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# Variables Associated With Overweight/Obesity Among African-American Women with Hypertension and/or Diabetes

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# Variables Associated with Overweight/obesity Among African-American Women with Hypertension and/or Diabetes

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**BACKGROUND**

Obesity is the second leading cause of preventable death next to tobacco use. Although it is prevalent in all populations, it disproportionately affects AA women. Overweight/obesity increases AA women's chances of developing chronic illnesses such as diabetes, hypertension, heart disease, and decreases their life expectancy. The purpose of this study was to explore variables associated with overweight/obese AA women with hypertension and/or diabetes.

**METHODS**

A secondary data analysis was conducted using a descriptive-correlational design to analyze cross-sectional data obtained from the 2013 Behavioral Risk Factor Surveillance System (BRFSS). The sample consisted of AA women (n =1823). The dependent variable was overweight/obesity. The independent variables were household income, physical activity, fruits/vegetables consumption, life satisfaction, emotional support, and sleep. Chi-square analysis was used to study the relationship variables. For all analyses, alpha was set at 0.05.

**RESULTS**

The majority of the sample of was <= 44 years of age (97.2%), and 72.9% was single. There were 68.2% with a family income <$35,000 per year. Regarding education, 10.2% did not complete high school (HS), 29.7% had a HS diploma, and 60.2% had education beyond HS. The respondents <44 years, 86.1% were overweight or obese. The respondents ≥45 years, 74.4% were overweight or obese. Obesity differed significantly by age category, $\chi^2(1) = 13.32$, $p < .001$. There were no statistically significant results for any of the independent variables.

**CONCLUSIONS**

Further studies are needed to identify modifiable variables that relate to overweight/obesity in AA women with chronic illnesses.

## Background

Chronic diseases such as heart disease, stroke, cancer, diabetes, obesity and arthritis have become a global concern within the United States (U.S.) (Centers for Disease Control and Prevention [CDC], 2015b). Obesity, the focus of this study, has become a global epidemic and is considered the second leading cause of preventable death, with only tobacco use causing more deaths (CDC, 2015a; AHRQ, 2013; Siahpush et al., 2013).

Obesity affects all populations regardless of age, sex, race, ethnicity, socioeconomic status, education level, or geographic region (CDC, 2012; 2015a). However, despite the obesity epidemic affecting all Americans, African American (AA) populations have substantially higher rates of obesity and are nearly 1.5 times as likely to be obese compared to White populations (State of Obesity.org, 2015; Dingfelder, 2013; Siahpush et al., 2013Robinson, Webb, and Butler-Ajibade, 2011;). The disparities of obesity continues as data shows that of the 47.8 percent of the AA adults that were obese, 27.1 percent were men, while AA women were disproportionately obese at 56.6 percent (National Center for Health Statistics [NCHS], 2015; Stateofobesity.org, 2015; Ogden, Carroll, Kit, and Flegal, 2013; Risica, Gans, Kumanyika, Kirtania, and Lasater, 2013). Currently, more that 75 percent of AA are overweight or obese to include 69 percent of men and 82.0 percent of AA women, who is the target population for this study (Stateofobesity.org, 2015).

This overweight/obesity trend has found to decrease the AA woman's life expectancy and increase their chances of developing other chronic illnesses such as diabetes and hypertension (Risica et al., 2013). This vicious cycle continues as higher rates of obesity and diabetes place AAs at greater risk for hypertension (American Heart Association [AHA], 2014). These conditions combined--high blood pressure, obesity and diabetes--can then increase the risk of

heart disease and stroke (2014). Studies reported the disparity was related to geographical factors associated with affordable, healthy food; access to safe environment; and/or high levels of racial and environmental stress (Dingfelder, 2013; State of Obesity.org, 2015; Choi and Pate, 2012;).

In order to combat this epidemic, long-term prevention and treatment strategies have been sought after. However, the optimal treatment strategy is still unknown despite the overabundance of weight loss tactics (Nurkkala, et al., 2015). Approaches to weight loss are traditionally geared toward comprehensive lifestyle interventions to include diet, physical activity, and behavioral change (Sutton, Magwood, Jenkins, and Nemeth, 2016).

Cost-wise, the prevalence of obesity has resulted in billions of dollars of weight-related medical expenses (Hellmich, 2013). The trend continues upward for adults from 25.5% in 2008 to 27.7% in 2014 based on their BMI measurement (Gallup, 2015). In 2013, the American Medical Association (AMA) classified obesity as a disease, and further stated that solving the obesity epidemic is to be viewed as one of the nation's most pressing public health challenges (Abrams and Thomas, 2015). Federal requirements now mandate insurers to cover obesity screening, and many states go further by mandating coverage that ranges from basic counseling to weight-loss surgery (HealthPac Online, 2015).

## Problem Statement

Identifying and isolating variables associated with overweight or obesity among AA women can lead to the development of interventions to prevent these conditions. The Centers for Disease Control's (CDC) Behavioral Risk Factor Surveillance System (BRFSS) survey conducted in 2013 (CDC, 2016) included such variables that may be associated with overweight/obesity in this population.

A gap in research in which this study will attempt to address, is the cultural, racial, and socio-economical differences experienced by AA women that play a role in whether an individual is overweight or obese. This can impact the types of weight loss programs, interventions, strategies, and/or further research designed specifically for the overweight or obese AA woman.

## Purpose

The purpose of this study is to explore the variables associated with overweight/obese AA women with hypertension and diabetes, including income, eating habits, exercise, life satisfaction, emotional support, and sleep habits.

## Hypothesis

In this study, the following research hypotheses were tested:

For AA women with hypertension and diabetes,

- There was a difference in rates of overweight/obesity between AA women who exercised during the past month versus those who did not.
- There was a difference in rates of overweight/obesity between AA women who consumed >=5 fruits and vegetables per day versus those who did not.
- There was a difference in rates of overweight/obesity between AA women who had inadequate sleep versus those who did not.
- There was a difference in rates of overweight/obesity between AA women who experienced positive life satisfaction versus those who did not.
- There was a difference in rates of overweight/obesity between AA women who reported receiving emotional support versus those who did not.

- There was a relationship between the rates of obese/overweight in AA women and their annual household income.

## Significance

The inequities regarding obesity continue as the prevalence of hypertension in AAs in the U.S. is among the highest in the world (AHA, 2016). Specifically, more than 40% of non-Hispanic AA men and women have high blood pressure. Eighty-two percent of AA women in the U.S. are overweight or obese, and they are projected to be 100 percent by 2034 (Mitchell and Polsky, 2013). Furthermore, the biggest driver of healthcare costs and reduced worker productivity are preventable diseases. Eliminating these health inequalities also has the ability to reduce medical expenditures, and the ability to recover work lost as a result of chronic illnesses (Dingfelder, 2013).

Despite policies implemented nationally and statewide to address the obesity issue among AA women, roadblocks impede these policy efforts (Stateofobesity.org, 2015). Specifically, initiatives lack sustainability, long-term focus, or people within the community taking ownership. This study, by identifying factors related to overweight/obesity among AA women, has the potential to fill in these deficits as well as steer future research toward more lasting lifetime successes. Thus the interventions are to be culturally sensitive which increases the possibility of being accepted by AA women.

## Literature Review

Although evidence-based weight loss programs emphasized improved nutrition and increased physical activity, rising obesity rates have suggested that these efforts are ineffective, especially with long-term effects (Lemmens et al., 2008). Interventions once were targeted at reducing obesity in obese adults. However, there has been a shift in focus towards prevention of

weight gain and maintaining a healthy weight, where a modest weight loss is desirable (Reilly et al., 2015). Other recently discovered modifiable interventions that can potentially impact this epidemic is through emotional support, by way of life-coaching and behavior modification strategies (Reilly et al., 2015). A member of the U.S. Preventive Services Task Force (USPSTF) recommends 12 counseling sessions as being the minimal requirement for significant weight loss (Hellmich, 2013).

The rate of obesity has disproportionately affected AA women where approximately 60% are considered obese based on BMI $\geq 30 kg/m^2$ (Agyemang and Powell-Wiley, 2013). Furthermore, 70% are more likely to be obese as compared to Non-Hispanic white women. Obesity also comes with cardiovascular morbidity and mortality conditions such as those linked with this study's population--hypertension and diabetes. These conditions also have disproportionate rates among AA women directly associated with death from cardiovascular (CV) events.

Studies to suggest heritable traits have been linked to obesity in blacks (Agyemang and Powell-Wiley, 2013; Zhao, 2012; Cohen et al., 2011). In a particular study, a single nucleotide polymorphisms in adioponectin-related genes were evaluated. Lower adiponective has been associated with greater adiposity, metabolic syndrome, and atherosclerosis. The study consisted of a prospective epidemiological cohort designed to examine racial disparities in cancer incidence and mortality and other health outcomes. The participants were between 40-79 years of age with a mean BMI of $\sim 30 kg/m^2$. The initial sample consisted of 2,000 women where 395 women were randomly selected within strata of race (black/white) one year, and another sample of 1,605 were selected who were also equal numbers across race another year.

Data was collected through interviews and blood samples. The adiponective was measured via blood sample serum. Genotyping was successful for 1,990 of the 2,000 original samples. Genotyped ancestry markers and structure software was used to analyze data. It was found that adiponectin levels in white women significantly correlated but not so among black women. Adiponectin levels were lower in black woman than in white women (15.4 vs. 19.9 µg/ml, $p < 0.00001$). What was taken into consideration for this study was that unknown rare variants may have had a strong effect on adiponectin levels, however few studies to date, including the study aforementioned, have been powered to detect rare variants (Cohen et al., 2011).

The lack of recommended levels of exercise also have corroborated with the unusually high rates of obesity in AA women (Webb, Hannah, Doldren, and Standord, 2015). A factor that may lead to a lack of exercise in AA women compared to women of other racial/ethnic groups, is overweight and obese AA women exhibit acceptance of a larger body size where the belief that a larger body size is embraced in their culture (Agyemang and Powell-Wiley, 2013; Robinson, Webb, and Butler-Ajibade, 2012). Thus, the desire to maintain or gain weight despite already being obese may be associated with an optimistic perception of CV risk and unhealthy behaviors such as lack of physical activity.

A cross-sectional population-based observational study was conducted to describe the exercise behaviors and intention to change using the independent variable of states of change (SOC) model in a sample of 292 AA women in Florida (Web et al., 2015). The dependent variables included engaging in aerobic, strength-based, and stretching exercise. According to the authors, the SOC has been used to guide interventions to modify unhealthy behaviors such as

tobacco use prevention and unhealthy diet. The model includes moving through a progression of 5 states—pre-contemplation, contemplation, preparation, action, and maintenance.

A 90-item questionnaire was developed for this study using items from the BFRSS survey. The questionnaire assessed health behaviors, health status, overall health views, SOC for health behaviors, and socio-demographic factors. Its content was validated via 9 women from the AA community and 3 from survey research and public health experts. Specific questions targeted at physical activity included 3 items—days per week of aerobic exercise of at least 20-30 min duration, days per week of strength-building exercises, and how many times per week of strength exercises to improve flexibility. A healthy eating index was created to control for confounding variables related to the association between diet and physical activity.

Data was analyzed using SAS software. Chi-square statistics and logistic regression was performed on the data obtained. The significance levels was set at $p < .05$. The population average age was 36.4 years with an average BMI of 27.5 $kg/m^2$. On average, 83.8% reported less than 3 healthy eating habits based on the healthy eating index. Results of physical activity are as follows: 37.7% reported not participating in any aerobic exercise this week; 61.2% reported not participating in any type of strength based exercise; and 46% reported they do not participate in any stretching exercises. Based on SOC, those in the action and maintenance levels were more likely to participate in all 3 exercises ($p<.0001$ for each exercise) compared to those in other SOC phases. Through logistic regression analysis it was also found that those in action and maintenance were 16.1 times (CI 7.09-25.7) more likely to participate in aerobic exercises compared to women in other SOC phases.

Despite a limitation of this study being that data collected was all self-reported, it was ultimately found that a large number of AA women do not engage in regular recommended

levels of exercise. However, through use of the SOC, one can still identify women in the different stages of change for exercise. Then, a more culturally appropriate matched intervention could be instilled to improve AA women's exercise habits.

The relationship between eating habits/dietary intake may also impact the prevalence of obesity among AA women as disparities in dietary intake among racial, ethnic, and socioeconomic groups in the U.S. have also been identified (Agyemang and Powell-Wiley, 2013; Kong et al., 2013). Overweight/obese AA women have been found to exhibit a lower intake of fruits, vegetables, and whole grains compared to women of other racial/ethnic groups (Kong et al., 2013). These food items have been replaced with a greater intake of added sugars, sodium and calories from fat.

A cross-sectional study, which included 352 mothers and 331 children recruited from 12 Woman, Infants and Children (WIC) sites in Chicago, IL was conducted comparing AA diets with Hispanic families. This study however was conducted prior to WIC's food package revisions, which included the addition of monthly vouchers for fresh fruits and vegetables, a reduction in fat content, and an increase of whole grains.

Data was collected using registered dietitians who collected 24-hour recalls. Statistical analysis included standard deviations or proportions. Correlations between mother and children's diets were estimated with Spearman's *p*. Confounders such as age, education and receiving public assistance was tested and not found significant.

The results showed that Hispanic mothers had significantly higher ($p < .001$) median intakes of whole grains, total fruit, and total dairy compared to AA mothers. In addition, Hispanic mothers also had significantly higher median intakes of fiber ($p < .001$), calcium ($p < .001$), vitamin A ($p < .001$) and calcium ($p < .001$). Although the participants of this study were

taken from WIC sites in an urban setting, which may not be representative of all AA and Hispanic families, the study does demonstrate significant diet differences despite similar socioeconomic statuses.

Another variable of this study is sleep. The relationship between sleep and obesity exists as sleep deprivation was found to be more prevalent in AA compared to Whites (Bidulescu et al., 2010). Furthermore, long-term sleep deprivation may increase the risk of obesity due to multiple metabolic and endocrine alterations. The authors further suggest that stress and sleep deprivation may have a bidirectional relationship as stress is known to influence sleep quality. The cross-sectional studies aim was to test whether habitual sleep is inversely correlated with body mass index (BMI) and test whether these associations are modified by psychosocial stress.

A sample of 1,514 AA (aged 30-65 years) was randomly selected from a Cardiovascular Health Epidemiology Study (CHES). The mean (standard deviation) for BMI was 29.4 and 72% of the sample were women. The Global sleep quality (GSQ) score was computed as the sum of response values for the seven components of the Pittsburgh Sleep quality Index (PSQI) scale. The general perceived stress (GPS) was obtained from a validated Cohen scale. Spearman correlation coefficients were used to assess the association between the variables and Chi-square was used to assess the statistical significance. The results showed that 50% of those surveyed reported suboptimal sleep of < 6 hours/night where as 50% of respondents had poor quality sleep demonstrated by a GSQ score > 5. In regards to stress, there was an increased likelihood of obesity in the medium stress category. The authors recommended based on the study, that these two variables—stress and sleep--should be assessed simultaneously

Life satisfaction may also have an impact on the disparity of obesity among the AA women due to psychosocial stressors (Kuroki, 2016; Dingfelder, 2013; Agyemang, Powell-

Wiley, 2013). It was found that AA women create a barrier of protection for themselves from the chronic stress of racism and supporting the entire family system by eating high calorie foods also known as “comfort food” (Dingfelder, 2013).

An association between one’s body weight and life satisfaction was examined though an economic perspective, which retorted that the rise in obesity within America is largely due to rational decision-making, thus there is no economic justification for government interventions unless there is a market failure (Kuroki, 2016). However, behavioral economics suggest people can fail to make optimal decisions.

To determine life satisfaction, the survey question inquiring about life satisfaction from the BRFSS was utilized from years 2005-2010. The population included 1,465,219 (600,662 men and 864,557 women), with an average BMI of 27.4 (standard deviation of 5.4). Data was analyzed using descriptive statistics and regression.

Despite controls for health and socioeconomic variables, it was found that respondents who were very satisfied with their life were less likely to be obese than those who were very dissatisfied with their life (23.2% vs. 38.0%). Thus, there was a negative association between life satisfaction and body weight. The author does emphasize that the results do not establish causality, but does provide insight as to whether people eat beyond the optimal point, or overweight people are content with their weight. Further making an argument that government intervention may be warranted due to one’s struggle with lack of control affecting one’s long-term wellbeing/life satisfaction.

Socioeconomic status has also impacted obesity among the AA women. A study conducted in a large rural region in Texas addressed the affordability of fresh fruits and vegetables in neighborhoods (Dunn et al., 2011). It was found that AA residents paid more for

fresh fruits and vegetables. One rationale was that neighborhoods with a high proportion of AAs had higher access to small grocery and convenience stores. The prices at these stores tended to higher versus the larger supermarket and supercenters.

The social environment has been found to influence the disparities of obese AA women (Johnson, Carson, Affuso, Hardy, and Baskin, 2014). A study of 195 overweight or obese AAs from rural communities of the Alabama Belt and Mississippi Delta was conducted to characterize the prevalence of social support from family and friends for healthy eating and exercise. This was study was deemed vital as AA women residing in these areas were disproportionately burdened by obesity, physical inactivity, and poor-quality diets. Thus, it was urgent to fully understand the behaviors of this group to secure successful modifications.

The data for the study was conducted using the Social Support and Eating Habits Survey and Social Support and Exercise Survey to capture support from family and friends for healthy eating and exercise, respectively. The surveys used a 5-point Likert-type scale. The association between social support and BMI was measured by linear regression.

The support for healthy eating yielded median 14.0 for family, and median 13.0 for friends with no significant differences observed by obesity status. However, encouraging support for healthy eating received from family was significantly higher than from friends. The multivariable model showed no significant association between BMI and encouraging support. The results demonstrated that AA women in the rural Deep South experience minimal social support from family and friends for exercise or healthy eating. Research should be focused on how to increase support from family and friends.

In a study that was conducted with 9,491 non-Hispanic AA and non-Hispanic White women, socioeconomic variables were examined to explain the higher BMI in AA women

compared to White women in the U.S. The socioeconomic of interest was income, which was measured using the ratio of income to poverty threshold. Data for the study was obtained from the 2010 National Health Interview Survey (NHIS)

The methods deployed in the study included normal regression in which the association of race with BMI was compared before and after adjusting for the socioeconomic variables. Results showed that there was a 27.2% difference between BMI of AA and White women. In addition, multivariate showed that a higher socioeconomic status was associated with lower BMI ($p < 0.001$), which explained the BMI inequality between AA and White women. Additionally, being a home owner/purchaser, and having a white-collar occupation, had the lowest BMI, whereas laborers had the highest. Thus it was recommended in this study that social policies that eliminate socioeconomic inequalities between races could reduce the BMI inequality between AA and White women.

A gap in research, which several of the studies attempted to fill, was to include culture differences experienced by AA that can play a role in their weight loss success or failure. It was noted that comprehensive lifestyle interventions needed to also address cultural, socioeconomic, environmental, and individual determinants of weight (Sutton et al., 2016). This impacts the types of weight loss programs/interventions geared specifically toward AA women who remain disproportionately obese compared to racial and ethnic groups (Markham, et al., 2013). Tailored interventions or culturally sensitive interventions may be needed for this particular population.

## Theoretical Foundation

Some of the variables related to obesity among the AA woman can be affected by outside influences such as the lack of safe areas to exercise within a neighborhood, one's income level, or access to healthy food. Ultimately, weight loss requires a lifestyle change, which can be

challenging and may not be easily attainable (National Heart, Lung, and Blood Institute [NHLB], 2012). However, the lifestyle change can be successful through motivation.

The ARCS Model of Motivational Design, originated by John Keller, addresses the steps for promoting and sustaining motivation, which include: attention, relevance, confidence, and satisfaction (ARCS) (Learning-theories.com, 2016). This design, which drove the development of this study, explained that resources could be arranged to bring about changes in motivation (ARCSMODEL.com, 2013). These same resources can be the driving force to weight loss once the study reveals the overarching variables that affect obesity--positively or negatively.

Through the steps of this design theory, one can transgress through the steps beginning with methods to grab the learner's attention. A potential successful technique to grab the attention of individuals attempting to improve their health is through active participation via role-play (Learning-theories.com, 2016). Role-play gets the learner involved in the material or subject matter and can be used in reading food labels, discussing sensitive topics, and build empathy (Hassink, 2014).

The next step is relevance, which is demonstrated through communicating the future usefulness of addressing the problem of being overweight or obese. If the issue is addressed, it can result in weight loss, improved health, a decrease in co-morbidities, improved life satisfaction, or improved sleep. This "relevance" must be modeled for the learner, which can be done through speakers, videos, or mentorship.

The third step of confidence can be achieved by providing feedback and support. Health care providers can provide positive feedback and support when creating a weight loss plan for their overweight and obese clients. Strategies can be provided specifically for exercise, improving sleep, stress management, and in addition, providing the emotional support that may

be lacking in their lives. For clients with low income, a sense of confidence is needed as their income status could affect their confidence in making changes. While their clients make small successes, encouragement is continued while fostering confidence that they will succeed.

The last step to achieve motivation using the ARCS Model is through satisfaction, where a sense of achievement is given for successes. As the learners appreciates the results, they are motivated to learn (Learning-theories.com, 2016). It is also important to demonstrate the usefulness of the newly acquired success of improving their health.

Figure 1 shows the interconnections of variables within this study. Table 1 further defines each variable theoretically and operationally. According to CDC's guidelines, a person defined as "obese" has a BMI of 30.0 $kg/m^2$ or higher while "overweight" is defined as a BMI between 25.0-29.9 $kg/m^2$ (CDC, 2012). A BMI of 18.5 to 24.9 $kg/m^2$ is considered normal or healthy.

## Methods

### Research Design

A retrospective secondary data analysis design was used in this study. This type of design provides a cost-effective way of gaining a broad understanding of high impact research questions related to the prevalence of obesity, which could otherwise be expensive and/or time-consuming to study (Smith et al., 2011). This secondary research design also serves as a reference for subsequent primary research in the future.

The data was obtained from the BRFSS, a state-based system of telephone surveys obtained from the CDC website. Interviewers administer the annual BRFSS surveys continuously throughout the year and is easily obtainable online. The BRFSS identifies respondents by using a multistage cluster design based on Random Digit Dialing (RDD) to select

a representative sample from each state's non-institutionalized civilian residents aged 18 years or older on both landlines and cell phones (Smith et al., 2011). For the 2013 survey, there were a total of 491,748 participants. Of the participants, 39,151 were AA (8.0%).

**Sample and sample size**

The target population was AA women. The BRFSS uses a national representative probability sampling strategies to recruit participants. In this study, respondents from the 2013 BRFSS were included if they were AA, women, aged 18 or older, with high blood pressure only, diabetes only, or both disease conditions. Respondents who were pregnant or had a mental illness were excluded. Respondents who indicated they were Black or African American were initially identified through the demographic section of the BRFSS. After applying all criteria, the sample size resulted in 1823 AA women. There were 1513 (75.8%) who had high blood pressure only, 162 (8.1%) who had diabetes only, and 320 (16.0%) who had both conditions.

The sample size of 1823 was sufficient to answer the research questions. Based on an alpha level of 0.05, moderate effect size, and statistical power level of 0.8, the minimum sample size for a two-tailed hypothesis (2 comparison groups) was 128.

**Measurements and Instrumentation**

The variables assessed within the BRFSS were lifestyle behaviors (i.e. exercise, consumption of fruits and vegetables, and inadequate sleep), perception of health (i.e. life satisfaction and emotional support), and demographic variables (i.e. household income). These variables were held within two different data files--the full annual survey data and the Selected Metropolitan/Micropolitan Area Risk Trends (SMART) data. The full data set was required to identify information for the entire state and to have geographic variables that allowed for differentiation between urban and rural countries (CDC, 2014).

The BRFSS also contains a codebook application that shows variable names, location, and frequency of values for all reporting areas. Overweight/obesity was based on the BMI calculations from the self-reported weight and height (see Table 1). For obesity measurement within the BRFSS, the validity was found to be moderate when compared with other national surveys and physical measures. Overall, self-reports were reliable but there was a difference between self-reports and physical measures. Bias was found in the self-report height and weight estimates, especially among women. Thus, the overweight and obesity measures are an under-estimate.

Exercise was assessed in different ways within the BRFSS. For this study, it was assessed using the question whether the individual participated in any physical activities in the past month such as running, calisthenics, golf, gardening, or walking for exercise (yes or no).

Meeting dietary recommendation was measured by consumption of five or more fruits and vegetables a day. This is based on the average recommended daily fruits and vegetables according to the United States Department of Agriculture's (USDA) updated MyPyramid, which is replaced with the Healthy MyPlate (Produce for Better Health Foundation [pbh], 2016). The consumption of fruits and vegetables was combined for this study to decrease the amount of variables.

The adequacy of sleep was determined by how much sleep time in terms of hours. The National Sleep Federation (NSF) (2016) recommends 7 hours or more of sleep for adults ages 18 years and older. Sleep deprivation is found to be associated with decreased day performance, increased morbidity and mortality, risk of accidents, and diminished quality of life (Jungquist et al., 2015). A reliability and validity testing was performed on the BRFSS sleep questions using a cross-sectional assessment of 300 adults over the age of 18 (Jungquist et al., 2015). During the

literature review of this study, it was found that sleep disorders and lack of sleep opportunity were established as the two main concepts used for comparison analysis in establishing the validity of the BRFSS sleep questions. The sleep questions were compared to BRFSS responses to data from a home sleep study, actigraphy (sleep monitor) for 14 days, Insomnia Severity Index, Epworth Sleepiness Scale, and a PROMIS-57 (Patient Reported Outcomes Measurement Information System). Of the five BRFSS sleep questions, two were found valid and reliable in determining total sleep time and excessive daytime sleepiness.

Quality of life variables included emotional support and life satisfaction. Emotional support was defined as support from any source. Life satisfaction was determined by "how satisfied you are with life" and was a subjective response to one's well-being. When comparing the measure within the BRFSS against a Satisfaction with Life Scale, which was considered a more psychometrically established measure to determine validity, two large samples and a representative sample (N=13,064, N=2,277, and N=1,312 respectively) were recruited (Cheung and Lucas, 2014). To determine criterion validity, zero-order correlations and disattenuated correlations were computed between the two measures. To determine construct validity correlations between each of the measures and relevant variables were computed (income, education, self-reported health, domain satisfactions, and happiness). The satisfaction measures and the Satisfaction with Life Scale strongly correlated. The correlations between the two life satisfaction measures and external variables were weak (income and over health) in some areas and strong in others (psychological flourishing and domain satisfaction). These suggest good validity of the measures in BRFSS.

The only demographic information for the study was income level. Annual household income was used.

### Data Collection Procedure

The BRFSS is the nation's premier system of health-related ongoing telephone health survey of adults ages 18 years and older. Health-related risk behaviors, chronic health conditions, and preventive services data were collected about U.S. residents, to include the U.S. Virgin Islands, Puerto Rico, and Guam. The data collected is a result of approximately 400,000 interviews each year and is considered the largest continuously conducted health survey system in the world. Variables assessed in this study were selected from the dataset, which consisted of a core set of modules and optional modules.

### Data Analysis

The IBM® SPSS® Statistics Standard GradPack 23 for MAC (OnTheHub® eStore, 2016) was used for data analysis. Descriptive statistics, which simply described what the data shows in a simple manner, were performed to examine the frequencies of variables (Trochim 2006).

Chi-square tests were used to test the study hypotheses. For all analyses, alpha was set at 0.05. (See Table 4.)

## Ethical Considerations

BRFSS is in a public domain and the data set does not include any personal identification information. This study received "exempt" status from GWU IRB.

## Results

Characteristics of the sample are presented in Table 1. The majority of the sample were 44 years of age or younger (92.7%). Over two-thirds of the sample were single (72.9%) with only 27.1% of the sample being married. Marital status did not differ significantly by obesity status, $\chi^2(1) = 3.39$, $p > .05$.

Among respondents younger than 44 years, 86.1% were overweight or obese; among respondents 45 years and older, 74.4% were overweight or obese. Obesity differed significantly

by age category, with a significantly higher percentage of those under 45 years old then 45 and older being in the overweight/obese category, $\chi^2(1) = 13.32$, $p < .001$.

The sample was not highly educated, with 10.2% not completing high school, 29.7% having only a high school diploma, and 60.2% having education beyond high school. Education did not differ significantly by obesity status, $\chi^2(2) = 2.12$, $p > .05$.

The majority of the sample had low-income, with 68.2% of incomes under $35,000 per year. Income distribution did not differ by obesity status, $\chi^2(2) = 0.41$, $p > .05$.

Table 2 displays the results of health related behaviors, life satisfaction, and availability of emotional support. Nearly two-thirds (65.4%) of the full sample said they had exercised within the past month. The rates of reported exercise were indistinguishable by obesity status (65.4% for overweight/obese and 65.3% for normal weight, $\chi^2(1) = 0.002$, $p > .05$).

Over half (53.1%) of the full sample got inadequate sleep at night (under 7 hours). Adequacy of sleep did not differ significantly by obesity status, with 53.3% of overweight/obese and 52.1% of normal weight respondents sleeping less than 7 hours per night, $\chi^2(1) = 0.14$, $p > .05$.

The only health behavior that differed by obesity status was eating at least 5 fruits and vegetables per day, $\chi^2(1) = 6.69$, $p = .01$. For the normal weight respondents, 98.3% said they met the 5 fruits and vegetable minimum compared with 99.7% of the overweight/obese category. However, this result should be viewed with caution as so few respondents (9 or 0.5%) said they did not eat at least 5 fruits and vegetables each day. Furthermore, the result is in the opposite direction as would be expected.

There were significant missing data on the emotional support and life satisfaction scores. In fact, over 90% of the sample did not have these scores. There were no statistically significant

differences in either life satisfaction of emotional support scores by obesity status in those who did have scores, $\chi^2(1) = 2.080$, $p = .05$ and $\chi^2(1)$ 1.164, $p = .05$ respectively. The majority of both groups felt satisfied with their lives and had emotional support, but considering the small percentage of the sample on which these results are based, these results should be viewed with caution.

## Discussion

The characteristics of the sample followed the previous findings within the literature review of continued rising obesity rates despite weight loss strategies. Regardless of age, the majority of the sample was categorized as overweight/obese. Only 65.4% of the entire sample reported that they exercised within the past month while more than one third had no physical activity in the previous month. The majority of the sample also were not highly educated and had low family income.

Obesity has been associated with a number of serious health complications to include sleep disorders (National Committee for Quality Assurance (NCQA, 2013). However, over half of the full sample did not receive adequate sleep at night--under 7 hours—which has been indicative of a larger problem. Surveys conduced by the BRFSS and the National Health and Nutrition Examination Survey (NHANES) identified short sleep durations among adults (CDC, 2015c).

There has been emphasis on improved nutrition to combat the obesity epidemic, however those in the overweight/obese category said they met the 5 fruits and vegetable minimum. One reason for the inverse fruits and vegetable responses could be due to the fact that respondents in this study included only women who had either hypertension or diabetes, thus eating healthy was a mandatory requirements.

Another reason may be due the validity of fruits and vegetable intake within the survey. A study was conducted which assessed 260 AA women ranging from ages 35 to 65. A telephone interview was completed where the measure included two 24-hour dietary recalls using the BRFSS Fruit and Consumption Module (Alcantara et al., 2013). Half of the participants were unemployed (49.6%) and most were obese (88.5%). The mean fruit and vegetable intake reported from the 24 hour dietary recall was lower than using the BRFSS module. Possible reason for difference was the BRFSS module did not include portion size information where actual consumption was over reported. Therefore it was found that dietary intake measure might vary by demographic characteristics of the sample (2013). Further studies using larger samples are needed to verify the findings.

The results of the emotional support and life satisfaction could have addressed the role stress played on AA women as discussed by Dingfelder, 2013. However, the significant amount of missing data from the life satisfaction and emotional support variables limited the generalizability of the data. African Americans have historically held beliefs related to the stigma of mental health issues, which may affect their openness to seek help (Ward, Wiltshire, Detry, and Brown, 2013). Their reluctance to seek help also may affect admitting to or discussing any psychological problems, stress, or depression.

## Study Limitations

There were several limitations associated with this study. These limitations included data collection, the sample, and generalizations of the results. The initial weakness was data being collected from phone surveys, which included self-report. This type of data collection lends itself to the possibility of under- or overestimating. Another limitation included the entire sample having diabetes and/or hypertension and majority of the sample was overweight/obese.

Therefore, we could not compare respondents who had no complications with this group to assess their health behaviors.

## Implications/Recommendations

In order to make a significant impact on obesity in the AA woman, it is imperative to identify factors that may be nontraditional strategies that could make a positive effect. The lack of significant findings may suggest that a community-based approach is required (Liao et al., 2016). In addition, the missing responses to the emotional support and life satisfaction variables suggest these questions should to be investigated further. These topics, which may be sensitive to the AA population, can be addressed in a sensitive and trusting environment. During clinic visits, questions regarding coping behaviors and stress management can be inquired. Patients can then be referred for further evaluation in order to determine how life satisfaction or emotional support impacts their behaviors and lifestyle.

## Conclusions

There were no significant predictors for overweight/obesity in this study for AA women who were diagnosed with hypertension and/or diabetes. This study, including the variables explored, could steer future research and development of effective, lasting interventions that decrease the rate of overweight/obese among AA women. Further studies are needed to identify modifiable variables that relate to overweight/obesity in AA women with chronic illnesses. Future interventions to decrease overweight/obesity in this population would have to be multifaceted and no one intervention could be of higher priority than the other.

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**Table 1**

Characteristics of the Sample by Obesity Status

| | ***Total sample n (%)*** | ***Overweight/ Obese n (%)*** | ***Normal Weight n (%)*** | ***χ2*** | ***p*** |
|---|---|---|---|---|---|
| **Total Sample** | 1,823 (100) | 1,154 (85.2) | 269 (14.8) | | |
| **Age** | | | | 13.32 | <.001 |
| <=44 | 1,690 (92.7) | 1,455 (86.1) | 235 (13.9) | | |
| >45 | 133 (7.3) | 99 (74.4) | 34 (25.6) | | |
| **Diagnosed with Hypertension** | | | | 0.29 | .590 |
| No | 141 (7.7) | 118 (7.6) | 23 (8.6) | | |
| Yes | 1,681 (92.3) | 1,435 (92.4) | 246 (91.4) | | |
| **Education** | | | | 2.120 | .346 |
| Not graduated from high school | 185 (10.2) | 151 (9.7) | 34 (12.6) | | |
| High School | 540 (29.7) | 462 (29.8)) | 78 (29.0) | | |
| More than high school | 1,095 (60.2) | 938 (60.5) | 157 (58.4) | | |
| **Annual Income** | | | | .405 | .816 |
| <$35,000 | 1,117 (68.2) | 955 (68.1) | 162 (68.6) | | |
| $35,000-$74,999 | 357 (21.8) | 304 (21.7) | 53 (22.5) | | |
| >= $75,000 or higher | 164 (10.0) | 143 (10.2) | 21 (8.9) | | |
| **Marital status** | | | | 3.385 | .066 |
| Married | 489 (27.1) | 429 (27.9) | 60 (22.5) | | |
| Single | 1,316 (72.9) | 1,109 (72.1) | 207 (77.5) | | |

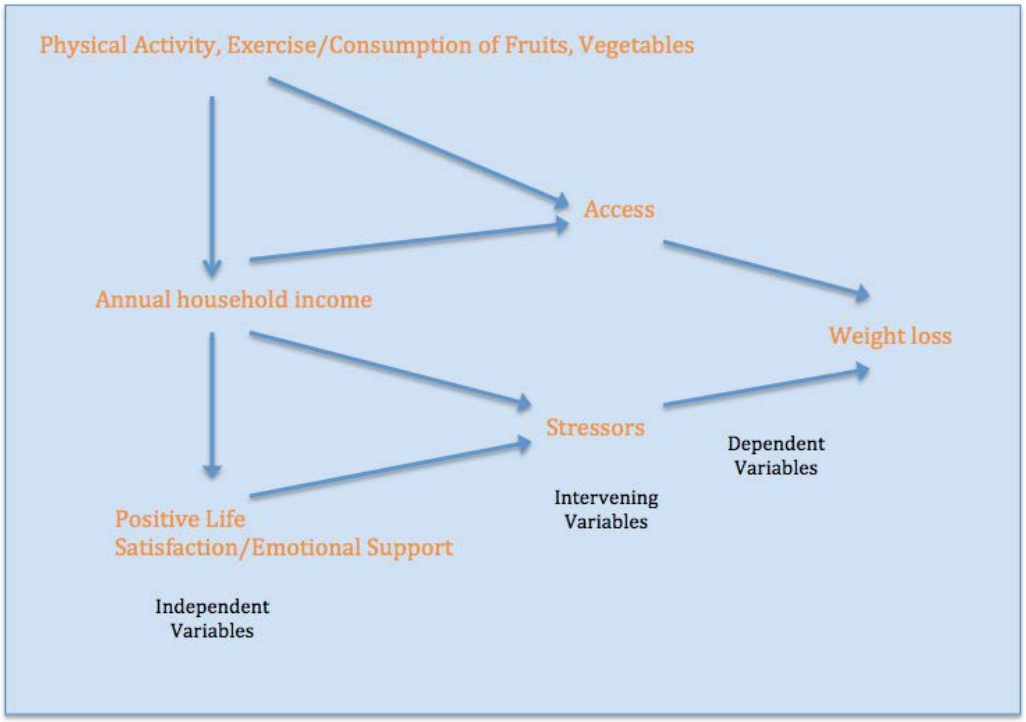
**Table 2**

Health Behaviors and Mental Health Characteristics by Overweight/Obese Status

| | *Total sample n (%)* | *Overweight/ Obese n (%)* | *Normal Weight n (%)* | *χ2* | *p* |
|---|---|---|---|---|---|
| **Exercised within the past month** | | | | 0.002 | .961 |
| No | 579 (34.6) | 496 (34.6) | 83 (34.7) | | |
| Yes | 1,095 (65.4) | 939 (65.4) | 156 (65.3) | | |
| **>=5 fruits/vegetables per day** | | | | 6.693 | .010 |
| No | 9 (0.5) | 5 (0.3) | 4 (1.7) | | |
| Yes | 1,681 (99.5) | 1,443 (99.7) | 238 (98.3) | | |
| **Adequate sleep** | | | | 0.136 | .712 |
| No | 945 (53.1) | 807 (53.3) | 138 (52.1) | | |
| Yes | 834 (46.9) | 707 (46.7) | 127 (47.9) | | |
| **Positive life satisfaction** | | | | 2.080 | .149 |
| Satisfied | 143 (92.9) | 120 (91.6) | 23 (100) | | |
| Dissatisfied | 22 (7.1) | 11 (8.4) | 0 (0) | | |
| **Emotional support** | | | | 1.164 | .281 |
| Usually/Always | 109 (69.9) | 90 (68.2) | 19 (79.2) | | |
| Sometimes/Rarely/Never | 47 (30.1) | 42 (31.8) | 5 (20.8) | | |

## Appendix A

Figure 1: Causal Model of Variables (Creswell, 2014)



## Appendix B

Variables Affecting Obesity Prevalence in African-American Women

| Variables | Type of Variable | Theoretical Definition | Operational Definition |
|---|---|---|---|
| Physical Activity/Exercise | Independent | | 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?1 =Yes; 2=No |
| Meeting dietary recommendations | Independent | Consumption of fruits to ensure adequate vitamins/nutrition | Consumption of five servings of Fruits and vegetables per day 1=Yes; 2 =No |
| Life Satisfaction | Independent | The perception of how satisfied you are with you life; experiences low stress | In general, how satisfied are you with your life?<br>1=Very satisfied, 2=Satisfied;<br>3=Dissatisfied; 4 =Very dissatisfied; |
| Emotional Support | Independent | Having a support system and/or network of friends | How often do you get social and emotional support you need?<br>1=Always; 2=Usually; 3=Sometimes;<br>4=Rarely; 5 =Never |
| Inadequate Sleep | Independent | Sleep pattern based on number of hours of sleep | On average, how many hours of sleep do you get in a 24-hour period? 1-24=Number of hours; 77=Don't know; 99=Refused (recommended sleep for an adult 18yr+ is >=7 hours (NSF, 2016) |
| Annual Household Level | Independent | Income earned annually | What is your annual household income from all sources less than $10,000 to <$15,000, $15,000 to <$20,000, $20,000 to <$25,000, $25,000 to <$35,000, $35,000 to <$50,000+ |
| Body Mass Index (BMI) | Dependent | A measure of body fat based on height and weight measurements | BMI calculation formula:<br>weight (kilogram)/height (meters)$^2$<br>BMI Weight categories:<br>Normal weight: 18.5-24.9<br>Overweight: 25.0-29.9<br>Obese: 30.0 or higher |

## Appendix C

Data Definition Codes (CDC, 2014)

| Variables | Code | Value/Value Label |
|---|---|---|
| Physical Activity/Exercise | EXERANY2 | 1 Yes<br>2 No--Got to Section 12.08<br>7 Don't know/Not sure--Go to Section 12.08 Strength<br>9 Refused--Go to Section 12.08 Strength<br>BLANK Not asked of mission |
| Physical Activity/Exercise | _TOTINDA<br>*calculated variable from EXERANY2 | 1 Had physical activity in the last 30 days<br>2 No physical activity in the last 30 days<br>9 Don't know/Refused/Missing |
| Consumption of Fruits | _FRUTSUM<br>*calculated variable from FTJUDA1_ +FRUTDA1_ | 0-99998 Number of Fruits consumed per day<br>. Not asked or Missing Respondents with a 99 value for all four fruits per day variables |
| Consumption Vegetables | _VEGESUM<br>*calculated variable from GRENDAY_, ORNGDAY_, BEANDAY_, +VEGEDAI | 0-99998 Number of Vegetables consumed per day<br>. Not asked or Missing Respondents with a 99 value for all vegetable per day variables |
| Inadequate Sleep | SLEPTIM1 | 1-24 Number of hours<br>77 Don't know<br>99 Refused |
| Life Satisfaction | LSATISFY | 1 Very satisfied<br>2 Satisfied<br>3 Dissatisfied<br>4 Very dissatisfied<br>7 Don't know/Not sure<br>9 Refused<br>Blank |
| Emotional Support | EMTSUPRT | 1 Always<br>2 Usually<br>3 Sometimes<br>4 Rarely<br>5 Never |
| Annual Household Level | INCOME2 | 1 Less than $10,000<br>2 Less than $15,000<br>3 Less than $20,000<br>4 Less than $25,000<br>5 Less than $35,000<br>6 Less than $50,000<br>7 Less than $75,000<br>8 $75,000 or more<br>77 Don't know/Not sure<br>99 Refused<br>Blank Not asked or Missing |

| | | |
|---|---|---|
| Height | HTM4<br>*calculated variable for reported height in meters from HTIN4 (multiplying HTIN4 by 2.54cm per inches and dividing by100 cm per meter | 91-244 Height in meters<br>999 Don't know/Refused/Missing |
| Weight | WTKG3<br>*calculated variable for reported weight in kilograms from WEIGHT2 by multiplying WEIGHT2 by 0.4535924 kg per lb | 2300-29500 Weight in kilograms (2 implied decimal places)<br>99999 Don't know/Refused/Missing |
| Body Mass Index (BMI) | _BMI5<br>*calculated variable from body mass index from WTKG3 and HTM4 by dividing WTKG3 by $HTM4^2$ | 1-9999 1 or Greater<br>. Don't know/Refused/Missing |
| Overweight/Obese | _BMI5CAT<br>*calculated variable for four-categories of BMI from _BMI5 | 1 Underweight (<18.50)<br>2 Normal Weight (18.50<= _BMI5 < 25.00)<br>3 Overweight (25.00 <= _BMI5 < 30.00)<br>4 Obese (30.00 <= _BMI5 < 99.00)<br>. Don't Know/Refused/Missing |
| Overweight/Obese | _RFBMI5<br>*calculated variable for adults with BMI greater than 25.00 (overweight or obese) from _BMI5 | 1 Respondents not classified as overweight or obese based on BMI<br>2 Respondent classified as overweight or obese based on BMI |

## Appendix D

GWU IRB Exempt Letter

GW Office of Human Research

Memorandum

To: Quiping Zhou, PhD

Monica Hamilton, MSN

From: The George Washington University Office of Human Research

Date: April 29, 2016

Study Title: Variables Affecting Obese/Overweight African-American Women with Hypertension and Diabetes using the United States Behavioral Risk Factor Surveillance System (BRFSS)

Re: Determination of Research Not Involving Human Subjects

Regarding the Determination Worksheet and supporting documents submitted April 26, 2016 for the project entitled, "Variables Affecting Obese/Overweight African-American Women with Hypertension and Diabetes using the United States Behavioral Risk Factor Surveillance System (BRFSS)," a determination has been made that this project does not meet the definition of human subjects research. That is, a living individual about whom and investigator 1) obtains data through intervention or interaction or 2) private identifiable information.

This determination is being made because the data will be obtained via the Center for Disease Control's Behavioral Risk Factors Surveillance System (BRFSS) and is not identifiable, nor will the research team have access to any codelink that may enable identification of respondents.

Further review by the GWU Institutional Review Board (IRB) is not required.

Should your project change in such a way that it does meet the definition of human subjects research, please consult with OHR before proceeding.

Cortni Romaine, MS, CIP

Education and Outreach Coordinator

**Appendix E**

GANTT Chart--Research Project Timelines (FPPT.com, 2016)