2017

The Influence of Cardiovascular Disease Risk Factors on Exercise Participation

Chadrick Cooper
Walden University

Walden University

College of Health Sciences

This is to certify that the doctoral study by

Chadrick Cooper

has been found to be complete and satisfactory in all respects,

and that any and all revisions required by

the review committee have been made.

Review Committee

Dr. Chester Jones, Committee Chairperson, Health Sciences Faculty

Dr. Adebowale Awosika-Olumo, Committee Member, Health Sciences Faculty

Dr. James Rohrer, University Reviewer, Health Sciences Faculty

Chief Academic Officer

Eric Riedel, Ph.D.

Walden University

2017

Abstract

The Influence of Cardiovascular Disease Risk Factors on Exercise Participation

by

Chadrick Cooper

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Public Health

Walden University

March 2017

Abstract

The study's purpose was to analyze whether the control (sustained healthy level) of independent cardiovascular disease risk factors could be used to significantly predict aerobic exercise status. The health belief and ecological model helped describe health awareness, autonomy, and ecological influences that could also influence the control of each risk factor. Multiple logistic regression analysis of behaviors and demographics was utilized to assess relationships of met aerobic recommendations to hypertension, diabetes, obesity, tobacco/alcohol use, diet, physical activity limitations, mood, and socio-economic status. The study consisted of 340 African American participants (37% male 63% female), between the ages of 30-64 who, lived in the state of Texas. With a 95% confidence internal, $p < .05$, and effect size of .15, results indicated that participants controlling the risk factor *poor diet* (*P* = .011; *OR* 3.3 [*CI* 95%]) were three times more likely to meet aerobic recommendations than those who did not. Participants controlling risk factors *education status* (*P* = .002; *OR* 2.4 [*CL* 95%]), *sex* (*P* = .012; *OR* 1.9 [*CI* 95%]), and *high blood pressure diagnosis* (*P* = .044; *OR* 1.7 [*CI* 95%]) were also more likely to meet exercise recommendations than those who did not. Findings showed that by initiating and sustaining changes in modifiable factors, participants were likely to meet aerobic recommendations and reduce their risk for cardiovascular disease. Policy makers, educators, health professionals, and employers are recommended to implement the study's results in communities, workplaces, and schools to target health promotion at persons with poor diet, hypertension, and less than a college education.

The Influence of Cardiovascular Disease Risk Factors on Exercise Participation

by

Chadrick Cooper

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Public Health

Walden University

March 2017

Table of Contents

List of Tables

Section 1: Foundation of the Study and Literature Review

The American Psychological Association (APA) concluded in its "Stress in America" survey of 3,068 participants that 42% of Americans were unsure of how to manage their stress and mood (2015). A majority of these participants reported engaging in unhealthy behaviors such as excessive eating, alcohol consumption, and smoking to suppress symptoms such as anxiety and depression (APA, 2015). With anxiety and depression classified as *poor moods* often stimulated by stressful events, multiple risk factors for cardiovascular disease may be linked to behaviors prompted by such moods, and therefore contribute to the advancements of certain diseases and increased mortality rates in existing and at risk populations (American Public Health Association [APHA], 2014). The APHA (2014) has identified common risk factors for cardiovascular disease, but has given little attention to alternative and non-pharmaceutical controls of moods and emotions that may be associated with unhealthy behaviors linked to the multiple risk factors for cardiovascular disease.

Problem

The public health concern I addressed in this study is the lack of research on the relationships between cardiovascular disease risk factors, relative to the numerous studies on reduction of a single factor. In addition, there has been even less investigation specifically targeting the general mood and the effects of multiple health related behaviors amongst African Americans. Chwastiak et al. (2011) for example, noted that there were a small class of authors who evaluated diets and or exercise routines for cardiovascular disease prevention/maintenance in addition to general mood, mental health status, and or the influencing causative factors for mood. The gap that I found in numerous past studies was the absence of investigation regarding links between physical and psychological (mental) health determinants that may either promote well-being or be linked to disease causing factors which may increase mortality and morbidity, especially in target populations already predisposed to certain diseases.

Purpose

The purpose of this doctoral study was to investigate the relationship of exercise participation to the cardiovascular disease risk factors hypertension, overweight/obesity, diabetes, smoking/alcohol drinking status, poor diet, socio-economic status, and stress (poor mood) previously recognized by American Heart Association (2016) and the National Institute of Health's (NIH) National Heart, Lung, and Blood Institute (2016). The "major" risk factors such as hypertension, overweight/obesity, and diabetes are defined as those that have been scientifically proven, whereas the "contributing" factors such as stress, poor diet, and socio-economic status have been acknowledged as potential influencers of the major factors which could ultimately increase cardiovascular disease risk (Centers for Disease Control and Prevention, 2016). I identified a problem and theoretical components that showed to have influence on a hypothesized homeostatic relationship between variables. I then proceeded to test this hypothesis. In this study, I investigated how changes in behaviors associated with cardiovascular disease risk factors including poor mood status, smoking/alcohol behavior, poor diet, hypertension and diabetes status, overweight/obesity, activity limitations, income, and education related to participant’s likelihood of meeting aerobic exercise recommendations. To create positive social change, I have developed recommendations from this doctoral study to assist individuals in modifying personal and familial behaviors. I accomplished this through increasing the identification of a single influencer that could have potential association to multiple factors. The results have displayed the effect of modifying risk factors that were found to be significant in the study to be used to reduce risk of cardiovascular disease. I discerned I strong need for this study to not only provide a quantitative analysis of data, but, to properly disseminate the findings to public health platforms created to meet the needs of African Americans. This was the subgroup that served as my target population and that had the highest rates of cardiovascular disease mortality from hypertensive complications (CDC, 2016).

Research Question

The following served as my primary research question: What is the relationship between the evaluated control over cardiovascular risk factors, hypertension, diabetes, overweight/obesity, tobacco/alcohol use, poor diet, activity limitations, poor mood, and socio-economic status (income and education status), and the predicted outcome of participants meeting weekly exercise recommendations of either 150 minutes moderate activity or 75 minutes vigorous activity, among African Americans? I also used age and sex as covariates due to the higher prevalence of hypertension diagnoses in middle- to later- aged male participants (CDC, 2015). In the dataset I utilized to answer the research question, diabetes, hypertension, alcohol use, tobacco use, and diet were each associated with a single variable, while poor mental health, physical activity limitations, overweight/obesity, and socio-economic status were associated with two variables each. The data set that I used was from the Texas Behavior Risk Factor Surveillance System.

Hypothesis

The alternative hypothesis was that the control of risk factors, poor mood status, smoking/drinking behavior, hypertension and diabetes status, overweight/obesity, poor diet, activity limitations, and higher socio-economic status, would display a significant outcome that, participants met aerobic exercise recommendations. The null hypothesis was that the control of risk factors, poor mood status, smoking/drinking behavior, hypertension and diabetes status, overweight/obesity, poor diet, activity limitations, and higher socio-economic status, would not display a significant outcome that, participants met aerobic exercise recommendations.

Theoretical Foundation

For the theoretical framework of this doctoral study, I used models which targeted the individual as well as environmental cues that may influence behavior, environmental barriers, and promoters of cardiovascular disease. The ecological model's focus on multiple factors in the environment, and the health belief model's specificity regarding awareness and health autonomy were useful when I worked to distinguish demographic differences in hypertension, nutritional awareness, and mood/emotional control that may influence the prevention or progression of cardiovascular disease. Dunn et al., (2005) found that it would be advantageous to measure for several modifiable factors of disease at one time, rather than testing them alone. In addition, the authors inferred that changes in the built environment and a comprehensive reorganization of multiple factors that have an identified significance or contribution to behavior could collectively promote various health outcomes (Dunn et al., 2005). I then recognized that the variation of health outcomes could derive from each of the factors' differences in how they ultimately affect the overall outcome (disease), and other related factors that are linked to behavior.

More specifically, in this study I used the ecological model's components *individual awareness* and *socio-economic status* to assist in identifying cofactors and confounding variables that could be related to risk factors for disease (see Edberg, 2007). I also used the constructs of *perceived susceptibility* and *self efficacy* from the health belief model to assess educational and demographical differences in the participants' perceived ability to modify known health-related risk factors. Combined, the two models strengthened my ability to evaluate the significance of essential variables related to individual and community level influencers. Additionally, the two models heightened my awareness of alternatives to control risk factors and behaviors linked to cardiovascular disease within a targeted subpopulation (see APHA, 2016). The application of these theories may promote health and disease-related insight specifically regarding the African American/Black population about possible behaviors, perceptions, moods, and approaches to improve control over recognized and previously unrecognized influencers of disease. My goal was to provide insight for the increased need of theories and models to be implemented into programs and further prioritized according to the magnitude of the health concern among the population.

Nature of Study

I implemented an inferential design using multiple logistic regression to analyze quantitative data. Next, I assessed all data with an SPSS statistical package, and used supplementary sources to confirm information. This process was followed by my assessment of the relationship of categorical variables to exercise participation to determine the susceptibility to the progression of cardiovascular disease. Specifically, I conducted the doctoral study using Texas' Behavioral Risk Factor Surveillance System to analyze the effects of theses specific variables for male and female African American/Black individuals aged 30-64 years. The differences in the participants' physical activity levels, behavior risks, and mental/physical health statuses allowed me to answer the research question and address the problem statement effectively. Secondary sources were also enlisted to assist me in the validation of health effects of known risk factors of cardiovascular disease associated with inactivity and the influence of other related risk factors for cardiovascular disease. Derivatives from these supplementary sources assisted me in making conclusions regarding how levels of awareness, choices of behavior, demographical factors, and physical/mental states directly and indirectly influenced the risk factors. An independent variable analysis was therefore used to show a prediction of an outcome of an associated risk-related variable (exercise participation).

Definitions

Age: In this study the variable was defined by the number of years lived to present date.

Alcohol consumption frequency: In this study it was defined as the average number of alcoholic beverages consumed in one day over a one week time frame.

Cardiovascular diseases: Also known as heart disease, it is a group of disorders of the heart and blood vessels that include coronary heart disease, cerebrovascular disease, peripheral artery disease, rheumatic heart disease, congenital heart disease, deep vein thrombosis, and pulmonary embolism (World Health Organization, 2016). In this study it was identified as all of the recognized diseases and disorders displayed.

Diabetes: A disease in which the body is unable to breakdown carbohydrates to efficiently use them for cellular functioning (CDC, 2015). In this study the threshold for diabetes was a high glucose level > 100mg/dl with fasting or > 140 mg/dl after food.

Education: In this study it was classified as the level of school-based learning (not specific to health education).

Exercise/physical activity status: The amount of exercise that meets aerobic recommendations of 150 minutes of moderate activity or 75 minutes of vigorous activity a week (World Health Organization, 2016). This was the threshold used in the study which classified participants as either meeting/not meeting aerobic recommendations.

Hypertension: Excessive pressure in the blood vessels due to inadequate balancing of receptors that regulate control, thus causing increased pressure on multiple systems such as the cardiovascular and urinary (CDC, 2015). In this study the threshold for hypertension was systolic/diastolic >140/90 mm/Hg.

Income: In this study it was defined by the earned wages in a calendar year.

Overweight/obesity status: In this study, the variable was defined by a Body Mass Index (weight in kilograms/height in meters squared) > 25.

Poor diet: In this study the variable was defined by an average consumption of less than 5 fruits and or vegetables in one day over a 30 day time frame.

Poor mental health status: A measure of the number of days in the past month where an individual has felt feelings of either sadness, stress, worthlessness, worry, excessive guilt, panic, extreme nervousness, or hopelessness (APA, 2015).

Sex: In this study it was defined by being born either a male or female.

Smoking frequency: In this study it was defined as tobacco usage through the average number of cigarettes smoked in one day over a one week time frame.

Assumptions

Given that the Texas Behavioral Risk Factor Survey was conducted via telephone, I assumed that the majority of the population had either a cell phone, landline, or business phone to be contacted and provide a response.

Scope and Delimitations

This study was rooted in the need to address a lack of investigative work assessing various risk factor relationships to exercise participation, and the multiple influence of hypertensive, diabetic, cholesterol, and obesity effects linked to cardiovascular disease among African Americans/Blacks. I chose this specific focus not only because of the limited data investigating common behavioral reactions to stress but, due to the higher prevalence of hypertension and cardiovascular-related mortality among the target population. The study was limited to Texas residents, age 30 to 64 years, who identified "Black" as their race on the Texas Behavioral Risk Factor Survey. This population offered the greatest prevalence of responses to variables in the data set that I used to answer the research question.

An issue of generalization may have arisen because the secondary data set used "Black" as a defined race, encompassing people of color from many nationalities such as African, Jamaican, Cuban, Haitian, Dominican, Ethiopian, and others. The results from this generalization of behaviors based on a selected race either perceived or chosen due to skin tone, may have not applied to all individuals of the race, or to those of different nationalities with similar skin complexions and, living in other states or territories. So, because “race” was used in the data set instead of “nationality”, I used “Black” when referencing the target subgroup with understanding that it may have referenced more than just African Americans.

The Texas Department of State Health Services [TDSHS] (2014) also stated there were more young adults and as well as households with older adults that had adopted cell phone only, or limited landline usage. Furthermore, the Behavior Risk Factor Surveilance System (BRFSS) only collected data from individuals speaking English, Spanish, Mandarin, Chinese, and Portuguese, leaving out individuals who may have spoken other languages or dialects. Additionally, the BRFSS did not collect data from individuals in nursing homes, long-term care facilities, military confinements, or correctional institutions, and for these reasons, results cannot be generalized to the entire population (see CDC, 2014).

Significance

My goal for this study was to strengthen public health objectives and future initiatives in customizing programs used to assess the multidimensional solutions to combat the multitude of risk factors for cardiovascular disease. I also sought data to increase community health education and behavioral risk factor awareness to highlight the influence of modifiable risk factors on others, in a statistically under-represented population having leading rates of hypertension (see CDC, 2016). As a doctoral candidate and scholar-practitioner, my efforts were to make advancements and build upon assessments and conclusions from the doctoral study to create and sustain positive social change. I hope to achieve this by making recommendations for future policies and modified environments that promote education regarding individual and familial health behaviors. Since political figures and decision makers have a greater ability to initiate broader and stronger mechanisms to reduce cardiovascular disease risk factors, I used an ecological perspective for alternative health-behavioral option to identify demographical subpopulations and the environments where they could be the most productive and sustainable.

APHA has recognized and stipulated that physical inactivity, smoking, and poor nutrition were all health risk factors which could lead to cardiovascular disease for Americans (2014). To provide additional knowledge to the discipline, I provided the major themes of the study which included physical activity status, smoking/drinking frequency, disease status, and poor mental health days for a targeted subgroup within the state of Texas. I also sought to recognize the potential influence of the health belief model's component of self *efficacy* on individuals in the population, seen in their ability to control risk factors which could affect cardiovascular disease prevalence.

Literature Review Strategy

To gather materials for the literature review, I used the Walden University Library to access MEDLINE and CINAHL databases, and the Google Scholar search engine. Search terms included *cardiovascular disease*, *psychological stress effects*, *exercise and* *hypertension, smoking and cardiovascular disease,* and *alcohol's affect on the cardiovascular system*. I limited the search to peer reviewed articles and research studies (2006-present) that not only included the use of similar variables to those in my doctoral study, but also used regression analysis and reviews of systematic behaviors and effects of related variables on the cardiovascular system.

Review of Literature

Multiple Risk Factor Control for Cardiovascular Disease

Many risk factors for cardiovascular disease have been identified by the CDC, and could be used as a framework to offer recognition to the specific factors that may vary in each individual. In a study comparing African Americans with diabetes to their non-Latino counterparts, Chatterji, Joo, and Lahiri (2012), used logistic regression analysis to measure the differences in outcome regarding the control of multiple cardiovascular risk factors such as blood glucose, blood pressure, cholesterol level, and smoking status. Education was an added variable that the researchers used to assess participant populations from two different decades using NHANES survey data. Chaterji et al. analyzed dichotomous variables and concluded that of participants in the 1999-2008 decade had improvements in diabetes control with analyzed control over four observed cardiovascular disease risk factors, as compared to control of only over 2-3 in the previous group (2012). They also concluded that there was a general improvement in diabetes education between decades that caused the effect. Bozovic, Racic, and Ivkovic

(2013) similarly determined from their work regarding the control of risk factors that the quality, quantity, and adaptation to risks were influenced not only by mere control but, multiple aspects such as type of risk factor, intensity, duration, and personal characteristics that promoted adaptation. The CDC (2016) as well as Bozovic et al. both concluded from their work regarding multiple risk factor controls, that the cause of hypertension, as a cardiovascular disease risk factor, could be based on multiple elements such as nutrition, behavior, and habits that may also be influenced indirectly by negative moods.

One of the multiple risk factors for the control of cardiovascular disease is the maintenance of healthy mood. Smith and Blumenthal (2011) noted that moods such as anger, stress, anxiety, and depression in cardiac patients were associating contributors to acquiring, as well as progressing harmful effects of cardiovascular disease. In their systematic review of studies, they investigated mood and found that acute and chronic stress increased risks of myocardial infarction, ischemia, and arrhythmias in cardiac patients (Smith & Blumenthal, 2011). Smith and Blumenthal concluded that cardiac patients diagnosed with or experiencing “negative moods” such as anger, anxiety, stress, and depression showed twice the rate of mortality from cardiovascular disease than those who expressed control over these general moods. Similar to Bozovic et al. (2013) and Chatterji et al. (2012), Smith and Blumenthal offered stronger recommendations for future combined behavioral modifications focusing on multiple risk factor controls with a heightened analysis of the relationships between them (2011). Bozovic et al. (2013) and Chatterji et al. (2012) acknowledged that indentifying a single risk factor that may have influence over multiple other risk factors could be essential in reducing future disease.

The limitations of these three sources included an inconsistent process of measurement for the individual value of each of the contributing factors in comparison to physiological response, leading to variations in the influence of each factor among different populations. Specifically, the study by Smith and Blumenthal (2011) was a review of past works where a consensus of conclusions showed that negative moods were related to higher mortality rates and progression of cardiovascular disease. Therefore, there was a limitation due to the mere absence of these moods not reflect non-cardiovascular disease prevalence in all populations (Smith & Blumenthal, 2011).

The differences in the manner of control of multiple risk factors could also promote various effects on the individual. The American College of Sports Medicine (ACSM) added that individual responses to risk factors include some combinations of physiological, emotional, psychological, and behavior characteristics, all of which could potentially be harmful to individuals susceptible or predisposed to cardiovascular disease (ACSM, 2015). Ezzati, Oza, Danaei and Murray (2008) used regression analysis, to analyze the relationship between systolic blood pressure/uncontrolled hypertension and self-reported hypertension, the use of medication, health service access, and socio-economic variables such as age, gender, and race in participants from all 50 states. In contrast to the factors mentioned by ACSM such as emotions and behavioral characteristics, results from Ezzati et al.'s regression analysis showed that systolic blood pressure and uncontrolled hypertension increased with age, that Blacks had consistently higher rates than Whites, and that uncontrolled hypertension prevalence was higher in women. A limitation of the study was that the authors were not able to record dietary intake or salt values on a daily basis for participants, their individual quality of care, and the use of pharmacological interventions that may have varied among states.

Individual Risk Factor Control for Cardiovascular Disease

Negative moods (stress, anxiety, and depression). The ACSM noted that numerous mechanisms of stress and moods of anger, anxiety, and depression promote a systemic interaction which stimulates the sympathetic nervous system and hypothalamus causing a hormonal response by the endocrine system's pituitary and adrenal glands (2015). Milani and Lavie (2009) also highlighted that stress hormones increased glucose in the bloodstream and the brain in response to exposures which positive substances that repair injured tissue. Similar to the Smith and Blumenthal (2011), Milani and Lavie concluded that psychosocial stressors in those rehabilitating from coronary artery disease and or myocardial infarction showed to increase mortality risks (2009). I noted bias however, as a limitation within the study in addition to non-randomization of participants resulting from its referral-method selection process of analyzing psychological and physiological risk factors only in those with coronary artery disease or who had past episodes of myocardial infarction, thereby leaving out disease-free participants.

Physiological changes within the body may show to occur differently in individuals and relative to the nature of the exposure. In a study by Wilkinson and Picket (2010), the researchers stated that catecholomines initiate the fight or flight response and prepare the body for activity by causing physiological changes such as increased heart rate and blood pressure. The natural reaction to acute stress was defined to be a “fight or flight response” where energy stores of glucose are released into the body, constricting blood vessels, and initiating clotting factors in the blood with an anticipation of injury (Wilkinson & Picket, 2010). Similar to Milani and Lavie (2009), Wilkinson and Picket inferred that whether an individual fights or flees from the event that caused stress, physiological reactions occur and are used as a protective mechanism. Taken together, both works showed that when stress or reactions to poor moods is chronic, the body could be in a consistent state of anticipation, challenge, or threat that produces persistent constriction of blood vessels and elevated clotting factors, increasing susceptibility to hypertension and heart disease.

Smoking and tobacco use. The CDC has also recognized smoking and tobacco use as a risk factor for cardiovascular disease (see CDC, 2015). Huxley et al. (2012) investigated the disproportion of African American smoke-related deaths compared to Whites, and their relation to cardiovascular disease risk. Placing into three groups (current, former, newly quit/never smoker) the researchers used logistic regression to analyze age at smoking initiation, cigarettes per day, and number of diagnosed cardiovascular complications after a 17-year follow-up of 14, 200 participants. Ultimately, Huxley et al. concluded that there was no significant difference between African Americans and Whites in the former smoker category and their relation to cardiovascular disease, but that other lifestyle factors may have contributed to higher cardiovascular disease prevalence in African Americans outside of smoking frequency or age of induction.

Salahuddin, Prabhakaran, and Roy (2012) noted that the ingredients or products from tobacco smoking had been found to promote atherogenesis, and increased blood pressure and heart rate. In contrast to Huxley et al. (2012), Saluhuddin et al. stated that smoking induced myocardial ischemia, vascular and endothelial dysfunction, inflammation, and a prothrombic state, especially in cardiovascular-disease-susceptible individuals such as African Americans (2012). Salahuddin et al. further added that, as one of the most preventable risk factors for cardiovascular disease, tobacco smoking causes approximately 35-40% of deaths from its health effects on the cardiovascular system. Similar to Huxley et al. (2012), Salahuddin et al. concluded that all of the effects of tobacco use and exposure to its harmful agents (whether primary, secondary, tertiary) were linked to increased prevalence of hypertension, coronary artery disease, myocardial infarction, and atherosclerosis (Salahuddin et al., 2012). Limitations of both studies were that they included self-reported smoking habits (which increases bias), lacked information on type of cigarette or tobacco used, and may have misclassified the type of tobacco exposure based on the participants' responses.

Alcohol use. Alcohol use and its affect on the cardiovascular system is another risk factor that is essential to evaluate, due to the presence of contrasting evidence. Costanzo et al. (2010) reviewed past studies concerning the effects of alcohol consumption and mortality among those who presently had cardiovascular disease. In their meta-analysis, the researchers concluded that light to moderate alcohol drinkers (1-2 drinks/day) actually showed positive health effects on the cardiovascular system including cardio-protective benefits of reduced platelet aggregation, lowered blood coagulation, vasodilatation, and reduced inflammation, all decreasing mortality risk from cardiovascular disease (Costanzo et al., 2010). Rehm (2011) reported that, in relation to cardiovascular disease, alcohol's impact varied according to consumption and the specific cardiovascular condition. Concluding results from this review of studies also showed an increasing linear dose response relationship of consumption that also increased hypertensive complications as well as those for atrial fibrilation, but a J-shaped curve response existed for ischemic heart disease and stroke conditions to a point for light-moderate drinkers that resulted in a cardio-protective effect (Rehm, 2011). In both works by Costanzo et al. and Rehm, the ethanol as well as the polyphenols in this population (light to moderate drinkers with and without cardiovascular disease) were shown to influence the promotion of this cardio-protective effect that showed to maintain balance between blood clotting factors and degradation (Costanzo et al., 2010).

Rehm (2011) defined alcoholism and its association to various diseases found in heavy drinkers (>40 grams for men/day and >20 grams for women/day) and binge drinkers (≥60 grams of alcohol in 1-2 hours). As in the work by Costanzo et al., results from binge (heavy ≥ 3 drinks within 1-2 hours) drinkers were also shown to have influenced hypertensive effects, due to vasoconstriction and hyperlipidemia increasing the risk of cardiovascular mortality from stroke, cardiomyopathy, and other cardiovascular-related diseases (Costanzo et al., 2010). Rehm reported that the protective effects were negated as drinking consumption increased to heavy or irregular drinking patterns beyond 60 grams in one sitting at least once a month, even for light to moderate drinkers, suggesting greater cardiovascular risk factors for binge drinking that could increase susceptibility of hemorrhagic stroke due to hypertensive influence (2011). A limitation of these two studies was in the population of participants chosen. There was a greater proportion of participants with cardiovascular diseases who were able to obtain or afford care to treat or cope with the illness, compared to those who could not. Therefore, light, moderate, or even binge drinking in a poverty-stricken population could show more disease complications and higher mortality rates due to decreased general health access.

Obesity and poor diet. Obesity and dietary intake have shown to be risk factors for multiple health concerns such as, cardiovascular disease, hypertension, and diabetes.

The CDC has stated that obese adolescents without control of these risk factors may also be susceptible to higher cholesterol levels and irregular glucose absorption that could lead to diabetic complications at earlier ages (2015). The obesity epidemic has also been linked to factors such as low income status, accessibility to nutritious foods, and lack of exercise (see CDC, 2015). Lavie et al. (2010) have shown that these factors have led to increased BMI, reduced cardiovascular system functioning, and susceptibility to other inter-related diseases. The researchers concluded that for every1 kg/m^ increase in BMI, the risk of heart failure (HF) also increased 5% in males and 7% in females (Lavie et al., 2010). Therefore, Lavie et al. recommended that healthier diet and increased physical activity would assist in lowering overweight/obesity levels and influence multiple risks that promote cardiovascular disease and diabetes (2010).

The daily consumption of more fruits and vegetables may reduce susceptibility to many diseases (see CDC, 2015). Guillaumie, Godin and Vezina-Im (2010) conducted a systematic review that specifically examined studies regarding health-behavior theories to predict participant fruit and vegetable intake (FVI). The authors noted that the social cognitive theory and theory of planned behavior were the most commonly used theories in reviewed research studies. Guillaumie et al. concluded that high levels of fruits and vegetables ($\geq$5) were associated with better health, which allowed individuals to not only avoid/reduce susceptibility to many diseases but, also perform greater amounts of physical activity (2010). A limitation of their study regarding dietary outcomes was a small number of reviewed articles. Therefore, their results could not be generalized for the entire population.

Differences Among Individuals

Differences in age, sex, culture, and past experiences may show to cause variations in individual behaviors that could influence risk factors in multiple ways. Mahmoud, Staten, and Hall (2012) investigated stress' physiological effects on college level individuals. The dependent variable of their study was response to psychological stress which was measured by hormonal reactivity and heart rate. Through the implementation of a multiple regression analysis of coping styles, demographics, and life satisfaction (independent variables) as predictors of stress, anxiety, and depression, the authors concluded that psychological and physiological effects occurred in all individuals irrespective of race, nationality, gender, and age (Mahmoud et al., 2012). Their use of college level participants was a limitation of the study due to an identification of a common maladaptive behavior to stress/anxiety but, for those between 18-24 years of age, in a collegiate environment, and based on actions most frequented by this population.

With physiological and psychological effects occurring in all individuals, the resultant behavior in response to these effects could vary based on environment and the characteristics of the individual. Chwastiak, Rosenheck, and Kazis (2011) investigated the association of advanced/extreme mood disorders and health behaviors identified to promote cardiovascular disease. The researchers also used logistic regression but, to analyze a population of military veterans that lived in the United States. Specifically, Chwastiak et al. assessed bivariate variables such as smoking and non-exercise status to investigate differences in health behaviors of veterans who had a diagnosed mental health disorder in comparison to those who did not (2011). In contrast to Mahmoud et al. (2012), Chwastiak et al. stated that there was a greater percentage of current smokers among mental health-diagnosed veterans and the older age group of veterans compared to veterans without a mental-health diagnosis (2011). The conclusion by Chwastiak et al. was that the greater rates of negative health outcomes and behaviors such as, obesity, alcohol abuse, and reported low-weekly exercise, were more present in the older veteran population with diagnosed mood disorders compared to the younger/non-diagnosed population (2011). A limitation of the study was that the population was comprised of 85% Caucasian participants who self-reported their health status, and could have therefore, under or over-estimated their responses to health behavior.

The physiological response to stimuli could therefore, influence health behavior and susceptibility to cardiovascular disease in different ways for each individual. Campbell and Ehlert (2011) implemented a systematic review of studies regarding hormonal levels, blood pressure, and heart rate. In their review of 358 studies they analyzed participant responses to stress/anxiety to identify the correlation of endorphins and neurotransmitters to mood. The researchers noted that each system displayed inconsistent values based on differences in hormone secretions and physiological reactions among participants. From their review, they concluded that individual reactions to stress involved multiple response systems but, that these systems led to different effects in participants over time that may have been influenced by past experiences (Campbell & Ehlert, 2011). A limitation of their review was seen in the inability to assess mood/emotional reactions within individuals that were placed in different environments and multiple stress-related experiences to see if variations of participant responses existed.

The World Health Organization (2016) recognized that age was a risk factor for cardiovascular disease. As an independent variable (id), “age” has also been stated to have a strong but inverse correlation with cardiovascular system functionality, commonly displayed in the higher prevalence of disease and co-morbidity complications in advanced age groups (CDC, 2016). Sex as a cardiovascular disease risk factor may however need to be further studied due to findings by Klaperski et al. (2012) that, mood and emotional responses were different in men and women for certain exposures, and similar when they encountered other exposures. Klaperski et al. found that, there was not enough consistent data for mood response to make a generalization of mood response for all men and women in the population (2012). The Anxiety and Depression Association of America (ADA) however stated that the number of days of poor mood influenced by stress, depression, and anxiety have been linked to greater frequencies of behaviors for both males and females (2015). In addition, the ADA acknowledged that, the greater the exposure to stressful stimuli, the greater the influence on behavior despite the sex of the individual (2015).

How individuals choose to cope with their mood may also show to have influence on the type of risk factor and the individual's susceptibility to disease. Azagba and Sharaf (2011) found that excessive tobacco smoking and alcohol consumption (drinking) were used in some populations to self medicate stress-induced physiological effects. Based on the users' perceptions of the behavior having anti-anxiety and anti-depressant agents, Azagba and Sharaf concluded from their results that smoking and drinking behaviors were engaged more when the participant felt comforted by the behavior (2011). In addition, the authors concluded that, the increased frequency led to negative health effects in greater abundance than for those who engaged smoking and drinking behaviors for other reasons (Azagba & Sharaf, 2011).

High blood pressure and chronic hypertension may be a result of un-controlled habits and behaviors in some individuals. Hypertension was stated to be influenced by many of the behaviors and factors mentioned (tobacco smoking, alcohol drinking, mood, obesity, demographics) (see CDC, 2014). Campbell and Ehlert recognized that in some combination, these behaviors could impact cardiovascular system functionality and the progression of the chronic hypertension (2011). However, I have recognized that more research is needed outside of the CDC's Behavioral Risk Factor Survey (2014) and the

APHA's chronic disease assessment (2014), to identify why certain populations may be at greater risk for complications and mortality. Therefore, I saw a need to conduct the doctoral study, with a specific emphasis on racial/ethnic health-related contributors to cardiovascular disease.

Exercise's Influence on Cardiovascular Disease Risk Factors

Mood. I have found that physical exercise's affect on mood has been investigated less frequently than the use of it for implementation in weight reduction programs. Barrington et al. (2012) used a linear regression model to assess variables of perceived stress levels, age, race, behavior, activity level, and body mass index of adults. The authors provided evidence that the presence (or psychological effect) of stress inhibited the desire for engagement in exercise among some participants, and in others, it reduced exercise participation contributed to increased stress levels (Barrington et al., 2012) From their study the authors inferred that there was a multi-psychological effect of stress which either worked independently, as a result of activity level, or both (Barrington et al., 2012). A conclusion from Barrington et al. however, was that there was a linkage to higher levels of perceived stress to those with lower physical activity levels (2012).

Similarly, Rimmele et al. (2009) found that physical activity played a role in neuro-endocrine, autonomic, and behavioral responses between Elite, Amateur, and Untrained sportsmen. In response to stress, Rimmele et al. noted that the lowest levels of cortisol (stress hormone) were in the Elite group examined in the study (2009).

Furthermore, the researchers stated that, the Elite group of participants also displayed a lowered heart rate and lowered response to emotional stress compared to the other two classes of sportsmen (Rimmele et al., 2009). A reduced autonomic nervous system response in the Elite athletes which induced quicker cardiovascular and physiological reactivity (rebound) to poor moods of anxiety and stress were concluded by the researchers (Rimmele et al., 2009).

Klaperski, et al. (2012), also implemented an analysis of stress reactivity and recovery in three exercise groups. In response to poor mood, Klaperski et al. similar to Rimmele et al. (2009) concluded that there were associated behaviors that were influenced by the choice and frequency of exercise routine that caused higher perceived confidence in trained participants and a lessoned response to stress (2012). A limitation of both studies was that healthy young men who were frequent runners and absent of disease were chosen as the target population. Therefore, the results could not be generalized across all populations or age groups regarding the contribution of routine exercise to psychological/ physiological responses. Additionally, an evaluation of multiple stress-related behaviors (such as drug use or emotional eating) and an assessment of individual quality of care of the participants was another limitation due to their absence of use in the study.

Exercise participation may ultimately show to influence mood, and to likewise be influenced by mood (see Barrington et al., 2012). Dinas et al. (2011) investigated the affects of exercise and physical activity on negative moods such as anxiety and depression. In a systematic review of studies, Dinas et al. (2011) recognized that exercise and activity offered similar effects as anti-depressant medications due to the production of endorphins (opioids secreted by the pituitary gland which reduce anxiety and depression). Although Dinas et al. (2011) reported that an inverse relationship between aerobic exercise participation and negative moods such as hostility, stress, depression, and anxiety existed, limitations of the study were that exercise methodologies did not show general consistencies of positive mood effects within different populations.

However, exercise has shown to be an activity which can also introduce certain amounts of stress upon the body, measured by the nature, impact, and frequency of the routine. The Mayo Clinic (2015) inferred that during moderate/routine exercise, the hormones adrenaline and cortisol are produced but, to increase the heart rate, elevate blood pressure, and boost energy supplies. Gerber et al. (2011) analyzed the effects of physical exercise and highlighted that endurance athletes and those participating in routine physical activity had 46% higher cortisol levels than non-athletes. But, in comparison, the endurance and routine participation athletes also had decreased stress perceptions compared to other moderately-active or non-active participants (Gerber et al., 2011). Conclusions from Gerber et al. (2011) were that the cortisol stress response initiated during exercise (a stressor) was beneficial to the physiological and psychological reactivity of that particular event. In contrast to non-active individuals, the researchers stated that, increased cardiovascular fitness and higher levels of cortisol in athletes/routine exercisers did not necessarily correlate to poor health (Gerber et al., 2011).

Hypertension. In referrence to those with cardiovascular disease, Milani and Lavi (2009) used regression analysis to assess the effects of exercise on blood pressure (2009). The researchers observed 522 African American males with severe hypertension, that were rehabilitating from cardiac conditions (coronary artery disease and myocardial infarction), and who simultaneously reported high levels of stress (Milani & Lavi, 2009). Results by Milani and Lavi showed that for every 1% increase in oxygen uptake due to exercise training, there was a 2% decrease in cardiovascular mortality (2009). Milani and Lavi concluded that, the patients with cardiovascular disease who underwent the greatest improvement in exercise capacity also showed reductions in cardiovascular mortality, depression, and anxiety (2009).

Alcohol and smoking use. Similar to the conclusion by Azagba and Sharaf (2011) that alcohol and tobacco use had been identified by participants to have anti-depressive effects, Dinas et al. 92011) concluded that exercise was effectively observed to be used as an alternative behavior that provided healthier effects. Rehm (2011) and Costanzo et al. (2010) acknowledged the vasoconstrictive and hypertensive effects of alcohol and smoking behaviors, and concluded that exercise showed to reduce the chronic effects caused by these behaviors. Friis and Sellers (2009) also investigated exercise participation and its physiological affects on mental stress. Among those who experienced a variety of barriers, different exercise routines, and various lifestyle factors, Friis and Sellers (2009) did not show evidence as to which type of exercise (aerobic/anaerobic) had the most beneficial effect on health.

Diabetes. The CDC has identified diabetes to have an association to hypertensions and, be a risk factor for cardiovascular disease (see CDC, 2015). Brook et al. (2013) used a meta analysis to investigate the effects of alternative approaches (non-medical) to reducing cardiovascular risk factors such as lowering blood pressure (BP) and diabetes complications through the observance of the effects from yoga, acupuncture, meditation, aerobic exercise, and resistance training. Brook et al. concluded from their review of 72 trials and 105 study groups that aerobic exercise training (walking, cycling, and jogging) was the most effective in lowering blood pressure in individuals with pre-hypertension and Stage 1 hypertension (2013). The researchers stated that the results showed to be the highest in participants who performed routine moderate-intensity exercise (≥40-60% maximum) for at least 30 minutes on most days or approximately 150 minutes/week (Brook et al., 2013). But limitations of the study by Brooks et al. were in the lack of ability to assess combinations of treatments, therapies, and medications used to lower blood pressure or increase insulin (2013). The researchers made recommendations for greater specificity were made for future works towards specific pharmaceuticals as well as target populations engaging in various exercises, frequencies, and or combinations of rehabilitative approaches (Brook et al., 2013).

The physiological effects that occur from various behaviors may therefore show to influence multiple cardiovascular disease risk factors. The ACSM (2006) suggested that, the neuroendocrine and structural vasculature changes among participants were the mechanisms which decreased the presence of catecholomines in the blood. In addition to increased insulin sensitivity and vasoconstricting/vasodialating properties of blood vessels, the ACSM noted a hypotensive effect and lowered blood sugar in those who performed routine exercise (2006).

The ACSM concluded that the cardiovascular system's general reaction in all individuals despite diabetes or hypertensive complications is to physiologically increase blood pressure and induce catecholamines into the blood, which places a force on the arterial walls (2015). This force was stated by the ACSM to either lead to arterial damage, kidney dysfunction, atherosclerosis, excessive glucose in the blood, and myocardial ischemia (2015). There was a reduction and an adaptation of the effects through aerobic exercise which showed to improve stroke volume and lower multiple risk factors for cardiovascular disease (ACSM, 2015). I acknowledged from these combined conclusions that there was a need for the doctoral study, an assessment of the relationship among risk factors, and their contribution to cardiovascular disease. My effort was to establish, maintain, and heighten the promotion of health, through increasing the knowledge and practice of combined behavioral controls of multiple risk factors.

Socio-economic status. The affect of socio-economic status on individual behavior may impact how each person may be introduced to harmful exposures. Wilkinson and Picket (2010) investigated the effects of income and education across different countries to assess the influence that it had on individual health. Wilson and Picket (2010) noted that countries with some of the highest levels of average income (a component of socioeconomic status that may also be influenced by education) displayed a greater prevalence of individuals with chronic diseases. Many of these diseases included cancers, cardiovascular disease, and diabetes. Compared to the results of countries with the lowest average incomes (third world countries) the authors found that acute diseases and illnesses were a more prevalent cause of death in the poorest countries (Wilson & Picket, 2010).

Based on the various extremes of populations investigated by Wilson and Picket, they however concluded that increased education and or income among individuals in certain societies did not necessarily reflect significant values of poor health or related mortality (2010). Due to the multitude of complexities and behavioral variations of residents in each country, their conclusions were that individuals in third world counties showed to have a higher prevalence of acute diseases but, that it may have been due to the population not living long enough to acquire chronic diseases (Wilkinson & Picket, 2010). The authors therefore, alluded to the description of income and education as being a contributing agent for cardiovascular disease but, simultaneously a diminishing agent, due to better medical care and health options offered in countries that promoted higher education and health services (Wilson & Picket, 2010).

Section 2: Research Design and Data Collection

The purpose of the study was to assess the predictability of exercise status based on the control of known cardiovascular disease risk factors. I made efforts to analyze the relationships between participants meeting exercise recommendations and risk factors which may influence morbidity and mortality. Investigating the characteristics of a targeted subgroup (age and race) related to environmental/social influences, I drew theoretical models to assist in determining the differences within the subgroup that may influence indentified independent risk factors for cardiovascular disease.

Research Design and Rationale

The independent variables were hypertension and diabetes status, alcohol drinking, tobacco smoking behavior, poor mood days, overweight/obesity status, activity limitations, diet, and socio-economic status. The participants' control of the independent variables was used to determine the dependent variable of met aerobic exercise recommendations. Age and sex were also used as covariates (due to higher hypertension prevalence in males and as participant age increases). I implemented an inferential research design with quantitative secondary data. The selected design provided me a means for acknowledging whether aerobic participation could be significantly determined by the control of risk factors for cardiovascular disease. This design choice not only enabled me to reduced gaps by incorporating advanced knowledge in the discipline, but also increase the availability of under-represented health information surrounding the subgroup. New data for the African American population could increase its members' autonomy and perceptions of their ability to manipulate modifiable risk factors adequately enough to influence the disposition of non-modifiable ones (APHA, 2016).

Methodology

The target population included males and females between the ages of 30 and 64 who lived in Texas in 2013, and who also selected "Black" as their perceived racial category. The size of this target population in 2013 for the state of Texas was estimated to be 1,115,000 individuals spread across 254 counties (DSHS, 2013). To comply with CDC standards, the BRFSS conducted for all states across the nation includes the following guidelines:

> Make use of two samples: one for landline telephone respondents and one for cellular telephone respondents. Since landline telephones are often shared among persons living within a residence, household sampling was used in the landline sample. Household sampling required interviewers to collect information on the number of adults living within a residence and then select randomly from all eligible adults. Cellular telephone respondents were weighted as single adult households. (CDC, 2014)

Sampling procedures used to collect information in the secondary data set consisted of the TDSHS's retrieval of telephone numbers accessed through the CDC, a review of sampling methodology by an independent state statistician (to ensure representativeness within the state), and a data collection procedure conforming to CDC methodology guidelines (CDC, 2014). With materials from federal agencies available in the public domain and reproducible without permission, Texas met the BRFSS sample design approval standard and justified its method by using sample records as a probability sample of all households with telephones users within the state (TDSHS, 2013). Using the CDC protocol, the Texas Department of Health implemented a disproportionate stratified sample (DSS) design (CDC, 2014). Furthermore, a technique called random digit dialing (RDD) was initiated on both landlines and cell phones. The above DSS design was noted to pull telephone numbers from two strata (lists) based on calculated density of known landline telephone numbers classified as either high density or medium density. The BRFSS from Texas sampled the high density stratum at the highest rate, producing the sampling rate and a sampling ratio of high to medium density, reported by Texas BRFSS to be is 1:1.5 in the sampling method (TDSHS, 2013).

Cell phone sampling was also reported to be randomly conducted and to have conformed to CDC methods, and was used in 20% of the Health Department's interviewing for respondents who used cell phones at rates of greater than 90% of their total yearly calls or communications (CDC, 2014). Inclusion criteria consisted of those who were those 18 years and older living in eligible households that were their primary or secondary place of residence such as houses, apartments, or college campuses (CDC, 2014). Participants were excluded if they were living in ineligible households (vacation homes, group homes, and institutions) not occupied by members for more than 30 days a year, or in temporary residence in homes in other states outside of Texas. Persons interviewed on landline telephone and cell phones were all randomly selected, non-compensated, and interviewed under BRFSS protocol (CDC, 2014).

The total sample size goal for the Texas BRFSS was 4,000 participants for the year of 2013, with a minimum effective sample size of 2,500 participants. But the source or tool used to calculate actual sample size was influenced by each states' cost of interviewing and the needs of specified populations determined by the independent state-based statistician familiar with the population (CDC, 2014). For example, the Texas BRFSS could derive to an interval "*k*", by dividing its population count of all telephone numbers in its frame (*N*) by the desired sample size needed (*n*). Using "*n*" number of intervals of size "*k*" telephone numbers, each interval had the ability to select one 10-digit number randomly (CDC, 2014). A 95% confidence interval was implemented in addition to a non-reporting of percentages where denominators fewer than 50 respondents (un-weighted sample) or the half-width of a 95% confidence interval greater than 10, was chosen. Codes additionally were removed for counties with fewer than 50 respondents, and for counties with populations less than or equal to 10,000 residents (CDC, 2014). I conducted a power analysis to determine the sample and effect size needed for the regression analysis. With the target population size set to 400, I implemented an effect size of .15, a statistical power of .19, a probability level of .05, a confidence level of .95, and a minimum effective sample size calculation of 162 participants (see Soper, 2016). However, I used a sample size of 340 participants for the doctoral study.

Instrumentation

In 1988 the CDC initiated the BRFSS to collect prevalence data on health risk factors and behaviors by state. This data gets documented monthly and then submitted to the CDC for national comparison (CDC, 2014). The BRFSS process is a composite of the CDC's surveyed protocol and each state's public health department questionnaire where core questions, rotating questions, and optional questions (presented by each state) are included. This instrument was a survey which included a telephone interview consisting of various health questions. The interview was only stated to be complete if values for age, sex, and race were documented (noted as half of the survey) in addition to a response from a 5% random sample of callback of participants to verify data and response (CDC, 2014). When each state finished its content, a hard copy or electronic version of the instrument was stated to be sent to the CDC (CDC, 2014). However, before this final data was collected and submitted, the CDC initially granted permission to each state only after approving the state's protocol and sampling design (CDC, 2014). I determined that the design and sampling by the state of Texas was appropriate for this doctoral study because the surveys provided data regarding health risk factors that were measured over a geographical group and a racial category, and included assessments of cardiovascular health factors related to comparable variables I sought to explore in this doctoral study.

Pierannunzi, Hu, and Balluz (2013) assessed articles regarding the reliability and validity of the BRFSS. Pierannunzi et al. measured the sensitivity and specificity of the BRFSS and used statistical comparisons to other data in published articles from the years 2004 to 2011. Conclusions were made by Pierannunzi et al. that the kappa and inter-correlation coefficients (ICC) that measured the reliability of BRFSS and compared them to other surveys, were notably high in their use of test and re-tests (2013). In addition, Pierannunzi et al. recognized that the validity of the BRFSS was at high levels, but with greater variation between works over time, due to changes in the wording and differences in survey format (2013). But overall, researchers concluded that reliability and validity were high and matched with major consistencies of other surveys implementing similar analyses (Pierannunzi et al., 2013).

Based on their systematic review assessing validity and reliability of the BRFSS, Nelson et al. (2001) also concluded that measures used in BRFSS were highly valid and reliable. This validity and reliability was compared to peer-reviewed articles and surveys of health responses previously used on the United States' population. From its induction in 1988 and use of telephoned landlines, evidence that has increased resultant construct validity can be recognized from the CDC's new inclusion of data from cell phone users now implemented in the current BRFSS. Because of this inclusion and a new data weighting methodology (ranking), many subpopulations that were inaccessible in the past (cell phone only users) may now have been able to add to the estimates for total risk factors of disease and increase the validity because of the greater representation of the population (CDC, 2014). The CDC, however, stated that it still continues periodic internal checks on the BRFSS data, and maintains weighted adjustments and critiques based upon population use of communication and response formats (CDC, 2014). For this doctoral study, this instrument ultimately assisted me in answering the research question regarding specific behavioral factors' influence on cardiovascular disease. The defined measures and risk factors proved to provide reliable and useful information which reasonably contributed to the doctoral study.

Operational Definitions, Variables, and Codes Used in BRFSS Data Set

In the BRFSS, the TDSHS assessed *high blood pressure status* in adults as either having been or having not been diagnosed by a doctor or medical professional as having high blood pressure or pre-hypertension. This did not include diagnoses of high blood pressure in pregnant women. Similarly, *diabetes status* was assessed by the TDSHS in adults either having been or having not been diagnosed by a doctor or medical professional as having diabetes This also did not include diagnoses of diabetes in pregnant women.

The TDSHS also investigated *Poor mental health status* for participants who reported to have either >5 days or <5 days of poor mental health which included stress, depression, and disturbances due to emotions, within the last 30 days. *Physical activity/exercise status* was also assessed for participants who met/did not meet recommendations. This included various levels of exercise but, was classified as meeting recommendations for either, moderate-intensity aerobic activity of 150 minutes a week, vigorous-intensity aerobic activity of 75 minutes a week, or a combination of moderate-intensity and vigorous-intensity aerobic activity within the last week. *Activity limitations* were further utilized and acknowledged by the department of health as a perception of the participant's activity limitations that were either physical, emotional, or mental.

Overweight/obesity status was evaluated by the TDSHS for participants with a Body Mass Index of >25 or less than 25 to determine the classification of control for this risk factor. Additionally, alcohol use status and tobacco smoking status was assessed for adults who had (greater than 2 drinks per day for men or greater than 1 drink per day for a women) in the past 30 days, and for adults who smoked every day, some days, formerly smoked, or had never smoked in reference to at least 100 cigarettes in their lifetime.

Poor diet was assessed for adults and categorized based on the average consumption (>5 or <5) of daily fruits and vegetables within their dietary intake in the past month. *Age* and *sex* were also included in the analysis of the participants and included the number of years alive and the male/female classification of the participant. The TDSHS classified responses to *Education* for adults with either less than a college education or a minimum of a college education (non health-based). *Income* was also evaluated for adults and assessed by the TDSHS as annual work earnings made by participants of either <$50,000 or >$50,000.

Data Analysis Plan

I used SPSS as the software package for the analysis of data. The next process that I completed was to extract data about the target population from the variables that I determined to be risk factors for cardiovascular disease for the study. The variables had already been weighted by the TDSHS, so I then proceeded to implement a coding of "*0/1*" (non-control/control) for participant risk factors. Female participants were coded as "*0*" and males as "*1*", with the risk factor *age* also categorized as either, "*0*" or "*1*". I also categorized *income* and *education status* based on their lower or higher amounts and coded them also as either "*0*" or "*1*". Variables specific to conditions such as *high blood pressure diagnosis*, *diabetes*, and *obesity* where coded as "*1*", for participants who were absent of these concerns or who had healthy levels. Similarly, this coding system was used for recognized behaviors and responses to such variables as *activity limitations*, *poor diet*, *alcohol drinking status*, *and smoking status*, where the value of "*1*" was provided for those who had sustained healthy levels for the individual risk factor. The value of "*0*" was coded for those who had not sustained healthy levels of the behavior. Participants without values or responses for all identified variables were extracted from the analysis and not included in calculations.

Research question

Q1: "What is the relationship between the evaluated control over cardiovascular risk factors, hypertension, diabetes, overweight/obesity, tobacco/alcohol use, poor diet, activity limitations, poor mood, and socio-economic status (income and education status), and the predicted outcome of participants meeting weekly exercise recommendations of either 150 minutes moderate activity or 75 minutes vigorous activity among African Americans?"

H0: The Null Hypothesis was that the control of risk factors, poor mood status, smoking/drinking behavior, hypertension and diabetes status, overweight/obesity, poor diet, activity limitations, and higher socio-economic status, would not display a significant outcome that, participants met aerobic exercise recommendations.

H1: The Alternative Hypothesis was that the control of risk factors, poor mood status, smoking/drinking behavior, hypertension and diabetes status, overweight/obesity, poor diet, activity limitations, and higher socio-economic status, would display a significant outcome that, participants met aerobic exercise recommendations.

I implemented an inferential assessment with the use of multiple logistic regression to analyze quantitative secondary data. This assessment was provided to determine the outcome of a binary dependent variable from the control of categorical independent variables. I also implemented *age* and *sex* as covariates in the doctoral study. I used a 95% confidence level and a .05 level of significance for the interpretation of the results. Of the 10,645 participants in the data set, 272 had missing information, which left 10,373 participants with adequate and complete information. From this, I excluded 9,557 participants from the analysis because of a race/ethnicity other than Black only, which left 816 participants aged 18 to 65+ years of age. I further reduced these participants to those Black only and between ages of 30 to 64 years, and with complete information in reference to the recognized variables under investigation. These adjustments provided 340 participants who met the participation criteria and were used for the doctoral study.

Threats to validity

External validity may have been compromised due to the percentage of Black/African American participants within the study that were not reflective of the percentage in Texas at the time of study. In addition, I acknowledged threats to internal validity due to the updated changes/modifications to the survey questions in BRFSS, the use of new variables for demographics, and the increase in the number of cell phone users over time. To address the internal and external validity threats, the CDC stated that the BRFSS used and continues to use weight trimming to reduce estimate errors (2014). In addition, landline and cell phone numbers were generated from a random sample with all having equal probability of being chosen. Exclusion of cell phone users with Texas prefixes but currently living in other states was enforced in the selection criteria so that a valid representation of Texas residents was assessed (TDSHS, 2013). Furthermore, all reported rates were weighted specifically for the Texas population with adjustments made in the sampling procedure to reflect the residents of this state only. Therefore, I recognized that the inclusion and exclusion characteristics were appropriate to the unique population under investigation only.

Ethical procedure

Permission was granted for the use of the Texas BRFSS data by the Texas Department of Health Services. All interviews for data collection were conducted over the phone consisting of a 25-minute survey of CDC and state approved questions, on individuals eighteen years of age and older (CDC, 2014). Treatment or manipulation to participants that was identified by the agency to cause harm was not conducted (CDC, 2014). Data storage was previously handled by the Texas' BRFSS, Center for Health Statistics, with the confidentiality and anonymity of participants assured by the TDSHS. As a secondary user of this data, anonymity and confidentiality continued to be maintained by ensuring that all names, social security numbers, and identifying markers which gave the identity or address of the participants remained absent from any reported/analyzed data. Data that may have compromised the identity of the participants was not used for the doctoral study. I conformed to the Walden University's Internal Review Board guidelines, and made every effort to uphold ethical research practices. Furthermore, to ensure personal confidentiality of research participants, all information that I gathered from the BRFSS data were kept on a personal flash drive with only I and IRB having access to it. In conclusion, strict use of all BRFSS information was used by me to only analyze cardiovascular risk factor variables for the identified population. Information or data outside of research targets or ethical parameters was in violation, and not used in the analysis or reporting of data. The IRB approval number for the doctoral study is 11-23-16-0510794.

Summary

I conducted a quantitative study that used BRFSS secondary data to analyze the control of cardiovascular disease risk factors to determine exercise participation among a population of African American/Black men and women. The study resulted in an answer to the research question and references that addressed the problem statement regarding the impact of aerobic exercise and the various controls of cardiovascular disease risk factors. Inferential statistics implementing regression analysis was the testing measure that I used to assess a population of individuals aged 30 to 64 that lived in the state of Texas, and met the requirements for inclusion and participation. The potential contribution of the study was to assist in the positive social changes in individual and group behaviors. I made recommendations to assist in devising future activities, lifestyle options, and health-related governmental mandates. Local and national implementations for improvements in community health were the targets that I identified to be the aim of the analysis. The results, recommendations, and findings displayed by the study may be used to influence the control of identifiable factors that could influence cardiovascular disease mortality and morbidity regarding the theoretical components of individual behavior and participant perception of health control. An analysis of risk factors and highlighted demographical differences showed to assist future implementations that could be used to predict individual and group behavior, and devise modifications for specialized subgroups.

Section 3: Presentation of Results and Findings

The purpose of this study was to investigate the relationship of exercise participation to the cardiovascular disease risk factors hypertension, overweight/obesity, diabetes, smoking/alcohol drinking status, poor diet, socio-economic status, and poor mood. The research question was, “What is the relationship between the evaluated control over cardiovascular risk factors, hypertension, diabetes, overweight/obesity, tobacco/alcohol use, poor diet, activity limitations, poor mood, and socio-economic status, and the predicted outcome of participants meeting weekly exercise recommendations of either 150 minutes moderate activity or 75 minutes vigorous activity among African Americans?” The Null Hypothesis was that the control of risk factors, poor mood status, smoking/drinking behavior, hypertension and diabetes status, overweight/obesity, poor diet, activity limitations, and higher socio-economic status, would not display a significant outcome that, participants met aerobic exercise recommendations. The Alternative Hypothesis was that the control of risk factors, poor mood status, smoking/drinking behavior, hypertension and diabetes status, overweight/obesity, poor diet, activity limitations, and higher socio-economic status, would display a significant outcome that, participants met aerobic exercise recommendations.

External validity may have been compromised because the percentage of participants of the Black race within the study may not have reflected the percentage of the subgroup in the state of Texas at the time of study. There were approximately 400 participants that met participation criteria. From this, I took a sample of 340 participants (63% female/37% male) who identified as Black, lived in Texas in 2013, were between the ages of 30 and 64, and reported responses for all variables analyzed within study. Using participants' answers from the original BRFSS, I analyzed the perceived control over multiple, cardiovascular risk factors among active and non-active adults who met the selection criteria. I coded the "control" standard of the variables as "*1*" in participants without disease or who met recommendations, whereas the absence of control in participants who were either at-risk, diseased, or border-line diseased, was coded as "*0*".

Results

Of the 340 participants, 136 (40%) met aerobic recommendations. Table 1 shows the number (sum) specifying having control for each risk factor/variable.

Table 1

Risk Factor Variable Descriptives For Participants (With Control Of Risk Factors)

	N	Minimum	Maximum	Sum	Mean	Std. Deviation
Age (30-64)	340	0	1	138	.41	.492
Sex (male)	340	0	1	127	.37	.484
Exercise/ phys activity recommendations (met)	340	0	1	136	.40	.491
Overweight/ obesity (<25)	340	0	1	82	.24	.428
Poor diet (>5 fruits + vegetables/day)	340	0	1	42	.12	.330
Smoker status (former-non smoker)	340	0	1	278	.82	.387
Alcohol use (moderate-non drinker)	340	0	1	331	.97	.161
Diabetes diagnosis (non diagnosed-non diseased)	340	0	1	289	.85	.358
High bp diagnosis (non diagnosed-non diseased)	340	0	1	168	.49	.501
Poor mood days (<5/month)	340	0	1	268	.79	.409
Depressive disorder diagnosis (non diagnosed)	340	0	1	281	.83	.379
Exercise/activity barriers (minimal -non limiting)	340	0	1	260	.76	.425
Education status	340	0	1	228	.67	.471
Income status	340	0	1	119	.35	.478
Valid N (listwise)	340					

Note. N = total participants. Sum represents the number of participants that acknowledged control of that risk factor for cardiovascular disease. Mean is the average as well as the approx percentage of the participants who acknowledged control of the risk factor. Age (30-44) and Sex (male) are recognized control groups for purposes of the analysis. High (bp) is blood pressure status.

There is a predicted significance of the independent variables further shown in Table 2 where *p* values (Sig) of <.05 display values of the individual variable fitting the model for the multiple logistic regression analysis.

Table 2

Independent Variable Associated Significance Values For Predicting Met Aerobic Recommendations

			Score	df	Sig.
Step 0	Variables	Age	1.710	1	.191
		Sex	3.521	1	.061
		Overweight/obese	6.431	1	.011
		Poor diet	7.611	1	.006
		Smoker status	3.801	1	.051
		Alcohol use	.171	1	.679
		Diabetes diagnosis	.015	1	.901
		High bp diagnosis	2.983	1	.084
		Poor mood days	1.060	1	.303
		Depressive disorder diagnosis	1.107	1	.293
		Exercise/activity barriers	3.337	1	.068
		Education status	12.152	1	.000
		Income status	7.001	1	.008
	Overall Statistics		41.758	13	.000

Note. High (bp) is blood pressure status.
*p< .05

The odds that a participant met aerobic recommendations are displayed in Table 3 where Exp (B) shows that meeting aerobic recommendations among participants is .67 times the odds of not meeting aerobic recommendations when not considering other independent variables.

Table 3

Output Values For Dependent Variable (Met Aerobic Recommendations)

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-.405	.111	13.415	1	.000	.667

I used multiple logistic regression to assess one binomial dependent variable (met aerobic recommendations) and multiple binomial independent variables. This test allowed for the control of each of the independent variables on the dependent variable. For this statistical test I assumed that there was a binomial distribution for the outcome variable, and that the distribution was maintained and referenced across my independent variables that had the same probability. The Cox & Snell R^2 showed that there was a 12.4% variation in met aerobic recommendations of participants explained by the independent variables, whereas Nagelkerke R^2 showed a 16.7% variation (Table 4). Therefore, there I acknowledged that despite the inclusion of independent variables, there was between a 12-16% independent variable influence on met aerobic recommendations that I inferred to be because of a greater presence of other factors that could have influenced the outcome. A goodness of fit test is displayed in Table 5 that shows significance of .712, which can be interpreted as a “fit” model for the data that was used in the regression analysis.

Table 4

Risk Factor (Independent Variable) Predictor Variations For Regression Model

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	412.704[a]	.124	.167

Table 5

Hosmer and Lemeshow Test For Goodness Of Fit

Step	Chi-square	df	Sig.
1	5.423	8	.712

The results of the regression analysis are represented by odds ratios and confidence intervals that are shown in Table 6. In reference to the individual risk factors (independent variables), for every 1 unit change of B (logit), a positive value means as the factor (B) increases, the odds Exp (B) also increase for predicting met aerobic recommendations for participants. And a negative value for the factor (B) means as it increases, the odds of Exp (B) decrease. The participants that had controlled responses for the variables *sex*, *poor diet*, *hypertension diagnosis*, and *education status* showed to have positive odds in Table 6 for determining met aerobic recommendations. These odds were comparison to the odds of the participants who did not control for these variables. In Table 6 significance levels and Exp (B) values are also displayed.

Table 6

Risk Factor Odds Ratios And Confidence Intervals For Predicting Met Aerobic Recommendations

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
Step 1[a]	Age (30-44)	-.014	.264	.003	1	.958	.986	.588	1.653
	Sex (male)	.647	.259	6.261	1	.012	1.910	1.150	3.170
	Overweight/obese (non)	-.926	.303	9.347	1	.002	.396	.219	.717
	Poor diet (non)	1.207	.367	10.804	1	.001	3.342	1.628	6.864
	Smoker status (non-min)	.408	.339	1.451	1	.228	1.504	.774	2.923
	Alcohol use (non-min)	.229	.758	.091	1	.763	1.257	.285	5.553
	Diabetes diagnosis (non)	-.189	.362	.272	1	.602	.828	.407	1.683
	Hypertension diagnosis (non)	.543	.270	4.044	1	.044	1.721	1.014	2.922
	Poor mood days (<5)	.064	.342	.035	1	.851	1.066	.545	2.084
	Depressive disorder diagnosis (non)	-.117	.392	.089	1	.765	.890	.413	1.916
	Exercise/activity barriers (non-min)	.260	.341	.581	1	.446	1.296	.665	2.527
	Education status (college)	.868	.287	9.178	1	.105	2.382	1.359	4.178
	Income status (>$50,000)	.238	.264	.805	1	.002	1.268	.755	2.132
	Constant	-2.112	.916	5.313	1	.021	.121		

Note. C.I. = Confidence Intervals. Exp (B) = Odds Ratio. Table represents variables for the controlled risk factors.

a. Variable(s) entered on step 1: Age, Sex, Overweight/obese, Poor diet, Smoker status, Alcohol use, Diabetes diagnosis, Hypertension diagnosis, Poor mood days, Depressive disorder diagnosis, Exercise/activity barriers, Education status, and Income status.

*p<.05

Section 4: Application to Professional Practice and Implications for Social Change

The results indicated that certain variables could be used as predictors in identifying participants who met aerobic recommendations, and those who did not. When used as predictors, I observed valuable importance regarding the manner in which the variables were controlled by the participants, and their influence on determining an outcome. With the purpose of predicting the outcome of meeting aerobic recommendations based on the control of multiple cardiovascular risk factors, I created an appropriate model for the study. The model showed significance to certain risk factors and, in contrast, non-significance to others. I therefore neither accepted nor rejected the null hypothesis because a certain portion of variables only associated to predicting exercise participation, ultimately influencing cardiovascular risks. But there also were variables that did not show significance to this prediction of determining the outcome of exercise participation that may need to be investigated in future studies.

Interpretation of Findings

Although variables showed a mixture of significance and non-significance to predicting exercise participation, a majority of the variables had been recognized as either major or contributing risk factors for cardiovascular disease by organizations such as the CDC and the AHA. I included education and income status in the analysis to explore their potential relationship to cardiovascular disease risks within the population of study, although they were not previously designated as major factors by the AHA. The analysis of the individual participants' risk factor controls within the study however did show to be in alignment with behavioral data and investigative studies of cardiovascular disease from the CDC and the NIH.

The findings specific to the doctoral study were that participants who were predicted to meet aerobic recommendations were three times more likely to also have associated control of at least two risk factors proven to be significant, compared to participants not predicted to meet aerobic recommendations (based Logistic Regression model/not shown in table). I set a 95% confidence internal for the variables, with $p < .05$, and an effect size of .15. I found four predictor variables (risk factors) to be significant in the logistic regression model which included *poor diet*, *high blood pressure diagnosis*, *education status*, and *sex*.

Each of the four risk factors that I identified within the study had significance levels and odds ratios which highlighted a valuable determinant in predicting the dependent outcome based on certain variables. Lavie et al. (2010) noted that diet, nutrition, and physical activity for example, were all recommended to work in association to lowering negative cardiovascular effects in overweight/obese participants. However, the results of the doctoral study displayed to me that additional significance was warranted due to the recognized influence of sex and education as independent risk factors. Lavie et al. acknowledged the importance of these variables but, did not include them within their study (2010). The researchers therefore concluded that many barriers to improve health may be due to such things as low income and education status, accessibility to nutritious foods, and lack of exercise (Lavie et al., 2010). Because their findings showed a lack of clarity of how the associated affects between these barriers could reduce cardiovascular system functioning, or increase disease susceptibility, the authors recommended that future studies investigate these factors more specifically (Lavie et al., 2010).

Diet

A description of the results for the variable *poor diet* (*P* =.011; *OR* 3.3 [*CI* 95%]), displayed that participants who ate >5 fruits and vegetables/day, showed three times the odds for meeting aerobic recommendations than those who ate <5 fruits and vegetables. Guillaumie et al. (2010) determined from their results that high levels of fruits and vegetables (≥5) were associated with better health that allowed individuals to reduce their susceptibility to many diseases and also perform greater amounts of physical activity. A comparison of the variable implemented in the doctoral study to that of Guillaumie et al. however, showed a difference in their usage and terminology. The variables *habits*, *goals*, *capabilities*, and *knowledge* were the factors significantly associated to influence fruit and vegetable intake (FVI) in their investigation, and not exercise status (Guillaumie et al., 2010).

The results of the doctoral study were consistent with that of Guillaumie et al. (2010) due to the finding of a 3 fold odd (200%-highest of all risk factors in the analysis) for participants that consumed >5 fruits and vegetables daily and meet aerobic recommendations compared to those who consumed less. Guillaumie et al. concluded that the prediction of behavioral intentions were strongly associated to the frequency of a habit, and due to FVI being something that is performed daily, a similar frequency of other behaviors, such as exercise, could also be found and predicted to be associated to *goals, habits, capabilities,* etc. (2010).

Education

The variable *education status* (*P* = .002; *OR* 2.4 [*CI* 95%]) showed significant positive odds that participants who attended college/graduated college were 2.4 times more likely to meet exercise recommendations than those with less education (2^{nd} highest odds of all risk factors used in analysis). Wilkinson and Picket (2010) investigated the effects of income and education, and concluded that increased education and income among individuals in a select society did not necessarily reflect significant values of health or related mortality due to various factors that differed from one society to another. The results of the doctoral study deviated from their findings by displaying a "significant" value for the variable (education) but, did help me to however derive to a similar conclusion that multiple influences did impact general health. Wilson and Picket concluded from their results that income and education were contributing agents for cardiovascular disease but, simultaneously diminishing agents (2010). Their reasoning was based on the findings that advanced healthcare and disease prevention were more strongly promoted in countries with residents who also had higher levels of education (2010).

Because results from doctoral study showed that a participant that had attended/ graduated college was nearly two and a half times more likely to meet aerobic recommendations than a participant who had not, I inferred that this variable did in fact have high significance in determining a health outcome or predictive behavior.
I interpreted the significance of this result to more than merely highlight a behavioral response form a health survey (similarly done in BRFSS data) but, to display an answer to an appropriate method for reducing a public health epidemic (cardiovascular disease). The results showed to assist future researchers and health programmers in investigating further ways to not only diminish health burdens but, increase public knowledge and education of risk factor/behavioral influences of cardiovascular disease. Although the variable *education status* was a measurement of the level of general education (not health-based knowledge), the approach of implementing various platforms outside of clinical settings to disseminate health information could show to influence health awareness and be significant in influencing choices for those with and without college education.

Sex

The variable *sex* (P = .012; *OR* 1.9 [1.15-3.17]) also resulted in significant positive odds that showed that participants that were males were 1.9 times more likely to meet aerobic exercise recommendations than female (seen as the third highest odd for predicting exercise participation). I found that this prediction resembled the outcome of Klaperzki et al. (2012) where they stated that specific demographic variables such as *age* and *sex* could not only affect the exposure to a health-related behavior (such as alcohol consumption, smoking, physical activity) but, could also cause differences in how the exposure/behavior was engaged and or perceived by the individual. From the results of the doctoral study, I recognized that a female for example, would be about 2 times (odds ratio 1.9) less likely to meet aerobic recommendations and could also have multiple risks for other factors associated to cardiovascular disease as well. Furthermore, I also gathered from the results of the doctoral study that if a female who drinks in moderation similar to a male but, is less physically active than a male counterpart, that health promotion campaigns would greatly benefit by targeting this non to minimally-active female population because of their higher susceptibility to disease due to reduced activity level. It is further essential for me to also note that the perception of sports and physical exercise within the female population may also be influenced by behavioral interests as well the surrounding environment, and therefore cause a reduced value or outcome of physical activity as it did in the doctoral study.

I have acknowledged that an effort to make generalizations specific to males and to females have only been recognized by certain organizations. In order to maintain or improve health, the ACSM and the AHA has recommended that all physically able adults (male and female) participate in at least 30 minutes of moderate-intensity aerobic activity five days a week, or 20 minutes of intense aerobic exercise three days a week, or a combination (2015). In doing so, ACSM found that structural changes in blood vessels impact the vasoconstricting/vasodialating properties, and lead to a lowered levels of blood pressure (2006). The results of the doctoral study were similar to the acknowledgements by the ACSM (2006) whereby the therapies for secondary prevention of cardiovascular disease showed to smoking cessation, hypertension control, and increased physical activity, all found to be significant (except smoking status) in the doctoral study.

High blood pressure

The risk factor *high blood pressure diagnosis* (*P* = .044; *OR* 1.7 [*CI* 95%]) displayed predictive significance for those who did not have a high blood pressure diagnosis, represented as 1.7 times the odds for determining met aerobic exercise recommendations for participants, compared to those who had a previous diagnosis of high blood pressure. Therefore, I recognized from the combined results found to be significant in the study that I could determine that a female (because of sex and or reduced exercise status) would have a higher susceptibility for cardiovascular disease than males due to hypertensive rates 70% greater (based odds ratio 1.7) than males. What I also gained from this insight was that there was an association of inactivity to other significant risk factors (poor diet and a lower education level) that I could use to identify those potentially at risk for disease. These outcomes were consistent with those of Chatterji et al. (2012) whereby they also concluded that a single risk factor displayed an influence over multiple other risk factors, and in turn, led to a definitive health outcome in a majority of the participants that they assessed.

Also, findings from the CDC and Bozovic et al. (2013) were that the cause of hypertension as a cardiovascular disease risk factor was based on multiple elements such as diet, behavior, and routine frequency of exercise. As I proceeded to also investigate their findings, it led me to assess my variable *high blood pressure diagnosis* (and not exercise participation) in greater detail. The result of the analyzed variable showed to display a significant influence over greater amounts of cardiovascular disease risk factors (4) when they were observed as the dependent variable (not shown in table). And similar to the conclusion from Bozovic et al. (2013), I further acknowledged that the variables *poor diet*, *physical activity status*, and *overweight/obesity* used in the doctoral study were the three variables that most strongly influenced *high blood pressure diagnosis* among the participants. The importance of this finding displayed to me a greater use for assisting present and future programs to advocate and educate the control of hypertension and the modification of the individual factor itself, and/or of the three variables that I found to impact hypertension, and be useful in decreasing cardiovascular disease.

The doctoral study showed unique importance displayed not only in the similarities of conclusive outcomes that were found in results from previous studies but, in the explanatory description of the individual risk factors' significance on met aerobic recommendations (a behavior linked to cardiovascular disease risk). Therefore, there was a display of evidence that could potentially assist programs and health campaigns which target older and younger populations, and intuitively seek to reach individuals before they obtain cardiovascular disease (or while they have control of the risk factor/ability to modify behavior).

Conclusion of interpretation of risk factors

In conclusion, I recognized points of emphasis that were shown in the display of three times the odds for predicting participants who met aerobic recommendations for participants who ate a greater than five fruits/vegetables daily, compared to those who ate less than five. Likewise, aerobic exercise status was determined to be 2.4 times more likely for college attendees/graduates than for those with less education, 1.9 times more likely for those of the male sex than for females, and 1.7 times more likely for non-hypertensive participants than for those with a previous hypertension status. I uniquely found that participant control of the variable *high blood pressure diagnosis* showed the most significant influence over the greatest amount of "controlled" risk factors (4) included in the analysis. This finding showed to raised the importance of the results of the study regarding significant risk factors that may influence the perceived control of other factors in similar populations. Because a behavior (control of a risk factor) was assessed to determine the outcome of another, the results and methodology of the study could be used to determine behaviors and outcomes among other populations.

Differences of the doctoral study compared to other BRFSS data sets

However, the difference of the doctoral study as compared to other BRFSS studies was in the methodology, analysis, and approach to identify the predictive value of a risk factor (variable) based on the perceived control of others. From the results of the doctoral study I found that multiple, significant variables not only assisted in determining the outcome of disease but, also the influence that risk factors had on each other. Due to the findings and the identification of health behaviors, I saw a highlighted value in the area of education. This value could show to be useful for present and future health professionals seeking to identify proper platforms for the dissemination of information. Although the doctoral study was not used to assess the health education of participants, it was shown that in combination, education, diet, physical activity, and hypertension status control could provide a health benefit to society when included into general education and work-based programs.

Non significant variables

I noted that the variables *smoker status, alcohol use, activity barriers, income status*, and *poor mental health* (depression diagnosis) displayed a positive B-logit, but were non-significant (alpha) within the regression model. In contrast to the work by Chwastiak et al. (2011) I recognized that that certain variables used by these authors such as *obesity*, *alcohol use*, and *smoking* did however show to be significant in their relationships to predicting low weekly exercise levels for participants in their study. From insight gained from Rehm (2011) and Costanzo et al. (2010) who found that the vasoconstrictive and hypertensive chronic effects of alcohol and smoking behaviors could again be attenuated by routine exercise it led me to acknowledging the fact that significance of the variables could be influenced by the difference in the population studied. Specific to the variable *smoker status* in the doctoral study, its linkage to cardiovascular disease (but non-significance to predict aerobic exercise participation) could have been attributed to Huxley et al.'s conclusion that other lifestyle factors outside of mere smoking frequency could influence the health of smokers and non-smokers (2012). With mentions to other variables analyzed in the study, the percentage of participants with a controlled or non-controlled value of poor mood days was also shown to be approximately the same despite meeting/not meeting aerobic recommendations (19%, 20%). Furthermore, the variables *poor mood days*, *depressive disorder*, *age*, *overweight/obesity*, and *diabetes diagnosis* all either, did not indicate a significant association to predicting exercise status or, displayed a negative relationship (negative B-logit) towards the dependent variable.

Theoretical framework

For participants predicted to meet aerobic recommendations, 75% noted that they did not have limitations and/or barriers that impeded physical activity. In contrast, of the participants who were not predicted to meet aerobic recommendations, 72% noted similarly to not have limitations and/or impediments to engaging in physical activity. Therefore, the components of the ecological model (individual perspective and socio-economic status) I used for this study showed a similar association to physical activity among participant control for those meeting as well as not meeting aerobic recommendations. So, what I gathered was that *education status* (as a component of the ecological model) may have had a significant and contributing affect on physical activity in the study, but may vary according to the population. And when I associated competence and perceived susceptibility under the health belief model to factors used to predict if a participant met or did not meet aerobic recommendations, there could have also been influence from other components such as income level and age. Although the variables *income level* and *age* showed to be non-significant risk factors in the study, there could some degree of significance found in an assessment of other populations.

Limitations

There was a limitation shown in the study whereby using the variables *age*, *poor mood days*, *overweight/obese*, and *diabetes status*, I may have allowed for an overrepresentation of those receptive to meeting recommendations. For example, those who may were older in age and or overweight showed to conform to exercises regimes more frequently than those not motivated to do so either because of the absence of the perceived necessity or health concern. A second limitation was that the racial category

“Black” encompassed many nationalities and ethnicities outside of African Americans. The designation “Black” was insufficient for marking differences in health concerns of “African Americans” and more recent immigrants from Africa. Participants that competently spoke English, Spanish, and or Chinese, had access to phones, and lived in a single unit home or apartment, were used in the original data set and my sample. This was seen as the third limitation of the study because many individuals may have been excluded from the BRFSS. In addition, based on the U.S. Census results, the participation percentage of males and females in my sample was not reflective of the actual percentages within the state of Texas at the time of the investigation (2015).

Recommendations

The findings of the doctoral study indicate a need for stronger education for individuals in the existing, pre-condition, and non-diseased populations. Health education earlier in life may help more Americans to see the importance of taking the necessary preventative action to reduce future risks of acquiring cardiovascular disease (or complications). There was greater percentage of participants who met exercise recommendations but were simultaneously dealing with overweight/obesity compared to those of normal weight who met recommendations. From this, I gathered an explanation that participants who were overweight/obese showed to exercise more frequently than those of normal weight.

From the lack of control of significant factors, recommendations for future analysis should incorporate younger age groups and various races/ethnicities to evaluate commonalities and difference among subgroups. Furthermore, because a gender specific report from the American Heart Foundation (2015) showed that nearly 90% of all women had at least one or more risk factors for developing cardiovascular disease, it would be advantageous for future studies to explore, in greater detail, specific differences that may also be influenced by sex, behavior, genetics, and individual perceptions of those of that sex. In addition, ecological factors such as individual living environment and occupation setting is also advised for researchers of future studies to investigate each of their potential influences on health behavior.

Implications for Practice and Positive Social Change

Because the results of the study displayed that increases in aerobic exercise frequency were positively associated and determined by the control over multiple risk factors, these behavior modification were shown to prevent and or reduce cardiovascular disease. Although aerobic exercise is a viable activity that could be recommended for most individuals and yet, still modifiable to the specific needs of the person and environment, the components of the ecological and health belief models used in the study provided an explanation of behavioral effects. The specific individual awareness and perceived control over internal and external factors related to behavior were displayed as important contributions of the theoretical models. From this research study, I have concluded that positive social change could impact many diverse subgroups, due to the chosen methodology of the study. The use of a multiple logistic regression analysis allowed me to be able to determine a behavioral outcome among males and females of various ages, physical/mental health perceptions, and disease statuses. So as an applied practice, influencing those with and without disease at the most earliest stages of learning, shows to be a more optimal maneuver for motivating behavioral adaptation and risk factor control.

The results from the multiple logistic regression analysis showed significance for the prediction of a behavior for a unique subgroup that was determined by the control of significant risk factors. But to support professional practice, data from this study could be used towards heightening the understanding of the relationships among independent cardiovascular disease risk factors for all Americans. In representation of the specific subgroup that I analyzed, nearly half of all adult African Americans were reported to have some form of cardiovascular disease that could be attributed to a cause of death (CDC, 2015). But from a broader perspective, physicians, health professionals, and those presently with and without cardiovascular disease, could be inspired through the positive social change of increased healthier-food varieties and higher levels of education shown by this study. Modifications in these areas could influence multiple areas of public health regarding the control of behaviors that may be also found to be associated to diet and education. Specifically, the results of this study showed to be useful in the promotion of positive social change through advocating for the increased engagement in exercise participation, the greater consumption of healthier foods, and the advancement of individual education.

Greater positive social change shows to specifically impact those who lack the control of the significant risk factors identified in the study for cardiovascular disease. When placed into individual and professional practice, results of this study show that users have the ability to reduce primary and secondary diseases which may therefore impact multiple areas of public health. Implementing the results of the study into individual, group, and work-place lifestyles, the control of health behaviors also show to promote an avenue of increased positive social change through heightening education (general) and health awareness regarding risk factors for cardiovascular disease. Collaborations with independent school boards and academic institutions highlights another platform/channel where the study's results could be disseminated and made effective. Since the Census Bureau (2015) reported that 77.1 million people were enrolled in school (all levels) in 2015, this study strongly indicates the benefit of promoting education at earlier ages (before the onset of disease), and making education and healthier nutrition a priority in health promotion. Furthermore, public health advancements gained from programs and health designs specific enough for a unique population but, with the adaptability to be tailored to others subgroups, is the contribution that I have recognized to promote positive social change from the study. By highlighting ways to reduce and or prevent disease, using a predictable yet, single behavior modification seen to influence another factor, this study has highlighted an approach to combating cardiovascular disease based on an individual's or groups' need or area of control. Because cardiovascular disease has been proven through evidence by the CDC and AHA to be inherently caused by multiple factors, it may therefore necessitate a multi-factored solution that promotes sustained, healthier behaviors.

Conclusion

Participants who had perceived control over a healthy diet and high blood pressure diagnosis showed to meet aerobic recommendations in greater frequency. The outcomes of the study showed that the identified relationships among significant risk factors and an outcome determined the effect of an individual's ability to control a risk factor that could ultimately lead to progressions of cardiovascular disease. As participants reported such things as, hypertension diagnosis and/or the engagement of unhealthy behaviors such as poor eating habits, they displayed an increased risk for not meeting exercise participation. These results could therefore, be used to strengthen public health objectives/initiatives that not only are used to assess the presence of risk factors but, identify the multidimensional influences among risk factors on health outcomes of disease. Recommendations and lifestyle modifications outlined within this doctoral study have the potential to initiate a reduction of disease and disease-related mortality among many individuals nation-wide through the identification and control of modifiable risk factors. The use of alternative measures and theoretical models (health belief and ecological) could also be implemented into programs to promote positive social change through alterations in perception, awareness, and individual control. I recommend for future studies of health behavior to investigate the influences of risk factors on health outcomes, with further attention towards the differences in behavioral diversity and health perception among various populations outside Black/African Americans. Because I have unveiled that individual autonomy over health behaviors may be used to determine and influence an outcome for certain individuals, more research is needed so that greater levels of positive social change may occur for broader populations.

References

American College of Sports Medicine. (2006). *ACSM Resource manual for guidelines for exercise testing and prescription* (5th Ed). Baltimore, MD: Lippincott, Williams & Wilkins.

American College of Sports Medicine. (2015). *Exercise*. Retrieved from http:www.acsm .org

American Heart Association. (2015). *Stress management*. Retrieved from http://www.heart.org/HEARTORG/GettingHealthy/StressManagement/Stress-Management_UCM_001082_SubHomePage.jsp

American Psychological Association. (2015). *Depression*. Retrieved from http://www .apa.org/topics/depression/index.aspx

American Psychological Association. (2015). *Stress in America Survey 2015.* Retrieved from http://www.apa.org/news/press/releases/stress/2014/stress-report.pdf

American Public Health Association. (2014).*Get the facts: Public health and chronic disease*. Retrieved from https://www.apha.org/~/media/files/pdf/factsheets /chronicdiseasefact_ final.ashx

American Public Health Association. (2016). *What is public health*? Retrieved from https://www.apha.org/what-is-public-health

Anxiety and Depression Association of America. (2015). *Exercise for stress and anxiety*. Retrieved from http://www.adaa.org/living-with-anxiety/managing-anxiety /exercise-stress-and-anxiety

Azagba, S. & Sharaf, M. (2011). The effect of job stress on smoking and alcohol consumption. *Azagba and Sharaf Health Economics Review*, *1*(15), 1-14. Retrieved fromhttp://www.ncbi.nlm.nih.gov/pmc/articles/PMC3403311/pdf/2191-1991-1-15.pdf

Barrington, W., Ceballos, R., Bishop, S., McGregor, B., & Beresford, S. (2012). Perceived stress, behavior, and body mass index among adults participating in a worksite obesity prevention program, Seattle, 2005–2007. *Preventing Chronic Disease*, *9,* 1-10. doi: http://dx.doi.org/10.5888/pcd9.120001

Bozovic, D., Racic, M., & Ivkovic, N. (2013). Salivary cortisol levels as a biological marker of stress reaction. *Med Arh*, *67*(5), 374-377. doi:10.5455/medarh.2013.67 .374-377

Brook, R., Appel, L., Rubenfire, M., Ogedegbe, G., Bisognano, J., Elliott, W, ... Rajagopalan, S. (2013). Beyond medications and diet: Alternative approaches to lowering blood pressure. *Hypertension*, *61*, 1360-1383. doi:10.1161/HYP .0b013e318293645f

Campbell, J. & Ehlert, U. (2011). Acute psychosocial stress: Does the emotional stress response correspond with physiological responses? *Pschonueroendocrinology, 37*, 1111-1134. doi: http://dx.doi.org/10.1016/j.psyneuen.2011.12.010

Center for Disease Control. (2014). *Behavioral risk factory survey*. Retrieved from http://www.cdc.gov/nchs/index.htm

Center for Disease Control. (2016). *Heart disease*. Retrieved from http://www.cdc.gov /heartdisease/faqs.htm

Center for Disease Control. (2015). *High blood pressure facts*. Retrieved from http://www.cdc.gov/bloodpressure/facts.htm

Center for Disease Control and Prevention (2015). *Obesity*. Retrieved from http://www .cdc.gov/chronicdisease/resources/publications/AAG/obesity.htm

Chatterji, P., Joo, H., & Lahiri, K. (2012). Racial/ethnic- and education-related disparities in the control of risk factors for cardiovascular disease among individuals with Diabetes. *Diabetes Care, 35*, 305–312. doi:10.2337/dc11-1405

Chwastiak, L., Rosenheck, R, & Kazis, L. (2011). Association of psychiatric illness and obesity, physical inactivity and smoking among a national sample of veterans. *Psychosomatics*, *52*(3) 230–236. doi:10.1016/j.psym.2010.12.009

Costanzo, S., Di Castelnuovo, A., Donati, M., Iacoviello, L., & Gaetano, G. (2010). Cardiovascular and overall mortality risk in relation to alcohol consumption in patients with cardiovascular disease. *Circulation*, *121*, 1951-1959. doi:10.1161

/CIRCULATIONAHA.109.865840

Creswell, J. (2003). *Research design: Qualitative, quantitative, and mixed methods approaches.* Thousand Oaks, CA: Sage Publications.

Dinas, P., Koutedakis, Y., & Flouris, A. (2011). Effects of exercise and physical activity on depression. *Irish Journal of Medical Science*, 180:319–325. doi:10.1007 /s11845-010-0633-9

Dunn, A., Trivedi, M., Kampert, J., Clark, C., & Chambliss, H. (2005). Exercise treatment for depression efficacy and dose response. *American Journal of Preventative Medicine, 28*(1) 1–8. doi:10.1016/j.amepre.2004.09.003

Edberg, M. (2007). *Essentials of health behaviors*. Social and behavioral theory in public health. Sudbury, MA: Jones and Bartlett Publishers.

Ezzati, M., Oza, S., Danaei, G., & Murray, C. (2008). Trends and cardiovascular mortality effects of state-level blood pressure and uncontrolled hypertension in the United States. *Circulation*, 117, 905-914. Retrieved from http://circ.ahajournals.org doi 10.1161/CIRCULATIONAHA.107.732131

Friis, R. & Sellers, T. (2009). *Epidemiology for public health practice*. Boston: Jones and Bartlett Publishers.

Gerber, M., Brand , S., Lindwall , M., Elliot, C., Kalak, N., Herrmann, C.,… Jonsdottir, I. (2012). Concerns regarding hair cortisol as a biomarker of chronic stress in exercise and sport science. *Journal of Sports Science and Medicine 11*, 571-581.

Huxley, R., Yatsuya, H., Lutsey, P., Woodward, M., Alonso, A., & Folsom, A. (2012). Impact of age at smoking initiation, dosage, and time since quitting on cardiovascular disease in African Americans and Whites. *The American Journal of Epidemiology, 175*(8), 816-826. doi:10.1093/aje/kwr391

Klaperski, S., Dawans, B., Heinrichs, M., & Fuchs, R. (2012). Does the level of physical exercise affect physiological and psychological responses to psychosocial stress in women? *Psychology of Sport and Exercise 14*, 266-274. doi:10.1016/j.psychsp ort.2012.11.003

Lavie, C., Milani, R., Ventura, H., Romero-Corral, A. (2010). Body Composition and Heart failure prevalence and prognosis: Getting to the fat of the matter in the "Obesity Paradox". *Mayo Clinic Proceedings, 85*(*7*), 605-608. doi:10.4065/mcp. 2010.0333

Mahmoud, J., Staten, R., Hall, L. (2012). The Relationship among young adult college students' depression, anxiety, stress, demographics, life satisfaction, and coping styles. *Issues in mental health nursing*. *33*(3), 149-156. doi:10.3109/01612840.2 011.632708

Mayo Clinic. (2015). *Chronic stress puts your health at risk.* Retrieved from http://www.mayoclinic.org/healthy-lifestyle/stress-management/in-depth/stress/art-20046037

Milani, R. & Lavie, C. (2009). Reducing psychosocial stress: A novel mechanism of improving survival from exercise training. *The American Journal of Medicine, 122*, 931-938. doi:10.1016/j.amjmed.2009.03.028

National Institute of Health. What are coronary heart disease risk factors. Retrieved from https://www.nhlbi.nih.gov/health/health-topics/topics/hd

Nelson D., Holtzman, D., Bolen J., Stanwyck, C., & Mack, K. (2012). Reliability and validity of measures from the Behavioral Risk Factor Surveillance System (BRFSS). *Internal Journal of Public Health*, 46(Suppl 1):1–42.

Pierannunzi, C., Hu, S., & Balluz, L. (2013). A systematic review of publications assessing reliability and validity of the Behavioral Risk Factor Surveillance System (BRFSS), 2004–2011. *BMC Medical Research Methodology 13*, 49. doi: 10.1186/1471-2288-13-49

Rehm, J. (2011). The risks associated with alcohol use and alcoholism. *Alcohol Res Health, 34*(2), 135–143.

Rimmele, U., Seiler, R., Marti, B, Wirtz, P., Ehlert, U., & Heinrichs, M. (2009). The level of physical activity affects adrenal and cardiovascular reactivity to psychosocial stress. *Psychoneuroendocrinology, 34*(2), 190-198. doi:10.1016/j.psyneun.2008.

08.023

Salahuddin, S., Prabhakaran, D., and Roy, A. (2012). Pathophysiological mechanisms of tobacco-related CVD. *Global Heart, 7*(2), 113-120. doi:10.1016/j.gheart.2012.05.003

Smith, P. & Blumenthal, J. (2011). Psychiatric and behavioral aspects of cardiovascular disease: Epidemiology, mechanisms, and treatment. *Rev Esp Cardiol, 64(*10) 924–933. doi:10.1016/j.rec.2011.06.003

Soper, D. (2016). A-priori sample size calculator for multiple regression [Software]. Retrieved from http://www.danielsoper.com/statcalc

Texas Department of State Health Services. (2013). *Texas Behavioral Risk Factor Surveillance System.* Retrieved from https://www.dshs.texas.gov/chs/brfss/

Texas Department of State Health Services. (2013). *Texas health data: Center for health statistics*. Retrieved from http://healthdata.dshs.texas.gov/Population

U.S. Census Bureau (2015). *School enrollment in the United States*. Retrieved from http://www.census.gov/newsroom/press-releases/2016/cb16-tps142.html

Wilkinson, R., & Pickett, K. (2010). *The spirit level:* Why greater equality makes societies stronger. New York, NY: Bloomsbury Press.

World Health Organization (2016). *Cardiovascular disease.* Retrieved from http://www.who.int/cardiovascular_diseases/en/