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Relationship Between Health Risk Behaviors and Obesity Among American High School Students

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Walden University

College of Health Sciences

This is to certify that the doctoral study by

Jacques Jean-Paul Cherry

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.

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Dr. Namgyal Kyulo, Committee Chairperson, Public Health Faculty
Dr. Jagdish Khubchandani, Committee Member, Public Health Faculty
Dr. Kai Stewart, University Reviewer, Public Health Faculty

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Walden University
2020

Abstract

Relationship Between Health Risk Behaviors and Obesity Among American High School Students

by

Jacques Jean-Paul Cherry

MA/MS, Troy State University, 1996

BS, Tuskegee University, 1994

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Public Health

Walden University

2020

Abstract

Adolescent obesity is a serious health condition that affects more than 55% of students aged 12 to 19 years in the United States. Recent statistical data have noted that the rate of adolescent obesity has more than quadrupled during the past few decades. Genetics and factors such as tobacco use, alcohol use, and marijuana use have contributed to this critical public health issue. Although uniqueness of prevalence has often been linked to gender and race, associations related to these health risk behaviors and increased body mass index remain relatively unexplored among today's U.S. youth. Adolescence has been described as a pivotal period in which adolescents begin to engage in risky health behaviors. Guided by the social cognitive theory, the purpose of this study was to evaluate the relationship between obesity and health risk behaviors among American high school students who participated in the 2015 Youth Risk Behavior Survey. A cross sectional quantitative design was used to analyze secondary data from the completed survey data of 1,624 high school students. Descriptive statistics, bivariate and multivariate logistic regression tests were used to analyze the data. Multivariate logistic regression results from this study detail that there were significant associations between adolescent tobacco use and obesity (*OR* = 1.164, 95% CI = (1.046, 1.296). Findings of this study suggest adolescent health risk behaviors associated with tobacco and alcohol use co -occur uniquely within the African American, White, and Hispanic high-school youth, in particularly those of OV/OB categorization. Initiation of culturally sensitive prevention programs are of urgency to counteract this epidemic that is affecting our vulnerable high-school aged population both within the United States and globally.

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August 2020

Dedication

I dedicate my study to my wife for her dedication, loyalty, and perseverance in this growth and learning process. Thank you for standing beside me. I also dedicate my study to my late grandmother, Virgie Mae Cherry. Thank you instilling the love for knowledge, self-esteem, and a sense of worth in me at an early age. You taught me to hold my head high and to never look down. I will abide by your method of teaching for the rest of my life.

Blessed is the man who trusts in the Lord. Jeremiah 17:7

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All praises and glory to Lord God Almighty whom I serve. To my wife Teresa, I thank you for your enduring gratitude, kindness, patience, and understanding. You are and will always be my rock, my soul mate. I truly love you. To my mother, Terri, I thank you for your prayers. You prayed quite a bit during this journey. I love you mother. Dr. Namgyal Kyulo, a special thank you for your direction while serving as my chair. You have been a great mentor and inspiration throughout this journey. I also want to thank you for your unique style of teaching. You taught me that nothing is ever worthwhile unless you put the necessary time in to make sure that the final outcome is of quality. Thank you from the bottom of my heart, Dr. Namgyal. I want to also thank Dr. Jagdish Khubchandani for his attention to detail. Your thoroughness gave me the inspiration to dig deeper and walk more confidently towards my goals. A special thank you to Dr. Kai Stewart for serving as my committee member during this journey as well. Thank you, Dr. Callahan, for your review during the final stages of my study. Dr. Margaritis Vasilios, thank you for helping me understand that what I was about to encounter was real. I appreciate you. I will never forget the day you snapped me into existence during my second residency in Atlanta, Ga. Dr. Rea, thank you for serving as my program director. A very special thank you to Dr. Joseph Gredler, the best editor ever. I appreciate all of your guidance and I hope we will cross paths in our various research endeavors in the future.

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Section 1: Foundation of the Study and Literature Review

Introduction

Current literature details that adolescent obesity rates remain elevated in the United States (Ogden et al., 2016). Recent analyses of growth charts provided by the U.S. Centers for Disease Control and Prevention (CDC) reveal age-specific prevalence of obesity, also known as body mass index (BMI), at or above the sex specific 95th percentile (Ogden et al., 2016). Analysis of BMI data obtained by the CDC detailed that 8.9% of U.S. children in the age category of ages 2 to 5 years are obese (Ogden et al., 2016). Supplemental data displayed that obesity rates doubled for U.S. children aged 6-11 at 17.5 percent (Ogden et al., 2016). Data pertaining to U.S. adolescents aged 12-19 revealed a staggering upward trend of 20.5 percent (Ogden et al., 2016).

Recent key findings by The National Health and Nutrition Examination Survey (NHANES) 2015-2016 explained that in 2015-2016, the prevalence of obesity was 39.8% in adults and 18.5% in youth (Hales, Margaret, Carroll, Fryar, & Ogden, 2017). Additional data detailed that the prevalence of obesity was elevated among youth aged 6-11 (18.4%) and adolescents aged 12-19 years (20.6%) (Hales et al., 2017). The most recent estimates from the 2015-2016 on obesity prevalence by sex, age, and race detailed that overall, the prevalence of obesity for non-Hispanic black (22.0%) and Hispanic youth (25.8%) was considerably higher when compared to non-Hispanic white (14.1%) and non-Hispanic Asian (11.0%) (Hales et al., 2017).

The CDC (2015) reported that in the United States, the leading causes of mortality, morbidity, and social problems among youth and adults are related to six

categories. These categories, commonly referred to as health risk behaviors include the followings: (a) behaviors that contribute to unintentional injuries, (b) tobacco use, (c) alcohol and other drug use, (d) sexual behaviors related to unintended pregnancy and sexually transmitted diseases, (e) unhealthy dietary behaviors, and (f) physical inactivity (CDC, 2015). Previous studies have indicated a positive association between increased BMI and smoking initiation, binge drinking of alcohol, tobacco use, and other drug use such as marijuana (Farhat, Iannotti, & Simons-Morton, 2010). According to Spring, Moller, & Coons (2012), the odds of having multiple health risk behaviors increases over the course of an adolescent's teenage years. Current literature asserts that by eliminating health risk behaviors, 80% of heart disease, stroke, type 2 diabetes, and 40% of cancers, could be prevented (Spring et al., 2012).

Tate et al., (2015) noted that African American adolescents experience inflated rates of overweight and obesity. African American adolescents also have an increased risk of obesity-related diseases than do their White peers (Tate et al., 2015). The CDC (2011d) notes that the obesity rates among African American adolescents (20.2%) was second only to Hispanic youth (22.4%). This percentage is much higher than the rates for White youth, estimations were only at 14.1% (Tate et al., 2015). Tate et al., (2015) asserted that this prevalence of overweight and obesity among African American adolescents has been attributed to the health risk behaviors such as physical inactivity and unhealthy eating.

Previous studies have addressed the association between overweight and obesity and other health risk behaviors such as marijuana use, alcohol use, and tobacco use

(Pasch, Nelson, Lytle, & Moe, 2008). In addition to intergroup disparities, current literature indicated that overweight and obesity among African American adolescents may also be associated with intragroup differences (Tate et al., 2015). These intragroup differences may include gender and socioeconomic status (Schultz, Israel, Williams, Parker, Becker, & James, 2000). Zeller, Becnel, Reiter-Purtill, Peugh, & Wu (2016) explained how risk pathways of excess BMI, tobacco use, alcohol consumption, and marijuana use may have a distinct connection among African American adolescents.

Adolescence is described as a pivotal period in which many health risk behaviors are initiated (Zheng et al., 2016). Health risk behaviors have been significantly associated with overweight and obesity among adolescents (Zheng et al., 2016). This study will be performed using secondary data from a representative sample of African American high school students who participated in the 2015 Youth risk Behavior Surveillance Survey (YRBSS) – United States. Weighted hierarchical logistic regression will be performed to assess the association between health risk factors and increased BMI (see Zheng et al., 2016).

Public action is needed regarding the assessment of trends related to health risk behaviors among African American high school students (Tate et al., 2015). Social Cognitive Theory as explained by Bandura (2004) defines knowledge as the basis for behavior change.

Problem Statement

The rate of adolescent overweight and obesity in the United States has quadrupled since the 1990s (CDC, n.d.). Ogden et al., (2014) details that in 2011, 55% of adolescents aged 12-19-year-old were classified as either overweight or obese in the United States. Adolescence is a period of change in which numerous health risk behaviors such as tobacco, alcohol, drug use (e.g. marijuana), physical inactivity, and unhealthy dietary behaviors are initiated (Zheng et al., 2016). These health risk behaviors are most commonly associated with premature morbidity and mortality among adolescents of high school age (Zheng et al., 2016). Previous literature has examined the relationship between health risk behaviors and their association with overweight and obesity amongst adolescents (Zheng et al., 2016). However, few findings are present in the literature placing emphasis on health risk behaviors of African American teens in the United States and obesity and health risk behaviors. Literature comparing unhealthy dietary behaviors and physical inactivity among African American teens who reside in urban and suburban communities throughout the United States (Tate et al., 2015). Trends data provided in a study by Ogden, Carroll, Kit, & Flegal (2012) conducted between the years of 1999 - 2010 showed that the odds of being obese remained significantly higher for non-Hispanic Black males and females aged 12-19. The prevalence of African American adolescent obesity has remained relatively high despite culturally sensitive health interventions (Tate et al., 2015). Findings from a study conducted by Tate et al (2015) detailed health care practices and social advancements that may address critical gaps in literature related to this public health issue. These gaps in literature may address clinical guidelines related

to: (a) tobacco use; (b) alcohol use; and (c) marijuana use among African American high school students residing in the United States.

Purpose of the Study

The purposes of the quantitative approach are to examine the association between overweight/obesity and health risk behaviors specific to marijuana use, moderate alcohol use, and tobacco use. This approach will also assist in the determination as to whether this association varies by age, gender, and grade among African American adolescents of high school age (12-19) who reside in the United States. Creswell (2009) specified that survey design provides a quantitative or numeric description of trends, attitudes, or opinions of a population. Creswell (2009) also asserted that this process is done by a researcher studying a sample size of that specific population. Results provide the researcher with data that may assist with experimental design (Creswell, 2009). Ogden et al. (2012) asserted that in the year 2011, over 55% of adolescents who resided in the United States, aged 12 to 19, were either overweight or obese. Adolescence is a time when numerous adolescents begin to engage in health risk behaviors such as marijuana use, moderate alcohol use, tobacco use, unhealthy dietary behaviors, and physical inactivity (Zheng et al., 2016). Tate et al. (2015) indicated that gender, socioeconomic status are significant predictors of unhealthy eating behaviors physical inactivity and BMI. These categories of behavior have been consistently found to correlate with increased morbidity and mortality among adolescents (Spring et al., 2012; Zheng et al., 2016). Weighted logistic regression will be performed to assess the association between the independent variables of tobacco use, alcohol consumption/use, marijuana use,

unhealthy dietary behaviors, physical inactivity and socioeconomic status, and the dependent variable of increased BMI.

Research Question(s) and Hypotheses

To assess the association of the independent variables of marijuana use, moderate alcohol use, and tobacco use on the dependent variable of BMI, the following research questions and hypotheses were developed.

Research Question 1: Is tobacco use among American high school students associated with BMI while controlling for race, gender and grade?

H*1o*: There is no association between tobacco use and BMI among American high school students while controlling for race, gender and grade?

H*1a*: There is an association between tobacco use and BMI among American high school students while controlling for race, gender and grade.

Research Question 2: Is alcohol use among American high school students associated with BMI while controlling for race, gender and grader?

H*2o*: There is no association between alcohol use and BMI among American high school students while controlling for race, gender, and grade.

H*2a*: There is an association between alcohol use and BMI among American high school students while controlling for race, gender and grade.

Research Question 3: Is marijuana use among American high school students associated with BMI while controlling for race, gender, and grade?

H*3o*: There is no association between marijuana use and BMI among American high school students while controlling for race, gender and grade.

H*3a*: There is an association between marijuana use and BMI among American high school students while controlling for race, gender and grade.

Theoretical Framework of the Study

The theoretical framework used to guide this study is Bandura's (2004) social cognitive theory. This theory evolved from social learning theory (Bandura, 2004). Social cognitive theory has assisted researchers and practitioners in the determination of the factors that motivate certain behaviors. Once factors are understood, behavior and behavior change can be regulated by forethought and a personal sense of control (Bandura, 2004).

WHO (2012) states that child obesity is categorized as one of the most serious public health challenges in the 21st century. Both behavioral and environmental factors have been known to contribute to adolescent behavior (Rolling & Hong, 2016). Social cognitive theory is categorized as an interpersonal theory (Rolling & Hong, 2016). This theory emphasizes how environmental and personal characteristics influence behavior (Rolling & Hong, 2016). Causes of childhood obesity may be categorized into behavioral, environmental, and personal factors as well (Rolling & Hong, 2016). These causes coincide with components found in Bandura's social cognitive theory (Rolling & Hong, 2016).

Perez-Lizaur, Kaufer-Horwitz, & Plazas (2008) detail that causes of adolescent obesity which include environmental, behavioral, and personal factors often work in unison. Examples of environmental factors include life at home, parenting style, peer influence, and school and/or community setting (Rew, Arheart, Thompson, and Johnson,

2013). Examples of behavioral factors involve an adolescent's choice of food (carbonated drinks) and food acceptance (Rew et al., 2013). Personal factors include knowledge and self-efficacy (Rew, et al., 2013). *Self-efficacy* is described as a person's confidence in performing a particular behavior or conquering barriers related to a specific behavior (Rew et al., 2013).

SCT seeks to define variables leading to behavior change (Rolling & Hong, 2016). SCT also seeks to explain the relationship that exist among variables that lead to behavior change (Rolling & Hong, 2016). SCT further posits that adolescents have the ability to transform and create environments with desired characteristics (McAlister, Perry, & Parcel, 2008). Key concepts related to SCT include outcome expectations such as self-regulation, goal setting, self-monitoring, self-reward, environmental structuring, observational learning, and self-efficacy (McAlister, et al., 2008).

Limbers, Young, & Grimes (2014) asserted that today's youth grow up in a sedentary world that promotes physical inactivity and the consumption of nutrient poor foods. The CDC (2011) details that the United States alone has spent over an estimate $147 billion on obesity-related medical costs. This estimate is nearly 9% of all United States expenditures (CDC, 2011). The prevalence of adolescent obesity has become a global issue (Karnik & Kanekar, 2012). The determinants of obesity are complex and varied (Gortmaker et al., 2011). Gortmaker et al. (2011) detailed that no single intervention is likely to prevent adolescent obesity. Adolescent obesity prevention efforts need to be closely integrated with other efforts to control health risk behaviors associated with overweight and obesity (WHO, 2011). Reviews suggested that the most sustainable

and benefit effective interventions are not single component, but rather involve multiple strategies (Wang et al., 2013; Nixon et al., 2012; Khambalia et al., 2012). Research concluded that the more an environment consistently promotes healthy behavior, the greater the likelihood that such behavior will occur (Wang, et al., 2013; Nixon, et al., 2012; Khambalia et al., 2012).

Nature of the Study

This study used a quantitative methodology to evaluate the relationship between health risk behaviors and BMI among African American high school students. A quantitative approach was selected to test the SCT as well. The dependent variable commonly referred to as BMI. CDC, (2012b) described BMI as a calculation of body fat based on an adolescent's weight and height. For Research Question 1, the independent variable is tobacco use. For Research Question 2, the independent variable is alcohol consumption. For Research Question 3, the independent variable is marijuana use. Archival quantitative data was obtained from the 2015 Youth Risk Behavior Surveillance Survey (YRBS). This quantitative data was used to further determine whether health risk behaviors exhibited by African American high school student population who reside in the United States is associated with increased BMI. YRBS presented data collected on adolescents from grades 9-12 in year 2015 (Eaton et al., 2012). The research methodology (research design, population sample and setting, instrumentation and materials, variables, data collection, and analysis) is detailed in Section 2 of this study.

Literature Search Strategy

Many studies have been conducted on the issue of adolescent obesity. However, gaps in literature suggest more research is needed to assist in the growing demand of how health risk behaviors may be associated with increased overweight/obesity among the African American adolescent population and to describe the most recent developments, limits, and outcomes of lifestyle modification programs that may be considered culturally relevant to better assist this subgroup. For the purpose of this study, scholarly literature public was reviewed dating back to 2009 to current 2018. Literature was compiled via the Walden Library which was used to access CINAHL, MEDLINE, EBSCO, SAGE, PubMed, and ProQuest Central. Additional literature was obtained via Google Scholar, the Centers for Disease Control and Prevention, and the World Health Organization. Search terms used included but were not limited to the following: *Body Mass Index* (*BMI), demographics, dietary behaviors, family-based interventions, school-based interventions, community-based interventions, academics, obese /obesity, overweight, socioeconomic status,* and *Youth Risk Behaviors Survey*. Specific terms and/or phrases such as: *race, age, gender, ethnicity, marijuana use, alcohol use, and tobacco use, unhealthy dietary behaviors, adolescent,* and *physical inactivity* were also searched.

Literature Review Related to Key Variables and/or Concepts

Prior literature provided by Price, Khubchandani, McKinney, & Braun (2013) foreshadowed the epidemic of adolescent obesity by noting that ethnic and racial minorities are at an even greater disadvantage. This disadvantage is a multifaceted one that carries over into adulthood (Price, et al., 2013). Factors such as socioeconomics,

marijuana use, moderate alcohol use, tobacco use, unhealthy dietary behaviors, and physical activity all play a pivotal role in the lives surrounding African Americans of high school age in the United States (Price, et al., 2013). A review provided by Price et al. (2013) provided background literature on racial/ethnic minority percentage rates compared to that of Whites. Data revealed that racial/ethnic minorities 1.5 to 2.0 times more likely to have a major chronic disease than Whites (Price, et al., 2013). Adolescents and children who are considered racial/ethnic and reside in a socio economically challenged built environment are at an even greater risk (Price et al., 2013).

The authors assert that the issue of overweight and/or obesity is a multi-faceted one that has many layers (Price, et al., 2013). Prior literature detailed by the authors note that between 1960 and 2005 the percentage of adolescents and children classified as having a chronic disease more than quadrupled (Price, et al., 2013). Racial and minority were said to have a higher likelihood of diseases such as overweight and/or obesity (Price, et al., 2013). Low socioeconomic status intermingled with physical inactivity, skipping meals such as breakfast, high consumption of sweetened beverages, and peer influences all play a pivotal role (Bernell, Mijanovich, & Weitzman, 2009). Findings produced by Tate et al. (2015) contribute to health care practices and social advancement. Implications suggested these contributions will assist with addressing the gaps in literature research (Tate, et al., 2015). Effective clinical guidelines related to eating behaviors, physical activity and obesity among African American adolescents is of urgency (Tate et al., 2015). Specific findings produced by the authors also revealed variances in gender, SES, and residential status.

This review focused on psychosocial factors that play important roles in the etiology and future solutions to health disparities such as adolescent overweight and obesity (Price, et al., 2013). Examination of access to health services such as schools may assist in urgent care for racial and ethnic students and may also assist in the reduction of health care disparities (Price, et al., 2013). Conclusive evidence produced from this study noted that the purpose of the review was to highlight the multiple health disparities afflicting youth in America (Price et al., 2013). The variety of individual health issues and the disparities create was acknowledged between racial/ethnic minorities and white youth (Price et al., 2013). However, there are tangible steps that must be taken in order to overcome barriers deemed as sufficient for change (Price, et al., 2013).

Overweight and Obesity: Overview and Implications

Farhat (2015) introduces this topic by noting that the prevalence remains high among adolescents with over one-third of the United States population categorized as obese (Farhat, 2015). Lobstein et al. (2015) backed up this claim when asserting that the prevalence has risen substantially in most high-income countries such as the United States. Overweight and obesity is stated as being a major health concern among adolescents and adults (CDC, 2010; Theodore, Bray, & Kehle, 2009). However, childhood obesity is an even greater concern with respect to the health and well-being of the child (Rubiero et al., 2010). Childhood obesity is defined as having a BMI at or above the 95th percentile (CDC, 2009). This definition is applied to children of the same age and sex related to percentile (CDC, 2009). Although data is scarce, there is still a great possibility that the prevalence of overweight and obesity is rising in low-income and

middle-income countries as well (Lobstein et al., 2015). Data collected between the time-period of 2007-2008 illustrated that children between the ages of 12-19 showed a 5.0 to 18.1% increase in obesity (Karnik & Kanekar, 2012). A study conducted by Mahajan et al. (2011) noted that their objective was to study the prevalence of overweight and obesity among children, aged 6 to 12, in Union Territory of Puducherry India. This study incorporated secondary analysis of anthropometric measurements (BMI) of school children (Mahajan et al., 2011). The study population incorporated 12,685 children who attended government and private urban schools (Mahajan et al., 2011). Analysis of this study revealed that regions from the Union Territory of Puducherry showed trends detailing strong influences of local environmental and sociocultural factors pertaining to overweight and obesity (Mahajan et al, 2011). Prevalence of overweight and obesity was at 5.07% and 2.61% among the children residing in urban areas (Herbert, 2009). Results revealed that female children form the urban and private schools residing in the Mahe region had the highest prevalence of overweight at 8.66% and obesity at 4.69% (Mahajan et al., 2011). Conclusive commentary eluded that residence, socioeconomic conditions combined with age and gender differences were contributing factors (Mahajan, et al., 2011). Higher risk of obesity was shown to be associated with lifestyle changes leading to unhealthy dietary behaviors and increasing levels of physical inactivity (Mahajan et al., 2011). Conclusive literature suggested that both home and school-based control measures be implemented (Mahajan et al., 2011). Additional research related to risk factors for childhood obesity is greatly needed (Mahajan et al., 2011). This research study may assist

with the monitoring of trends future considerations of adolescents of specific age groups (Mahajan et al., 2011).

Prevalence of Obesity and Severe Obesity among Children and Adolescents

A study provided by Skinner, Perrin, and Skelton (2016) provide the most recent data on the prevalence of obesity and severe obesity among adolescents residing in the United States. The authors used nationally representative date provided by the national Health and Nutrition Examination Survey 1999-2014 (Skinner et al., 2016). Weight status for this study was defined using measured height and weight to determine BMI (Skinner et al., 2016). Class I obesity was defined as ≥ 95tyh percentile (Skinner et al., 2016). Class II obesity was defined as ≥ 120 percent of the 95th percentile or equivalent to the BMI ≥35 (Skinner et al., 2016). Class III obesity was defined as ≥ 140 percentile or BMI ≥ 40 (Skinner et al., 2016). Multivariate logistic regression was used to determine estimations of odds ratios for differences with the 2011-2012 and 2013-2014 cycles that were used (Skinner et al., 2016). Data from the 2011-2012 survey demonstrated an increase in severe obesity among children and adolescents over the previous 14-year period (Skinner & Skelton, 2014). Another aim for Skinner et al., (2016) was to examine the changes in trends for the time period of 1999 to 2014. The statistical approach taken by Skinner et al., (2016) presented subgroup analysis to examine the trends for the following: three age categories for females and males separately and four race/ethnicity categories for females and males separately. Results revealed that older children had a greater prevalence of all classes of obesity compared to younger children (Skinner et al., 2016). Results also indicated a clear statistically significant increase in all classes of

obesity from 1999 to 2014 and all classes of obesity had increased over time for adolescents of both sexes (Skinner et al., 2016). Evidence retrieved from this study revealed that changes over time are similar by race and prevalence was consistently higher among African American and Hispanic adolescents (Skinner et al., 2016).

Discussion taken from this literature review noted that there were several critical reasons for ongoing examination of obesity prevalence and trends in prevalence (Skinner et al., 2016). Noted reasons included allowing additional years for a more detailed examination of trends and reporting trends while using all available data (Skinner et al., 2016). By doing so, the ability to assess changes in prevalence are abnormal or genuine trajectory shifts (Skinner et al., 2016). The authors also made known that understanding the ongoing trends in obesity is crucially important to public health and policy makers (Skinner et al., 2016). While this literature review was unable to specifically link policies or interventions related to obesity prevalence, the results did show an indication that current policy does have an extensive effect on obesity (Skinner et al., 2016). Chan & Woo (2010) specified that public health tracking of obesity is beneficial in informing policies, distribution of limited resources, and determining sub-groups at risk such as African Americans. Dietz et al. (2015) asserted that coordinated efforts by means of integration of clinical and community systems as well as supported policies are important to the addressing of this hard to grasp problem.

The Association between Socioeconomic Status and Childhood Obesity

A review presented by Wang & Lim (2012) offered evidence of the current prevalence and time of childhood obesity worldwide. The association between childhood

obesity and socio-economic status (SES) was also reviewed (Wang & Lim, 2012). The issue of childhood obesity has become a global health crisis and has shown the highest prevalence in Western and industrialized countries (Wang & Lim, 2012). Prevalence also varies by age and gender (Wang & Lim, 2012). Estimations showed that the Americas and eastern Mediterranean regions as having the highest prevalence of overweight and obesity at 30 and 40% (WHO, 2010). A total of 43 million children, 35 million in developing countries, were estimated as overweight or obese (WHO, 2010). This global overweight/obese epidemic has dramatically increased since 1990 (Wang & Lim, 2012). Evidence revealed that if this trend continued, then overweight and obesity would reach 9% or 60 million people by the year 2020 (Wang & Lim, 2012).

Recent studies produced by WHO (2009) indicated that approximately 20% of school-aged children who resided in European countries were overweight or obese. In North American, these figures indicated that 30% and 15 % (WHO, 2009). Based on the literature provided, SES groups who have greater access to energy-dense diets may play a pivotal role in the increased risk of being obese (Wang & Lim, 2012).

Available data produced by Wang & Lim (2012) showed combined prevalence of overweight and obesity in numerous regions throughout the globe; however, substantial variations continue to exist. Combined prevalence was stated to be elevated in western and industrialized countries (Wang & Lim, 2012). These countries include the United States, Canada, some European countries. (Wang & Lim, 2012). SES may affect lifestyle, such as population access to nutritional foods and patterns of physical activity (Beydoun & Wang, 2009). Numerous researchers have attempted to study the impact of SES on

obesity risk by using cross-sectional survey data collected from previous population groups (Beydoun & Wang, 2009). In general studies revealed that low SES groups residing in industrialized countries were at higher risk for developing and maintaining overweight and obesity (Wang & Lim, 2012). Tendencies showed that urban children and children form high-income families had an increased risk for excess weight gain (Wang & Lim, 2012). Data collected by NHANES between 1971 and 2002 showed a reverse association between SES and overweight (Wang & Lim, 2012). An increasing body of literature suggested that the SES and obesity association is a complex one that varies by age, gender, and ethnicity or by environment (Wang & Lim, 2012).

The scope of this review examined the drivers of the current overweight and obesity epidemic (Wang & Lim, 2012). However, a growing body of research still seeks to identify the contributions of globalization and the result of numerous profound changes in society such as living environments and individual behavior patterns (Wang & Lim, 2012). Conclusive results of this review asserted that further research is needed to better understand the many controversies regarding the relationships between SES and obesity (Wang & Lim, 2012). Childhood obesity, as described by Wang & Lim (2012), is a growing threat that calls for timely and effective population-based approaches. Obesity continues to hold numerous health and financial consequences for families and society as well (Wang & Lim, 2012). Prevention should take high national priority along with the development of revised national and regional policies (Wang & Lim, 2012). Population-based intervention programs were stated to be crucial to combatting this growing epidemic around the globe (Wang & Lim, 2012).

Karlsen et al. (2014) offered background literature related to ethnic variations in childhood overweight and obesity. The objective of this study was to examine whether and how ethnic variations in childhood overweight and obesity have evolved over a certain period of time (Karlsen et al., 2014). Methods used involved logistic regression to analyze ethnic differences in the likelihood of being at or above age and gender thresholds (Karlsen et al., 2014). These specific thresholds for overweight and obesity were developed by the International Obesity Task Force for children aged 2 to 15 among 11 ethnic groups (Karlsen et al., 2014). Data was retrieved from the Health Surveys for England from the time period of 1998 to 2009 (Karlsen et al., 2014). Adjustments for age, gender, and year of data collection were made in comparison to household income or SES (Karlsen et al., 2014). Results from this review divulged that trends in overweight and obesity over a period of time for ethnic minority groups such as African American children had elevated rates of overweight and obesity (Karlsen et al., 2014). Conclusive evidence found that these trends did not follow those of white English children (Karlsen et al., 2014). The authors noted that policies were required to encourage healthier lifestyles among ethnic minority groups of children (Karlsen et al., 2014).

Several studies have identified ethnic variations in levels of overweight and obesity among children (Munro, Wild & Fellows, 2009; Cronberg et al., 2010). However, studies have reported that different ethnic groups may be at higher risk due to varying approaches taken when assessing childhood overweight and obesity (Munro, Wild & Fellows, 2009; Cronberg et al., 2010). Findings from the Health Surveys for England (HSE) indicated that the prevalence of obesity increased by five percentage among boys

and three percentage points among girls between 1995 and 2009 (Diment, 2010). Strand et al., (2012) contended that childhood obesity is associated with a few immediate and long-term health risks which also impacts the individual's quality of life. Although studies have identified ethnic variations in levels of childhood overweight and obesity, ethnic groups have been reported to be at higher risk (Munro et al., 2009; Cronberg et al., 2010). This is stated in part due to varying approaches taken to assessing overweight and obesity as well as differences in the ethnic groups (Munro et al., 2009; Cronberg et al., 2010). Regression analysis was used to estimate the impact of differences between ethnicity (Karlsen et al., 2014). Regression analysis was also used to explore trends in overweight and obesity by groups of ethnicities over a period of time (Karlsen et al., 2014). Data obtained from the 1999 and 2004 surveys were additionally weighted to allow for over sampling (Karlsen et al., 2014). Analyses of combined data revealed that Black African boys had a greater risk of being obese than their white English and white Irish boy counterparts (Karlsen et al., 2014).

Results derived from this study showed that regards to trends, significant variation over time could be identified for some but not all ethnic groups (Karlsen et al., 2014). Results also suggested that levels of overweight and obesity peaked among other ethnic groups such as 'other white', 'white Irish', and 'other South Asian' (Karlsen et al., 2014). This study provided evidence that rates of childhood overweight and obesity vary by ethnicity over time (Karlsen et al., 2014). Identification and understanding why the impact of lifestyle and other factors might vary was beyond the scope of this study (Karlsen et al., 2014). Suggestive literature stated that an effective response may possibly

lead to the development of culturally appropriate educational policies (Karlsen et al., 2014). These educational policies may assist with the encouragement among adolescent black and minority ethnicity people (Stead et al., 2011).

Overweight, Obesity, and Health Risk Behaviors

The Centers for Disease Control (CDC, 2009) referenced childhood obesity as the imbalance between caloric intake and calories used for growth, development, metabolism, and physical activity. Under normal circumstance, if the number of calories consumed through food and/or beverages is not consumed, then the possibility of overweight and obesity may occur. The (CDC, 2009) also noted that obesity can be multifactorial in adolescents. These factors may range from genetics, behavior, and environment (CDC, 2009). According to Farhat, Iannotti, & Simons-Morton, 2010) the prevalence of overweight and obesity has increased among children and adolescents. Medical and psychosocial outcomes of childhood and adolescent overweight and obesity have been stated to be well documented (Farhat, Iannotti, & Simons-Morton, 2010). However, gaps in literature have been stated to still exist between the association of adolescent obesity and health risk behaviors. Spring et al. (2012) provided background information on the topic of multiple health risk behaviors. *Health risk behaviors* have been described as detrimental actions that increase the odds of illness or delay recovery (Mente et al., 2009; Danaei et al., 2009). These actions have been considered to be a primary threat to the health of the adolescent (Farhat, Iannotti, & Simons-Morton, 2010).

Farhat, Iannotti, & Simons-Morton (2010) examined the association of overweight and obesity among adolescents residing in the United States. Methods uses

for this study incorporated self-height and weight combined with substance use, violence, and bullying (Farhat, Iannotti, & Simons-Morton (2010). Data was analyzed by Farhat, Iannotti, and Simons-Morton (2009) using a nationally representative sample of students who were aged 11 to 17 (N=7825) who participated in the 2005/6 Health Behaviors in School-Aged Children survey. Results revealed that significant gender and age differences in the relationship of adolescent obesity and risk behaviors were observed (Farhat, Iannotti, & Simons-Morton, 2010). Additional literature showed that overweight and obesity were significantly associated with substance use only among girls (Farhat, Iannotti, & Simons-Morton, 2010). Plotnikoff et al. (2009) asserted that the association of obesity-related behavioral factors to substance use suggests that adolescents may be more vulnerable to health risk behaviors in comparison to their normal-weight peers. Multinomial and logistic regression models were computed for all variables such as age and gender (Farhat, Iannnotti, & Simons-Morton, 2010). Data analyses produced by this study showed that overweight and obesity were significantly associated with substance use among girls primarily (Farhat, Iannotti, & Simons-Morton, 2010). Frequent smoking of tobacco products, alcohol consumption, and smoking of cannabis (marijuana) were associated with overweight and obesity among younger girls (Farhat, Iannotti, & Simons-Morton, 2010). A relationship between violent behavior and overweight and obesity were shown to exist primarily among boys (Farhat, Iannotti, & Simons-Morton, 2010). The observations produced by this study highlight the increased exposure of overweight and obesity to frequent substance use among girls and violent behavior among boys (Farhat, Iannotti, & Simmons-Morton, 2010). Past studies have shown that overweight/obese girls

are more subject to weight discrimination and stigma than overweight boys (Farhat, Iannotti, & Simons-Morton, 2010). Farhat et al. (2015) noted that adolescents who are overweight/obese along with those who perceive themselves as being so are particularly more vulnerable to health risk behaviors. Empirical evidence has demonstrated that self-perceptions of overweight and obesity are more positively associated with inadequate health-related quality of life (Jiang, Kempner, & Loucks, 2011; Ford, Schroeder, & Dodson, 2014). Farhat and colleagues (2015) asserted that according to stress and coping theory, adolescents who are overweight/obese are stated to be more likely to demonstrate maladaptive coping by engaging in health risk behaviors. Such coping strategies could possibly involve practices such as substance use, risky sexual behaviors, and violence (Farhat, Iannotti, & Simmons-Morton, 2010). These behaviors may lead to negative health consequences for the adolescent (Farhat, Iannotti, & Simmons-Morton, 2010).

This study used a population-based sample to enable the examination of association weight status combined with risk behaviors across various sub-groups (Farhat, Iannotti, & Simmons-Morton, 2010). Early interventions may be validated as a means of protecting overweight/obese adolescents from developing medically, socially, and health compromising outcomes (Farhat, Iannotti, & Simmons-Morton, 2010). Future research was stated as means of investigation for mechanisms that could further the understanding between the association of overweight/obesity with health risk behaviors (Farhat, Iannotti, & Simmons-Morton, 2010).

Youth and Overweight/Obesity and Health Risk Behaviors: Overview

Mente et al. (2009) described health risk behaviors as actions that heighten the possibility of illness or slow down recovery. Danaei et al. (2009) detailed that three are at least five categories of risk behaviors that have consistent to the correlation with increased morbidity and mortality. These categories include: (a) consuming a diet that is high in calories; (b) low levels of physical activity; (c) tobacco use; (d) abuse of substances such as alcohol, prescription or illicit drugs; and (e) engaging in risky sexual behaviors. Spring, Moller, & Coons (2012) note that these health risk behaviors are prevalent in the United States. Background literature showed that currently in the United States, approximately two-thirds of the population exceeds a healthy weight. The obesity rate of American adults detailed a staggering 27.2% and another 36% are considered to be overweight. Flegal et al. (2010) noted that the number of American obese youth has more than doubled if not tripled within the last decade. Approximations are similar in England, with approximately 25% of adults being classified as obese in 2009 (National Health Statistics on obesity, physical activity, and diet: England, 2011).

The odds of possessing multiple health risks behaviors was stated to increase over the course of human development, in particular during the teenage or pubescent years (Alamian & Paradis, 2009; Mistry et al., 2009). Alamian &Paradis (2009) noted that adolescents may acquire unhealthy behaviors from friends that persistently discourage the development of other self-regulatory skills. Sprint et al. (2012) also noted that risk behaviors have been seen to grow cross-culturally as well. Farhat et al. (2010) surveyed 7825 US early adolescents between the ages of 11 to 17 who participated in the World

Health Organization Health Behaviors in School –Aged Children Survey. Results produced by Farhat et al., (2010) revealed that overweight and obesity were associated with substance abuse such as frequent smoking of cigarettes, cannabis use, and alcohol consumption primarily among girls. Contrasting results showed that boys who were age 15 or older who were either overweight or obese were more likely to carry a weapon such as a gun (Farhat et al., 2010). Spring et al. (2012) asserted that by older adolescence, college students appear to have matured into the pattern of bundled in a chronic disease behavior category. An example provided by Spring et al., (2012) noted that 87.5% of German university students had been grouped in into two or more of four health risk categories. Those categories included: (a) minimal fruit and vegetable intake; (b) minimal physical activity; (c) tobacco use; and (d) excessive alcohol use (Spring et al., 2012).

Current Studies Involving Adolescent Overweight/Obesity and Health Risk Behaviors

Background literature produced by Zheng et al., (2016) used secondary data analysis of a state wide representative sample of middle school students in Tennessee. These students participated in the 2010 Tennessee Middle School Youth Risk Behavior Survey (YRBS) (Zheng et al., 2016). Data was collected from 119 or approximately 85% of the state of Tennessee's local education agencies (LEAs) which was equivalent to 95.2% of the schools (Zheng et al., 2016). The dependent variable for this study was adolescent obesity ($\geq 95^{th}$ percentile) (Zheng et al., 2016). Independent variables were divided into four different categories: (a) district level: Do you seatbelt when riding in a car? Have you ever been asked to show ID for tobacco purchase; (b) school level: Have

you attempted to smoke a tobacco product? Have you received HIV instruction in school?; (c) class level: On average, how many of days have you smoked in a 30-day period? How often do you exercise to lose weight?; and (d) individual level: Have you ever been in a fight? Have you ever tried an illegal substance? (Zheng et al., 2016).

Results from this study noted the use of simple descriptive statistics (age, gender, and race/ethnicity) along with means and standard deviations (Zheng et al., 2016). Results also concluded that out of sample study of 64,790 student living in the state of Tennessee, over 52.9% were reported as having an inaccurate perception of their weight (Zheng et al, 2016). Approximately 30 % surveyed ever tried smoking a cigarette (Zheng et al., 2016). Additional results showed that over 17.52% had ever consumed alcohol, 9.24% had ever used tobacco products, and 3.10% had ever tried marijuana (Zheng et al., 2016). Data related to physical education did not show any real difference between 0 days of physical education and 1 day of physical education per week (22,82% and 22.14 % respectively) (Zheng et al., 2016). Hierarchical logistic regression models were used to show estimations of effect size (Zheng et al., 2016). *P*-values was not used so that statistical significance would result due to large sample sizes (Zheng et al., 2016). Bias related to this study included volunteer bias and self-reporting bias (Zheng, et al., 2016).

Zheng et al. (2016) stated that their study used small area estimations in weighted categorical logistic models. These estimates were used to describe prevalence and distribution of health risk behaviors associated with adolescent obesity among middle school student subpopulations within the state of Tennessee (Zheng et al., 2016). This work adds to the growing body of literature that is vital to community driven school-

based lifestyle interventions (Zheng et al., 2016). These interventions may be instrumental in helping to target early onset chronic disease (Zheng et al., 2016). More specifically, these interventions may be used to enhance geographic resolution for adolescent obesity. These interventions may be addressed to specific subpopulations across the state of Tennessee (Zheng et al., 2016). Future considerations, as described by Zheng et al. (2016), should consider age, gender, race/ethnicity and region stratifications.

Associations among Overweight and Obesity and Tobacco, Alcohol, and Illicit Drug Use among Minority High School Students

Needham et al., (2010) asserted that there is a wealth of literature pertaining to negative physical and psychosocial problems and adolescent obesity. However, gaps in literature still exist related to the role that weight status plays in future health risk behaviors such as substance use and abuse (i.e. alcohol, tobacco, and marijuana/cannabis). Zeller et al. (2016) asserted that obesity and substance use behaviors such as cigarettes, alcohol, and marijuana) each present a public health concern for today's youth. Ogden et al. (2014) stated that over one-third of adolescents who reside in America are estimated to be overweight (BMI $\geq 85^{th}$ percentile) or obese (BMI $\geq 95^{th}$ percentile). Merten (2010) contended that current trends forecast the likelihood of excess weight status well into adulthood. A study produced by Zeller et al. (2016) noted that adolescent substance use and overweight/obesity are each public health priorities. More specifically, prevalence's are unique based on race/ethnicity (Zeller et al., 2016). The links between these risks and today's youth remains to known which leaves critical gaps in prevention science (Zeller et al., 2016). A national sample of 19,678 tenth grade

students (69.5% White, 15.5 % Black, and 16.0% Hispanic) was taken from the Monitoring the Future Survey (Zeller et al., 2016). Adolescent substance use behaviors and overweight/obese status was compared to the status of students of healthy weight category for each race/ethnicity group listed (Zeller, et al., 2016). Chen & Jacobsen (2012) maintained that substance use behaviors are typically initiated during adolescence. Johnston et al., (2013) contended that these prevalence rates have been known to increase during the high school years. Hu et al. (2012) contended that in many cases this trajectory to abuse and dependency continues well into adulthood, ages 12 to 28. Nelson et al. (2014) furthered this claim by noting that early onset has been closely associated with problematic substance use. This substance use was noted to have stemmed from tobacco use which has shown to be a distinct signal of high-risk alcohol and marijuana use (Nelson et al., 2014). Early adolescence has been seen as key targets for early intervention; however, gaps in literature noted that more needs to be understood about obesity and substance use co-occur (Moss et al., 2014).

Analysis of data showed that there was an increasing empirical base that demonstrates how cigarette smoking before 9^{th} grade was more prevalent among adolescents who were considered overweight (BMI $\geq 85^{th}$ percentile) (Farhat et al., 2010; Huang et al., 2013; Ratcliff et al., 2011). Patterns that were considered unique due to race/ethnicity and degree of excess weight were also reported (Zeller et al., 2015). The work presented by Zeller et al. (2015) detailed that White and Black youth in all overweight and obese categories had increased odds of current smoking. This data was compared to that of White and Black youth in healthy weight categories (Zeller et al.,

2015). Results taken from adolescent demographic data in each weight status group showed that alcohol was the most frequently used substance closely followed by marijuana use and tobacco (Zeller et al., 2016).Specific examination of moderating effect on weight status and associations with early initiation of smoking, alcohol use, and marijuana use were examined for possible links (Zeller, et al., 2016). Findings added to concerns regarding substance use for obese White teen with moderating severe weight status and early initiation of smoking (Zeller et al., 2016). Conclusion of this study noted that there was no real change among Black or Hispanic adolescents (Zeller, et al., 2016). However, weight status associated with smoking, alcohol and marijuana use was a significant moderator for obese White students over a 12-month period (Zeller et al., 2016). Johnston et al. (2015) explained that recent data released from MTF showed declining rates of substance use such as cigarettes, alcohol, and illicit drugs. This data was obtained from monitoring trends of the past two decades (Johnston et al., 2015).

One application of this study noted efforts to examine substance use behaviors related to race/ethnic groups however larger samples would be required for future research efforts (Zeller, et al., 2016). This type of examination may assist in the exploration of links between weight status and substance use behaviors (Zeller, et al., 2016). Public health messaging that targets and encourages the adoption of simultaneous health promotion (Zeller et al., 2016). Excess weight eight grade White adolescents may benefit greatly from discussions regarding tobacco, alcohol, and illicit substance use (Zeller et al., 2016). Noted resources for adolescent patients include websites such as "NIDA for Teens" (http://teens.drugabuse.gov) (Zeller et al., 2016).

Rolle et al. (2016) offered a review of national and/or state-based health surveys to examine methodology, race/ethnic classifications, and tobacco-use related measures. Background literature by Rolle et al. (2016) explained that beginning in the 1970s, the US national surveys showed African American youth as having a lower prevalence of cigarette smoking than White youth. Conversely, during adulthood, African American prevalence seemed to increase during adulthood with comparable rates to White adults (Rolle et al., 2016). This review noted that chosen data sources may help contribute in various ways to understanding tobacco use behaviors among African American adolescents and adults (Rolle et al., 2016). A total of 11 national and/or state-based health surveys were reviewed out of a total of 47 (Rolle et al., 2016) These reviews were completed for the purpose of examining: (a) their methodology; (b) racial/ethnic classifications; and (c) tobacco use related measures (Rolle et al., 2016). A 2008 review of tobacco surveillance and evaluation presented by Delnevo & Bauer (2009) identified several factors that make it a challenge to capture the impact of tobacco use within communities. Factors included: (a) the rapidly changing tobacco environment in regards to emerging products; (b) differing estimates of tobacco use depending on the type of survey used such as school based, household, tobacco specific, and multifactor; (c) reliance on cross sectional data; and (d) inadequate use of multilevel factors such as state tobacco policies (Delnevo & Bauer, 2009). This review addressed the concerns regarding the representation of data for minorities such as African Americans in tobacco surveillance systems (Rolle et al., 2016).

Methods involved examination of surveys from their inceptions until the year 2012 (Rolle et al., 2016). Some of the surveys included the following: (a) Behavioral Risk Factor Surveillance System (BRFSS) both state and national (b) Health Information National Trends Survey; and (c) national Health and Nutrition Examination Survey (HINTS). Consideration of common aspects of tobacco surveillance for the general population as well as factors relevant to African American tobacco use assisted with survey characteristics (Rolle et al., 2016). The aim of this review was to guide researchers and programs in determining a specific objective or research question when selecting appropriate surveys for the examination of African American tobacco use within the community (Rolle et al., 2016). Rolle et al. (2016) asserted that future researchers may want to use surveys such as BRFSS the surveys normally include populations that are typically excluded from national surveys due to differing and/or sometimes inflated estimates among populations. As African American adolescent transition into adulthood, longitudinal surveys such as Add health and TUS-CPS might be used (Rolle et al., 2016).

Rolle et al., (2016) noted that the accuracy surrounding estimates of self-reporting surveys may be problematic for all populations. This review provided a much needed observation of the select features national surveys might provide researchers in the informed measurement of African American tobacco use behaviors (Rolle et al., 2016). A recent study by Arrazola, Kuiper, & Dube (2014) examined patterns of current use of tobacco products by US high school students by using NYTS survey data. Evidence from such surveys found significant declines in the prevalence of cigarette smoking for both

White and African American high school students. Jones et al. (2014) found links between tobacco use and marijuana use among US high school students. Data from the 2013 YRBS indicated African American youth had a much higher prevalence of current marijuana use (27%) than that of 18 % of White high school students (Kann et al., 2014). Rolle et al. (2016) added that purpose of this review was not to rank or make specific recommendations for surveys to collect additional data. Rolle et al. (2016) concluded that programmatic objectives and/or research questions should be used by the researcher to assist in guiding the selection of the data sources for tobacco control programs when examining African American tobacco use.

Associations of Overweight and Obesity and Physical Inactivity among US High School Students

Cataldo et al. (2013) stressed the prevalence of childhood obesity has dramatically increased over the past 20 years. The US Department of Health and Human Services (2010) noted that personal, social, and environmental factors each play an important role in the determination of physical activity levels among today's adolescents. McKenzie & Lounsberry (2009) expressed that the lack of physical activity places the adolescent at an inflated risk for overweight and obesity. Pate et al. (2009) specified that oftentimes children and adolescents are at a disadvantage for having adequate physical activity incorporated into their daily routine. Oftentimes, schools may have limited time allowances for physical education as well as funding for physical activity equipment (Pate et al., 2009). Pate et al. (2009) also noted that fewer elementary schools have recess

or physical education. This alarming fact may be a contributing factor for physical inactivity into middle, high school, and well into early adulthood (Pate et al., 2009).

The objectives for physical activity as described by Healthy People 2020 reflect the 2008 Physical Activity Guidelines (US Department of Health and Human Services, 2010). These guidelines recommend that children and adolescents obtain at least 60 minutes of daily physical activity (US Department of Health and Human Services, 2010). This daily physical activity should consist of: (a) mostly moderate to vigorous activity; (b) aerobic physical activity that includes vigorous intensity physical activities (≥ 3 days per week); (c) muscle strengthening physical activities (≥3 days per week); and (d) bone strengthening physical activities (≥ 3 days per week) (US Department of Health and Human Services, 2010). Lowry et al. (2013) analyzed cross sectional data from the National Youth Physical Activity and Nutrition Study (NYPANS). This school-based study was conducted in 2010 by the CDC with the purpose of collecting information on physical activity and dietary behaviors along with the determinants of those behaviors among adolescents of high school age (Lowry et al., 2013). Survey data was taken from a total of 11,429 students with a weighting factor and oversampling of African American and Hispanic students (Lowry et al., 2013). Weighted distribution of demographic characteristics was 49.4% female, 50.6% male, 57.7% non-Hispanic White, 14.9% non-Hispanic Black and an average of 25% of respondents deriving from grades 9-12 (Lowry et al., 2013). Correlates of physical activity showed that based on BMI, 19.0% of the students surveyed were obese, 17.8% were overweight, 60.7% were normal weight, and 2.5% were underweight (Lowry et al., 2013). Conclusive result from this study showed

that only 36.3 % of all students surveyed participated win daily PE classes and 61.0% engaged in activity through a sports team (Lowry et al., 2013).

Lowry et al. (2013) stated that this study helps to build on existing research that has reported on adolescent physical activity behaviors and their correlates. Discussion that was consistent with other studies, revealed that females, older adolescents, and African American/Hispanic adolescents are less likely to engage in physical activity on a daily basis (Bauman et al., 2012). The CDC (n.d.a.) stated that communities need to work simultaneously with schools and families to provide safe, attractive, and accessible places if physical activity is to be increased among adolescents. Lowery et al. (2013) suggested that communities help by providing safe neighborhood parks which may be safe for physical activity. These parks may provide walking trails, safe play areas, and bike trails (Lowry et al., 2013). Schools may also assist by offering recess and in-class physical activity breaks for younger students (Lowery et al., 2013).

Eating Behaviors, Physical Activity, and Obesity among African Americans: Intervention Studies

An examination produced by Tate et al. (2015) explained that African American adolescents experience elevated rates of obesity. Examination of African American adolescents also revealed that there is an increased risk of obesity-related diseases than their White counterparts (Tate et al., 2015). Background literature presented by Tate et al. (2015) foreshadowed that despite culturally sensitive obesity intervention strategies, African American adolescent obesity rates still continue to increase. Tate and colleagues asserted that their examination is a first because interventions normally do not address the

heterogeneity (SES, gender, nor residential status) combined with unhealthy eating behaviors and physical inactivity within the African American adolescent community. (Tate et al., 2015). Ogden, Carroll, Kit, & Flegal (2012) cited that trends data taken from the National Health and Nutrition Examination Surveys (NHANES) which was conducted between 1999 and 2010 exhibited that the odds of being obese for non-Hispanic Black and Mexican American males and females (12-19) remained significantly higher than other ethnic groups.

Recruitment of African American adolescents (n = 145) derived from community outreach clinics, community organizations, social networks (fraternities, sororities, and professional organizations) and churches within and outside the city of Detroit from January 2011 to May 2011 (Tate et al., 2015). Participant eating behaviors were assessed with the Eating Behaviors Pattern Questionnaire (Tate et al., 2015). Reliable measures for each subscale included low-fat eating ($\alpha = 0.88$) with questions such as "I rarely eat breakfast" ($\alpha = 0.78$); "I eat at a fast food restaurant at least three times a week" ($\alpha = 0.70$); and lifestyle behaviors such as "I eat a large meal with my family on Sunday evenings" ($\alpha = 0.78$) (Tate et al., 2015). Physical activity levels were measured using the Physical Activity Questionnaire-Adolescent version (PAQ-A) (Tate et al., 2015). Step type regression analysis was used to in the prediction of African American adolescents' eating behaviors and physical activity to assist the researchers in obtaining the optimal model (Tate et al., 2015). Hypothesis for gender, SES differences, and residential status differences, were tested to better understand the intragroup characteristics for the African American adolescents (Tate et al., 2015). Results showed no significant differences in

eating behaviors (t = 1.54, p = .13) among the categories examined however African American females were found to be less physically active than African American males (Tate et al., 2015). Findings also showed African American females were more overweight than their African American male counterparts in terms of BMI (Tate et al., 2015). Additional findings revealed that African American adolescents who resided in lower SES were more overweight than those from higher SES (Tate et al., 2015).

Initial findings of this examination may help contribute to health care practices by addressing the gaps in literature related to eating behaviors, physical activity, and increased BMI among African American adolescents ages 15 -17 (Tate et al., 2015). Specific findings revealed that gender, SES, and residential status affected the study population which may ultimately place the individuals at a greater risk of obesity and obesity related diseases (Tate et al., 2015). Suggestions presented by Tate et al. (2015) specified that nurses and other health care providers may find this examination beneficial by providing culturally sensitive education related to healthier food choices and neighborhood challenges. These findings may also serve as a basis for the development of suitable interventions for the age group surveyed according to gender, SES, and residential status (Tate et al., 2015).

Obesity, Dietary Behaviors, Health Risk Behaviors and Race/Ethnicity

Ford et al. (2016) provided literature based on the identification of modifiable behaviors and their link to obesity prevention programs. The study provided by Ford et al. (2016) examined obesogenic behaviors in obese students in a Northern California obesity intervention program. Data was used from parent/teen-completed intake

questionnaire which dealt with lifestyle behaviors such as unhealthy snaking and beverages, frequency of breakfast, and exercise (Ford et al., 2016). Ford and colleagues found that of the cohort (n = 7,856) with a BMI $\geq 95^{th}$ percentile, 24.9% were non-Hispanic White, 11.3% Black, 43.5% Hispanic, and 12.) % Asian/Pacific Islander (Ford et al., 2016). Severe obesity was prevalent among 37.4% which were mostly Blacks, Hispanics, and children ranging from 12-17 years in age (Ford et al., 2016). The association for severe obesity was linked to minimal frequency in eating breakfast, exercise, and excess screen time (Ford et al., 2016). Ford et al. (2016) noted that severe obesity and obesogenic behaviors increased with age and was found to vary among gender and race/ethnicity.

Although demographic and behavioral factors have been sufficiently documented over the topic of adolescent overweight and obesity, minimal knowledge still remains to discovered related to the examination of obesity severity (Larson, et al., 2013; O'Neil, Nicklas, & Kleinman, 2010). Kaiser Permanente Northern California (KPNC) offered a multifaceted approach to assist with the growing overweight/obesity problem within an ethnically diverse population (Ford et al., 2016). KPNC implemented the Get Healthy Action Plan (GHAP) to further assess adolescents who met the criteria for overweight and obesity (Ford et al., 2016). Data was then taken from a 19-item questionnaire which included specific questions pertaining to nine dietary/lifestyle behaviors (Ford et al., 2016). Descriptive statistics involved using chi-square for categorical variables and student's t-test for continuous variables (Ford et al., 2016). The Cochrane-Armitage test was used to examine trends in severe obesity (Ford et al., 2016). Logistic regression was

used to examine differences in dietary and lifestyle behaviors by age group such as 6-11 and 12-17 (Ford et al., 2016). Logistic regression was also used to examine race/ethnicity (Black, Hispanic, and Asian/Pacific Islander versus non-Hispanic White) (Ford et al., 2016). Results showed that distribution of moderate and severe obesity varied by gender and race/ethnicity for preschool-aged (3-5 years), school-aged (6-11), and adolescents 12-17) (Ford et al., 2016). The proportion of children categorized as severely obese increased age group (31.4%, 36.1%, and 40.9%. $p > 0.001$) and Black and Hispanic children who meet the criteria of severely obese significantly increased by age group (Ford et al., 2016). Findings were consistent with data from previous studies which showed that higher sugary drinks, lowered participation in physical activity, and lowered proportions of eating breakfast were prevalent among Black and Hispanic youth (Dodd et al., 2013). Fahlman et al. (2010) asserted that children and adolescents of low socioeconomic status have been found to possess more obesogenic behaviors.

The strengths of this examination included a comprehensive assessment of dietary and lifestyle behaviors (Ford et al., 2016). This review also assisted in the examination of trends in obesogenic behaviors by age, race/ethnicity, and obesity severity (Ford et al., 2016). Given the strong tracking effects, observations provided by Ford et al. (2016) showed that the focus of future examinations need to address the existing ethnic disparities along with identification of young and preteen children at highest risk for obesity. Findings from this examination may also assist with cost-effective, targeted lifestyle interventions among pediatric patients in primary care settings (Ford et al, 2016).

Adolescent Physical Activity Intervention Programs: Impact on Self-Efficacy

Ogden et al. (2012) presented the issue of childhood and adolescent obesity by establishing that may young Americans suffer from increasing morbidity associated with obesity before reaching adulthood. Cataldo et al. (2013) noted in their review that lack of physical activity is a major benefactor to the nation's obesity crisis. Health behavior modifications must become lifestyle changes in order to support healthy weight loss (Cataldo et al., 2013). Self-efficacy, which is a construct of SCT, relates to an individual's confidence in achieving and maintaining a certain behavior change (Cataldo et al., 2013). However, the impact of physical activity on the mediator of self-efficacy has not yet been examined (Cataldo et al., 2013). Cataldo and colleagues (2013) offered a systematic review that described published evidence related to the impact that physical activity programs have on the self-efficacy among adolescents. The authors stated that the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) standards were used to assist with the identification of publications such as PubMed, PsychInfo, Web of Knowledge, and the Cochran Database of Systematic Reviews (Cataldo et al., 2013). Literature stated that out of 10 types of interventions and self-efficacy assessments reviewed, only 6 article identified improvements in post self-efficacy and 4 were proven ineffective (Cataldo et al., 2013). Conclusive review showed that effective physical activity intervention programs may improve self-efficacy in today's youth (Cataldo et al., 2013). Cataldo and colleagues (2013) asserted that a standardized approach may be required to effectively classify and measure self-efficacy in children and adolescents. Further research is required in order to quantify the

association of self-efficacy ratings upon the completion of physical activity interventions (Cataldo et al., 2013).

Methods protocol involved an extensive database search using PubMed, Web of Knowledge, PsychInfo, and Cochran Database of Systematic Reviews during the period of January 2000-June 2011(Cataldo et al., 2013). A requirement of reviewed articles included structured physical activity programs with a duration of up to 4 weeks or more with an emphasis on stratification of data for subpopulations of overweight youths (Cataldo et al., 2013). School and community-based physical activity which included individual or group activities were used in addition to types of physical activity such as cardiovascular, resistance training, or modified physical education classes (Cataldo et al., 2013). All reviewed publications entailed either a comparison or control group that either underwent an assessment period with no concurrent intervention (Cataldo et al., 2013). Quality of study findings reported were assured by the Oxford Centre for Evidence-Based Medicine with a 5-level hierarchical tool however only studies with level of 3 or more were reported (Cataldo et al., 2013). Results showed that out of the 10 studies included, only 6 (60%) found an association with improved self-efficacy after the intervention occurred and thus received the "gold-standard" description (Cataldo et al., 2013).

Discussion revolved around the suggestions that exercise combined with a multidisciplinary approach may have a positive outcome and thus influence self-efficacy assessments for today's youth and adolescents (Cataldo et al., 2013). Theoretical persuasion notes that once self-efficacy is obtained then there is a greater potential to continue the desired health outcome (Cataldo et al., 2013). Findings by Cataldo et al.

(2013) also suggest that there is moderately solid evidence that physical activity related programs may assist with the improvement of self-efficacy within youths and adolescents (Cataldo et al., 2013). Cataldo and colleagues (2013) concluded that supplemental physical activity related research should be expanded to include a more diverse representative sample of school aged participants. Future results may assist with policy to support health behavior interventions which are needed for optimal impact of the obesity crisis among youth and adolescents in the United States (Cataldo et al., 2013).

Healthy Lifestyle Promotion: Implications and Interventions

Abraham et al., (2013) detailed that although progress has been made to better understand the association between obesity and physiological and lifestyle behaviors. Ethnic differences in markers of obesity as well as pathways continue to be unclear (Abraham et al., 2013). The objective of this review highlighted ethnic differences in African Americans and Whites (Abraham et al., 2013). These contributions may assist with the elevated prevalence of obesity among African Americans (Abraham et al., 2013).

Folsom et al. (2011) asserted that healthy lifestyle promotion must be at the center point of all efforts to improve public health. The reasoning noted is because health risk behaviors are associated as biomarkers with the onset of chronic diseases (Folsom et al., 2011). Desired outcomes revolve around the prevention of premature death, condensing of morbidity, enhancement of productivity, and quality of life (Spring, Moller, & Coons, 2012). Grave et al., (2013) specified that is very unlikely that the obesity-promoting environment will diminish in the near future. However, the authors noted that it is

obligatory that strategies be developed to match treatments specific to individual patient needs (Grave et al., 2013). Grave et al. (2013) specified that an individual possessing the mere knowledge of healthy nutritional standards, dietary prescriptions, and regular physical activity programs are not sufficient to reach and maintain a healthy lifestyle. In order to reduce excess bodyweight, personal motivation may assist in the fundamental role for change (Grave et al., 2013). Discrepancy and self-efficacy are both key factors necessary for facilitating change in behavioral strategies (Grave et al., 2013). Self-efficacy, specifically, may be the most important predictor of a number of various health risk behaviors (Grave et al., 2013). These health risk behaviors may include alcohol consumption, smoking of tobacco products such as cigarettes (Grave et al., 2013). In the physical activity arena, self-efficacy has been qualified as an important predictor in adult weight loss (Grave et al., 2013).

Numerous studies and reviews have pointed towards the identification of predicators and correlates of weight loss and maintenance but the complexity of the obesity topic may lead to the difficulty in results and prediction (Grave et al., 2013). Studies also provide empiric support and often provide strategies to increase self-efficacy (Grave et al., 2013). Such strategies involved in the increase of self-efficacy may include: (a) learning from or observing others who engage in regular physical activity; (b) experiencing the psychologic benefits associated with regular physical activity; and (c) increased verbal/social persuasion (Russell, et al., 2013). A study produced by Tate, Davis, & Yarandi (2015) examined the sociocultural factors related to weight behaviors in African American adolescents. This descriptive correlational design included a sample

group of 145 African American adolescents aged 15-17 to assist in the identification of perceived familial socialization, ethnic identity, physical activity and eating patterns. Data was analyzed using descriptive statistics, Pearson product-moment correlations, and multiple regression equations (Tate, Davis, & Yarandi, 2015). A power analysis with the power of .80, an alpha of .05, and a critical effect size of .50 was conducted using a sample size of 144 (Tate, Davis, & Yarandi, 2015). This most recent study focused on familial socialization (Tate, Davis, & Yarandi, 2015). *Familial socialization*, as described by Tate, Davis, & Yarandi (2015), is the adolescent's perception of how family members such as mother and father, have influenced their physical activity and eating behaviors. Results were illustrated in several tables. Table 1 showed that mothers and fathers had a less negative influence on their adolescent eating behavior patterns and physical activity as well as reporting a moderately high fat, low level of physical activity (Tate, Davis, & Yarandi, 2015). Table 2 illustrated that ethnic identity was not significantly related to eating nor physical activity behaviors (Tate, Davis, & Yarandi, 2015). Table 3 illustrated the predictors of eating and physical activity behaviors with approximately 19% (p = .205) of the variance in physical activity and 24% (p = .109) in the variance of eating behaviors could be explained (Tate, Davis, & Yarandi, 2015). Findings of this study were consistent with the outcomes of other studies with the father being an influential motivator in physical activity participation in African American adolescents (Tate, Davis, & Yarandi, 2015). Findings also found that African American mothers were associated with eating behavior patterns in African American adolescents (Tate, Davis, & Yarandi, 2015).

Initial findings of this study may contribute to health care and society by addressing the gaps in literature that focus on the African American adolescent with regard to eating and physical activity behavior patterns (Tate, Davis, & Yarandi, 2015). Results from this study may assist health care providers with the task of informing African American parents and adolescents about weight related behaviors of eating and physical activity behaviors (Tate, Davis, & Yarandi, 2015). Societal findings of this study were deemed as significant due to their ability to inform culturally sensitive and developmentally appropriate research approaches to assist African American adolescents with weight loss (Tate, Davis, & Yarandi, 2015). Tate, Davis, & Yarandi (2015) concluded that there is a great need to explore additional sociocultural socialization factors as well as the media in order to better understand how African American adolescents develop attitudes and behaviors regarding eating and physical activity (Tate, Davis, Yarandi, 2015). Ickes et al. (2014) asserted that school-based interventions have been developed and implemented to combat the ever growing concern of adolescent overweight and obesity. The Robert Wood Foundation (2013) expressed that school-based programs have historically been used to impact child and adolescent health. The foundation also expressed that schools have been considered an ideal target, given the propensity to further: (a) prevent obesity through well-established physical activity programs; (b) offer nutritious foods; (c) offer nutrition education through practice, policy, and supportive environments (The Robert Wood Foundation, 2013). Past reviews have not been successful when directly focusing on the varying degrees of what is considered to be successful, especially within the United States (Hollar et al., 2010; Johnson et al.,

2013). It is imperative that parents, family, teachers, and community members continue to build on previous lessons learned and not undertake a one-size fits all approach with diverse populations such as African Americans (Hollar et al., 2010; Johnson et al., 2013). Possible interventions may involve varying degrees of a parental component (Hollar et al., 2010; Johnson et al., 2013). These components may range from phone calls, meetings, use of social media, and information and instructions sent home to reinforce information presented at school (Hollar et al., 2010; Johnson et al., 2013).

Definitions

Adolescence: A period following the onset of puberty during which a child develops into adulthood. This pivotal period in which many health risk behaviors are initiated (Zheng, et al., 2016).

BMI: Body Mass Index (BMI) is a body fat estimation based on an individual's weight and height. The formula of (weight (lbs.) / [height (in) ^{2}] x 703). (CDC, 2010a).

Demographics: Social statistic of a human population that affects studies including: age, race, sex, economic status, educational attainment, and income level (Porta & International Epidemiological Association, 2008).

Dietary Behavior: A group's eating habits (Porta & International Epidemiological Association, 2008).

Experimental designs: Assist in the impact of treatment or interventions on an outcome in research (Creswell, 2009).

Familial socialization: The adolescent's perception of how family members such as mother and father, have influenced their physical activity and eating behaviors (Tate, Davis, & Yarandi, 2015).

Health risk behaviors: Detrimental actions that increase the odds of illness or delay of recovery (Mente et al., 2009; Danaei et al., 2009).

Obese: BMI at or above the 95th percentile for adolescents of the same age and sex (CDC, 2011d).

Overweight: BMI between the 85th percentile to the 95th percentile (CDC, 2010a).

Self-efficacy: A person's confidence in performing a particular behavior or conquering barriers related to a specific behavior (Rew et al., 2013).

Survey design: Provides a quantitative or numeric description of a populations' trends, attitudes or opinions (Creswell, 2009).

Assumptions

For this secondary analysis, no assumptions were made due to data being obtained from YRBS (CDC, 2015). This database was representative of national, state, and large urban school district patterns regarding students of various sex, race/ethnicity, grade, BMI, marijuana use, moderate alcohol consumption, unhealthy dietary behaviors, physical inactivity, tobacco use, and family socioeconomic status (CDC, 2015). The YRBS was designed to be representative by use of stratified sampling (CDC, 2015).

Scope and Delimitations

The data taken for this study were taken from the Youth National Behavior Surveillance – United States, 2015 (CDC, 2015). Approximately 15,624 questionnaires were completed in 125 public and private schools throughout the United States (CDC, 2015). The findings for this study from YRBS were weighted based on student sex, race/ethnicity, and grade (CDC, 2015). Weighting was applied to each record so that adjustment could be made to adjust for oversampling of Black and Hispanic students (CDC, 2015). Weighted estimates were representative of all students in grades 9-12 who attended public and private schools throughout the US (CDC, 2015). The 2015 YRBS dataset contained the variables of age, sex, grade, race/ethnicity, BMI, marijuana use, alcohol consumption, tobacco use, unhealthy dietary behaviors, and physical inactivity which were appropriate for the use of this study. SCT was used in this study to support self-efficacy as a component in the determination of behavior change. Cataldo et al. (2013) specified that it is reasonable to anticipate that physical activity programs may benefit from the incorporation of SCT modifications. A social ecological approach was linked to this study but was not investigated in detail. According to Tate, Davis, & Yarandi (2015) the sociocultural approach to social ecology places focus on the individual within his or her sociocultural environment rather the individual's cognition. This model incorporates adolescent characteristics such as ethnic identity, and familial attributes which work cohesively to moderate the impact of risk factors related to the development of weight-related behaviors (Tate, Davis, & Yarandi, 2015). The results of this study may not generalize to other similar samples or variance in years (CDC, 2015).

Appropriate caution was utilized during the research, review, and findings of this study (CDC, 2015).

Significance, Summary, and Conclusion

Farhat (2015) detailed that adolescents are particularly susceptible to health risk behaviors. In this stage of their lives, many adolescents may be experiencing extreme physical, psychological, and social changes (Farhat, 2015). In particular, adolescents who meet the criteria of overweight or obese have been stated to be more likely to engage in health risk behaviors than those who perceive themselves as being normal weight (Farhat, 2015). The central focus of this secondary data analysis revolves around the reduction of overweight/obesity exhibited among African American adolescents particularly of high school age who reside in the United States. The findings of this study may contribute to the already existing body of literature, research, and clinical guidelines related to health risk behaviors such as marijuana use, moderated alcohol use, tobacco use, unhealthy dietary behaviors, physical inactivity, and socioeconomic status. Findings from a related study by Ford et al., (2016) produced results that may assist with the informed development and implementation of cost-effective, targeted healthy lifestyle interventions. These interventions may focus on reducing increased rates of overweight/obesity specifically for minorities such African American adolescents (Ford, et al., 2016). Findings produced by Tate et al., (2015) detailed that health care practices may also benefit nurses, advanced practice, and other health care providers regarding culturally appropriate methods. These methods of interventions may be used to educate African American adolescents who suffer from increased overweight/obesity associated

with eating behaviors and physical activity (Tate et al., 2015). Limitations in studies such as the one produced by Zheng et al., (2016) detailed that biases such as volunteer and self-report biases may contribute to underreporting and therefore compromise the associations found in the models. Zheng et al. (2016) expressed that their examination could have had the potential to examine other risk factors associated with adolescent obesity. The 2010 YRBS questionnaire also included other risk factors related to the built environment that may have been associated with adolescent obesity in previous studies such as exercise facilities, parks, and walking paths (Zheng et al., 2016).

An article produced by Buckner-Brown et al. (2011) detailed that racial and ethnic minority populations are more likely to experience poverty. Racial and ethnic minorities were also described as being more likely to lack access to safe and affordable housing, high-quality education, fresh and affordable fruits and vegetables, and culturally appropriate interventions and services (Buckner-Brown et al., 2011). Understanding the factors that most influence persistent and deepening disparities is essential in the design of strategic responses (Buckner-Brown et al., 2011). At this point, it is probable to state that additional information needs to be known about how to optimize multiple health risk behaviors associated with overweight and obesity among adolescents (Spring et al., 2012). Summary of empirical evidence detailed that findings from studies examining weight status were diverse and varied by risk behavior, gender, and race/ethnicity (Farhat, 2016). Lanza, Grella, & Chung (2014) noted that marijuana and alcohol use were generally not associated with overweight and obesity issues among adolescents. An additional study produced by Wang et al. (2013) used cross sectional data from the 2010

Washington State Healthy Youth Survey. This survey was conducted among 8th, 10th, and 12th grade students (n = 11,222) and used multinomial regression to model cigarette smoking (Wang et al., 2013). Results revealed smoking tobacco products contained more variance but had no associations among boys within the adolescent age grouping (Wang et al., 2013). Findings from these types of studies may assist researcher, practitioners and health care professionals with critical school-based prevention. Findings related to this topic are sometimes confusing to practitioners and policy because early or short psychosocial programs have promised short term effects that did not last or were not effective. The present study adds to the growing body of research that supports community driven school-based lifestyle interventions (Zheng et al., 2016). These types of interventions may assist in enhancing the geographic resolution with which adolescent obesity may be addressed in urban high school populations across the United States. Findings from studies such as these suggest that school-based smoking intervention programs may add to the growing body of literature and produce significant long-term effects if they: (a) are interactive social influences or social skills programs; (b) involve multiple sessions; and (c) produce substantial short-term effects.

The purpose of this examination was to provide a detailed evaluation of the relationship between obesity and health risk behaviors among African American high school students. This examination included the introduction, problem statement, purpose of the study, research questions and hypotheses. The theoretical foundation for the study, nature of the study, literature search strategy, literature review related to key variables and/or concepts, definitions, assumptions, scope and delimitations were included as well.

The significance, summary, and conclusion sections detailed possible contributions, implications for positive social change, and a concise summarization of the major themes in the literature, description of how this examination will fill in the gaps of knowledge related to the topic. Future research related to this topic may consider stratification analysis on age, gender, race/ethnicity, and region (Zheng et al., 2016). Research consideration such as this may further the understanding of health risk behaviors and their associations on adolescent obesity in various states. Section 2 of study will provide a comprehensive explanation of the type of research design and data used to assess the association(s) between health risk behaviors and obesity using appropriate effect size (ES) and odds ratio (OR) estimates.

Section 2: Research Design and Data Collection

Introduction

The purpose to this quantitative study was to evaluate the relationship between obesity and health risk behaviors among African American high school students aged 12-18 in the United States. Section 2 of this study will detail the type of research design and data used to assess the associations between adolescent obesity (BMI $\geq 95^{th}$ percentile) and health risk behaviors such as marijuana use, moderate alcohol consumption, tobacco use, unhealthy dietary behaviors, and physical inactivity. SES will also be assessed as a moderating variable for this study. The obesity-SES association, as described by Wang & Lim (2012) varies by gender, age, and locale. SES groups that have greater access to energy-dense diets have been stated to be at an increased risk of being obese than their counterparts (Wang & Lim, 2012). This study will use weighted hierarchical logistic models to assist in the description of the prevalence and distribution of health risk behaviors commonly associated with adolescent obesity among African American high school students residing in the United States. This study adds to the growing body of literature by supporting community driven school-based culturally appropriate lifestyle interventions. These interventions may assist with the targeting of early-onset chronic disease (Zheng et al., 2016). This study may also assist with the enhancement of geographic resolution with which adolescent obesity can be addressed in high school populations across the country (Zheng et al., 2016). Section 2 of this study presents an outline of the methodology selected for this study based on the YRBS – United States, 2015 data set. The research design and rationale, methodology, threats to validity, and

summary were introduced for examining the variables associated with this topic. The IRB approval code for this study is 01-29-19-0081853,

Research Design and Rationale

The HHS (2016); CDC (2016) described the YRBS 2015 as a system that monitors 6 categories of priority health behaviors commonly exhibited among adolescents and young adults. Additionally, this system includes a national school-based Youth Risk Behavior Survey (YRBS) which is conducted by the CDC in conjunction with state and urban school districts (HHS 2016; CDC, 2016). This report provides a summary of results for 118 health risk behaviors which include obesity, overweight, and asthma from the 2015 national survey (HHS 2016; CDC, 2016). Approximately 37 state surveys and 19 large urban school district surveys were conducted among students attending high school, grades 9-12, in the United States and District of Colombia (HHS 2016; CDC, 2016). Survey procedures for the national, state, and large urban school districts were stated as being designed to protect students' privacy (HHS 2016; CDC, 2016). This was accomplished by allowing for anonymous and voluntary participation among student participants (HHS 2016; CDC, 2016). Local parental permission procedures were followed prior to the administration of the surveys (HHS 2016; CDC, 2016). Length of time for students completing the self-administered questionnaire was one class period followed by the opportunity to record responses directly onto a computer-scan able booklet and/or answer sheet (HHS 2016; CDC, 2016). Protocol used for the national YRBS was approved by the CDC's Institutional Review Board (HHS 2016; CDC, 2016). The variables used to guide this study were taken from the YRBS

2015 data set for adolescents ranging in age from 12-18. Data pertaining to the independent variables of marijuana use, moderate alcohol consumption, tobacco use, unhealthy dietary behaviors, and physical inactivity. The dependent variable, or outcome variable of increased weight status or class I adolescent obesity (BMI $\geq 95^{th}$ percentile), was defined using measured height (inches) and weight (pounds). This study, as defined by the CDC, will identify an age and gender specific BMI in the 95^{th} percentile as obese, with a BMI $< 95^{th}$ percentile as non-obese (HHS 2016; CDC, 2016).

This study used a cross-sectional design to answer the proposed research questions. Alexander et al., (2013) detailed that a cross-sectional design study begins with a population base. Additionally, noted was that cross-sectional designs may be used to examine the prevalence of disease at a given moment in time (Alexander et al., 2013). This allows the researcher to take a 'snapshot' of the proportion of individuals in a given population at one point in time (Alexander et al., 2013).

Methodology

Population

The specific population examined for this study was African American adolescents, aged 12-18, who attend a private or public within the United States and District of Columbia. Data taken from the 2015 detailed that 15,713 questionnaires were completed throughout over 125 public and private schools throughout the United States and District of Columbia (US Department of Education, 2013). The US Department of Education (2013) also noted that out of the 15, 713 completed questionnaires, 89 failed quality control and were therefore excluded from our final analysis. The final response

rate for the 2015 YRBS national was calculated at 69%, with a student response rate of 86%, and a cumulative response rate of 60% (US Department of Education, 2013). Independent variable data related to the primary group of examination; African American was taken from the 2015 YRBS Data User's Guide – Appendix C: National High School YRBS Codebook. The independent variable data responses for race was detailed as response Black or African American with an unweighted frequency of 1,667 respondents. Additional independent variables considered for examination included: age, sex, and current grade level.

Sampling and Procedures used to Collect Data

The HHS (2016); CDC (2016) referenced that data collection and sampling methodologies used in the 2015 national YRBS set out to achieve precise representations of adolescent demographics and measurements of health behaviors in the United States. Accurate representation of adolescent demographics and measurements as described by the US Department of Education (2013), consisted of all regular and private schools. Students were stated to belong in one grade level between 9 and 12 within the 50 United States and District of Columbia (US Department of Education, 2013). MDR (2014) provided the sampling frame basis which include information on public and private schools alike. MDR (2014) also provided the most recent data retrieved from the Common Core of Data from the National Center for Education Statistics. A three-stage clustering sample design provided a nationally representative sample of students in grades 9-12 (HHS/CDC, 2016). A total of 1,259 primary sampling units (PSU) consisting of 16 strata according to their metropolitan statistical area (HHS/CDC, 2016). This was

comprised mostly of urban city as well as the percentage of Black and Hispanic students were in the PSU (HHS/CDC, 2016). In order to provide a separate analysis of data related to Black and Hispanic students, two classes per grade level, rather than one class was sampled. Due to increased representation among Black and Hispanic students, only one section of two classes per grade level were needed in the 2015 survey (CDC, 2016). Zheng et al. (2016) referenced that it is important to consider the overrepresentation and assumptions that support YRBS weighting calculations. This consideration is important when interpreting results from the study. The 2015 YRBS dataset only include high school students from public and private schools (CDC, 2016). Therefore, results may not represent the entire population falling within the desired target group.

Recruitment and Participation

According to the CDC (2016) the 2015 YRBS was designed to protect individual student privacy. This was achieved by allowing the students who participated in the survey to be anonymous and voluntary in participation (CDC, 2016). The survey administration process could not be completed until local parental permission procedures were followed and completed (CDC, 2016). The 2015 standard questionnaire was stated to contain 89 questions (CDC, 2016). These questions were used as a starting point for state and large urban district questionnaires (CDC, 2016). The 2015 national YRBS questionnaire contained 99 total questions of which 89 were listed on the standard questionnaire (CDC, 2016). Demographic questions relating to sex, grade, age, Hispanic ethnicity, race, and sexual identity combined with three questions assessing height, weight, and asthma remained on the standard questionnaire (CDC, 2016). Skip patterns

occurred when a particular response to a question indicated that one or two future questions should not be answered by the student (CDC, 2016). Student race and ethnicity was computed using following two questions: (a) Are you Hispanic or Latino? Response options were "yes" and "no" and (b) What is your race? Response options were: "American Indian or Alaska Native", "Asian", "Black or African American", "Native Hawaiian or other Pacific Islander", or "white." (CDC, 2016). Student who selected "no" to the first question and selected the only "Black or African American" to the second question were classified as black (CDC, 2016). It was also stated that students who answered "no" for the first question and chose only "white" to the second question were referred to as "white." (CDC, 2016). Farhat and colleagues (2011) provided important implications in their study by posing the question, are there associations linked with obesity and moderating characteristics such as race/ethnicity and SES? BMI was stated to be self-reported by the students and were classified as having obesity or being overweight based on body mass index (kg/m^2) (CDC, 2016). The CDC (2016) classified obesity as exceeding the 95^{th} percentile for student age and sex. Previous studies presented by Farhat and colleagues (2011) also detail significant associations among race/ethnicity, health risk behaviors, SES, and obesity. Suggestions detailed in this study noted that SES and race/ethnicity could be potential moderators of the weight status/risk behaviors association (Farhat et al., 2011). The CDC (2016) asserted that the classifications presented were not meant to diagnose obesity in students, but to rather provide specific population-level estimates of obesity.

Data Collection

According to the CDC (2016), the national YRBS 2015 data reporting period was from September 2014 through December 2015. Data was also collected from each state and large urban school district which was then edited and cleaned for inconsistencies with the national set (HSS 2016; CDC, 2016). Of the 15,713 questionnaires 89 failed quality control and were excluded from the analysis which resulted in 15,624 useable questionnaires (HSS 2016; CDC, 2016). Three important characteristics of surveys were examined before selecting the 2015 YRBS dataset involved for this study (a) survey design and methods; (b) racial and ethnic background classification; and (c) selected marijuana use, alcohol consumption, marijuana use, unhealthy dietary behaviors, physical inactivity, and socioeconomic status questions. Statistical analysis was conducted via SPSS 21, prevalence estimates and confidence intervals were computed for all variables and all data sets (CDC, 2016) *t*-test and *p*-values were the determinants of statistical significance at < 0.05 for main effects such as sex, race/ethnicity, and grade level (HHS, 2016; CDC, 2016). Results for interactions such as sex by race/ethnicity, sex by grade, race/ethnicity by sex, and grade level by sex were reported as statistically significant only in the national YRBS (HHS 2016; CDC, 2016).

Access to Data and Permission

The findings from the Youth Risk Behavior Surveillance - United States, 2015 (YRBSS) were obtained from the Center for Disease Control and Prevention. The results section provided information on long-term linear and quadratic trends (HHS, 2016; CDC, 2016). Results from the *t* tests were used to assess 2-year temporal changes (HHS, 2016;

CDC, 2016). Information about long-term temporal trends and 2-year temporal changes were not available because of changes in question or response option wording (HHS, 2016; CDC, 2016). Sampling weights were used to adjust for the complex design in their 2010 YRBS Survey analysis (Zeller et al., 2016). Analyses for this study was performed separately by racial/ethnic category for Caucasian (white), African American (black), and Hispanic adolescents (Zeller et. al., 2016). Gender was a covariate in this study (Zeller et al., 2016). Logistic regression was best suited for this study. Evaluation of the effect of weight status related to each outcome variable relied on logistic regression to compute odds ratios (ORs) (Zeller et al., 2016).

Power Analysis

Prevalence estimates were taken from the 2013 and 2015 data and compared using *t* tests for each variable assessed (HHS, 2016; CDC, 2016). This analysis was used to identify 2-year temporal changes in health behaviors on a nationwide basis (HHS, 2016; CDC, 2016). Prevalence estimates were considered to be statistically significant different if the *t* and *p* value was 0.05 (HHS, 2016; CDC, 2016). Alpha level for this study was set at 0.05.

Instrumentation and Operationalization of Constructs

Zheng et al. (2016) noted that the majority of understanding related to the public health issue of adolescent obesity results derive from large national surveys such as YRBS or YRBSS, NHANES, and NSCH. Sampling frames used in such surveys may produce demographically representative samples (Zhang et al., 2013). However, these sampling frames may lack accurate geographic representation (Zhang et al., 2013). The

CDC administered the YRBS dating back to the 1990's (HHS, 2016; CDC, 2016). Ratcliff et al. (2011) used data from the 2007 Youth Risk Behavior Survey to compare adolescent high school students (HSS) with extreme obesity (N = 410) and healthy weight peers (N = 8669) in their particular engagement in: (a) tobacco use; (b) alcohol/other drugs (marijuana/cannabis) use; (c) high-risk sexual behaviors; and (d) suicidal behaviors Logistic regression was used to calculate gender-stratified odds ratios (OR) and 95% confidence intervals (CI), controlling for age and race (Ratcliff, et. al., 2011). Published results revealed that HSS with extreme obesity engage in risk behaviors at rates comparable with healthy weight peers (Ratcliff, et. al., 2011). A similar study, produced by Zeller et al. (2016) showed associations among excess weight status and tobacco, alcohol, and illicit drug use. This study was accomplished by using a large national sample of early adolescent youth (Zeller et al. 2016). The Tennessee Coordinated School Health (TNCSH) administered a modified version of the YRBS from January through May of 2010 (Zheng et al., 2016). This was accomplished using a statewide representative sample of middle school students (Zheng et al., 2016). Small area estimates in weighted hierarchical logistic models were used (Zheng, et. al., 2016). Strengths associated with this study may assist with the description of prevalence and distribution of health risk behaviors associated with adolescent obesity among middle school student population in the state of Tennessee (Zheng et al., 2016). Research such as this may add to the growing body of research that supports community driven school-based lifestyle interventions which target early-onset chronic disease (Zheng et al., 2016). Future analysis related to stratification analysis on age, gender, race, and region may aid

parents, teachers, community members, and healthcare professionals gain a better understanding of the interaction of health risk behaviors and their association with adolescent obesity within specific regions throughout the United States.

Measures: Independent Variables

Tobacco Use: National surveys dating back to the 1970's portrayed African American youth as having a lowered prevalence of tobacco use such as cigarette smoking than in comparison to white youth (Rolle et al., 2016). Data produced by Tate et al. (2015) showed that African Americans now have a smoking prevalence comparable to whites during their young adulthood stage of life (Rolle et al., 2016). In 2013, the prevalence of cigarette smoking in African American adults was 18.3 % compared with 19.4 % of white adults. The following survey questions were used to guide this study. *Question Code Label (Q31)*: "Have you ever tried cigarette smoking, even one or two puffs?" (HSS, 2016: CDC, 2016). *Question Code Label (Q32)*: "How old were you when you smoked a whole cigarette for the first time?" (HHS, 2016; CDC, 2016). *Question Code and Label (Q33)*: "During the past 30 days, on how many days did you smoke cigarettes?" (HSS, 2016; CDC, 2016). *Question Code Label (Q34)*: "During the past 30 days, on the days you smoked, how many cigarettes did you smoke per day?" (HHS, 2016; CDC, 2016). The responses were coded as follows: *(Q31)*: "1 = Yes, 2 = No, missing data was recorded at 1, 825" (HHS, 2016; CDC, 2016). *(Q32)*: "1 = I have never smoked a whole cigarette, 2 = 8 years old or younger, 3 = 9 or 10 years old, 4 = 11 or 12 years old, 5 = 13 or 14 years old, 6 = 15 or 16 years old, 7 = 17 years old or older, missing data was recorded at 805" (HHS, 2016; CDC, 2016). *(Q33)*: "1 = 0 days, 2 = 1 or

2 days, 3 = 3 to 5 days, 4 = 6 to 9 days, 5 = 10 to 19 days, 6 = 20 to 29 days, 7 = All 30 days, and missing data was recorded at 635" (HSS, 2016; CDC, 2016). *(Q34)*: "1 = I did not smoke cigarettes during the past 30 days, 2 = Less than 1 cigarette per day, 3 = 1 cigarette per day, 4 = 2 to 5 cigarettes per day, 5 = 6 to 10 cigarettes per day, 7 = 11 to 20 cigarettes per day, and 8 = More than 20 cigarettes per day" (HHS, 2016; CDC, 2016). Missing data was recorded at 827 (HHS, 2016, CDC, 2016).

Current Alcohol Consumption: Data results taken from the 2015 YRBS dataset showed that over 32.8 % of student had ever drank at least one alcoholic beverage on at least 1 day during the past 30 days (HHS, 2016; CDC, 2016). Results also showed that prevalence of current alcohol use was considerably higher among white (35.2 %) and Hispanic adolescents (34.4%) (HHS, 2016; CDC, 2016). Zeller and colleagues (2016) asserted that the prevalence rates produced by a recent study found that Caucasian youths of high school age were said to exhibit excess weight status increased with the possibility of having tried alcohol prior to the 9th grade. The following survey questions were used for this study. *Question Code and Label (Q41)*: "During your life, on how many days have you had at least one drink of alcohol?" (HHS, 2016; CDC, 2016). *Question Code and Label (Q42)*: "How old were you when you had your first drink of alcohol other than a few sips" (HHS, 2016; CDC, 2016). *Question Code and Label (Q43)*: "During the past 30 days, on how many days did you have at least one drink of alcohol?" (HHS, 2016; CDC, 2016*). Question Code Label (Q44)*: "During the past 30 days, on how many days did you have 5 or more drinks of alcohol in a row, within a couple of hours?" The responses were coded as follows: *(Q41)*: "1 = 0 days, 2 = 1 or 2 days, 3 = 3 to 5 days, 4 =

6 to 9 days, 5 = 10 to 19 days, 6 = 20 to 29 days, 7 = All 30 days, missing responses were recorded at 575"(HHS, 2016; CDC, 2016). *(Q42)*: "1 = I have never had a drink of alcohol other than a few sips, 2 = 8 years old or younger, 3 = 9 or 10 years old, 4 = 11 or 12 years old, 5 = 13 or 14 years old, 6 = 15 or 16 years old, 7 = 17 years old or older, missing data was recorded at 367" (HHS, 2016; CDC; 2016). *(Q43)*: "1 = I have never had a drink of alcohol other than few sips, 2 = 8 years old or younger, 3 = 9 or 10 years old, 4 = 11 or 12 years old, 5 = 13 or 14 years old, 6 = 15 or 16 years old, 7 = 17 years old or older, missing responses were recorded at 1,510" (HHS, 2016; CDC, 2016). *(Q44)*: "1 = 0 days, 2 = 1 day, 3 = 2 days, 4 = 3 to 5 days, 5 = 6 to 9 days, 7 = 10 to 19 days, and 8 = 20 or more days with missing responses recorded at 657" (HHS, 2016; CDC, 2016).

Marijuana Use: Marijuana use data results taken from the 2015 YRBS survey showed the nationwide current marijuana use at 21.7% (HHS, 2016; CDC, 2016). Prevalence was much higher among males (23.2%) than females at (20.1%) (HHS, 2016; CDC, 2016). Marijuana use among black males was much more elevated (31.3%) than that of black females (22.1%) (HHS, 2016; CDC, 2016). The following survey questions were used for this study. *Question Code Label (Q47)*: "During your life, how many times have you used marijuana?" (HHS, 2016; CDC, 2016). *Question Code and Label (Q48)*: "How old were you when you first tried marijuana for the first time?" (HHS, 2016; CDC, 2016). *Question Code and Label (Q49)*: "During the past 30 days, how many times did you use marijuana?" (HHS, 2016; CDC, 2016). *Question Code and label (Q90)*: "During the past 30 days, how did you usually use marijuana?" (HHS, 2016; CDC, 2016). The responses were coded as follows: *(Q47)*: 1 = 0 times, 2 = 1 or 2 times, 3 = 3 to 9 times, 4

= 10 to 19 times, 5 = 20 to 39 times, 6 = 40 to 99 times, 7 = 100 or more times, and missing data was recorded at 467" (HHS, 2016; CDC, 2016). *(Q48)*: 1 = I have never tried marijuana, 2 = 8 years old or younger, 3 = 9 or 10 years old, 4 = 11 or 12 years old, 5 = 13 or 14 years old, 6 = 15 or 16 years old, 7 = 17 years old or older, missing data was recorded at 426" (HHS, 2016; CDC, 2016). *(Q49)*: "1= 0 times, 2 = 1 or 2 times, 3 = 3 to 9 times, 4 = 10 to 19 times, 5 = 20 to 39 times, 6 = 40 or more times, missing responses were recorded at 374" (HHS, 2016; CDC, 2016). *(Q90)*: "1 = I did not use marijuana during the past 30 days, 2 = I smoked it in a joint, bong, pipe, or blunt, 3 = I ate in food such as brownies, cakes, cookies, or candy, 4 = I drank it in tea, cola, alcohol, or other drinks, 5 = I vaporized it, 6 = I used it some other way, and missing data was recorded at 4,478" (HHS, 2016; CDC, 2016).

Dependent Variable: BMI

BMI: Self-reported height (inches) and weight (pounds) were used to assist the student with the calculation of their individual BMIs (HSS, 2016; CDC, 2016). Each student corresponding age and gender specific BMI percentile on the CDC growth chart was used as well (HSS, 2016; CDC, 2016). The CDC also defines obesity as an adolescent having a BMI $\geq 95^{th}$ percentile.

Variations by Gender

Gender

The 2015 YRBSS as stated by the CDC (2016) was designed to assist with the identification of how health behaviors vary by subpopulations among high school students defined by sex and race/ethnicity. By gaining a better understanding of these

variations, or lack thereof, related to health behaviors may assist the researcher with the designation, target, and identification of school and community policies, programs, and practices (HHS, 2016; CDC, 2016). The CDC (2016) stated that the prevalence of most health behaviors varies by gender.

Research Question(s) and Hypotheses

To assess the association of the independent variables of tobacco use, alcohol use, and marijuana use, on the dependent variable of BMI, the following research questions and hypotheses were developed. Multivariate logistic regression analysis was used to measure the predictors of BMI.

Research Question 1: Is tobacco use among American high school students associated with BMI while controlling for race, gender and grade?

H*1o*: There is no association between tobacco use and BMI among American high school students while controlling for race, gender and grade.

H*1a*: There is an association between tobacco use and BMI among American high school students while controlling for race, gender and grade.

Research Question 2: Is alcohol use among American high school students associated with BMI while controlling for race, gender and grade?

H*2o*: There is no association between alcohol use and BMI in the American high school population while controlling for race, gender and grade.

H*2a*: There is an association between alcohol use and BMI among American high school students while controlling for race, gender and grade.

Research Question 3: Is marijuana use among American high school students associated with BMI while controlling for race, gender and grade?

H3*o*: There is no association between marijuana use and BMI among American high school students while controlling for race, gender and grade.

H3*a*: There is an association between marijuana use and BMI among American high school students while controlling for race, gender, and grade.

Threats to Validity

This quantitative study is a secondary analysis of the 2015 national YRBS High School dataset (HSS, 2016; CDC, 2016). The findings in the report were subject to at least four limitations (HSS, 2016; CDC, 2016). The data applied to only youth who attended high school (HSS, 2016; CDC, 2016). Representation of all persons of this group were not recorded (HSS, 2016; CDC, 2016). The extent of under-reporting and over-reporting of behaviors which could not be determined (HSS, 2016; CDC, 2016). BMI calculations were the third limitation (HSS, 2016; CDC, 2016). This limitation places emphasis on self-reported height and weight (HSS, 2016; CDC, 2016).

Summary

YRBS is an ongoing source of high-quality data which may be retrieved at the national, state, and large urban district levels (HSS, 2016; CDC, 2016). In 2015, 37 states, 19 large urban school districts obtained statistical data representation of their high-school students (HSS, 2016; CDC, 2016). The 2015 YRBS dataset is an important tool that may be used for the planning, implementation, and evaluation of public programs, health policies, and practices in various jurisdictions throughout the United States (HSS,

2016; CDC, 2016). Trend analysis is essential in understanding the impact of broad public health and school health policies and practices (HSS, 2016; CDC, 2016). These analyses are designed to assist and improve with the health outcomes of students particularly of African American heritage (HSS, 2016; CDC, 2016). Surveillance systems must be sustained for future use (HSS, 2016: CDC, 2016). The impact of new education and public health laws, policies, and practices related to data collection are extremely important (HSS, 2016; CDC, 2016). The efforts are greatly needed to protect and promote the health of our youth nationwide (HSS, 2016; CDC, 2016).

Section 3: Presentation of the Results and Findings Section

Introduction

This study was designed to test the statistical significance of increased obesity and specific health risk behaviors among American high school students. Exploration of BMI, tobacco use, alcohol use, marijuana use, and marijuana use among American high school students aged 12-19. In order to examine the association of the independent variables on the dependent variable of BMI, the following research questions and hypotheses were developed. Multivariate logistic regression analysis was used to measure the predictors of BMI.

Research Question(s) and Hypotheses

RQ1: Is tobacco use among American high school students associated with BMI while controlling for race, gender and grade?

H*1o*: There is no association between tobacco use and BMI among American high school students while controlling for race, gender and grade.

H*1a*: There is an association between tobacco use and BMI among American high school students while controlling for race, gender and grade.

RQ2: Is alcohol use among American high school students associated with BMI while controlling for race, gender and grade?

H*2o*: There is no association between alcohol use and BMI among American high school students while controlling for race, gender and grade.

H*2a*: There is an association between alcohol use and BMI among American high school students while controlling for race, gender and grade.

RQ3: Is marijuana use among American high school students associated with BMI while controlling for race, gender and grade?

H*3o*: There is no association between marijuana use and BMI among American high school students while controlling for race, gender and grade.

H*3a*: There is an association between marijuana use and BMI among American high school students while controlling for race, gender and grade.

Section 3 presents an outline of the data collection pertaining to the 2015 YRBS secondary dataset. This section includes descriptive statistics as well as bivariate analysis to see any association between predictors/confounding factors and outcome variables. Multivariate logistic regression analysis was performed to answer the research questions after controlling confounding variables of race, gender, and grade.

Results

A quantitative cross-sectional research study using secondary data was conducted to test for statistical significance between obesity and health risk behaviors. This statistical significance testing examined the prevalence of obesity among American high school students, aged 12 to 19, who reside in the continental United States. This study examined three research questions and associated hypotheses. The 2015 YRBSS data was prepared by the CDC in conjunction with SPSS statistical software version 25.

Results derived from the 2015 YRBSS data specified that numerous high school students continue to engage in priority health risk behaviors (HHS, 2016; CDC, 2016). These health risk behaviors are associated with the leading causes of death among persons aged 10-24 who reside in the United States (HHS, 2016; CDC, 2016). During the

30 days prior to the survey administration, 32. 8% of students in grades 9-12 had drunk alcohol and 21. 7% had used marijuana (HHS, 2016; CDC, 2016). During the 30 days prior to the survey administration, approximately 10.8% of students in grades 9-12 had smoked cigarettes and an estimated 7.3% had used smokeless tobacco. Results of the 2015 YRBSS also detailed that numerous high school students engage in behaviors that place them at risk for the leading causes of morbidity and mortality (HHS, 2016; CDC, 2016). Statistical summaries showed that over 13.9 % of those students surveyed were categorized as being obese and an estimated 16.0 % were overweight (HHS, 2016; CDC, 2016).

Statistical Assumptions

This statistical model relied on a number of assumptions. First, due to the nature that BMI is calculated on the basis of self-reported height and weight, the possibility that under reporting and/or over reporting may have affected the overall quality of data. Second, the extend of over reporting and under reporting could not be determined, although the survey questions demonstrated reliable test re test reliability.

Table 1

Sociodemographic Profile of the Study Population

Characteristic	Frequency	Percentage
Gender		
Male	7749	49.5%
Female	7757	49.6%
Missing	118	0.9%
Total	15624	100%
Grade		
9th	4003	25.6%
10th	3938	25.2%
11th	3930	25.2%
12th	3601	23.0%
Missing	152	1.0%
Total	15624	100%
Race		
Black or African American	1667	10.7%
White	6849	43.8%
Hispanic or Latino	2365	15.2%
Missing	4743	30.3%
Total	15624	100%
BMI		
Healthy weight	9185	58.8%
Overweight/obese	4258	27.3%
Missing	2181	13.9%
Total	15624	100%
Tobacco use		
Did not smoke	13178	84.3%
Smoked 1 or more days	475	3.1%
Smoked ≤ 10 cigarettes per day	1003	6.4%
Smoked >10 cigarettes per day	141	0.9%
Missing	827	5.3%
Total	15624	100%
Alcohol use		
Did not consume	9455	60.5%
Consumed 1 to 5 days	3549	22.7%
Consumed more than 5 days	1110	7.1%
Missing	1510	9.7%
Total	15624	100%
Marijuana use		
Did not use in past 30 days	11895	76.1%
Used 1 to 39 Times	2651	17.0%
Used More than 40 Times	704	4.5%
Missing	374	2.4%
Total	15624	100%

Table 1: Results of Socio-Demographic Profile of the Study Population

Table 1 provides adolescent demographic data for each weight status group referenced in this study. This secondary data was derived from a total of 15, 713 participants however only 15, 624 were considered as usable. A total of 7,749 females (49.6%) and 7,757 males (49.6%) were included in the research study. Demographic representation by grade showed that a total of 4003 (25.6%) 9th graders were recorded as survey participants. Tenth grade participants were recorded at 3,938 (25.2%), 11th graders (3,930 (25.2%), and approximately 23% were 12th grade survey participants. Regarding race/ethnicity, 1667 (10.7%) were recorded as Black or African American. Approximately, 6,849 (43.8%) were recorded as White and 2,365 (15.2 %) of the survey participants were Hispanic or Latino. BMI characteristics showed that participants categorized as healthy weight represented over 58.8% of the population and 4,258 (27.3%) of the participants were categorized as overweight/obese. Independent variable categorization of tobacco use showed that approximately 84.3% of the population surveyed did not smoke. However, 1,003 of the high school population surveyed had ever smoked over 10 cigarettes within a day's time period. Alcohol use categorization showed that 9,455 (60.3%) of the students surveyed stated that they did not consume alcohol however over 22.7% of the surveyed population recorded that they had consumed 1 to 5 drinks containing alcohol. Marijuana use categorization data showed that approximately 76.1% of the students surveyed had never consumed marijuana. Approximately 2,651 of

those surveyed recorded that they had used marijuana 1 to 39 times within a 30-day period.

Table 2

Bivariate Analysis of Student Characteristics for BMI Range Normal or Overweight/Obese

Variable	BMI (Normal) (*N*)	(%)	BMI (Overweight/ obese) (*N*)	(%)	Total	χ^2
Grade						
9th	2326	71.6%	922	28.4%	3248	x^2 (6.688)
10th	2314	71.8%	907	28.2%	3221	*p* (.245)
11th	2313	71.9%	903	28.1%	3216	
12th	2199	73.9%	777	26.1%	2976	
Ungraded/other	33	67.3%	16	32.7%	49	
Gender						
Female	4808	73.3%	1754	26.7%	6562	x^2 (6.828)
Male	4377	71.2%	1771	28.8%	6148	*p* (.009)
Race						
Black or African American	927	71.0%	379	29.0%	1306	x^2 (41.606)
White	4333	75.1%	1439	24.9%	5772	*p* (.000)
Hispanic or Latino	1246	67.7%	595	32.3%	1841	
Current tobacco use						
No	5472	73.1%	2012	26.9%	7484	x^2 (13.112)
Yes	2627	69.9%	1133	30.1%	3760	*p* (.000)
Current alcohol use						
No	5803	72.4%	2212	27.6%	8015	x^2 (0.014)
Yes	3096	72.3%	1186	27.7%	4282	*p* (.001)
Current marijuana use						
No	5423	73.3%	1971	26.7%	7394	x^2 (9.442)
Yes	3527	70.8%	1453	29.2%	4980	*p* (.002)

Table 2: Results of Bivariate Analysis of Student Characteristics for BMI Range Normal or Overweight/Obese

Table 2 shows the odds ratios of BMI categorization and substance use adjusting for grade and gender. All predictor variables and previously used socio demographic variables were run against BMI (normal/healthy versus overweight/obese). Approximately 71.6% of 9th graders surveyed were categorized under normal weight BMI and 28.8% of the 9th graders surveyed were categorized as overweight/obese. Of those categorized under the normal BMI classification approximately 73.3 % were female and 26.6% were categorized as being overweight/obese. Approximately 71.2% of those categorized under normal BMI classification were male and 28.8% of the male population were categorized as overweight/obese. Race categorization showed that 71.0% of those referenced under the normal BMI categorization identified as Black or African American. Over 29.0% of the Black or African American student population were categorized as overweight/obese. Approximately 75.1% of the categorized under the normal BMI category identified as White while 24. 9 % of the White respondent population were categorized as overweight/obese. Bivariate analysis was conducted to test for the effect of independent variable use (tobacco, alcohol, and marijuana) against BMI. The Chi-square test measured the significance of the contribution. The results indicated that gender of the student ($x^2 = 6.828$, $p > 0.009$) and race of the student ($x^2 = 41.606$, $p > 0.000$) both significantly contributed to increased BMI percentages amongst the high school population. Tobacco use ($x^2 = 13.112$, $p > 0.000$); alcohol use ($x^2 = 0.014$), $p > 0.001$) and marijuana use ($x^2 = 9.442$, $p > 0.002$) were also significantly contributed to increased BMI percentiles amongst the high school student population.

However, grade ($x^2 = 6.688$, $p > 0.245$) was found to be a non-contributor to increased BMI percentiles.

Multivariate Logistic Regression Analysis

Tables 3, 4, and 5 detail multivariate logistic analysis for each of the research questions presented. Multivariate logistic regression was performed to assess the relationship between the independent variables (tobacco use, alcohol use, and marijuana use) while adjusting for the demographic covariates of race, gender and grade for each weight status group. Weighted hierarchical logistic models were also used to estimate the effect sizes of various health determinants on overweight/obesity outcomes for high school students in the United States. Effect size (ES) is not dependent on sample size and thus considered to be a more appropriate measure for a large-scale secondary analysis such as the 2015 YRBS. Covariates considered to have strong associations with overweight/obese categorization were gender and grade.

Research Question 1 (RQ1): Is tobacco use among American high school students associated with BMI while controlling for race, gender and grade?

Table 3: Multivariate Analysis to Find the Association Between Tobacco Use and BMI Controlling for Race, Gender and Grade

Variable	β	OR	CI		P
			Upper	Lower	
Tobacco Use					
No					
Yes	.152	1.164	1.046	1.296	.005
Race					
Black or African American					
White	-.154	.857	.732	1.004	.057
Hispanic or Latino	-.379	.684	.608	.771	.000
Gender					
Female					
Male	-.110	.895	.809	.991	.032
Grade					
9th					
10th	.221	1.247	1.078	1.442	.003
11th.	.152	1.164	1.007	1.346	.040
12th	.096	1.101	.951	1.275	.199

Table 3: Multivariate Logistic Regression Analysis –Odds Ratios for high-school aged adolescent engagement in Tobacco Use

A multivariate logistic regression was conducted to examine to what extent tobacco use correctly predicts the odds of increased BMI among the American high school population. The prevalence rates and OR's for the associations between weight status group and race, gender, and grade of ever tobacco use are presented in table 3. Respondents who responded "no" to ever tobacco use were excluded from these analyses and the those who responded "yes" were used as the reference category. For the coefficient tobacco use, the odds ratio is 1.164 and it yielded statistical significance;

therefore, analysis detailed that American high school students who answered ‘answered ‘yes’ to survey question *Q31* ‘ever used tobacco’ are 1.164 times more likely than be categorized as overweight/obese with increased of ever using tobacco (*OR* = 1.164, 95% CI = [1.046, 1.296]. No significant associations were identified for the covariates of race nor gender. Statistical significance was however met under the grade coefficient. Tobacco use while controlling for grade results yielded (*OR* = 1.247, 95% CI = [1.078, 1.442] for 10th grade high school students, (*OR* = 1.164, 95% CI = [1.007, 1.346] for 11th grade high school students and (*OR* = 1.101, 95% CI = [.951, 1.275] under the OV/OB weight categorization in comparison to the 9th grade HW categorization.

Upon completion of multivariate logistic regression, it was determined that the research question pertaining to tobacco use, RQ1, was shown to have had a positive statistical significance. Therefore, the null hypothesis was rejected and the alternate hypothesis was accepted:

H*1a*: There is an association between tobacco use and BMI among American high school students while controlling for grade.

Research Question 2 (RQ2): Is alcohol use among American high school students associated with BMI while controlling for race, gender and grade?

Table 4: Multivariate Analysis to Find the Association Between Alcohol Use and BMI Controlling for Race, Gender and Grade

Variable	β	OR	CI		P
			Upper	Lower	
Alcohol Use					
No					
Yes	.001	1.001	.869	1.155	.984

Race					
Black or African American					
White	-.233	.792	.645	.972	.026
Hispanic or Latino	-.375	.687	.586	.806	.000
Gender					
Female					
Male	-.187	.829	.726	.947	.006
Grade					
9th					
10th	.284	1.328	1.087	1.623	.006
11th	.196	1.217	.989	1.497	.063
12th	.176	1.192	.960	1.481	.112

Table 4: Multivariate Logistic Regression Analysis –Odds Ratios for high-school aged adolescent engagement in Alcohol Use

A multivariate logistic regression was conducted to examine to what extent alcohol use correctly predicts the odds of increased BMI among the American high school population. The prevalence rates and OR's for the associations between weight status group and race, gender, and grade of ever alcohol use are presented in table 4. Respondents who responded "no" to ever tobacco use were excluded from these analyses and the those who responded "yes" were used as the reference category. For the coefficient alcohol use, the odds ratio is 1.001 and it yielded statistical significance; therefore, analysis detailed that American high school students who answered 'answered 'yes' to survey question *Q41* 'ever used alcohol' are 1.001 times more likely than be categorized as overweight/obese with increased odds of having ever used alcohol (*OR* = 1.001, 95% CI = [.869, 1.155]. No significant associations were identified for the

covariates of race nor gender. Statistical significance was however met under the grade coefficient. Alcohol use while controlling for grade results yielded (*OR* = 1.328, 95% CI = [1.087, 1.623] for 10th grade high school students only under the OV/OB weight categorization in comparison to the 9th grade HW categorization.

Upon completion of multivariate logistic regression, it was determined that the research question pertaining to tobacco use, RQ2, was shown to have had a positive statistical significance. Therefore, the null hypothesis was rejected and the alternate hypothesis was accepted:

H*2a*: There is an association between alcohol use and BMI among American high school students while controlling for grade.

Research Question 3 (RQ3): Is marijuana use among American high school students associated with BMI while controlling for race, gender and grade?

Table 5: Multivariate Analysis to Find the Association Between Marijuana Use and BMI Controlling for Race, Gender and Grade

Variable	β	OR	CI		P
			Upper	Lower	
Marijuana Use					
No					
Yes	-.033	.967	.814	1.149	.706
Race					
Black or African American					
White	-.280	.755	.617	.924	.006
Hispanic or Latino	-.395	.674	.584	.776	.000
Gender					
Female					
Male	-.219	.803	.716	.901	.000

Grade					
9th					
10th	.143	1.153	.974	1.365	.097
11th	.038	1.039	.874	1.235	.669
12th	.092	1.096	.918	1.309	.311

Table 5: Multivariate Logistic Regression Analysis –Odds Ratios for high-school aged adolescent engagement in Marijuana Use

A multivariate logistic regression was conducted to examine to what extent tobacco use correctly predicts the odds of increased BMI among the American high school population. The prevalence rates and OR's for the associations between weight status group and race, gender, and grade of ever marijuana use are presented in table 5. Analysis of regression models did not yield statistical significance for the coefficient marijuana use. No significant associations were identified for the covariates of race nor gender. Logistic regression models indicated that 15.3 % of 10th grade students were more likely to engaged in marijuana use under the OV/OB categorization (*OR* = 1.153, 95% CI = [.974, 1.365]. Models also indicated that there was a 3.9 % increase of marijuana use within the 11th grade OV/OB categorization (OR = 1.039, 95% CI = [.874, 1.235] and a 9.6 % increased odds rate of marijuana engagement under the OV/OB categorization for 12th grade students.

Upon completion of multivariate logistic regression, it was determined that the research question pertaining to marijuana use, RQ3, was not shown to have had a positive statistical significance. Therefore, the alternate hypothesis was accepted and the null hypothesis was rejected:

H*3o*: There is no association between marijuana use and BMI among American high school students while controlling for grade.

Statistical Analysis

Research Question(s) and Hypotheses

Research Question 1 (RQ1): Is tobacco use among American high school students associated with BMI while controlling for race, gender and grade?

H*1a*: There is an association between tobacco use and BMI among American high school students while controlling for grade.

Research Question 2 (RQ2): Is alcohol use among American high school students associated with BMI while controlling for race, gender and grade?

H*2a*: There is an association between alcohol use and BMI among American high school students while controlling for grade.

Research Question 3 (RQ3): Is marijuana use among American high school students associated with BMI while controlling for race, gender and grade?

H*3o*: There is no association between marijuana use and BMI among American high school students while controlling for grade.

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

Introduction

The aim of this study is to examine the relationship between health risk behaviors and obesity among African American high school students. Obesity is categorized as a major health problem within the United States that disproportionately affects Black or African American adolescents (Kann et al., 2014). Adolescent substance use (tobacco, alcohol, and marijuana use) and overweight/obesity as describes by Zeller et al. (2016) are each public health issues. These public health issues are considered to have unique prevalence's based on gender and grade. Determination as to whether or not these bio behavioral risks are connected in today's youth is unknown (Zeller et al., 2016). This uncertainty has left critical gaps in prevention science (Zeller et al., 2016). In order to gain a better understanding, a national epidemiological sample was derived from the 2015 YRBSS. Examination of adolescent high school student substance use behaviors (initiation of use, current use, grade of initial use, and polysubstance use) categorized as overweight (OV) and obese (OB) was compared to adolescents currently attending high school who were categorized as healthy weight (HW) for each race/ethnicity (Zeller et al., 2016).

Summarization of Key Findings

Key findings as summarized by Keys et al. (2014) noted that African American adolescents of high school age who reside within the continental United States are less likely to consume tobacco, alcohol, and marijuana during this time period. These findings are comparable to those of non-Hispanic whites (Keys et al., 2016). Among Black,

White, and Hispanic male and female high school students, Black adolescent females are described as having the highest prevalence of overweight and obesity (Kann et al., 2014). Current estimations detail that 42% of Black females either meet or exceed the CDC overweight classification (Ogden et al., 2014). This perseverance of overweight and/or obesity suggests that more focus should be placed on the adolescent period of life (Ogden et al., 2014). This focus may be important to understanding of preventative measures within this fragile age group (Ogden et al., 2014). As described by Rolle et al. (2016) health surveys serve as an important component of how health behaviors such as tobacco use, alcohol use, and marijuana use surveillance may assist with provides school-based and population-based information. This information may also be used to assist with the monitoring of trends and patterns associated with these health risk and how they negatively affect body mass index within the African American high school population. Findings relative to overweight (HW)/ obese (OB) adolescents showed that those categorized as non-Hispanic white had higher odds of utilizing some type of illicit substances (inhalants, cocaine, amphetamines) prior to 9th grade (Zeller et al., 2016).

Interpretation of the Findings

Description of how Findings Confirm, Disconfirm, or Extend Knowledge in the Discipline

As reported by Lobstein et al., (2015) prevalence of adolescent overweight and obesity has substantially increased not just within the United States but on what is considered to be a world wide scale as well. Reviewed literature conveyed that the average weight of an adolescent who resides in the United States has more than 5kg

within the past three decades (Lobstein et al., 2015). Although more than sufficient documentation exists pertaining to the medical and psychosocial consequences of adolescent obesity, less information related to the relationship of overweight/obesity with health risk behaviors has been examined (Farhat, Ionnatti, & Simons-Morton, 2011). This quantitative study used small area estimated in weighted hierarchical logistic regression models to assist in the description of prevalence and distribution of adolescent health risk behaviors (tobacco, alcohol, and marijuana).

Analyzation and Interpretation of Findings in the Theoretical and/or Conceptual Framework

Social cognitive theory (SCT) has been described as a theory that assists researchers with the designation of educational intervention programs (Bagherniya et al., 2018). Programs such as these have been used in particularly for nutrition and/or physical activity programs for adolescents who have been categorized as overweight/obese (Bagherniya et al., 2018). Obesity has been attributed with long –term physical and psychological adverse consequences (Haynos & O' Donohue, 2012) A few of these consequences may include: low self-esteem, increased risk of developing a chronic disease, depression, and increased risk of engaging in a behavior that may present future negative consequences (Haynos & O' Donohue, 2012). Additional reports detailed that considerable costs to our United States healthcare system continue to increase both directly and indirectly (Hanynos & O' Donohue, 2012). Research has shown that the use of behavioral family, school, and community-based interventions may assist with more sustainable weight loss (Sharma & Romas, 2011; Sharma, 2012). Additionally, SCT has

been shown to be an effective tool that may assist with the improvement of efficiency of childhood obesity prevention as well as weight loss programs (Sharma & Romas; Sharma; 2012). SCT denotes that human behavior is representative of dynamic interactions (Bagherniya et al., 2018). These interactions may be categorized as personal, behavioral, and/or environmental (Bagherniya, 2018). Furthermore, SCT provides a framework that is comprehensive in nature (Bandura, 2004). This framework may also assist teachers, parents, community leaders, and researchers with the understanding of determinants associated with behaviors exhibited by today's adolescents (Bandura, 2004). Social ties, as suggested by sociological theory, are highly influential in engagement of both positive and negative behaviors (Crosnoe, 2012). Using tobacco as an exemplar, Schaefer et al. (2012) describes adolescent smoking behavior as being a peer group phenomenon. Huang (2012) further notes that adolescents who are categorized as overweight/obese are socially marginalized or isolated. These adolescents are described as being more likely to smoke with others who are more embedded within their social network (Huang, 2012).

Community-based provides an important framework that may be used in the partnering with communities in order to reduce health disparities such as these (Hoeft et al. 2014). Additionally noted is that CBPR is a collaborative approach that is designed to ensure and establish structures for participation (Davison, Jurkowski, & Lawson, 2012). Social change is ultimately achieved when: communities being affected by the issue is studied, there is representation of organizations, and researchers in all aspects of the research process take part in the improvement of health and well-being of the participants

through action (Davison, Jurkowski, & Lawson, 2012). According to Davison, Jurkowski, & Lawson (2012) parents as well as primary caregivers provide the foundation in the shaping of an adolescent's lifestyle behaviors. This research is evidenced by linking parents' attitudes, beliefs and parenting strategies with children's dietary intake, physical activity, and sedentary behaviors (Davison et al., 2012).

Limitations of the Study

There were several limitations associated with the present findings of this secondary analysis of 2015 YRBSS data. This analysis could not establish temporality between covariates and outcomes. This was due to the cross-sectional nature of the 2015 YRBSS survey. Questionnaires were answered on a voluntary and self-administered during school hours. Zeller et al. (2017) explained that in most cased biases occur. These biases included volunteer bias, self-reported bias, and social desirability bias (Zeller et al., 2017). Biases may lead to under- and over – representation of certain variables included in the study. Among the most problematic limitation was the issue of self-administered height and weight measurements which was vital in the calculation of BMI and determination of overweight/obesity status (Zeller et al., 2017). As a result, under reporting of overweight/obese prevalence measures may have occurred. This under reporting may have influenced the associations. As suggested by Zeller et al. (2017) retrospective reporting on grade of substance use initiation (tobacco, alcohol, marijuana) does not allow for temporal frequency examination. Another limitation associated with this examination lends focus to racial/ethnic groups surveyed. The 'other' groups' category was excluded based on limited sample size. YRBSS surveillance data is

restricted to adolescents who attend high school, and thus, may not be representative of youth in this age group. This limitation may also be extended for those adolescents who are home schooled or who may have stopped attending for various reasons. Other risk factors such as the built environment may have contributed to limitations involved with this examination but were not included in the 2015 YRBSS survey included: access to proper health care, accessibility to healthcare facilities, parks, and/or walking paths (Zeller et al., 2017).

Recommendations

Current research shows that there is a wealth of literature which highlights the negative physical and psychosocial consequences associated with adolescent obesity (Lanza, Grella, & Chung, 2014). Lanza et al. (2017) further explained that less attention has been given to the relationship of adolescent obesity and health risk behaviors. Research provided by Lanza et al. (2017) noted that approximately 33.6% of adolescents ages 12-19 who reside in the United States are categorized as overweigh. Recent percentages portrayed that approximately 18.4 % of these adolescents were obese (Lanza et al., 2017). Substance use has shown to be more prevalent during young adulthood (Lanza et al., 2017).

Reviewed literature from section 1 of this examination provided background literature produced by accomplished authors in the public health field. Examinations by Tate et al. (2014) revealed that higher rates of overweight/obesity along with increased risk of obesity-related diseases have been associated with African American adolescents. Current literature has also shown that the highest prevalence of overweight/obesity has

been a growing concern among African American females (Winkler, Bennett, & Brandon, 2017). Despite current efforts, culturally sensitive obesity interventions designed to counteract this public health issue struggle for effective outcomes in program design, implementation, and evaluation (Tate et al., 2014). Adolescence, as described by Lanza et al. (2017) is a critical period in which prevention efforts should be aimed to reduce obesity as well as problematic health risk behaviors which include substance uses such as tobacco use, alcohol use, and marijuana use. Rolling & Hong (2016) reviewed articles that were categorized based on research design, individual SCT principles. These principles were environmental, cognitive, and behavioral in nature and also assisted with behavior change and/or BMI outcome effects (Rolling & Hong, 2016). Results of these reviews detailed that all 16 articles reviewed reported at least one SCT principle (Rolling & Hong, 2016). Studies noted consistent significant correlations amongst factors and dietary behavior in adolescents (Rolling & Hong, 2016). Reports of high self-efficacy was related to increased intake of fruits and vegetables and lowered intake of fats, sugars, and sodium (Rolling & Hong, 2016).

The Impact of Physical Activity Intervention Programs on Self – Efficacy in Adolescents

Studies have shown that lack of physical activity has a positive association to the nations' youth and adolescent overweight/obesity crisis (Cataldo et al., 2013). A study performed by Kelishadi, Minasian, Marandi, Faraizadegan, Khalighinejad, Shirdavani, & Omidi (2014) expressed that schools serve as attractive settings to implement interventions. These interventions may be designed in order to promote physical activity

(Kelishadi et al., 2014). Schools have also been recognized as key settings for public health strategies (Kelishadi et al., 2014). These strategies may be used to decrease and/or prevent the prevalence of overweight and obesity (Kelishadi et al., 2014). Intervention strategies derived from this study detailed that teachers were key persons needed to implement these interventions. More specifically, physical education teachers received specific guidelines that referenced training programs, healthy nutrition and energy balance for students involved in this study (Khelishadi et al., 2014). Efforts of this study were meant to promote students' participation in regular physical education activities (Kelishadi et al., 2014). Efforts were also targeted at promoting a reduction in sedentary behaviors during a selected 6-week intervention period (Kelishadi et al., 2014). Discussion revolved around that collaboration of school principals, teachers, school health service and parental committees (Kelishadi et al., 2014). The primary aim of this study was to increase the overall physical activity level in general and specifically among overweight/obese adolescent female students (Kelishadi et al., 2014). Guidelines specific to physical education in youth and adolescents recommended that there should be moderate to vigorous physical activities for at least 60 minutes for a period of 7 days (Kelishadi et al., 2014). Conversely, the impact of physical activity on self-efficacy as a mediator of behavior change has limited examinations (Cataldo et al., 2013). A systematic review conducted by Cataldo et al. (2013) described the published evidence related to the potential impact of physical activity intervention programs on self-efficacy among youths aged 5-18. The authors noted that 6 out of 10 diverse studies identified and improvement in post self-efficacy (Cataldo et al., 2013). Results of this systematic review

indicated that physical activity intervention programs may actually improve the self-efficacy within today's youth (Cataldo et al., 2013).

Implications for Professional Practice and Social Change

Few studies have been conducted on adolescent overweight/obesity and its association to health risk behaviors (Lanza, Grella, Chung, 2014). Adolescence has been described as a vital time period for implementation of prevention efforts aimed at reducing adolescent overweight/obesity (Lanza et al., 2014). These prevention efforts should be aimed to further reduce problematic substance use (tobacco, alcohol, and marijuana) associated with overweight/obesity into young adulthood (Lanza et al., 2014). Use of an adolescent developmental framework, SCT, may increase the likelihood of understanding (Lanza et al., 2014). Survey data compiled by the 2011 National Survey of Drug Use and Health detailed that young adults have the highest rates of current tobacco use (39.5%) and illicit drug use (21.4%) (Lanza et al., 2014). Externalizing behaviors, poor parental monitoring, and negative peer interactions have been established as critical factors involved in the development of problematic substance use (Lanza et al., 2014). The discussion related to risk taking behaviors is one of importance (Lanza et al., 2014). Adolescents have been stated to derive their self-concept from peers and/or social groups (Lanza et al., 2014). Social status is often achieved by portraying actions considered as similar or normative to the group (Lanza et al., 2014). Typically, adolescents who do not fit the group norm, such as physical appearance, are less likely to be accepted by peers (Lanza et al., 2014). Those adolescents who are categorized as overweight/obese have also been stated to be at a higher risk for peer alienation and victimization than their

normal and/or healthy weight peers (Lanza et al., 2014). Additionally, those who try to deviate from said group may try to overcome their minimized social status by engaging in risky behaviors such as substance use (Lanza et al., 2014).

Positive Social Change

Cataldo et al. (2013) referenced that self-efficacy is a construct of Albert Bandura's social cognitive theory. Self-efficacy has been defined as the belief in one's own ability to achieve (Cataldo et al., 2013). This ability to achieve is demonstrated though actions that are necessary for the production of a desired effect (Bandura, 2004). Self-efficacy also relates to an individual's confidence in achieving and maintaining behavioral change (Bandura, 2004).

Self-efficacy has additionally been referenced by Cataldo et al. (2013) as a predictor pf physical activity intervention outcomes. Therefore, it may be reasonable to anticipate that physical activity intervention programs may benefit from the incorporation of SCT modification (Cataldo et al., 2013). Properly administered physical activity programs hold the potential to assist with the facilitation of self-efficacy (Cataldo et al., 2013). Thus, self-efficacy may be the transformational missing link to effectively address the obesity crisis that continues to plague the United States (Cataldo et al., 2013).

According to Davison et al. (2012), the Family Ecological Model (FEM) may assist parents in shaping behaviors by using contexts in which families are embedded. However, parents and families are not currently included in the forefront of adolescent obesity prevention efforts (Davison et al., 2012). Additionally, families are not featured as the 'center-point' for research nor policy development related to obesity prevention

efforts (Davison et al., 2012). For over two decades, the EST model has been instrumental in the development of public health programs (Davison, eta l., 2012). These programs have been stated to focus less on individual beliefs, attitudes, and knowledge but more so on environments such as schools and communities that shape the adolescent's behavior (Davison et al., 2012). In order to design and effectively implement family centered interventions it is imperative that the researcher gain a better understanding of the context in which parenting takes place (Davison et al., 2012). Combining cultural factors in conjunction with ecological and family system factors may assist with the explanation of parenting cognitions and behaviors (Davison et al., 2012). This combination of factors may either promote or discourage healthy lifestyle exhibited by adolescents (Davison et al., 2012).

Description of the FEM

The FEM was developed to gauge contextual and family systems factors (Davison et al., 2012). These factors are specific healthy lifestyles and factors that affect parenting (Davison et al., 2012). The inner circle of this model provides a summary of the processes by which adolescents' diet and activity are influenced by parents (Davison et al., 2012). Parental knowledge and beliefs pertaining to obesity, modeling of healthy behaviors, and opportunities provided for healthy eating and physical activity are also portrayed within the inner circle (Davison et al., 2012). Demographic factors, adolescent characteristics, organizational/community characteristics, media, and policy are represented in the model's outer domains (Davison et al., 2012).

Conclusion

Overweight/obesity and adolescent substance use (tobacco, alcohol, and marijuana) have been described as significant public health issues for adolescents who reside in the United States (Ogden et al., 2014). These public health issues have previously been described as having unique prevalence's based on gender and race/ethnicity (Zeller et al., 2016). Critical gaps in prevention science still exist pertaining to the determination as whether or not these bio-behavioral risks are linked (Zeller et al., 2016). The CDC (2016) states that YRBSS is an ongoing source of high-quality data. This data is recorded at the national, state, and large urban school district levels throughout the United States (CDC, 2016). This data is primarily used for monitoring health behaviors that contribute to the leading causes of mortality and morbidity among youth and adults (CDC, 2016).

The 2015 YRBSS data was derived from students surveyed from 37 states and 19 large urban high school districts (CDC, 2016). This survey data was used to examine adolescent substance use behaviors (ever use, current use, frequency of use) for high school aged adolescents of overweight (OV) and obese (OB) status. This survey data was compared to high-school adolescents of healthy/normal (HW) for each race/ethnicity group. YRBSS data as described by CDC (2016) is an instrumental tool for planning, implementation, and evaluation of public health programs, policies, and practices. A particular strength of YRBSS data is the system's potential for analysis of the inter-relationships among health behaviors (CDC, 2016). Due to surveys extensive history and consistent methodology, it can not only assist in the identification of national long-term

temporal trends in health behaviors, but also long-term trends among subgroups of students as well (CDC, 2016). Long term temporal trends may also be identified at the state and large urban school districts (CDC, 2016). The CDC (2016) referenced that these trends analyses may be valuable for assisting researchers in gaining a better understanding of the impact of broad public health and school health policies. Rutkow et al. (2016) referenced that broad support is critical to the advancement of policies on legislator's agendas. Studies have confirmed that policy-makers, nongovernmental organizations (NGO's) and academics have been successful in influencing legislators (Rutkow et al., 2016). This influence occurs by sharing research and anecdotes, providing testimony and providing a window into constituents' views (Sparer, 2015; Kent & Carmichael, 2015). Activity such as this also provides legislators with a breadth of support for a given piece of proposed legislation (Rutkow et al., 2016). In essence, stakeholder and researcher engagement is critical for the effective promotion of adolescent obesity prevention policies (Rutkow et al., 2016).

Funding

According the CDC (2016) public health programs may be funded via a variety of federal, state, and local supplements. Analyses are derived a number of organizations such as the Centers for Disease Control (CDC), the Institute of Medicine (IOM), and New York Academy of Medicine (NYAM) just to name a few (CDC, 2016). Experts have noted that public health has been severely underfunded for decades (CDC, 2016). Furthermore, public health has been stated to not receive sufficient support for the purposes of carrying out many core functions which include programs that are

implemented to prevent disease and obesity (CDC, 2016). Grants offer much of the federal support needed to supplement obesity prevention (CDC, 2016). This is accomplished through states distribution via the CDC's National Center for Chronic Disease Prevention and Health Promotion (NCCDPHP) (CDC, 2016). The CDC (2016) detailed that the underlying consensus it that there is a vast need to combine funding bases to effectively support initiatives such as early child care education programs. It was stated that although the State Health Actions – funding Opportunity Announcement (FOA) is known for providing funding to all 50 states including the District of Columbia (CDC, 2016). However, the ulterior is that obesity prevention strategies which include expanded reach are often underfunded (CDC, 2016). This underfunding is seen in areas related to nutrition and physical activity (CDC, 2016). This issue revolves around DNPAO funding for state level obesity prevention (CDC, 2016).

Factors Related to Overweight and/or Obesity among Black Females in the United States

The public health issue of overweight/obesity has been categorized as a major health issue. According to Kann et al (2014), this public health issue disproportionately affects Black adolescent females (Winkler et al., 2017). Current analyses have shown that Black females of high school age have the highest prevalence of overweight among male and female Black, White, and Hispanics (Kann et al., 2017). Estimates detailed that 42 percent of black females either meet or exceed the overweight classification as determined by the CDC (Ogden et al., 2014). To complicate matters, it has also been stated that black females demonstrate the highest risk of developing overweight/obesity

during the course of adolescence (Huh et al., 2012). Supportive literature detailed that 95 percent of adolescent black females who have been categorized as being obese remain obese into adulthood (Gordon-Larsen, the, and Adair, 2010). With this persistence in obesity, it was suggested that a focus be placed on the adolescent period due to the importance of understanding preventative measures related to adolescent and adult obesity among Black females (Winkler et al., 2017).

To date, few interventions have been deemed as effective in this fight to produce meaningful reductions in weight or obesity at the individual or population level (Kumanyika, Whitt-Glover, & Haire-Joshu, 2014). Insufficient repetition conjoined with limited findings of significance provide a dismal portrait filled with multiple gaps in knowledge (Winkler et al., 2017). These gaps in knowledge exist across all categories regarding factors related to overweight/obesity particularly among Black females of high school age who reside in the United States (Winkler et al., 2017).

Winkler et al. (2017) detailed in an extensive review of 51 studies, three categories which paralleled the bio -ecological theory of human development: (1) individual, (2) interpersonal, and (3) community and societal factors. It was stated that from this review, the authors explored the relationship of overweight and obesity among Black adolescent females combined with these three categories and their potential associations (Winkler et al., 2017). Discussion presented by Winkler et al. (2017) noted that most exploration of this public health issue have concentrated on individual level factors on behaviors, demonstrating that the vast majority of Black females categorized as being overweight/obese are less physically active and have had fewer daily eating

occasions. However, limited knowledge remains on other individual factors such as sedentary activity and sleep practices. Results derived from the examination of interpersonal and community/societal factors proved to be even less conclusive (Winkler et al., 2017). Instances revealed that families had an extremely important role with significant mother daughter weight correlations (Winkler et al., 2017). It was also noted that variance in certain factors such as SES further complicated the understanding of which community factors further greater associated with obesity among Black females (Winkler et al., 2017).

Systems Thinking Approaches to Knowledge and Action: Improved Models Methods, and Effective Leadership in a Changing Society

Best and Holmes (2010) propose that the process by which we think about how research, policy, and practice inform and interconnect with one another shapes our efforts to improve the health of individuals and social outcomes. During the course of this paper linear relationship and systems models were described with regard to best approach bridging evidence and policy/practice (Best & Holmes, 2010). The most important takeaway was turning knowledge into action which is also referred to as KTA (Best & Holmes, 2010). The authors proposed that the development of KTA combined with the emergence of systems of thinking in the health sector should be applicable across multiple sectors. Highlighted discussion focused on four interconnected aspects of this proposed model which included evidence of knowledge, leadership, networks, and improved communications (Best & Holmes, 2010). Early KTA literature focused on evidence that is derived from research (Best & Holmes, 2010). The authors of this article

stressed that focus should be placed on evidence of ways to change service delivery or policy development (Best & Holmes, 2010). Effective leadership is vital if change is to occur (Best & Holmes, 2010). The authors referenced that as systems become more complex, leadership needs to rely on facilitation and empowerment combined with participatory action and continuous evaluation (Best & Knowles, 2010). Leaders must also model an openness to risk taking and reflection (Best & Knowles, 2010). Communication is also instrumental in learning and portraying a vision that provides support and personal advocacy (Best & Knowles, 2010). Networks, as prefaced by Best & Knowles (2010) function at an individual, inter-unit, and inter-organizational level. Effective networks have been known to be connected in ways that facilitate achievement of a common goal (Best & Knowles, 2010). The flip side to networks is that they are understudied especially in areas related to improved healthcare systems (Best & Knowles, 2010). One interesting concept related to networks is that they are of center focus in systems-oriented models of leadership (Best & Knowles, 2010). Effective leadership is dependent upon successful communications and communication theory has experienced a linear, sender to receiver models (Best & Knowles, 2010). Variants of communication such as the incorporation of feedback or simultaneous encoding and decoding through cultural theory models thus evolve into systems models (Best & Knowles, 2010).

Culturally Sensitive Leadership: Why Gender and Culture are Interdependent

Authors Ayman & Korabik (2010) expressed that for decades, understanding of leadership has largely been based on the results of studies carried out on White males in

the United States. Ayman & Korabik (2010) prefaced that they reviewed major theories and models related to leadership as they pertain to gender and culture. The primary focus of their review pertained to three approaches of leadership: trait, behavioral, and contingency (Ayman & Korabik, 2010). Discussion further revolves around the 'dynamics' associated with leadership related to culture and gender (Ayman & Korabik, 2010). In particularly, stereotypes, schemas, and in group/out group interaction were investigated with relationship to how each dynamic might impact the various styles of leadership (Ayman & Korabik, 2010).

Although the authors contended that the definition of culture is debatable, most would agree that the definition presented by Kluckhohn is an acquired and transmitted pattern of shared meaning, feeling, and behavior (Ayman & Korabik, 2010). The authors make note that it is necessary to make distinction among the definitions of culture, ethnicity, and gender (Ayman & Korabik, 2010). The first reason being that different leadership researchers have used various definitions interchangeably (Ayman & Korabik, 2010). The second reason notes that leaders in a diverse and multicultural society need to be aware of these distinctions (Ayman & Korabik, 2010). Phenomenological discussions will always prevail however culture can be can operationalized into two ways based on leadership research (Ayman & Korabik, 2010). The first operationalization is by characteristics that are visible (Ayman & Korabik, 2010). Examples of this operationalization may include skin color, hair texture, or eye shape (Ayman & Korabik, 2010). These visible characteristics have been stated to allow for categorization of people into various social groups such as country or nationality (Ayman & Korabik, 2010). The

second mentioned operationalization is described in terms of values and personalities (Ayman & Korabik, 2010). Underlying assumptions from this review suggested that when these operationalizations of culture are tied together, a common bond is formed due to similar languages for instance, and boundaries will have similar cultural values (Ayman & Korabik, 2010). Conversely, this is not the case in today's global village (Ayman & Korabik, 2010). We know partake of a diverse and pluralistic society in which numerous groups of people live and vary by appearance which are embedded deeply in their cultural values (Ayman & Korabik, 2010).

Future Directions in Research

As a scholar practitioner at Walden University and future leader in the field of public health, I will look to the future to see what work still remains in the arena of adolescent obesity. I will approach this public health issue with hopes of gaining a better understanding of the role of cultural norms and values in the leadership process. As referenced by Ayman & Korabik (2010) it is critical in a diverse society to be aware of the impact of people's appearance and value in social interactions. Therefore, gender and culture should be determined as variables that should be incorporated into theory construction in leadership (Ayman & Korabik, 2010). It is the scholar practitioner's recommendation that additional research teams be composed of more people from diverse backgrounds. This allows for diverse perspectives for the common good of mankind.

Implications suggested that future research investigate mechanisms (Farhat et al., 2011). These suggested mechanisms could further researchers understanding of the

differential association of overweight/obesity combined with health risk behaviors (Farhat et al., 2011). Relative examples are as follows: 1) Do overweight adolescent males and females react to stigma differently than obese peers; 2) How does the relationship between overweight/obesity develop over various time frames; and 3) Are there associations moderated by race/ethnicity and geographic location? Authors Draper, Hewitt, & Rifkin (2010) identified developing indicators for assessment of community participation in health programs. This article addresses the challenge of living in a world where cost effectiveness and target oriented approaches dominate (Draper et al., 2010). Community participation was stated to have come into prominence within the public health arena with the Alma Ata Declaration in 1978 (Draper et al., 2010). Consequently, this principle has been described as being 'lost' within primary health care (Draper et al., 2010). Stronger evaluation tools need to be developed to capture the many forms of community participation (Draper et al., 2010).

A vast percentage of African American adolescents are classified as overweight/obese (Tate et al., 2016). This weight classification could lead to a lifetime of health challenges as well as astronomical increases in individual and public health care costs (Tate et al., 2016). Findings from a study conducted by Kelishadi et al. (2014) detailed that implementation of interventional strategies in the school system may have a beneficial effect on public health. Thus, increasing overall physical activity among low active adolescents and possibly among children of younger age categorization (Kelishadi et al., 2014). The variables of gender and race combined with tobacco use, alcohol use, and marijuana use during adolescent high-school years are essential components (Tate et

al., 2016). This combination of variables needs to be included in developmentally appropriate and culturally related targeted intervention programs (Tate et al., 2016). The 'bigger' picture will not be developed unless all of the current variables involved in the lives of African American adolescents are intertwined along with the positive associations of healthy eating and regular/moderate physical activity (Tate et al., 2016).

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