumption and can stimulate an increase in obesity (Chakraborty, 2014). A meta-analysis conducted by Lorant et al. (2003) established that the prevalence, incidence, and persistence of major depression are higher in individuals with a low SES compared to individuals with a higher SES. Being unemployed or out of the labor force has also been associated with a higher risk of major depression. An association between low SES and the onset of depression has been observed based on the psychosocial determinants (Lorant et al., 2003). Appelhans et al. (2010) suggested that depression correlates with reduced physical activity due to greater fatigue and loss of energy. Wise, Adams-Campbell, Palmer, and Rosenberg (2006) confirmed that the prevalence of depression is greater in women than men, with an even higher prevalence in African Americans than in other ethnic groups and with such established risk factors as low income, low educational attainment, age, and single status.

African American women have been found to have lower rates of anorexia nervosa and bulimia nervosa but higher rates of binge-eating disorders than their European Americans counterparts (Taylor et al., 2013). Taylor et al. (2013) confirmed that unemployed African Americans had a greater propensity to having a lifetime history

of an eating disorder. Given this relationship between excess weight, poor health and the effects of depression on the individual, further research is needed to assess why this association exists in African American women living in North Carolina.

Physical exercise was also reviewed in several studies along with its association with obesity and depression. Results of the study documented that general fatigue was significantly associated with BMI and significantly predicted depression scores, suggesting that general fatigue and physical health may be associated with BMI and depression while another found that physical activity was significantly associated with obesity and depression. Gender differences were also found to be related to the onset of obesity and depression more than men. Women were associated with the onset of obesity and depression. This pattern of results suggested that physical activity influences the relationship between depression and obesity but that gender plays a role in how this influence impacts depressive symptoms (Preiss et al., 2013).

Dietary Intake & Obesity

A likely reason for the rapid rise in obesity may be contributed to the increase in energy intake and inadequate levels of physical activity. Self-reported energy intake has increased by 18% in women and this increase may be due to the increased availability and consumption of larger portions of food (Shaw et al., 2010). Portion sizes offered by fast food establishments and many popular restaurants are often two to five times larger than what is considered a normal serving. In addition, individuals are 40% more likely to consume food from restaurants three or more times a week. Among African American women the consumption of restaurant foods is also a potential contributor (Krishnan et

al., 2010). In studies conducted by Krishnan et al. (2010) a positive association between frequent consumption of certain types of restaurant meals, increased BMI and the risk of type II diabetes was confirmed. These associations were the strongest for restaurant meals of burgers and fried chicken. (Krishnan et al., 2010). BMI values at baseline were considerably higher in women who frequently ate burgers, fried chicken and fried fish than in women who seldom ate such meals. Data from studies conducted in the United States suggested that restaurants that served the least healthy foods were predominant in African American neighborhoods (Krishnan et al., 2010).

Fast food consumption has been associated with higher intakes of energy, fat, saturated fat, sodium and carbonated soft drinks and lower intakes of vitamin A and C, fruits and vegetables, and milk (Krishnan et al., 2010). Portion sizes were larger in meals consumed in a restaurant than those consumed at home. The energy consumption of foods such as burgers, fried chicken and French fries is very high and can lead to passive overconsumption with little reference to the high energy density and its potential influence in causing obesity. Block et al. (2004) confirmed that environmental factors contribute to the increasing prevalence of obesity, especially in the African American and low-income populations in which fast food consumption is habitual. Fast food restaurants are geographically associated with predominately African American and low-income neighborhoods (Block et al., 2004). More convenient access to fast food restaurants invariably leads to increased consumption of fast food and exacerbates the increased prevalence of obesity among African Americans and low-income populations.

African American women are disproportionately affected by obesity. A possible reason or contributing factor for the overconsumption of food may be a lack of knowledge regarding what constitutes a standard serving size as established by the United States Department of Agriculture (USDA) and by the Food and Drug Administration (FDA) for food labels. (Shaw et al., 2010). In addition, restaurant foods are usually higher in calories and less nutritive than food prepared at home, thus increasing daily caloric intake and reducing diet quality, contributing to health risks such as type II diabetes and obesity (Groth & Morrison-Beedy, 2013). Environmental factors such as fewer supermarkets and higher numbers of convenience stores and fast food restaurants in urban areas have contributed to the development of 'food deserts' in many low-income, minority neighborhoods. Besides the best intentions, studies portrayed that appetite, taste and cravings drive eating behaviors (Groth & Morrison-Beedy, 2013). During interviews conducted by focused groups it was found that African American women working at fast food restaurants consumed their largest meal at work and or purchased meals from the restaurant they were working at for their families. For others it was the convenience of drive thru after working a full day (Groth & Morrison-Beedy, 2013). Several studies have illustrated that African American women have been taught to eat and prepare foods in a certain way (Kumanyika et al., 2007, Shah et al., 2010, Taylor, 2000, Gordon-Larsen, Nelson, Page, & Popkin, 2006). Many of these recipes have been passed down through many generations and traditions of food preparation may not be healthy for their current lifestyles and their current levels of physical activity (Kumanyika et al., 2007, Shah et al., 2010.).

The rapidly growing epidemic of type II diabetes in the United States is most notable among African American women. Its prevalence is twice as high in African American women compared to their European Americans counterparts. Obesity is a powerful determinant of diabetes risk. The intake of sugar-sweetened teas and drinks and a low intake of cereal fiber compounded by a high intake of foods with a high glycemic load contribute to the increased risk of this disease (Krishnan et al., 2010). African American women are also less likely than European Americans women to adopt lower fat eating behaviors such as avoiding fried foods (Gans et al., 2009). Obesity develops when energy intake continuously exceeds energy expenditure causing a fundamental increase in energy imbalance.

Alcohol Intake and Obesity

Previous studies conducted on the role of energy from alcohol in body weight control have been reviewed from several angles; epidemiologic (alcohol intake and body weight) (Sayon-Orea, Martinez-Gonzalez & Bes-Rastrollo, 2011), psychophysiological investigation (alcohol intake and appetite regulation) and metabolic studies (effects of alcohol intake on energy expenditure) (Sayon-Orea, Martinez-Gonzalez & Bes-Rastrollo, 2011). Alcohol consumption constitutes a risk factor for increased body fat due to passive overconsumption of energy in the form of fat when alcohol is ingested with food as well as a decrease in total fat oxidation in the presence of alcohol (Sayon-Orea, Martinez-Gonzalez & Bes-Rastrollo, 2011). Energy ingested in fluid form may be poorly compensated for in contemporary consumption or in the form of food intake. Given that alcohol is liquid it may have a lower satiating capacity compared to food yet it adds

empty calories contributing to BMI increase. In longitudinal studies conducted by Preiss et al. (2013) alcohol consumption was considered in relation with obesity and depression. According to these, a significant association existed and that alcohol consumption significantly predicted depressed mood among overweight and obese African American women (Preiss et al., 2013).

In two large-scale cohort studies conducted by Caton, Ball, Ahern and Hetherington (2003) alcohol intake was examined in relation to diet and obesity in men and women. Administration of a relatively high dose of alcohol (four units) increased energy intake at lunch by 17% and was associated with higher hunger levels. The results of these studies confirmed the stimulatory effect of alcohol on appetite and food intake. The higher dose of alcohol promoted intake of salty potato crisps relative to the low-dose and no alcohol conditions (Caton et al., 2003). Participants in this study reported feeling more hungry after lunch and for three hours after consuming the higher dose of alcohol despite consuming more energy. In the same study participants reported hunger levels were consistently higher at dinner following the earlier consumption of four units of alcohol. This report implies that elevated hunger produced by the high dose of alcohol lasted for many hours beyond ingestion and indeed its metabolism (Caton et al., 2003).

Alcohol-related deaths are more than twice as high for African American women than for European Americans (Williams et al., 2010). Susceptibility to liver damage in African Americans is higher than that for European Americans as African Americans have higher levels of common biomarkers of liver damage at every level of alcohol consumption and this pattern was consistent after adjustments for age, sex, education,

BMI and pack years of smoking (Williams et al., 2010). Finally, having a low income has also been associated with having an above average prevalence of drinking (Hovick et al. 2011). Alcohol consumption also promotes greater caloric intake adding empty calories and increasing the incidence of obesity primarily in binge drinkers. In comparison, studies indicated that the odds of obesity were higher in African American women who consumed up to three drinks a day while consumption over the moderate limits was associated with a small but significant increase in obesity in these women (Chakraborty, 2014). Thus, it could be implied that alcohol has the capacity to disrupt satiety mechanisms and that the suppression of satiety may contribute to the additive effects of energy from alcohol to the habitual diet.

Physical Activity and Obesity

Although the benefits of adopting physical activity are well publicized, 31% of adults are physically inactive especially among minorities and women (Lee et al., 2012). Only 36.3% of African American women and 4.8% of Hispanic women achieve the recommended (150 minutes per week levels of physical activity compared to 50.1 % of European Americans women (Lee et al., 2012). Diets may contribute to increased prevalence of obesity and chronic diseases in African American women compared with other ethnic groups (Gans et al., 2009). African American women have also been shown to have higher intakes of cholesterol, total and saturated fat and sodium. The combined effects of physical inactivity and excess caloric intake account for an estimated 300,000 deaths each year and are a major contributor to the 50% increase in the prevalence of obesity.

Physical inactivity is also a risk factor for poor mental health especially depression; physical activity has the capacity to prevent chronic disease and premature death (Dishman, Heath & Lee, 2012). Morgan and Goldston (2013) advocate the importance of exercise as an important stress reducing and stress coping mechanism. Biologic stimuli such as altered central nervous system and hormonal regulation are added benefits. A dose-response relationship exists between physical activity and health benefit.

Sofi et al. (2011) confirm that although cognitive decline is heterogeneous, an inverse relationship exists between physical activity and the risk of developing cognitive decline. The investigators found that individuals, who remain active throughout life, especially during their middle years, have better cognitive performance during later life, thus preserving their cognitive functions for linger (Sofi et al., 2011). The meta-analysis conducted by Sofi et al. (2011) confirmed that physical activity reduced the occurrence of cognitive decline and the incidence of neurodegenerative diseases such as dementia and Alzheimer's disease. Walsh (2011) proposed that exercise offers physical benefits that extend over several physiological systems, reduces multiple disorders, depression and neurodegenerative disorders such as age-related cognitive decline, Alzheimer's disease and Parkinson's disease (Walsh, 2011).

Physical activity has been associated with environments that are safe, crime-free, and well-lit with sidewalks, pavements, providing walking trails and parks (Gordon-larsen et al., 2006). Individuals of low SES generally reside in lower income areas where the levels of crime and homicide are typically high; these areas do not promote an environment for physical activity. Physical activity is of prime importance as it has the

ability to negate the adverse effects of obesity and is imperative not only in decreasing

the incidence of disease and mortality but is also at the heart of issues concerning the

reduction of disease risk and obesity. Even in the case of obesity it is possible to be obese

but also physically fit at the same time (Gordon-larsen et al., 2006).

      Physical activity has the ability to reduce both the risk of disease and healthcare

costs. The main domains of physical activity that contribute to overall prevalence

estimates are sports or recreational activities, occupational physical activity, heavy

domestic physical activity or the choice of vehicle for movement one adopts. Gym

memberships are expensive and even a luxury for those on a budget and perhaps

impossible for those on welfare or other public assistance. With the subsequent decrease

in occupational and domestic activity and the rise of automated domestic appliances and

labor-saving devices that have been driven by productivity and employee welfare,

physical labor is no longer the norm (Gordon-Larsen et al., 2006). The decrease in energy

expenditure due to technological improvements has also contributed to the rise in obesity

in African American women living in North Carolina.

      It is a documented fact that people of color in the United States have a higher

prevalence of physical inactivity. Lee et al. (2011) found that 35% of African Americans

and 40% of Hispanics are physically inactive compared to their European Americans

counterparts, for whom the prevalence of physical inactivity is 18%. African American

women and Hispanic women had an even higher prevalence of physical inactivity

compared to African American and Hispanic men. The rates were documented at 41% for

African American women and 45.7% of Hispanic women versus their male counterparts

who had 23% and 29% prevalence rate, respectively (Lee et al., 2011). The high

prevalence of physical inactivity and poor dietary habits are a concern primarily because

the combination results in weight gain and ultimately obesity which is a precursor of

many diseases (Lee et al., 2011).

Physical inactivity is the fourth leading cause of death worldwide. Craig et al.

(2012) confirmed that the associated morbidity of health disorders related to inactivity

including health-related quality of life. Both direct and indirect economic costs have

exerted a substantial burden on both societies and health systems. Social and economic

transitions similarly, can affect populations and can also profoundly affect their health

behaviors. Rapid economic development and drastic social changes in many states have

accelerated urbanization and are linked to reductions in occupational physical activity in

adults and increased television viewing (Craig et al., 2012). Although major progress has

been made in the organization and mobilization of efforts for tobacco and alcohol control

and the promotion of a healthy diet, physical inactivity has now been recognized as the

fourth type of exposure that needs to be addressed for the control of non-communicable

diseases (Craig et al., 2012).

Ding and Gebel, (2012) confirmed that the role of the built environment in

contributing to physical activity and obesity is dynamic. The rising trend of employment

in service industries versus manufacturing and agriculture has also contributed to a

decline in physical activity. Although recreational activities have increased so has the

time spent watching television and gaming, as such levels of physical activity have been

found to be poor in the southern states of the United States. Levels of physical activity in

men in North Carolina are higher than that of women residing in the same state. Overall, the physical activity guidelines of 150 minutes per week are not being met in the United States. Society changes over the years have increased the adoption of mechanization and computerization which have invariably reduced physical activity at work (Sallis, Floyd, Rodríguez, & Saelens, 2012).   Labor-saving devices have reduced household chores, and the preferred method of travel is no longer walking, although many of these changes have had some desirable effects such as time saved during mundane chores, labor-saving devices have also led to a decrease in daily physical activity. Healthy People 2020 and the Institute of Medicine have identified public parks and recreation facilities as providing the needed environment for diverse recreational family activities (Sallis, Floyd et al., 2012). A national study conducted revealed that neighborhoods with populations that were 95% minority and overwhelmingly lacking a college education (5% or less) had lower odds of having even one recreational facility (Sallis, Floyd et al., 2012).

Obesity has also been associated with greater television viewing, less time sleeping and lower levels of physical activity (Sallis, Floyd et al., 2012). Patterns of diet and physical activity are major drivers of morbidity and mortality. Unhealthy diet and sedentary living are the root causes of morbidity and mortality in developed societies with the greatest toll on disadvantaged populations. Moderate aerobic physical exercise, an hour a day, five times a week or vigorous intensity for 20 minutes a day three times a week are the recommendations for healthy individuals 18-65 years to promote weight loss and maintain health (Sallis, Floyd et al., 2012).

Danon-Hersch and Santos-Eggimann, (2013) found that a higher proportion of women (25%) avoided using stairs or carrying more loads than men (20%). They also found that women who lived alone had a greater incidence of depression than men; 47% versus 28%. Increased physical activity decreases the likelihood of obesity and has major benefits in reducing the risk of cardiovascular disease and coronary heart disease. Engaging in sufficient levels of moderate to vigorous intensity physical activities for at least 30 minutes on five or more days a week has been shown to provide health benefits, while sedentary behaviors such as sitting, television viewing and driving have been classified as low-energy expenditures (Danon-Hersch, & Santos-Eggimann, 2013). The benefits of moderate and vigorous intensity physical activity are numerous and affect all age groups often in multiple dimensions of wellness. Barwais, Cuddihy and Tomson, (2014) found that participants from health populations who engage in higher physical activity levels may have a higher quality of life, associated with improved physical and mental health, cognitive function and social connectedness. In contrast, participants who spent more time sitting were not sufficiently physically active and were more likely to enjoy a lower quality of life (Barwais et al., 2014).

Physical Activity & Ethnicity

Pekmezi et al. (2013) found in their exploratory study that African American women living in the "Deep South" experienced several limitations and physical activity barriers. They ranged from lack of time to negative expectations, lack of access to safe, affordable means to be physically active, fear of injury, lack of social support, and disapproval of physical activity. Pekmezi et al. (2013) also found that African American

women may prefer different physical activities from their European Americans counterparts, for example the investigators found that Africa American women may prefer activities such as dance versus golf. The ecological model for health promotion emphasizes multiple levels of influence upon individual behavior; intrapersonal, interpersonal and social, organizational, institutional, community, and policy (Hooker, Wilson, Griffin, & Ainsworth, 2005). The disparity in rates of physical activity may then contribute to the health disparities that exist between white and African American adults. This idea has led to an increased interest in gaining a greater understanding about the determinants and mediating factors of physical activity behaviors, among racial and ethnic populations (Hooker et al., 2005). In their study, Hooker et al. (2005) found that safety, streetlight quality, unattended dogs, trust in neighbors, were barriers to physical activity experienced by African American women living in the rural South.

Another possible explanation may be that race and ethnicity are simply serving as proxies for differing levels and types of preferred physical activity among Africa American and European Americans adults. Variations in preferences and purposes for physical activity and types of physical activity may create varying perceptions of social and safety related environmental factors among people from different racial and ethnic groups (Hooker et al., 2005). Similarly Cohen et al. (2013) confirmed that increased sedentary behavior and lack of physical activity are associated with increased risk for many chronic diseases and that the differences seen in leisure-time physical activity between Africa Americans and European Americanss partially explained racial disparities in obesity and chronic disease outcomes (Cohen et al., 2013).

Summary of Literature Review

The increase in acknowledgement and acceptance of the role that the built environment plays in physical activity and obesity suggests the need for intervention that addresses this growing need along with the need to gain an appreciation of why food insecurity impact African American women more than their European Americans counterparts (Nguyen & El-Serag, 2010). Physical activity always takes place in the context of the four domains of active living. Obesity is the result of the complex interaction between the environment, genetic predisposition and human behavior, though environmental factors are likely to be the major contributor of the obesity epidemic viewed in African American women living in North Carolina (Nguyen & El-Serag, 2010). Factors of the built environment include proximity to grocery stores and fast food establishments, the quality of schools, opportunities for social interactions with neighbors, and places for walking and other types of physical activities (Affenito et al., 2012). Unfavorable built environments such as few parks or recreational facilities, low perceived neighborhood safety, increased access to restaurants, and convenience stores were associated with higher body mass index scores among adolescents, particularly those of low socioeconomic status (Affenito et al., 2012).

Further, depression and depressive symptoms have been strongly associated with financial adversity or strain. As financial distress increases, individuals may experience a myriad of stress related mental and physical symptoms and illnesses. These include worrying, anxiety and tension, insomnia and sleep disorders, headaches and migraines, high blood pressure, appetite disorders and weight gain, fatigue and alcohol dependence

(Starkey et al., 2013). The trends indicated that morbid obesity rates (above 40 kg/m2) continue to rise rapidly in the United States. In addition, African Americans are at a significantly greater risk of morbidity and premature mortality than their European Americans counterparts, with socioeconomic status accounting for much of these differences. The development of obesity in African Americans and Hispanics has been influenced by diet, income, physical activity, education and ethnicity. It can be inferred from these findings that obesity is a heterogeneous condition and oversimplification in characterization may increase inconsistencies in obesity studies. Therefore a need exists to fill the gaps that exist in the literature to establish an understanding and association of the factors that influence obesity in African American women living in North Carolina. The psycho-social and psycho-behavioral determinants of obesity in African American women living in North Carolina requires a through and in depth study.

The research design and method is addressed in chapter three; the basic framework within which the research is carried out. It provides an explanation of why a quantitative design was adopted using BRFSS, a cross-sectional survey to achieve an understanding of the associations between the factors, both psycho-social and psycho-behavioral facets that impact the rise in BMI levels in African American women living in North Carolina.

Chapter 3: Research Method

Introduction

The rise in obesity since the 1980s in the United States and globally is well documented (Mokdad et al., 2003). Obesity is a precursor for a plethora of diseases such as Type II diabetes, cardiovascular diseases, and certain forms of cancer (Mokdad et al., 2003). Clinically severe or morbid obesity (BMI over 40 or 50) involves greater health consequences (Mokdad et al., 2003). According to the BRFSS, BMI over 40 increased during the years 2000 to 2010 (Mokdad et al., 2003). Obesity, due to its severe health consequences, presents a public health problem that needs to be addressed. African Americans are at a significantly greater risk of morbidity and premature mortality than European Amercans, with studies documenting a 30% higher age adjusted risk of mortality (Franks et al., 2006). North Carolina has a large African American population and has been ranked as 17th in the comparison among states where prevalence of obesity is concerned (Franks et al., 2006). Female obesity in the United States has risen from 30.2% to 54.0% among African Americans (Li, Wen, & Henry, 2014). Psychosocial and psycho-behavioral factors influence obesity in African American women living in North Carolina. These factors include household size, income, education, dietary intake, alcohol intake, and physical activity and depression.

The prevalence of severe obesity among minority women in the United States generates particular concern as both the BMI for a given level of body fat and the incidence of cardiovascular risk factors (CVRF) for a given BMI may vary by racial or ethnic background (McTigue et al., 2014). Researchers have not examined the health risk

of severe obesity in minority women or the factors that promote severe obesity in

minority women.

During the years 2007-2009, unemployment in the United States increased from

8.1% to 9.6% (Appelhans et al., 2013). These were higher than normal historical

averages; unemployment in North Carolina was 9.4% higher than the national average

(Appelhans et al., 2013). Psychosocial factors such as income, household size, and,

psycho-behavioral factors (i.e., dietary intake, alcohol consumption, physical activity,

and depression) may have contributed to the rise in BMI levels among African American

women living in North Carolina (Appelhans et al., 2013). The rates of obesity are higher

in rural areas of the south such as North Carolina and, although the proximal behavioral

determinants of obesity are physical inactivity and excess food consumption, the role of

psychosocial and psycho-behavioral factors in influencing these behaviors need further

investigation. Research on the role of home environments in shaping and maintaining

adult weight status, especially in rural communities, is limited. The home as a behavior

setting for obesity prevention warrants further study as the availability of exercise

equipment in the home is associated with higher levels of physical activity, and the

greater availability of healthy goods in the home is associated with decreased fat intake

and increased fruit and vegetable consumption (Kegler et al., 2013).

This chapter includes an outline of the selection of study design for this

investigation; the study population and sampling decisions; data collection procedures

and methods; and the statistical analysis planned to test the hypothesis concerning the

potential BMI differences among African American women, Hispanic American women,

and their European American counterparts. A study of the data conducted in bivariate and multivariate analyses were assessed to determine whether an association existed between the dependent variables (household size, income, education, dietary intake, alcohol intake, and physical activity and depression (and the independent variable (BMI).

In this chapter, I document the quantitative methodology adopted to investigate the degree to which psycho-social factors (i.e., income level and household size) and psycho-behavioral factors (i.e., dietary intake, alcohol intake, physical activity, and depression) promote obesity in African American women living in North Carolina. Population demographics and socioeconomics were obtained from the BRFSS (CDC, 2010). This data set is publicly available via online databases. Population distribution measurements of health indicators for obesity can be used to target health care and community resources to areas with greatest need. The BRFSS collects data on weight, diet, exercise, obesity, depression, and physical activity.

Research Design and Approach

This study was based on secondary data analysis using data derived from the BRFSS examining the psycho-social and psycho behavioral factors that contribute to obesity and increased BMI levels in African American women living in North Carolina. I also analyzed, from a comparative perspective, European American and Hispanic American women with their African American counterparts living in North Carolina. In this descriptive study, I used BRFSS data ranging from 2003 to 2013. The BRFSS is conducted continuously at the national, state, and local level every month through landline telephones. The population sample was determined by a random computer

numbers generated. There is a disparity between those with a landline and those who own only cell phones, which limits the sample size. However, observations were made to support obesity prevention and intervention efforts at the local level.

Statistical data analysis was conducted through the SPSS data analysis software program. I focused on 20 neighborhoods in North Carolina, limiting analysis to participants aged 18 and older. A logistic regression model used to predict the prevalence of obesity in each of the neighborhoods. The intent of this investigation was to ascertain potential differences and patterns, as well as to determine the level of association that exists between African American women, Hispanic American women, and their European American counterparts in the psychosocial and psycho-behavioral factors that define BMI levels. The BRFSS uses disproportionate stratified random sampling (DSS) to select survey participants. The BRFSS telephone numbers are drawn from two lists based on the density of the known household telephone numbers: strata of high telephone density and strata of medium density. The telephone numbers in the high density stratum are sampled on a highest sampling rate; the sample design stratification variable (STSTR) adopted in the present study is a five digit number consisting of BRFSS variables STATE (first two characters), GEOSTR (third and fourth character), and DENSTR2 (fifth character). STATE represents the code of each of the participating states. GEOSTR refers to geographic stratum code, and DENSTR2 refers to household density stratum code.

Research Questions

The research questions for this study were the following:

1. What association do psycho-social factors (i.e., income level and numbers in house hold) have on BMI levels between African American, Hispanic American, and European American women living in North Carolina?

$H_0 1$: Psycho-social factors (i.e., income levels and household numbers) do not influence BMI levels between African American, Hispanic American, and European American women living in North Carolina.

$H_1 1$: Identified psycho-social factors (i.e., income level and house hold numbers) influence BMI levels between African American, Hispanic American, and European American women living in North Carolina.

2. What association do psycho-behavioral factors (i.e., dietary intake, alcohol intake, and physical activity and depression) have on BMI levels in African American, Hispanic American, and European American women living in North Carolina?

$H_0 2$: Psycho-behavioral factors (i.e., dietary intake, alcohol intake, physical activity, and depression) do not influence BMI levels in African American, Hispanic American, and European American women living in North Carolina.

$H_1 2$: Psycho-behavioral factors (i.e., dietary intake, alcohol intake, physical activity, and depression) do influence BMI levels in African American, Hispanic American, and European American women living in North Carolina.

3. Is there a difference between African American, Hispanic American, and European American women living in North Carolina with the psycho-

behavioral (i.e., dietary intake, alcohol intake, physical activity, and

depression) factors?

$H_0$3: There is no difference between African American, Hispanic American, and

European American women living in the North Carolina with the psycho-behavioral (i.e.,

dietary intake, alcohol intake, physical activity, and depression) factors.

$H_1$3: There is a difference between African American, Hispanic American, and

European American women living in the North Carolina with psycho-behavioral (i.e.,

dietary intake, alcohol intake, physical activity, and depression) factors.

4.   Is there a difference between African American, Hispanic American, and

European American women living in the North Carolina with the psycho-

social (i.e., income level and household numbers) factors?

$H_0$4: There is no difference between African American, Hispanic American, and

European American women living in the North Carolina with the psycho-social (i.e.,

income level and household numbers) factors.

$H_1$4: There is a difference between African American, Hispanic American, and

European American women living in the North Carolina with the psycho-social (i.e.,

income level and household numbers) factors.

Setting and Sampling

Target Population

The population investigated in this study consisted of African American women

living in North Carolina. A comparison study was conducted by comparing Hispanic

American women and European American women with the estimated sample group of

800 participants. This sample size adopted was appropriate in that it represented the total

population in a way that would facilitate the generalization of the phenomenon being

explored. Secondly, it allowed for a margin of error of 5% or confidence intervals. This

provides the positive and negative deviation allowed on the survey results for the sample

or the deviation between the opinions of the respondents and the opinion of the entire

population. Finally, a population selection of this size allowed for a 95% confidence

level. This study entailed drawing telephone samples to draw a sample from a sampling

frame that is a part of a universal population. As the universal population was the group

from which inferences were being made, the sampling frame provided the sub-universe

from which the sample was selected, and the sample became the group of respondents.

This probability-based method includes random digit dialing, which decreases the biases

that are embedded in listed samples in which a large proportion of household may be

unlisted or nonpublished. Some of the other advantages of using this form of sampling

are that individuals who have just moved in or are unlisted may be included in the

sample. Finally, a study conducted with this sample size and of this form can be

replicated.

Sampling Method

A cross-sectional survey was conducted with adult African American women

between the ages of 18-65 years to test the hypothesis that the identified psycho-social

factors (i.e., income level and house hold numbers) influence BMI levels between

African American, Hispanic American, and European American women living in North

Carolina and to ascertain the degree to which psycho-behavioral factors (i.e., dietary

intake, alcohol intake, and physical activity and depression) influence BMI levels in African American, Hispanic American, and European American women living in North Carolina.

Sample Size

A sample size of 800 records was randomly selected with a total of 385 records designated where the participants were African American women, 270 were Hispanic American women, and 145 were European American. This was done primarily to provide a representative sample of the wider population. Measurement validity, often referred to as construct validity, is based on whether the measurement designed for construct reflects the concept that it is supposed to be denoting. Another consideration in the determination of sample size is consideration of how large the sample needs to be to allow for the identification of consistent patterns and the size needed to represent the variation within target populations. In this case, the sample size was ascertained based on the data collection method (quantitative) to address the degree of diversity in the population of interest. The population of interest was women; the variations were African Americans, European Americans, and Hispanic Americans. Sample size determination was aimed at selecting the number of observations or replicates to include in a statistical sample. The sample size enables the investigator to make inferences about the population under study. It also provides a determination for the statistical power needed. Larger sample sizes increase the precision in estimating unknown parameters. In the case of this study, an 80% power was required to detect an association of difference in ethnic groups. Each observation measures one or more properties such as income, household size, or physical

activity. A nonprobability sample such as this could give rise to exclusion bias. This bias

is built in to the method in which data are collected by the BRFSS as it depends on

individuals who have phones in their homes.

An assortment of 385 records was selected to provide an optimum representation

of the phenomenon being observed. This practice also allowed for an assessment of

power which targets using 0.80 as a standard for adequacy, which implies a four to one

tradeoff between the probabilities of risk of Type II error and the probability of a Type I

error. Power analysis, therefore, is an appropriate method in addressing concerns with the

correct rejection of a null hypothesis. In this study an *a priori* analysis conducted prior to

the research study provided the estimated sample sizes for this study.

Power Analysis

In calculating the sample size for the study, several factors were taken in to

consideration. These factors consisted of the intended power of the study, the effect size

of the phenomena under study, and the level of significance to be used in rejecting the

null hypothesis (alpha). The power of the study was then set at 80% while the alpha level

was set at 0.05. The effect size was projected at 0.5 or 50%. Higher for the risk of

obesity in African American women living in North Carolina, in keeping with the

analysis of data provided by Lloyd-Jones et al. (2010) in which African American women

with or without a high school education were found to high the highest propensity for

obesity with a rate of 48.4%. Effect size was considered as a measurement of strength of

the relationship between the independent and dependent variables in the study. The effect

size can be categorized as being small, medium, or large. The estimated sample size for

this study was determined by G*Power 3.1 software (Faul, Erdfelder, Buchner, & Lang, 2009). Statistical power analyses using G* Power 3.1 tests were adopted for correlation and regression analyses. This is a free, downloadable statistical analysis program frequently used in social, behavioral, and biomedical research. This software runs on most computer platforms, covering a wide variety of statistical tests, power analysis, effect size calculations, and graphic options. Because this was a quantitative, epidemiological study, G*Power 3.1 was appropriate in determining an adequate sample size for this study. Its application in the domain of multiple linear regression and logistic regression was a good fit for this study. Descriptive statistics was used to determine the analytic sample and to evaluate the variable distributions for skewness and outliers. Descriptive statistics for the variables (household size, income, physical activity, diet, depression, and alcohol intake) was stratified by ethnicity to compare differences between African American women living in North Carolina and their European American counterparts.

Study Participants Eligibility Criteria

Secondary data were obtained from BRFSS; data were used where the participants were over the age of 18 years. The health-related life style factors in this study included weight, income, diet, physical activity, household size, depression, alcohol consumption, and BMI.

<center>**Instrumentation and Materials**</center>

The BRFSS is a cross-sectional surveillance survey that includes 54 reporting areas and is based on a complex sample design. BRFSS web survey questionnaires were

used to collect data on adult African American women living in North Carolina.

Questions on the core BRFSS instrument were reliable and valid (Bombard et al., 2005;

Carlson et al., 2009; Everson & McGinn, 2005; Ezzati et al., 2006). BMI was calculated

according to self-reports of height and weight. Obesity was measured using the BMI or

weight in kilograms divided by height (in meters) squared. BMI was categorized as

normal weight ($18.5 \geq BMI \leq 25$), overweight ($25 \leq BMI < 30$), obese ($BMI \geq 30$), and morbid

obese ($BMI \geq 40$). The BRFSS survey includes standardized questionnaires developed by

the CDC's Behavioral Surveillance Branch (BSB) and state health departments. The

questionnaire has three components: core, optional modules, and state-added questions.

During the data collection, the core questions must be asked without modification; the

states have the option to decide whether they will ask any or all or one of the optional

questions. This study has questions included in the core modules only. Disproportionate

stratified random sampling (DSS) was used to choose the numbers that were dialed in the

survey and was implemented by the CDC in 2003.

In presenting the analysis of this study, IBM Statistical Package for the Social

Sciences (SPSS) was used for data collection and analysis. SPSS is a widely used and

powerful tool for statistical analysis; it has the ability to facilitate both data collection and

analysis. It is widely adopted in the social sciences as a tool for quantitative,

epidemiological studies and the software contains several modules, which enable the

researcher the ability to create databases for analysis. SPSS creates a database from

which statistical treatment can be directed from simple drop down menu options. The

analytical capabilities enable it to read and assess the data entered through statistical

means such as descriptive statistics, cross tabulation and frequencies and bivariate statistics. SPSS also generates linear regression and multiple regression generating data analyses in tabular and or graphical.

Study Variables

Dependent Variable

The dependent variable in this study was BMI levels for each individual based on the BRFSS findings and operationalized on SPSS. In interval measurement this absolute zero is meaningful, as the BMI score based on the Metropolitan Life Tables. BMI is a statistical measurement which has been derived from an assessment of height and weight. The body mass index (BMI = weight (in kg/height^2 [in m^2]) is the primary measurement used to categorize obese patients (Table 1). Excess body weight (EBW) is defined as the amount of weight that is in excess of the ideal body weight (IBW). Ideal body weight is conventionally determined by the Metropolitan Life Tables, or as a BMI of 19.5-24.9 kg/m^2. In 1991, the National Institutes of Health defined severe obesity (Class II) as a BMI of $\geq$ 40.0 kg/m^2 morbid obesity (Class III) as a BMI of $\geq$ 50.0 kg/m^2. Between 2000 and 2010, the prevalence of Class III obesity calculated from self-reported height and weight increased by 70% (Sturm, 2013). The prevalence of BMI of >50.0 kg/m^2 increased even faster with rates at every point in time being higher among Hispanics and African Americans (Sturm, 2013). This study provides a comparison of BMI levels among African American women, Hispanic women and their European Americans counterparts.

Identification of variables predictive of BMI is an essential public health measure for the prevention and incorporation of interventions to reduce this public health concern and is in keeping with social change. Previous studies have considered the clinical aspects of obesity such as the onset of diabetes and cardiovascular diseases but few have considered the core reasons behind the prevalence and increase in obesity particularly among African American women living in North Carolina. A progression of statistical techniques has been selected from a pool of variables to assess the associations as well as any prognostic information that could be procured as relevant.

Independent Variables

The independent variables considered in this study were the psychosocial and psycho-behavioral influences previously discussed. The influence of income, household size, physical activity, diet, depression, income and alcohol consumption, factors that potentially may promote obesity in African American women living in North Carolina. In considering the effects of these variables it is important to note that that North Carolina in much more rural than the national average (see Appendix E). Minorities in the rural communities are more likely to live in poverty than their European Americans counterparts. Levels of measure for the variables: income (categorical), household size (Nominal), ethnicity (categorical), gender (categorical), depression (ordinal), physical activity (ordinal) dietary intake (interval level) and alcohol consumption (continuous).

Measurement of Variables

Measures of variables have been selected based on the information needed to assess associations between them. In designating income as a categorical variable it

provided information on weather differences exist between groups. In designating

alcohol consumption as continuous it enabled any differences between groups to be

evaluated and it also always used to appreciate how much variance can be accounted for.

In designating depression and physical activity as ordinal facilitates numeric results such

as yes and no answers which could be coded as yes:1 and no:2 for statistical testing. A

bivariate analysis could then be adopted to assess how the two variables are related to

each other. Finally, levels of measure facilitate the quantitative precision needed for a

rigorous assessment in research studies.

Logistic regression in which the outcome variable is binary (0 or 1) is presumed

to follow a logistic distribution and the goal of the regression analysis in order to predict

the probability of the successful outcome by fitting data into a logistic cure. The goal of

this analysis is to determine if differences exist between groups and to determine the

significance of mean group differences. The levels of measure of the variables also

enable the determination of whether a prediction can be made through the adoption of

bivariate analysis or correlation. A detail of each specific data analysis is provided in

subsequent sections.
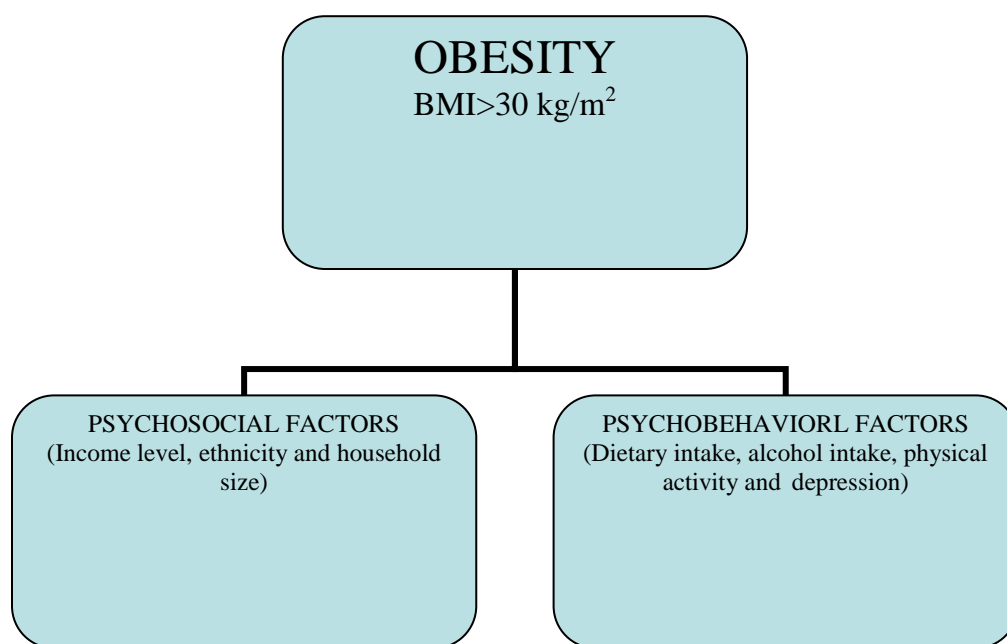
Figure 1. Measurement model for the study.

Data Recoding

In SPSS, recoding was done in a number of different ways, to categorize ordinal, interval, or nominal variables (e.g., ethnicity, income, etc.). The variable that was coded was placed in the input variable to output variable box. In this study the candidate predictor variables were income, household size, physical activity, dietary intake, alcohol intake, and depression. In preforming a multiple logistic regression analysis, the selection made was done to analyze-regression-binary logistic, placing BMI in the dependent variable and income, physical activity, household size dietary intake and depression as the independent variables. Details for each coded variable were listed in Table 1: Variables and Levels of Measure.

Using SPSS to analyze associations or differences the existing data procured from the BRFSS database were recoded as 1 for individuals who answered the question based on physical activity as engaging in physical activity three times a week and 2 was used to recode for individuals who responded as not engaging in physical activity. Data responses that provided answers that were positive in areas such as experiencing thirty day of hopelessness or depression as 1 while respondents who experienced more than thirty days of depression as 2. Analyzing descriptive statistics and frequencies provided the information based on the categories that have been input. In this case, depression and physical activity were recoded. Similarly data extracted from the BRFSS was recoded using 1 and 0 to view levels of association and comparisons. The variable for household size, alcohol consumption, house-hold size, single women, and households with two or more children will be created based the definition give to the variable. Data was recoded to reorganize the structure and recode the variables so that the codes were consistent. It increased efficiency and decreased errors and was more feasible in replicating results. Recoding is a technique that allows us to combine or group two or more categories of a variable together in order to simplify the process of analysis. Recoding is advantageous in that it allows us to create tables that are easier to read and identify patterns in responses, facilitating us to group continuous data in to categories so that the results are not presented in an exceedingly long table. Coded data can then be entered into a spread sheet, database or directly in to the statistical program like SPSS.

Table 1

Variables and Level of Measurement

Variable	Survey Question(s) Appendix C	Type	Level of Measure
BMI	4, 5	Dependent	Continuous
Income	3	Independent	Interval
Household size	1	Independent	Continuous
Physical Activity	19, 23	Independent	Interval
Depression	6-10	Independent	Ordinal
Alcohol Intake	11-13	Independent	Continuous
Gender	Women only	Independent	Categorical
Dietary Intake	14, 15	Independent	Interval
Race/Ethnicity	Preselected	Independent	Categorical

Data Analysis

After accessing the data from BRFSS, the necessary data was then uploaded into SPSS to conduct a comparison of demographic differences of all three ethnic groups; African American women, Hispanic women and European Americans women. Multivariate analysis was included with frequency tables for the variables under study. Mean values of BMI, of the three groups were assessed and compared within the parameters of the factors evaluated. Univariate: mean, sd, median and a t-test were used to assess possible differences in BMI levels. Statistical analysis details for each research question are listed in Table 2.

RQ 1 investigated the association that the psycho-social factors (i.e., income level and numbers in house hold) have on BMI levels between African American, Hispanic, and European Americans women living in North Carolina. To address this question a Multiple Logistic Analysis was adopted to assess the possible association and differences in the expression of these factors and how they qualify in the population group. This was

the appropriate multivariate statistical test to address the relative contribution of each co-variable in addition to the study's dependent variable and to identify their individual relationship to the independent variable of BMI levels.

RQ2. Questioned the influence that psycho-behavioral factors (i.e., dietary intake, alcohol intake, physical activity and depression) had on BMI levels in African American, Hispanic, and European Americans women living in North Carolina. To address this question a Multiple Logistic Regression Analysis was adopted to assess the possible association and differences in the expression of these factors and how they qualify in the three population groups' understudy. Multiple Logistic Regression Analysis was considered the appropriate multivariate statistical test to address the relative contribution of each co-variable in addition to the study's dependent variable and to identify their individual relationship to the independent variable of BMI levels.

RQ3 questioned if a difference existed between African American, Hispanic and European Americans women living in North Carolina with the psycho-behavioral (i.e., dietary intake, alcohol intake and physical activity and depression) factors. A comparison was conducted based on the Multiple Logistic Regression Analysis adopted to assess the possible difference between African American, Hispanic and European Americans women.

RQ4 questioned whether there was a difference between African American, Hispanic and European Americans women living in the North Carolina with the psycho-social, (i.e., income level and household numbers) factors. A comparison was conducted based on the Multiple Logistic Regression Analysis to determine if a difference existed

between the dependent variables among the African American women, Hispanic women

and their European Americans counterparts.

Table 2

Statistical Procedures per Research Question and Hypothesis

Research Question	Hypothesis (Ha)	Variables	Statistical Procedures/Analysis
RQ1. What level of influence do identified psycho-social factors (i.e., income level and numbers in house hold) have on BMI levels between African American, Hispanic, and European Americans women living in North Carolina?	Ha. Identified psycho-social factors (i.e., income level and house hold numbers) influence BMI levels between African American, Hispanic, and European Americans women living in North Carolina?	Income level, house hold numbers, ethnicity BMI	Multiple Logistic Regressions
RQ2. What is the level of influence do identified psycho-behavioral factors (i.e., dietary intake, alcohol intake and physical activity and depression) have on BMI levels in African American, Hispanic, European Americans women living in North Carolina	Ha. Psycho-behavioral factors (i.e., dietary intake, alcohol intake and physical activity and depression) do influence BMI levels in African American, Hispanic, and European Americans women living in North Carolina	Dietary intake, alcohol intake, physical activity depression, and BMI	Multiple Logistic Regression
RQ3- Is there a difference between African American, Hispanic and European Americans women living in North Carolina with identified psycho-behavioral (i.e., dietary intake, alcohol intake and physical activity and depression) factors?	Ha. There is a difference between African American, Hispanic and European Americans women living in the North Carolina with identified psycho-behavioral (i.e., dietary intake, alcohol intake and physical activity and depression) factors.	Dietary intake, alcohol intake and physical activity and depression	Dietary intake, alcohol intake and physical activity and depression
RQ4- Is there a difference between African American, Hispanic and European Americans women living in the North Carolina with identified psycho-social (i.e., income level and household numbers) factors?	There is a difference between African American, Hispanic and European Americans women living in the North Carolina with identified psycho-social (i.e., income level and household numbers) factors.	Income level, ethnicity and household numbers.	Multiple Logistic Regression

Threats to Validity

This research had several potential validity threats that may have influenced its study outcome. Recall bias may be present as data in the BRFSS are self-reported making it subject to respondents over-estimation or under-estimation of physical activity or dietary intake for example. Since the means by which data is collected is though telephone based surveys, less affluent groups may have been underrepresented as they may be less likely to have a house phone. Individuals living in nursing homes are not included in this survey as they do not have access to a telephone. Further, for this study secondary data used had certain built in disadvantages such as lacking depth of information. Also, the proposed population for this study was African American women living in North Carolina; as such generalizability to other populations may be limited.

The key disadvantage of secondary data acquisition is that the selection and quality as well as the methodology of the data collection are not under the control of the investigator, making it very difficult to validate. Another potential issue with secondary data in research is that this data is not collected with any specific research purpose making it difficult to adopt (Sørensen, Sabroe, & Olsen, 1996). Finally, a major factor that may affect the value of secondary data in epidemiological research is the completeness of registration of individuals, the accuracy and degree of completeness of variables, its precision and validity (Sørensen, Sabroe, & Olsen, 1996). Therefore, to minimize these occurrences test and measures as well as conducting tests using multiple samples will be used to achieve more reliable results. The collected data will be analyzed using descriptive and multivariate regression weighted analysis. Mean Z-score will be

used to ascertain the cut-offs for defining extreme values. Fixed criteria will also be adopted where the mean Z-score is below -1.5.

Data cleaning refers to the process of removing invalid data points from a dataset, as such, data points which are either obviously disconnected with the effects or the assumption will be removed. Erroneous samples due to a mistake during data collection will be removed as well. The points that would be cleaned are the extreme outliers or those points that stand out as they do not follow the pattern which is clearly visible in the data. The way in which this would be done is to plot the data points and visually inspect them for points which lie far outside the general distribution, another way would be to run the analysis on the entire dataset and then eliminate the points that do not meet the mathematical control limits. Cleaning can also be conducted judgmentally by ignoring historical data from an area that has a tendency to misreport such as height and weight.

A few potential threats to the validity exist that may impact the veracity of this research project. As previously stated, secondary data that has been collected by self-reported surveys are biased due to the fact that they are self-reported. Areas that appear to be misrepresented are height and weight, where height has generally been over estimated and weight under-reported. This makes it difficult to assume that the BMI levels recorded are a valid and accurate assessment. This distortion has the ability to either under-represent or over represents the null, which may invariably favor the null or alternative hypothesis leading to an inaccurate assessment of the study.

Secondly, this study used the questions already adopted by the BRFSS questionnaire (Appendix F) in assessing the nature of depression and alcohol consumption of the participants in the study (CDC, 2012). The questions may be considered to be too narrow, or too broad to accurately identify the fact that participants are depressed due to the level of their BMI, lack of employment or because of the nature of issues they are currently facing in the home. Question one on the BRFSS considers the participant to state the largest number of drinks consumed on any occasion, this question would be subject to recall bias as well as having consumed several drinks the individual may not be able to remember how many drinks were consumed. Similarly question 14 asks respondents to provide the amount of time spent in a physical activity per week or per month (Appendix F). Again recall bias and over estimation of the amount of time spent exercising may be over represented in this data set as individuals naturally want to be viewed in a positive light and may be tempted to overestimate the number of hours spent working out per week or per month. Questions that are targeted towards depression such as; during the past 30 days how often did you feel hopeless, does not take in to consideration that perhaps an individual suffering from depression and in that state may not be able to provide an accurate assessment as they may be in this state for such a prolonged period that it may no longer seem to them that any other state of mind in normal (see appendix F).

A major issue as previously discussed with the collection of data for the BRFSS is that they are based on the participants having a phone, several individuals do not and as such this may lead to under-representation of a particular group of people.

Research Design and Approach

Research in the field of obesity in the United States has historically adopted self-reported studies, primarily because it has been cost efficient to do so, as well as from the prospective of convenience. Data is generally collected from National Health and Nutrition Examination Survey (NHANES), or the BRFSS as this study has strategically inclined to do. A few studies enroll participants who may volunteer their time and consent to provide the investigators with information, these studies however are conducted on a smaller scale and do not necessarily focus on the psycho-social and psycho-behavioral factors as this study undertakes to accomplish. The advantage of this form of secondary study is that it is convenient and has been conducted systematically. Developments in the field of technology has created a considerable increase in the number of individual based data sources, registers, data bases as well as information systems that may be of value in epidemiological research. Secondary data in research are data that has been collected with a specific research purpose.

The key advantage of this form of data is that it already exists which means that the time spent on the study is more likely to be much less than the time spent on studies that use primary data collection. Some very critical advantages are that time is saved as there are no participants needing to be recruited and followed; the fear of participants leaving the study also does not present a problem (Sørensen, Sabroe, & Olsen, 1996). Gaining consent and ensuring that the study does not endanger the health of the participants presents another major advantage. More importantly for a very large research project such as this one, as it targets African American women living in North Carolina,

secondary data provides an excellent opportunity to scrutinize this population and to contribute to a generalization based on the findings of the study. Where secondary data is used for comparing occurrence of data over time and between different populations as in this study, where a comparison of BMI levels is conducted in African American women, Hispanic women and their European Americans counterparts, the validity of the outcome needs to be complete so that the sensitivity and specificity is the same over time or in the populations being compared. The closeness of the validity measures depends on the level of the desired detection and on the changes in the true underlying factors that influence BMI in the population under study (Sørensen, Sabroe, & Olsen, 1996). Non-differential misclassification can also bias the relative measures, such as the relative risk and odds ratio, towards the value of one (Sørensen, Sabroe, & Olsen, 1996).

Ethical Concerns

The BRFSS data is collected in strictest confidence, with the method adopted for gathering and protecting in keeping with HIPPA; the requirements of federal law that prohibits giving out any information that identifies the individual or family without your consent. Data is maintained in a safe and secure manner. Individuals collecting the data for BRFSS give respondents the opportunity to decline or accept being part of the survey, this informed consent for research studies are a requirement for research studies and also includes extensive details of how the participant's protected health information will be kept private. The information files, data used in my research project and all the relevant literature used was saved in hard copy and on my flash drive as well as on the hard drive of my computer and retained for a period of ten years. Data was saved password

protected and encrypted for confidentiality and safety. The BRFSS data set 2013 is

available to the public and formal approval from the Walden IRB was required prior to

initiating the data analysis process is required for its use. The approval number for this

proposal is 04-02-15-10149127.

Summary

Chapter three was based on conducting data based analysis which includes a

descriptive study using BRFSS data ranging from 2003 to 2013. The BRFSS is conducted

continuously at the National, State and local level very month through landline

telephones and the population sample was determined by a random computer numbers

generated. The aim of this chapter was to describe the methods used to explore the

potential association between the psycho-behavioral (i.e., dietary intake, alcohol intake,

physical activity and depression) and psycho-social (i.e., income and house hold sizes)

with the BMI levels in African American women living in North Carolina in comparison

to Hispanic women and their European Americans counterparts. One of the Null

Hypothesis investigated in this study considered that the Psycho-social factors (i.e.,

Income levels and household numbers) and the psycho-behavioral (i.e., dietary intake,

alcohol intake, physical activity and depression) do not influence BMI levels between

African American, Hispanic, and European Americans women living in North Carolina.

The estimated sample size for this study determined by G*Power 3.1 software, was 800

this was the sample size required to answer the questions that would determine the

credibility of this study.

In conducting this analysis the objective was to assess some level of relationship between BMI levels and the variables (physical activity, depression, alcohol consumption, income, and household size. Potential threats to the validity and ethical concerns were viewed in the context to which they may affect the credibility of the study. Chapter four describes the results of this research study.

Chapter 4: Results

The purpose of this quantitative, cross-sectional study was to evaluate the

relationship between the psycho-social and psycho-behavioral factors and their impact on

BMI levels of African American women living in North Carolina. A comparative study

was conducted to ascertain if this association was also similar in nature in Hispanic

American women and European American women living in North Carolina. Participants

were sampled from the 2011 BRFSS survey (CDC, 2011), and the sample size for each

variable generated 8,000 to 11,000 respondents. Psycho-behavioral variables were dietary

intake, alcohol intake, physical activity, and depression and psycho-social variables were

income and house hold sizes (CDC, 2011). First, descriptive statistics were derived to

illustrate the characteristics of the distribution of numbers of the population being

studied. Secondly, statistics were derived in order to make inferences about the

population based on the data and findings. The observations and their respective

interpretations were made. To provide a baseline for the categorization of obesity, BMI

levels were classified as given in the table III below.

Table 3

Classification of Obesity (CDC, 2012)

BMI	Weight Status
Below 18.5 kg/m^2	Underweight
18.0 Kg/m^2-24.9 Kg/m^2	Normal
25.0 g/m^2-29.9 Kg/m^2	Overweight
30.0 Kg/m^2 and above	Obese
40.0 Kg/m^2 and above	Morbidly Obese

Based on the data derived from the BRFSS website (CDC, 2012), the population estimated in North Carolina for the year 2011 was 9,651,377. There were 6,276.451 European Americans comprising 65% of the population, African Americans 2,053,824 comprising 23.4% of the population, and Hispanic Americans were 826,440 and comprised 8.6% of the population. A total of 4,950,651 women reside in North Carolina. Adult obesity in North Carolina was 29.6%, while the national average is 28.1% (CDC, 2011).

Limitations of the Data

The population included in the dataset derived from the BRFSS primarily targets women living in North Carolina. It varies from the whole population in that only completed surveys were selected. There were no missing values or variables from the surveys chosen. The CDC has adopted post stratification to ensure that the data are reliable and valid. Post stratification is a standard method for weighting survey data. Principally a state-based surveillance system, the BRFSS surveys are designed to meet the public health needs of each state; many cases may involve oversampling minority populations, oversampling certain counties, or various health regions across the state. Another factor that may affect the reliability and validity of the BRFSS survey data is related to the wording of the survey questions.

Some of the questions used in the 2011 survey have been modified over the course of the last decade. Changing the format or the order of questions or definitions of an item may also impact the results. The increase in cell phone-only households in the United States and in North Carolina may also impact the reliability of the BRFSS results.

Because the results of this study do not include cell only respondents, the estimates derived for indicators such as those associated with poverty may be biased and underestimate the true prevalence of certain conditions and health risk behaviors. Social bias may also influence response. The inclusion criterion for selection was based on overweight or obesity as a risk factor.

Table 4

Descriptive Statistics of the Study Population

Ethnicity	Age (yrs.)	BMI (kg/m^2)	Mean ±*SD*	Household Income	Household Size
n=1.391					
African American	18-64	35-39.9 (*m*)	37kg/m^2 ±0.19	< $15,000(67%)	No children (3%)
				$15,000 - $25,000(14%)	1 child (17%)
				$25,000 - $35,000(9%)	2 children (43%)
				$35,000 - $50,000 (7%)	3 Children (13%)
				>$50,000 (3%)	4 Children (18%)
					5 + Children (6%)
n=6,726					
European Americans	18-64	25.0-29.9(*m*)	27kg/m^2 ±0.13	< $15,000(16%)	No children (46%)
				$15,000 - $25,000(23%)	1 child (22%)
				$25,000 - $35,000 (41%)	2 children (18%)
				$35,000 - $50,000 (12%)	3 Children (7%)
				>$50,000 (8%)	4 Children (5%)
					5 + Children (4%)
n=349					
Hispanic	18-64	30.0-34.9 (*m*)	35kg/m^2 ±0.25	< $15,000 (79%)	No children (2%)
				$15,000 - $25,000 (9%)	1 child (7%)
				$25,000 - $35,000 (7%)	2 children (36%)
				$35,000 - $50,000 (3%)	3 Children (41%)
				>$50,000 (2%)	4 Children (11%)
					5 + Children (3%)

The values provided above reflect the mean age and BMI and relative income and number of children in the respective households of African American, Hispanic American, and European American women.

Among the questions selected from the BRFSS were self-reported height and weight, from which the BMI was calculated. BMI is used as a measure of the degree to which a person is overweight or obese and is calculated as the weight of the person (kg) divided by their squared height (m). BMI classification is provided in the table above.

Some of the other questions asked in the BRFSS survey and provided in the appendix of this study target alcohol consumption, depression, physical activity, income, and household size. These questions were proposed to reflect the research questions that have been framed to reveal how these factors impact and promote obesity in African American women living in North Carolina. The following research questions were designed to investigate the level of obesity in North Carolina in African American women compared to their European American and Hispanic American counterparts based on the variables being considered as having a direct influence on their respective weights.

1. What association do psycho-social factors (i.e., income level and numbers in house hold) have on BMI levels between African American, Hispanic American, and European American women living in North Carolina?

$H_0 1$: Psycho-social factors (i.e., income levels and household numbers) do not influence BMI levels between African American, Hispanic American, and European American women living in North Carolina.

$H_1$1: Identified psycho-social factors (i.e., income level and house hold numbers) influence BMI levels between African American, Hispanic American, and European American women living in North Carolina?

2.   What association do psycho-behavioral factors (i.e., dietary intake, alcohol intake, and physical activity and depression) have on BMI levels in African American, Hispanic American, and European American women living in North Carolina?

$H_0$2: Psycho-behavioral factors (i.e., dietary intake, alcohol intake, physical activity, and depression) do not influence BMI levels in African American, Hispanic American, and European American women living in North Carolina.

$H_1$2: Psycho-behavioral factors (i.e., dietary intake, alcohol intake, physical activity, and depression) do influence BMI levels in African American, Hispanic American, and European American women living in North Carolina.

3.   Is there a difference between African American, Hispanic American, and European American women living in North Carolina with the psycho-behavioral (i.e., dietary intake, alcohol intake, physical activity, and depression) factors?

$H_0$3: There is no difference between African American, Hispanic American, and European American women living in the North Carolina with the psycho-behavioral (i.e., dietary intake, alcohol intake, physical activity, and depression) factors.

$H_1$3: There is a difference between African American, Hispanic American, and European American women living in the North Carolina with psycho-behavioral (i.e., dietary intake, alcohol intake, physical activity, and depression) factors.

4. Is there a difference between African American, Hispanic American, and European American women living in the North Carolina with the psycho-social (i.e., income level, ethnicity, and household numbers) factors?

$H_0$4: There is no difference between African American, Hispanic American, and European American women living in the North Carolina with the psycho-social (i.e., income level and household numbers) factors.

$H_1$4: There is a difference between African American, Hispanic American, and European American women living in the North Carolina with the psycho-social (i.e., income level and household numbers) factors.

Table 5 provides the results of the multiple logistic regression; a statistical analysis that provides the probability of getting a particular value of the variable associated with the measureable variable. The assumptions of the logistic regression were met by checking the data to ensure that the data could be analyzed using this methodology. The data were assessed for normal distribution that was graphed on a histogram to ensure that there were no outliners. A visual inspection was conducted to ensure a normal distribution existed. The dependent variable was measured at the nominal level, and several independent variables (physical activity, diet, depression, alcohol consumption, and house-hold size) were designated to be continuous, ordinal, or nominal in order to run the SPSS statistics (Osborne, Christensen, & Gunter, 2001).

Table 5

N=8,466 Relationship between Income, Household Size, and BMI

Characteristics	African American	European Americans	Hispanic	OR	*P*-Value	*CD*	CI 95%
	1,391	6,726	349				
Overweight/Obese	35-39.9*(m)*	25-29.9 *(m)*	30-34.9*(m)*				
Psycho-social							
Indicators							
Age: 18-24	230	1,624	89	2.45	<0.0001	0.16	(1.78-3.38)
Age: 25-44	680	2,864	143	1.20	0.091	0.11	(0.97-1.49)
Age: 45-64	363	1,924	76	.70	<0.0001	0.09	(0.59-0.83)
Age: 65 or older	128	314	41	1.00	<0.0001	0.00	(1.00-1.00)
Income (5 categories)							
<$15,000	931	1,076	731	0.92	0.496	0.13	(0.64-1.30)
$15,000-$25,000	194	1,546	31	0.86	0.122	0.11	(0.69-1.05)
$25,000-$35,000	125	2,757	24	0.89	0.321	0.12	(0.70-1.12)
$35,000-$50,000	135	807	10	0.85	0.135	0.11	(0.68-1.05)
>$50,000	42	538	7	1.00	0.00	0.00	(1.00-1.00)
No children	42	2,080	4	0.37	0.112	0.48	(0.18-1.20)
1 child	236	1,479	24	0.38	0.049	0.49	(0. 15-1.00)
2 children	598	1,210	125	0.39	0.080	0.49	(0.16-1.11)
3 children	180	470	143	0.42	0.048	0.50	(0.14-0.99)
4 children	250	336	38	0.49	0.096	0.56	(0.15-1.00)
5+ children	83	269	10	1.00	0.000	0.00	(1.00-1.00)

According to the results, the psycho-social factors (i.e., income and house-hold size) influenced BMI levels between African American, Hispanic American, and European American women living in North Carolina. African American women living in North Carolina were in a category known as Class II obesity (severe) of 35-39.9 kg/m^2 who earned a median income less than $15,000 per annum and had on average of two or more children. Their European American counterparts earned an average of $25,000-$35,000 per annum and, on average, had no children; their median age range was 25-44 years, and they were classified as being overweight BMI level was 25-29 kg/m^2. Hispanic American women living in North Carolina earned on average less than $15,000 a year and had an average of three or more children; their respective BMI levels were classified

as Class I obesity of 30-34 kg/m^2. The null hypothesis was rejected in favor of the alternative.

The confidence interval indicated the level of uncertainty around the measure of effect (precision of the effect estimate), which was expressed as an OR. Confidence intervals were used because I recruited only a small sample of the overall population. By having an upper and lower confidence limit, the true population effect can be shown between these two points. Most scholars report that the 95% confidence interval (95%CI). $P < 0.05$ indicates a statistically significant difference between groups. $P>0.05$ indicates that there is not a statistically significant difference between groups.

According to table 5 amongst the variables income, house-hold size and the incidence of obesity, women aged 18-24 were 2.45 ($p<0.001$) times more likely to be obese than women in the age range 25-44. Women in the age range 25-44 were 1.20 ($p<0.09$) times more likely to be obese than women in the age range 45-64. Women in the age range 45-64 were 0.70 ($p<0.001$) times less likely to be obese than women over the age of 64. Where income was analyzed as the variable promoting obesity, women making less than $15,000 were 0.496 ($p<0.112$) times more likely to be obese than women making over $50,000. Women making between $15,000 and $25,000 were 0.86 ($p<0.048$) times more likely to be obese than women who made between $25.000 and $35,000. Women making between $25,000 and $35,000 were 0.89 ($p<0.040$) times more likely to be obese than women who made over $50,000. Women who made over $50,000 had an odds ratio of 1.00 ($p<0.048$) compared to women making less than $15,000 a year.

Women with no children had an odds ratio of 0.37and were less likely to be obese than women with one child. Those with one child were 0.38 less likely to be obese than women with two children. Women with two children were 0.39 times less likely to be obese than women with three children. Women with three children were 0.42 times less likely to be obese than those with four children. Women with four children were 0.49 times more likely to be obese than women with three children. There were significant correlations between the increases in house-hold size and the potential for increase in obesity in women.

To address Research Question 1, a multiple logistic regression analysis was adopted to assess the possible association and differences in the expression of these factors and how they qualify in the three population groups' understudy. The BRFSS questionnaire found in the appendix of this study addresses the type and format of the questions respondents were asked.

Table six illustrated that women in the age range 18-24 were 0.85 ($p < 0.0001$) times more likely to be obese as a result of their dietary intake, which included the number of fruits and vegetables consumed daily. Women in the age range 25-44 were 0.54 ($p < 0.0001$) less likely to be obese as a result of their dietary intake, while women in the age range 45-64 were 0.70 ($p < 0.0001$) times more likely to be obese than women in the age range of 25-44. In the case of alcohol consumption, women in the age range 18-24 were 0.19 ($p < 0.0001$) times more likely to be obese as a result of alcohol consumption, while women in the age range 25-44 were 0.29 ($p < 0.0001$) times more likely to be obese as a result of alcohol consumption. Women in the age range 45-64

were 0.30 ($p < 0.0001$) times more likely to be obese as a result of alcohol consumption. The extent to which physical activity influenced obesity in women in the age range 18-24 resulted in an odds ratio of 1.81, suggesting that women in the age range 18-24 were more likely to engage in physical activity, while women in the age range 25-44 were 1.71($p < 0.0001$) times less likely to be obese as a result of physical inactivity. Women in the age range 45-64 had an OR of 2.00 ($p < 0.0001$) showing that they were more likely to engage in physical activity than women in the age range of 25-44. In the case of depression as having the potential to influence obesity, women in the age range 18-24 were 0.48 ($p < 0.0001$) times less likely to be obese as a result of depression, while women in the age range 25-44 had an OR of 0.53($p < 0.0001$) and were more likely to be obese as a result of depression. Women in the age range 45-64 were 0.50 ($p < 0.0001$) times less likely to be obese due to the onset of depression.

In the case of dietary intake, the number of portions of fruits and vegetables consumed were assessed. Women in the age range 18-24 had an OR of 0.85($p < 0.0001$), while women in the age range 25-44 had an OR of 0.54($p < 0.0001$), suggesting a higher consumption of fruits and vegetables. Women in the age range 45-64 had an OR of 0.70 ($p < 0.0001$), suggesting that they were more likely to be obese than women in the age range 25-44 based on the level of consumption of fruits and vegetables.

Table 6

Level of Influence of Psycho-Behavioral Factors N=8,466

Characteristics	African American	European Americans	Hispanic	Odds Ratio	*P*-Value	*CD*	CI 95%
	1,391	6,726	349				
	35-39.9(*m*)	25-29.9 (*m*)	30-34.9(*m*)				
Psycho-Behavioral Indicators	918 (66%)	5,380(80%)	282(81%)				
Dietary Intake		5,380(80%)	282(81%)				
Age: 18-24	72	1,224	52	0.84	<0.0001	0.33	(0.69-1.05)
Age: 25-44	262	1,459	117	0.54	<0.0001	0.27	(0.32-0.92)
Age: 45-64	429	3,279	89	0.70	<0.0001	0.35	(0.59-0.83)
Age: 65+	155	1,028	24	1.00	<0.0001	0.00	(1.00-1.00)
Alcohol Consumption	82 (5.9%)	5,313 (79%)	48(13%)				
Age: 18-24	12	1,022	8	0.19	<0.0001	0.33	(0.09-0.40)
Age: 25-44	49	3,285	27	0.29	<0.0001	0.21	(0.17-0.49)
Age: 45-64	12	3,279	11	0.30	<0.0001	0.32	(0.19-0.48)
Age: 65+	9	1,028	2	1.00	<0.0001	1.00	(1.00-1.00)
Physical Activity	859 (61%)	4,778(71%)	83(23%)				
Age: 18-24	121	1,331	18	1.81	<0.0001	0.38	(1.27-2.57)
Age: 25-44	218	1,524	24	1.77	<0.0001	0.27	(1.43-2.18)
Age: 45-64	449	1,758	41	2.00	<0.0001	0.24	(1.43-2.18)
Age: 65+	71	165	0	1.00	<0.0001	0.00	(1.00-1.00)
Depression	128 (9%)	4,439 (65%)	59(17%)				
Age: 18-24	22	1,009	7	0.48	<0.0005	0.31	(0.32-0.72)
Age: 25-44	53	2,429	28	0.53	<0.0001	0.24	(0.40-0.68)
Age: 45-64	39	1,758	13	0.50	<0.0001	0.22	(0.39-0.63)
Age: 65+	14	165	11	1.00	<0.0001	0.00	(1.00-1.00)

I stopped reviewing here due to time constraints. Please go through the rest of your chapter and look for the patterns I pointed out to you. I will now look at your Chapter 5.

The level of association that the psycho-behavioral factors (i.e., dietary intake, alcohol intake and physical activity and depression) have on BMI levels in African American, Hispanic, and European Americans women living in North Carolina were based on both age and ethnicity. The highest consumption of alcohol was seen in European Americans women but this did not appear to affect their BMI levels. The

lowest consumption of alcohol was seen in African American women followed by their Hispanic counterparts. A common component is age amongst the various ethnicities as the age range 25-44 years sees the highest consumption of alcohol. African American women had the lowest incidence of depression while their European Americans counterparts have the highest incidence. Dietary intake which represents both the consumption of fruits and vegetables on a daily basis (see appendix G) resulted in Hispanic and European Americans women having the highest consumption rate for both fruits and vegetables

In the case of physical activity (i.e. number of days exercised in the past month) both African American women and their Hispanic counterparts represented the lowest incidence with European Americans women having the highest rate of activity at 71% compared to African American women with 61%. The age at which most women respond to having the highest level of activity was between the ages of 45-64. The results that psycho-behavioral factors (i.e., dietary intake, alcohol intake, physical activity and depression) do influence BMI levels in African American, Hispanic, and European Americans women living in North Carolina as a correlation exists between level of activity, fruit and vegetable consumption and a lower incidence of obesity while women with the highest incidence of depression (i.e. having 30 days of poor mental health where everything is an effort) also have a lower incidence of obesity.

RQ3   Is there a difference between African American, Hispanic and European Americans women living in North Carolina with the psycho-behavioral

(i.e., dietary intake, alcohol intake and physical activity and depression) factors?

Null Hypothesis: There is no difference between African American, Hispanic and European Americans women living in the North Carolina with identified psycho-behavioral (i.e., dietary intake, alcohol intake and physical activity and depression) factors.

Alternative Hypothesis: There is a difference between African American, Hispanic and European Americans women living in the North Carolina with identified psycho-behavioral (i.e., dietary intake, alcohol intake and physical activity and depression) factors.

Table seven represents the results of research question III in which the survey questions were completed by 992 African American women, 4,549 European Americans women and 232 Hispanic women with an incidence of obesity or overweight. In this study 16% of African American women consumed more than one alcoholic drink a day, 74.9%European Americans women consumed more than one alcoholic drink a day and only 3.82% of Hispanic women consumed more than one alcoholic drink a day. An odds ratio of $0.51 (p < 0.277)$ for African American women represents the fact that African American women are 0.51times less likely to become obese as a result of consuming alcohol, while European Americans women were $0.81 (p < 0.72)$ times more likely to become obese as a result of alcohol consumption while Hispanic women were $0.50\ (p < 0.005)$ times less likely to become obese as a result of consuming alcohol.

In the case of physical activity in women, African American women were 0.33 less likely to engage in physical activity, while European Americans women were 0.65 times more likely to engage in physical activity and Hispanic women were 0.36 less likely to engage in physical activity. These findings were very similar to the findings of depression in which the odds of African American women being prone to obesity due to depression was 0.50 ($p < 0.013$) times less likely whereas in European Americans women the odds were 0.81 ($p < 0.006$) more likely while Hispanic women were 0.35 ($p < 0.018$) less likely to be obese due to depression.

Table 7

Body Mass Index and Differences between Groups N=6,072

Characteristic	African American	European Americans	Hispanic
	992	4,549	232
Over Weight/Obese	35-39.9 (*m*)	25-29.9 (*m*)	30-34.9 (*m*)
Alcohol Consumption	992 (16.3%)	4,549 (74.9%)	232 (3.82%)
Odds Ratio	0.51	0.81	0.50
P-value	0.277	0.72	0.005
SD	0.67	0.60	0.79
CI 95%	(0.55-7.89)	(0.25-2.66)	(3.36-76.2)
Psycho-behavioral indicators			
Physical Activity	620(62.5%)	3.608(79%)	75(32%)
Odds Ratio	0.33	0.65	0.36
P-value	0.141	0.05	0.009
SD	0.32	0.31	0.35
CI 95%	(1.12-2.80)	(1.19-2.70)	(1.23-4.51)
Depression	128 (12%)	2,739 (60%)	39 (16%)
Odds Ratio	0.50	0.81	0.35
P-value	0.013	0.006	0.018
SD	0.26	0.23	0.34
CI 95%	(1.20-2.95)	(1.21-2.71)	(1.24-4.46)

There were differences among African American, Hispanic and European Americans women living in North Carolina with the psycho-behavioral (i.e., dietary intake, alcohol intake and physical activity and depression) factors assessed. The null was rejected in favor of the alternative as a higher number of European Americans women responded in the affirmative to having more than two weeks of feeling hopeless, worthless and feeling so depressed that nothing could cheer them up and although they were the group with the highest number of exercise days in a month, European Americans women also had the highest representation of adults who had more than one drink a day (see appendix F for BRFSS questionnaire) Odds ratios are used to compare the relative odds of the occurrence of the outcome of interest (e.g. obesity), given exposure to the variable of interest (e.g. dietary intake, alcohol intake and physical activity and depression). The odds ratio can also be used to determine whether a particular exposure is a risk factor for a particular outcome, and to compare the magnitude of various risk factors for that outcome.

Szmuilis (2010) showed that the 95% confidence interval (CI) can be used to approximate the exactness of the OR. A large CI according to Szmuilis (2010) designates a low level of accuracy of the OR, whereas a small CI shows a higher accuracy of the OR.

The following results were obtained from the analysis conducted for research question IV. This analysis shows the overall likelihood of obesity in all three groups of women; African American, European Americans and Hispanic residing in North

Carolina. The likelihood of African American women being obese was 0.93 ($p<0.0005$)

times more likely than the possibility of European Americans women being obese. The

possibility of European Americans women being obese was 0.50($p<0.651$) times less

likely than African American women whereas the possibility of Hispanic women being

obese was 0.75 ($p < 0.204$) times more likely than that of European Americans women.

In the case of house-hold size as having a potential influence on obesity, African

American women are 0.85($p < 0.0003$) more likely to be obese due to house-hold size or

number of children while European Americans women were 0.50($p < 0.351$) times as

likely. Hispanic women were 0.65($p < 0.042$) times as likely to be obese.

Table 8

Difference between Groups in Income and House Hold Numbers N=8,499

Characteristic	African American	European Americans	Hispanic
	992	4,549	232
Over Weight/Obese	35-39.9 (m)	25-29.9 (m)	30-34.9 (m)
Income (5 categories) <$15,000	931	1,076	232
$15,000-$25,000	194	1,546	76
$25,000-$35,000	125	2,757	24
$35,000-$50,000	106	807	10
>$50,000	42	566	7
Odds ratio	0.93	0.50	0.74
P-value	0.0005	0.651	0.204
SD	0.20	0.17	-0.52
CI 95%	(0.37-0.76)	(0.68-1.28)	(0.34-0.91)
No children	42	2,980	4
1 child	236	1,479	24
2 children	598	1,210	130
3 children	189	478	143
4 children	250	336	38
5+ children	83	269	10
Odds ratio	0.85	0.50	0.65
P-value	0.0003	0.351	0.042

SD	0.200	0.15	-0.50
CI 95%	(0.18-1.20)	(0.69-1.05)	(0.34-0.91)

The results in table seven show the differences between African American, Hispanic and European Americans women living in the North Carolina with the psycho-social (i.e., income level, and household numbers) factors. The majority of European Americans women living in North Carolina earned an average of $25,000-$35,000 per annum, had less than one child and had the lowest BMI levels at 25-29.9 kg/m^2. Whereas, Hispanic women and African American women had the highest BMI levels and the highest number of children a minimum of two plus. The results showed that the higher the income level the lower the incidence of obesity in women. However, the association viewed in the case of house-hold size or number of children and the incidence of obesity was stronger in the case of all the groups of women; African American, Hispanic and European Americans. As such, the null was rejected in favor of the alternative hypothesis as the results showed that there was a difference in the three groups being analyzed.

Summary

The results of this study demonstrated the complexities associated with understanding the underlying reasons for obesity. The association between psycho-social and psycho-behavioral factors and obesity is based in a variety of environmental factors such as the cost and convenience of purchasing food. Income and the number of individuals that comprise a house hold and directly impacts the type of food selection made based on budgetary constraints. As such obesity is not simply a behavioral problem but an economic one as well. Among ethnically diverse, low-income women and their

families the results of this study suggested that these factors affect weight gain and BMI levels. The direct appeal of low cost processed foods versus fruit and vegetable options are based on their price and the convenience of purchase. Convenience of purchase is impacted by location, access to good groceries stores and transportation systems. Given the current findings it may be concluded that obesity remains a major problem for African American women living in North Carolina, primary due to the fact that they are the major recipients of lower incomes. The findings here revealed that race or ethnicity and income as well as house hold size influence food choices and dietary compliance primarily due to the budgetary constraints they produce. African American women and adults of low income have been shown to have limited access to supermarkets and healthy foods and to consume more energy dense and nutrient poor foods when compared with their European Americans counterparts (Yu et al., 2015).

If left unaddressed, African American women living in North Carolina will continue to experience poor health, financial, and environmental challenges. Weight loss, decrease in BMI levels and decrease in waist circumference may lead to positive outcomes. Chapter five provides a discussion on the interpretation of these results.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

Obesity continues to escalate and causes detrimental effects to individuals and society alike. Attempting to control it has become a global issue because it poses a multitude of health challenges, ranging from psychosocial to psycho-behavioral, that affect many individuals. The Southeast region of the United States has the highest level of obesity (Hoban, 2012). The Southeast region of the United States has the lowest consumption levels of fruit and vegetables (Hoban, 2012). The income levels in the Southeastern regions of the United States are also considerably lower compared to the Northeast and Northwest (Hoban, 2012). Poverty levels are also highest amongst minorities living in the southeastern regions (Hoban, 2012).

Interpretation of the Findings

In this quantitative, investigative study, I examined the relationship between the psycho-social factors (i.e., income level and household size) and psycho-behavioral factors (i.e., dietary intake, alcohol intake, physical activity, and depression) that promote obesity and BMI levels among African American women living in North Carolina. In this study, I used data from the BRFSS survey. From a psycho-social perspective, it is important to understand why African Americans make certain food choices that are different from their European American and Hispanic American counterparts. Understanding the cultural and ethnic differences may help to articulate the cause of the increased BMI levels observed in African American women residing in North Carolina, where the BMI level is the 13th highest in the United States (Hoban, 2012).

The results of this study portrayed the fact that African American women continue to have more children than their European American counterparts. Hispanic American women also have larger families. The results portrayed that a majority of European American women earn between $35,000 and $50,000 and a greater population of European American women earn over $50,000 compared to their African American and Hispanic American counterparts. There were 732 Hispanic American women in this study who confirmed that they earned less than $15,000 a year, and had two or more children and were at risk for overweight or obesity. Based on the population of North Carolina, the numbers of respondents who were Hispanic American and who completed this survey were significantly smaller in number, and this may be due to several factors. Immigration status is a factor that contributes to the vulnerability of Latino immigrants, especially among the undocumented (Marshall, Urrutia-Rojas, Mas, & Coggin, 2005). It is more difficult for immigrants to find jobs and achieve economic stability, confront language barriers towards social integration, and gain access to adequate health care (Marshall et al., 2005). These are some of the factors that may contribute to a lower number of Hispanic respondents.

Robbins, Vaccarino, Zhang, and Kasl, (2001) showed that socioeconomic inequalities in health may be attributed to different factors including unhealthy behaviors. Income is not only a direct measure of economic resources, but also a primary determinant of social prestige in the United States. Systemic racial inequalities in education are attributed to the fact that the majority of African American women in their study were from the South and would have attended segregated schools with inferior

resources (Robbins et al., 2001). In the case of immigrant Latino women, although immigrant women contributed to the labor force, they continue to experience lower levels of education, income, and employment (Marshall et al., 2005).

Townsend, Peerson, Love, Achterberg, and Murphy, (2001) stated that the prevalence of overweight among women increases as food insecurity increases, from 34% for those who were food secure to 41% for those who were mildly food insecure and to 52% for those who were moderately food insecure. Food insecurity remained a significant predictor of overweight status after adjustment for potentially confounding demographic and lifestyle variables (Townsend et al., 2001). In a logistic regression analysis, mildly insecure women were 30% more likely to be overweight than those who were food secure (Townsend et al., 2001) Food insecurity has an association with overweight status among women with a higher prevalence of overweight among the food insecure, and a resulting potential for increased incidence of obesity-related chronic diseases is directly linked to income and household size.

Research Question 2 included the level of influence that the psycho-behavioral factors (i.e., dietary intake, alcohol intake, and physical activity and depression) had on BMI levels in African American, Hispanic Americans, and European American women living in North Carolina; p-values were less than 0.0001, and the OR was 1.73. The exposure was associated with higher odds of outcome, and there was a statistical difference between the three groups being investigated. The group in question that presented the greatest number of days with poor mental health were European American women with 4,439 reporting having some poor or bad mental health. One hundred and

twenty eight African American women and 59 Hispanic American women reported having over 30 days of poor or bad mental health where they felt that everything was an effort and nothing could cheer them up.

Based on the BRFSS questionnaire, adult women were considered heavy drinkers if they consumed more than one drink per day. Only 859 African American women participating in this survey were at risk of obesity. Again, European Amercian women were the group with the highest rate of consumption at 79% while only 5.9% of African American women and 13% of Hispanic American women responded in the affirmative when asked if they consumed more than one drink a day.

Miranda, Siddique, Belin, and Kohn-Wood (2005) confirmed that Hispanic American women migrating to the United States have the lowest incidence of depression and suggested that this may be attributed to the "healthy immigrant effect" (p.365). The prevalence of depression increased based on the number of years spent in the United States as efforts were made to assimilate and acquire a measure of equality (Miranda, Siddique, Belin, and Kohn-Wood (2005). Carpenter, Hasin, Allison, and Faith (2000) found an association between obesity and depression as they found a U-shaped relationship such that relatively high and low BMI values were associated with an increased probability of major depression. A higher consumption of alcohol was also associated with higher rates of depression (Carpenter et al., 2000). Immigrants may be more likely to underuse mental health services because of the stigma associated with mental illness in many cultures, cultural and linguistic barriers, less access to health insurance, and a regular source of care (Kandula, Kersey, & Lurie, 2004).

Based on the variables that have been considered in this study where physical activity was categorized as interval, depression as ordinal, alcohol as continuous, and income as continuous, adopting a multivariate analysis provided the best representation in assessing the relationship between a number of variables. According to the results of the logistic analysis, both diet and exercise were related to obesity. Women who eat fruit and vegetables fewer than three times a day were more likely to be obese than were those who consumed such foods five or more times a day. Similarly, women who participated in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise for 150 minutes per week in North Carolina had a lower incidence of obesity. European American women had the highest rate of physical activity at 71%, while Hispanic American women had the lowest at 23%. African American women rated 61% in the affirmative where physical activity was concerned; however, African American women in the rural parts of North Carolina had lower participation in physical activity compared to those who lived in the city. Younger African American women also were more likely to participate in physical activity. Women in the age range 45-64, regardless of ethnicity, were more inclined to participate in physical activities.

There are significant race differences physical activity and dietary intake. Lovejoy, Champagne, Smith, de Jonge, and Xie, (2001) found that protein intake was slightly but significantly higher in European American subjects. Additionally, polyunsaturated fat intakes were significantly higher in African Americans, whereas fiber, calcium, and magnesium intakes were significantly lower in the diets of African American women (Lovejoy et al., 2001). African American women had a significantly

higher BMI, fat mass, lean mass, and percentage body fat than did European American women (Lovejoy et al., 2001). African American women spent significantly fewer hours standing (as opposed to sitting or lying down) and climbed significantly fewer flights of stairs than did European American women. On the whole, fat consumption was higher in African American women than in their European American counterparts in the United States (Lovejoy et al., 2001).

Research Question 3 examined whether a difference existed between African American, Hispanic American, and European American women living in North Carolina with the psycho-behavioral (i.e., dietary intake, alcohol intake, and physical activity and depression) factors. I found that 82% of European American women in the state of North Carolina consumed more than one alcoholic beverage daily, while only 5.9 % of African American women consumed more than one alcoholic beverage a day and only 0.3% of Hispanic American women consumed more than one alcoholic beverage a day. African American and Hispanic American women were not heavy drinkers and were not affected by depression or poor mental health to the degree that European American women were affected. There may be several reasons for these differences. Respondents may have found it embarrassing to answer truthfully as there is stigma attached to mental illness and cultural differences whereby individuals of certain ethnicities and cultural backgrounds may seek out their pastor or other church members for solace and comfort.

Studies have found that individuals of ethnic minority were less likely to seek assistance for depression or any form of mental disability. Cutrona et al. (2005) found that ethnic minority persons were not only less likely to seek help in specialty mental

health settings, but also had higher rates of attrition from follow-up visits. The barriers to

mental health care for African American and Hispanic Americans patients include

patient's perceptions of stigma, beliefs that life experiences are the cause of depression,

problems should not be discussed outside of the family, mistrust of health care

professionals, and concerns about the effects of psychotropic medication (Cutrona et al.,

2005). African Americans in primary care settings prefer counseling over medications,

but without desiring referrals to mental health specialists (Cutrona et al., 2005). A lower

acceptability of antidepressant medication for both African Americans and Hispanic

Americans exists with a higher acceptability of counseling in Hispanic Americans

compared to European Americans (Cutrona et al., 2005). Most European Americans

found it more acceptable to be prescribed antidepressant medications as opposed to their

African American and Hispanic American counterparts (Cutrona et al., 2005).

Research Question 4 examined the difference between African American,

Hispanic American, and European American women living in the North Carolina with

the psycho-social (i.e., income level and household numbers) factors. I found that house-

holds with single mothers having more than two children, particularly of African

American decent, had the highest incidence of obesity where income levels were less

than $15,000 per year. This is in keeping with previous studies conducted by Blocker and

Freudenberg (2000) who found that obesity presents a threat to the health and the well-

being of low-income, urban, African American women. African American women have

among the highest rates of obesity in the United States and suffer from a corresponding

excess burden of obesity-related diseases. Distinct physiological, societal, cultural, and

environmental factors form a mosaic of forces that promote weight gain and prevent weight loss in these women.

In considering the differences between African American, European American, and Hispanic American women, I found that European American women on the whole had higher incomes than African American and Hispanic American women. Education is the key to higher incomes and greater income equality (Orr, Galea, Riddle, & Kaplan, 2014). Education influences health not just because of the knowledge a person obtains in school, but because education improves general skills, including critical thinking skills and decision-making abilities. Education may alter other individual characteristics that affect health investments and health. Education may operate via several mechanisms, some working through income and occupation(e.g., increased access to health care, more comprehensive health insurance, and safer working environments) and some directly linked to education itself (e.g., lower discounting rates for returns to future health, increased cognitive skills, increased ability to delay gratification, and societal rank; Orr et al., 2014). Wang and Beydoun (2007) found that minority and low SES groups are disproportionately affected at all ages with the exception of Asian Americans. Low-income families spend a higher proportion of their disposable income on food. Whereas households with income greater than $50,000 spent 7% of after-taxes income on food, low-income families (range: US$10–15 000/y) spent close to 25% (Wang & Beydoun, 2007).

North Carolina has a higher number of indicators that were rated worse than the national average. Some of these indicators are obesity, cardiovascular disease, high blood

cholesterol, high blood pressure, and diabetes (Wang & Beydoun, 2007). Among the health risk factors, North Carolina has higher indicators in the category of individuals who do not meet physical activity recommendations or meet the dietary guidelines for the recommended fruit and vegetable consumption (Jackson & Montgomery, 2014). Approximately one in five North Carolinians, almost 2.2 million people, live in a rural county (Jackson & Montgomery, 2014). North Carolinians living in rural areas are less likely to have access to adequate health services, are more likely to engage in risky health behaviors, and have a higher mortality rate than North Carolinians living in nonrural areas (Jackson & Montgomery, 2014). North Carolina's rural communities face many challenges; North Carolina is the 13th most overweight/obese state in the nation. Adults in rural areas are more likely to be overweight or obese (68.9%) compared to those in urban areas (63.3%) primarily due to the lack of accessibility to grocery stores that provide nutritious food choices and their lower income levels (Jackson & Montgomery, 2014). These facts are relevant to the results derived from this study as they provide substance to the correlations obtained. Both the NHAES and BRFSS also show that environmental and socioeconomic factors have been associated with an increase in BMI levels and that the relationship of BMI with body fatness may differ by race and ethnicity (Wang & Beydoun, 2007). The limitations placed in rural areas by inaccessibility to good food stores and the lack of public transport is directly associated with an increase in BMI levels.

Implications for Future Research

Empowering individuals with the knowledge to make better lifestyle choices in preventing obesity could decrease the development and progression of chronic diseases (Birdee et al., 2013; Carter et al., 2011; Chaudhry et al., 2009; Kurec, 2009). Kumanyika et al. (2007) confirmed that obesity is more prevalent among African Americans and other racial and ethnic minorities and that the behaviors that determine weight status are embedded in the core social and cultural processes and environments of day-to-day life in these populations. As such, identifying effective, sustainable solutions to obesity requires an ecological model such as the one recommended in this study that is inclusive of relevant contextual variables. The ecological model as the theoretical basis of this study considers all aspects of the way in which individuals eat and move, which enables the exploration of the social, economic, and physical elements of the environment. Given that race and ethnicity are potent stratification variables in the United States and its social classifications, changes in policy and practice would make a difference. Accordingly, identifying approaches to obesity prevention and treatment that are both feasible and effective in African American communities require a focus on life contexts in these communities (Kumanyika et al., 2007).

Research emanating from fields such as sociology and history has long supported the perspective that social and environmental contexts, particularly in the United States are strongly defined by race and ethnicity (Kumanyika et al., 2007). Hence, the need exists for an expansion of the paradigm of obesity from the perspective of research and community involvement which integrates the needs of African American women as they

continue to be the sole providers of their families. One-fourth of African American females aged 6 to 19 years were found to be obese (Kumanyika et al., 2007). Knowledge of effective weight-loss approaches has been derived primarily from European Americans populations (Kumanyika et al., 2007). Psycho-social and psycho-behavioral processes are fundamental aspects of African American life and knowledge. They form a fundamental understanding of the perspectives and day to day experiences that are the backdrop for weight control efforts. Multiple therapeutic modalities such as behavioral therapy, pharmacotherapy and bariatric surgery can be used in the treatment of adult obesity with the integration of clinical and community approaches for sustained weight loss (Bray, Frühbeck, Ryan, & Wilding, 2016). Hospitals need to act as models to foster changes in social norms through institutional and community practices with a combination of effective clinical service to treat obesity.

Hartman et al. (2015) provided conclusive data with findings that are similar to those in this study that confirm that diet quality is associated with psychosocial constructs and that African Americans are less likely than other racial groups to adhere to dietary standards. In their study the investigators compared psychosocial factors with fruit and vegetable intake. Hartman et al. (2015) found in a sample of 658 African Americans living in North Carolina that there was a frequency of eating at fast-food restaurants. This was positively associated with total fat and saturated fat intake as well as with dietary fat intake and inversely associated with fruit and vegetable intake (Harman et al., 2015).The role of stress in promoting obesity; one of the factors that was not considered in this study and that has important implications for future research are some of the major life stressors

associated with weight gain. The difficulty of simply being an African American women in society, safety issues and lack of career options along with the incidence of major life stressors such as the loss of a loved one through death, illness or simply living in an unsafe neighborhood. These are life stressors that may make it challenging to shop or go walking in the park. Occupational stressors such as workload, managing other employees, job politics and racism may all contribute to obesity in African American women that have not been acknowledged as consequential. Richardson, Arsenault, Cates, and Muth, (2015) endorse these associations in their study; the investigators found that stress was associated with weight gain.

Durham, North Carolina with the highest population of African American women has seen its crime rate for 2014 increase by 15% with 1,870 reported incidents of homicide, rape, robbery and aggravated assault (ncdoj.gov, 2014). African American women living in these areas are forced to deal with these life stressors on a daily bases. Use of food as a mechanism to cope with stress related to poverty, sexual abuse, violence and racial discrimination is relatively more adaptive than coping through the use of alcohol or drugs as palliatives (Kumanyika et al., 2007). Having a large body size too may have adaptive elements as well as it may convey strength and power and offer protection from domestic and street violence (Kumanyika et al., 2007). Richardson, Arsenault, Cates, and Muth, (2015) confirmed in their study that stress increased the physiologic responses that were independent of eating behaviors and diet and influence obesity through biological processes. The investigators found that women of low socio-economic strata are a particularly vulnerable population disproportionately burdened by

severe obesity. The activation of the central sympathetic nervous system and the

hypothalamic-pituitary-adrenal axis may induce cortisol secretion that may be followed

by visceral fat accumulation (Richardson, Arsenault, Cates, and Muth, 2015).

Interventions designed by future researchers should consider the importance of

designing mediations that are congruent with the needs of African American women

living in North Carolina, taking into consideration their environment and life stressors. A

pathway from stress to severe obesity may operate through eating behaviors such as

greater intake of snack foods and lower intake of fruit (Richardson, Arsenault, Cates, and

Muth, 2015). Consumption of whole grains, fruits and vegetables were below national

estimates in African American women living in North Carolina (Harman et al., 2015).

These findings have significant implications for future interventions and studies in

promoting strategies that focus on accessibility to more healthful options and on

education as well as skill building activities that promote healthful shopping, food

preparation and consumption. Yu et al. (2015) confirmed in their study that African

Americans have lower dietary scores than European Americans or Hispanics.

Social Change Implications

Obesity is a multifactorial problem, and supporting evidence proves that diets

high in fat, sodium and sugar which have become the basic intake due to their being the

main ingredients in cheap processed foods that African American women living in North

Carolina consume (Yu et al., 2015). With a household size of three or more children these

women are forced to consider their options due to the limitations of their household

budget and respective incomes. It is therefore imperative that a consideration of the

factors discussed (i.e. household size, income, depression,) and (physical activity, diet and alcohol consumption) be taken in to consideration as factors that should be addressed to decrease the inequity between groups thereby promoting social change. Population-based policies and programs that accentuate environmental alternatives are most likely to be successful if the strategies to tackle obesity are incorporated into other existing health promotion programs, particularly those preventing chronic diseases by promoting healthful eating and physical activity. Harman et al. (2015) found that African American women have a higher prevalence of obesity (58.5%) compared to all women (35.8%) and non-Hispanic European Americans women (32.2%). Environmental determinants such as access to higher quality diets, health shopping practices (e.g. the regular purchase of fresh fruits and vegetables) healthy styles in food preparation (e.g. steaming, grilling and broiling) are important and significant social change elements. Skill building activities that focus on food preparation activities that limit the intake of dietary fat and reduce the consumption of large portions are imperative aspects of social change activities that would decrease the prevalence of obesity.

Health risks increase proportionately as BMI increases and are a risk factor for multiple chronic diseases such as cardiovascular diseases, especially heart disease and stroke, diabetes, musculoskeletal disorders and some cancers such as endometrial, breast and colon cancers. African American women living in North Carolina require a culturally sensitive weight loss model and approach with guidelines which could decrease risk factors such as, morbidity and early mortality. Obesity continues to be a visible social issue for the past 15 years. Healthy People 2020 have addressed obesity as an important

goal to promote health and decrease the risk of chronic diseases (United States Department of Health and Human Services, [USDHHS], 2010). Change in diet and healthy weight maintenance have been emphasized as a priority. An important goal of Healthy People 2020 is the elimination of health disparities among the various segments of population which may occur by gender, ethnicity, education and income. This study has been based on these goals. The prevalence of obesity among African American women is 56.6 % and the highest compared to any other population in the United States (Flega, Carroll, Kit & Ogden, 2012).

The results of this study therefore, are vital for social change as they illustrate the need for a change in policy and specific strategies in the public health community in providing intervention strategies that target the needs of these individuals who are faced with the challenges of providing wholesome meals for their families while living with these social and economic obstacles discussed in this study. This study explored the factors (i.e. physical activity, diet, alcohol, income, house-hold size and depression) that needs to be addressed to bridge the gap between unhealthy eating behaviors and the overall quality of life, especially for low income women with limited resources and education that have originated due to budgetary or income forces by providing greater education and information to individuals in need of this information. Studies conducted by Hartman et al. (2015) confirmed that unhealthy eating habits, age, social and behavioral issues are some of the risk factors for obesity. The high sodium and fat content in fast foods, and processed foods contribute to the obesity epidemic especially in those areas of North Carolina that are historically rural. They reported that factors such as

knowledge, self-efficacy and attitudes related to fruit and vegetable consumption were important determinate of overall intake. Their study conducted in North Carolina reported that the frequency of eating at fast food restaurants was positively associated with total and saturated fat intake and dietary fat related behaviors and inversely associated with vegetable intake. Lack of public transport in these areas makes it especially difficult for residents to have access to good grocery stores that offer nutritious options, access to trails and parks for recreation and physical activity as well as greater job opportunities that provide benefits such as health insurance. This study provided the major factors that if addressed may promote positive social change by reducing negative stigma and improve the human and social conditions for African American women living in North Carolina.

Summary

Optimal health is imperative to the overall welfare of all human beings as it promotes longevity reduces the burden of healthcare costs and increases the quality of life, promoting the fulfillment of individual goal, expectations and achievements. Obesity has become a modern day American epidemic pervading individuals of all ethnicities but is more prevalent among lower income groups. Obesity is influenced by cultural and lifestyle factors as well as personal attitudes and behaviors such as the consumption of alcohol, dietary intake and depression. This research may contribute to social change in identifying factors associated with obesity and the psycho-social and psycho-behavioral factors that influence them. The purpose of this study was to determine why African American women in North Carolina were disproportionately

affected by obesity. This research provides some insight to the need for further studies on the prevalence of obesity among minority populations. Previous research methods is an indication that obesity prevalence has not always been diligently tracked (CDC, 2006). The ecological model of obesity illustrates the important nature and benefits of a diet high in fruits and vegetables as this has been associated with decreased incidence and mortality from a variety of chronic diseases such as cardiovascular diseases, stroke, hypertension, diabetes, obesity and certain cancers. The intrapersonal and interpersonal factors; psychosocial and psycho-behavioral factors play a role in behavior. In other words, the way individuals perceive environments in which they live can be important as the actual resources available.

Approximately 89% of Americans failed to meet the United States Department of Agriculture (USDA) dietary guidelines for fruits and vegetables in 2010 United States Department of Agriculture (USDA), 2010. Among those least likely to meet these guidelines on recommended daily servings of fruits and vegetable are non-Hispanic African Americans and individuals of lower income groups.

Longer obesity duration can also contribute to biological risk through a variety of pathways. It has been shown that the impact of obesity on peripheral insulin resistance may eventually exhaust pancreatic B cells, which can lead to decreased insulin production and subsequent diabetes (Dowd & Zajacova, 2014). Obesity is associated with altered cardiac hemodynamics which over time may impact cardiac muscle performance and increase blood pressure (Dowd & Zajacova, 2014). Long term obesity duration may be associated with health risks primarily through its association with more severe obesity,

which has known associations with a higher prevalence hypertension, dyslipidemia,

diabetes and inflammation (Dowd & Zajacova, 2014).

Conclusion

Although research has found that many factors contribute to obesity, the primary

cause is energy imbalance between the consumption of food energy and output in the

form of physical activity (Dowd & Zajacova, 2014). This disease does not develop

overnight, but its rapid rise since the 1970's is a cause of concern with the most

notoriously affected geographic region appearing to be the Southeast. Death statistics rely

on relative risk estimates to account for variances in the estimation of death related to

obesity. Degrees of obesity are associated with different levels of care as well as costs.

BMI of 30-35 kg/m^2 increases healthcare costs by 25% and a BMI of 35-40 kg/m^2

increases healthcare costs by 40%. While a BMI of 40 kg/m^2 doubles healthcare costs up

to 100%. One of the overarching goals of Healthy People 2020 is to eliminate health

disparities (Dowd & Zajacova, 2014).

In the United States, African Americans with low incomes tend to bear the burden

of chronic illnesses at much higher rates than their European Americans counterparts.

Healthy People 2020 also highlight the fact that the population groups with the worst

health status are those that have the highest rates of poverty: African Americans and

Hispanics are included in this group. Disparities in income and education levels are also

associated with differences in the occurrence of illness and death, including heart disease,

diabetes, obesity, elevated blood pressure and low birth weight. While higher economic

levels promote increased access to medical care enabling people to afford better housing

and to live in safer neighborhoods; increasing their opportunity to engage in health promoting behaviors.

Income not only influences diet, it is also strongly associated with sedentary behavior (Levine, 2011). African American women not only have the highest prevalence of obesity but also the highest rates of sedentary behavior compared to their European Americans counterparts. The costs of gym membership, work-out equipment and childcare are some of the factors that hinder their ability to participate in physical activity. Perceptions of body image and beauty are deep seated in their cultural and inherited lens (Jenkins, Jenkins, Gregoski & Magwood, 2015). Cross cultural differences in norms which pertain to ideal body image have been associated among African American women (Duncan et al. 2003). Consuming a balance diet with all the basic food groups represented on "MyPlate" is the major key to improving health disparities. This is an option that can only be achieved when good grocery stores are made available to African American women living in rural areas of North Carolina and when their income levels are at the level which allows them to make healthier options.

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Appendix A: Age-Adjusted Prevalence of Overweight, Obesity, and Extreme Obesity

among U.S. Adults Aged 20 and Over

Sample size, sex, and weight status[1]	NHANES III 1988–1994	NHANES 1999–2000	NHANES 2001–2002	NHANES 2003–2004	NHANES 2005–2006	NHANES 2007–2008	NHANES 2009–2010
Sample (n)	16,235	4,117	4,413	4,431	4,356	5,550	5,926
Total							
Overweight	33.1	34.0	35.1	34.1	32.6	34.3	33.0
Obese	22.9	30.5	30.5	32.2	34.3	33.7	35.7
Extremely obese	2.8	4.7	5.1	4.8	5.9	5.7	6.3
Men							
Overweight	40.7	39.7	42.2	39.7	39.9	40.1	38.4
Obese	20.2	27.5	27.7	31.1	33.3	32.2	35.5
Extremely obese	1.7	3.1	3.6	2.8	4.2	4.2	4.4
Women							
Overweight	25.9	28.6	28.2	28.6	25.5	28.6	27.9
Obese	25.4	33.4	33.2	33.2	35.3	35.4	35.8
Extremely obese	3.9	6.2	6.5	6.9	7.4	7.3	8.1

1
Overweight is body mass index (BMI) greater than or equal to 25.0 kg/m2 and less than 30.0 kg/m2. Obese is BMI greater than or equal to 30.0 kg/m2. Extremely obese is BMI greater than or equal to 40.0 kg/m2.

NOTES: NHANES is National Health and Nutrition Examination Survey; BMI is body mass index. Data are age adjusted by the direct method to the 2000 U.S. Census population using age groups 20–39, 40–59, and 60 and over. Crude estimates (not age adjusted) for 2009–2010 are 33.3% overweight, 35.9% obese, and 6.3% extremely obese. Pregnant females were excluded from the analysis.
SOURCE: CDC/NCHS, NHANES.

Appendix B: HHS Poverty Guidelines

The following figures are the 2014 HHS poverty guidelines which are scheduled to be published in the Federal Register on January 22, 2014. (Additional information will be posted after the guidelines are published.)

2014 POVERTY GUIDELINES FOR THE 48 CONTIGUOUS STATES AND THE DISTRICT OF COLUMBIA

Persons in family/household	Poverty guideline
For families/households with more than 8 persons, add $4,060 for each additional person.	
1	$11,670
2	15,730
3	19,790
4	23,850
5	27,910
6	31,970
7	36,030
8	40,090

Appendix C: Prevalence of Overweight and Obese by Household Income for Persons

Age 18-64 by sex

Prevalence of Overweight and Obese by Household Income for Persons Age 18–64, by Sex

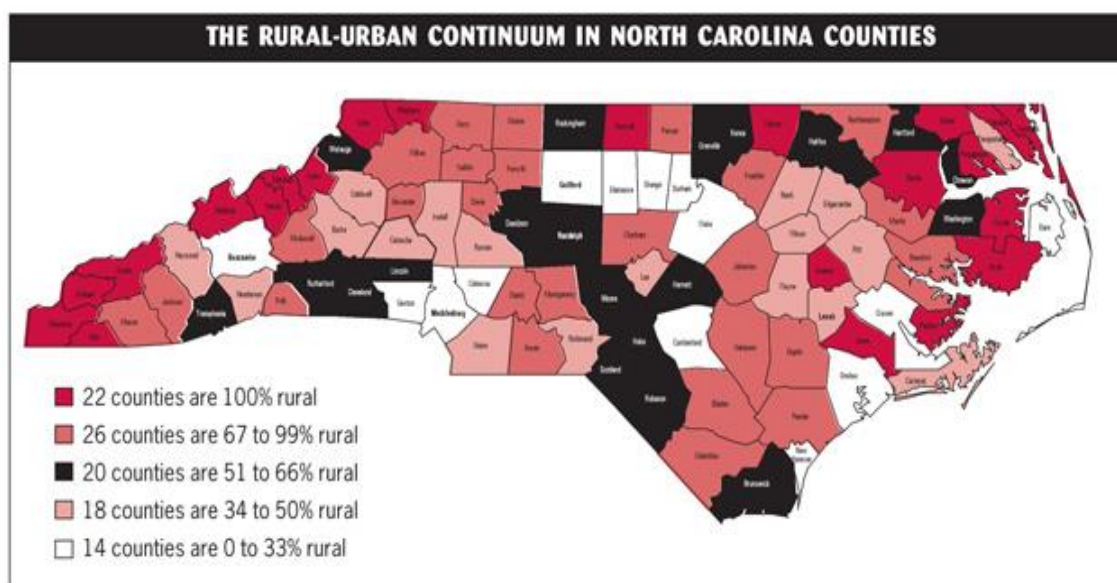| Annual Household Income	Men Weight Classification		Women Weight Classification	
	Overweight	Obese	Overweight	Obese
Less than $10k	32.28%	26.53%	26.09%	35.61%
$10k–15k	36.31	27.66	25.24	36.27
$15k–20k	35.81	27.65	27.11	35.56
$20k–25k	37.11	27.52	28.89	32.90
$25k–35k	39.97	27.52	29.53	29.84
$35k–50k	42.44	27.50	30.00	27.24
$50k–75k	46.76	27.99	29.11	24.09
>$75k	49.22	24.62	26.50	15.54
Overall	44.19%	26.61%	28.12%	25.18%

Source: Author's Calculations using data from the Behavioral Risk Factor Surveillance System 2005.

Appendix D: Definitions of Obesity

Definitions of Obesity		
Category	Body Mass Index (kg/m2)	Over Ideal Body Weight (%)
Underweight	<18.5	
Normal	18.5-24.9	
Overweight	25.0-29.9	
Obesity (class 1)	30-34.9	>20%
Severe obesity (class 2)	35-39.9	>100%
Severe obesity (class 3)	40-49.9	
Superobesity	>50	>250%

The development of obesity involves the interactions between excessive caloric intake, inefficient use of food energy, reduced metabolic activity, a reduction in the thermogenic response to meals, and an abnormally high set point for body weight. Genetic, environmental, and psychosocial factors all contribute to this problem.

Appendix E: Rural-Urban Continuum in North Carolina Counties

THE RURAL-URBAN CONTINUUM IN NORTH CAROLINA COUNTIES

- 22 counties are 100% rural
- 26 counties are 67 to 99% rural
- 20 counties are 51 to 66% rural
- 18 counties are 34 to 50% rural
- 14 counties are 0 to 33% rural

Centers for Disease Control and Prevention. (2012). Behavioral Risk Factor Surveillance System Dataset.

Retrieved from http://www.cdc.gov/brfss/annual_data/annual_data.htm#2001

Appendix F: BRFSS Questions Pertaining to Demographics

1.   How many children less than 18 years of age live in your household?

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

3.   Is your annual household income from all sources-

   a. Less than $25,000

   b. Less than $20,000

   c. Less than $15,000

   d. Less than $10,000

   e. Less than $35,000

   f. Less than $50,000

   g. Less than $75,000

4. About how much do you weigh without shoes?

5. About how tall are you without shoes?

BFRSS Questions Pertaining to Depression

6.   Now thinking about your mental health, which includes stress, depression and

problems   with emotions, for how many days during the past 30 days was your mental

health not good?

7. During the past 30 days, about how often did you feel hopeless-all of the time, most

of the time, some of the time, a little of the time or none of the time?

8.   During the past 30 days, about how often did you feel so depressed that nothing

could cheer you up?

9. During the past 30 days, about how often did you feel that everything was an effort?

10. During the past 30 days, about how often did you feel worthlessness?

BRFSS Questions Pertaining to Alcohol

11.   During the past 30 days, how many day per week or per month did you have at

least one   drink of any alcoholic beverage such as beer, wine, a malt beverage or

liquor?

One drink is equivalent to a 12-ounce beer, a 5-ounce glass of wine, or a drink with one

shot of liquor. During the past 30 days, on the days when you drank, about how many

drinks did you drink on the average?

BRFSS Questions Pertaining to Diet

12.   During the past month, how many times per day, week, month did you eat

orange colored vegetable such as sweet potatoes, pumpkin, winter squash or carrots?

13.   Not counting what you just told me about, during the past month, about how

        many times per day, week, or month did you eat OTHER vegetables? Examples

of other vegetables include tomatoes, tomato juice or V-8 juice, corn, eggplant, peas,

lettuce, cabbage, and white potatoes that are not fried such as baked or mashed potatoes.

BRFSS Questions Pertaining to Physical Exercise

        During the past month, other than your regular job, did you participate in any

        physical activities or exercises such as running, calisthenics, golf, gardening, or

        walking for exercise?

14.   And when you took part in this activity, for how many minutes or hours did you

usually keep at it?

15.   What other type of physical activity gave you the next most exercise during the

past month?

16.   How many times per week or per month did you take part in this activity during

the past month?

17.   And when you took part in this activity, for how many minutes or hours did you

usually keep at it?

18.   During the past month, how many times per week or per month did you do

physical activities or exercises to STRENGTHEN your muscles? Do NOT count aerobic

activities like walking, running, or bicycling. Count activities using your own body

weight like yoga, sit-ups or push-ups and those using weight machines, free weights, or

elastic bands.

Centers for Disease Control and Prevention. (2012). Behavioral Risk Factor Surveillance System Dataset.

Retrieved from http://www.cdc.gov/brfss/annual_data/annual_data.htm#2001