SEXUAL MINORITY HEALTH: USING THE 2016 NATIONAL HEALTH INTERVIEW SURVEY TO EVALUATE PHYSICAL ACTIVITY, BEHAVIORAL RISK FACTORS, AND HEALTH OUTCOMES

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JAIMI L. ALLEN, PhD(c), MS, CHES, ACE-CHC

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DEDICATION

I would like to dedicate this dissertation to my Momma, Susan Marie Allen.

Mom has always encouraged me to give 110% in everything I do in life. She has supported and loved me throughout this entire journey and picked me up when I needed it the most. Growing up, she instilled a strong work ethic in my siblings and me, and she was a shining example of a positive role model. She never missed a game I played, graduation, or milestone in my life, big or small. She has taught the importance of family time and family values to me and my siblings and has been the rock for each of us. My family is the most important thing to me, and there is no way I could have completed this research without them.

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To God be the glory!

"I can do all things through Christ who strengthens me." Philippians 4:13

ABSTRACT

JAIMI L. ALLEN

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Due to the historical exclusion of LGB individuals in research, there is a gap in knowledge regarding physical activity (PA) adoption and adherence which prevents public health professionals from creating evidence-based interventions tailored to fit the specific needs and barriers for LGB populations. This is a major public health concern because, until recently, national surveys did not gather information on sexual orientation.

Positive health benefits of PA spread across physical, psychological, and social dimensions of health. Due to the scarcity of research on PA and health outcomes based on sexual orientation, this study sought to determine if sexual orientation is a predictive factor of certain health behaviors and outcomes. Utilizing data from the 2016 National Health Interview Survey, this research study focused on the following: (1) to evaluate the effect of physical activity on self-reported behavioral risk factors, and health status for LGB participants; and (2) to evaluate the effect of sexual orientation on physical activity, cigarette smoking, alcohol use, and health status.

Results indicated that as the minutes of vigorous PA increased, alcohol use also increased. As an individual increased their strengthening activities, he or she was less likely to smoke. Additionally, as participants increased the frequency of vigorous PA, their BMI decreased. Results also revealed as participants got older, they were less likely

to be active, decreasing the health benefits from PA. These were alarming since results showed as individuals increased their duration of vigorous PA, they were more likely to be in excellent health versus good health.

For comparative analysis, 331 heterosexual participants were included in the study. Heterosexual participants lived in all regions of the U.S., but they made more money when compared to LGB participants. Even though the mean averages revealed participants from both sexual orientations to be overweight, LGB individuals had higher BMI and were less likely to participate in the recommended amount of PA when compared to heterosexual counterparts. Additionally, LGB participants were more likely to be current smokers and heterosexuals were more likely to have never smoked. LGB participants were more likely to be heavy drinkers and less likely to report excellent health and participate in the recommended levels of PA. LGB participants also had a much higher prevalence of heavy drinking and binge drinking and were less likely to report excellent health and more likely to report fair/poor health. Lastly, heterosexuals were more (11.2% versus 7.5% for LGB participants).

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CHAPTER I

INTRODUCTION

Sexual minorities include individuals from all demographic backgrounds, including race and ethnicity, social class, religion, age, and sex. With limited data on this population, it is difficult for health professionals to meet the needs with targeted health promotion programs and interventions (Institute of Medicine [IOM], 2011). Lesbians, gay men, and bisexuals (LGB) face similar health challenges as their heterosexual counterparts; however, specific health issues disproportionately affect LGB individuals as a result of discrimination and societal stigma, including mental health disorders, substance abuse, and suicide (U.S. Department of Health & Human Services, Office of Disease Prevention & Health Promotion [ODPHP], 2014). In comparison with heterosexuals, LGB individuals are nearly three times more likely to experience mental health issues, and LGB adolescents and young adults are four times more likely to attempt suicide (National Alliance on Mental Illness [NAMI], 2018).

Additionally, lesbians and bisexual women have a higher prevalence of smoking, drinking, obesity, and associated comorbidities (Cochran, Bjorkenstam, & Mays, 2016; Fenway Institute, 2016; Ward, Dahlhamer, Galinsky, & Joestl, 2014), and are less likely to participate in preventive services such as screenings for cancer (ODPHP, 2014). Data from the 2001 to 2010 National Health and Nutrition Examination Survey (NHANES) revealed sexual minority women, especially bisexual women, were more likely to report

worse overall health, monthly binge drinking, and frequent mental distress when compared to heterosexual women (Cochran et al., 2016). Sexual minority women are also more likely to binge drink (Cochran et al., 2016), which is defined as four or more alcoholic drinks for women and five or more alcoholic drinks for men on the same occasion in the past 30 days (Substance Abuse and Mental Health Services Administration [SAMHSA], 2015).

Gay and bisexual men also have higher rates of smoking, drinking, and substance abuse when compared to their heterosexual peers (Fenway Institute, 2016; Ward et al., 2014). According to Cochran et al. (2016), mental distress was much higher for sexual minority men, especially bisexual men. As a result of these behaviors and associated comorbidities, members of the LGB community are at greater risk for early mortality than heterosexual men and women (Cochran et al., 2016).

Physical activity (PA) has been shown to have numerous positive effects on physical, psychological, and social health (ODPHP, 2018) including prevention of cardiovascular disease (CVD), type 2 diabetes, some cancers, and obesity (HHS, 2008). Additionally, PA promotes improved mental health by reducing symptoms of depression, improving self-esteem and health-related quality of life, and reducing the risk of premature death (HHS, 2008). Despite these benefits, very limited data is available on PA programs designed specifically for LGB communities even though tailored programs have shown to be successful in other groups (Bopp, 2018). Participation rates in PA are lower among LGB individuals; therefore, tailored approaches could yield promising results (Gorczynski & Brittain, 2016). A comprehensive approach is needed to examine

the unique experiences of LGB individuals, including the effect of PA on general health status, chronic disease, and psychosocial health (Gorczynski & Brittain, 2016) as well as risk factors associated with those health outcomes (ODPHP, 2014).

Statement of the Purpose

Utilizing data from the 2016 National Health Interview Survey (NHIS), the purpose of this research study has a two-pronged focus: (1) to evaluate the effect of physical activity on self-reported behavioral risk factors, and health status for LGB participants; and (2) to evaluate the effect of sexual orientation on physical activity, cigarette smoking, alcohol use, BMI, and health status. Descriptive variables of sex, race, ethnicity, armed forces status, age, and income were included as covariates in the analyses.

Hypotheses

H_{O1}: There will be no statistically significant relationship between physical activity and cigarette smoking, alcohol use, obesity, and health status for LGB participants of the 2016 National Health Interview Survey (NHIS).

H_{O2}: There will be no statistically significant relationship between physical activity and sociodemographic factors for LGB participants of the 2016 NHIS.

H_{O3}: Physical activity will not increase nor decrease cigarette smoking, alcohol use, BMI, and health status for LGB participants of the 2016 NHIS (with and without controlling for other sociodemographic factors).

H_{O4}: Sexual orientation will not increase nor decrease physical activity, cigarette smoking, alcohol use, BMI, and health status for participants of the 2016 NHIS (with and without controlling for other sociodemographic factors).

Delimitations

The delimitations for this study are as follows:

1. Participants for the 2016 NHIS were randomly selected using a multistage area probability design covering the 50 States and the District of Columbia. The households selected were a representative sample of the U.S. population.
2. All adult members 17 years and older who were home during the interview were invited to answer questions in the Family Questionnaire for themselves. A responsible adult resident of the household could provide information on children under 17 and adults who were not at home at the time of the interview.
3. One adult was randomly selected per family to provide information for the Sample Adult Questionnaire. As long as they were physically and mentally capable of answering questions, they responded for themselves. If they were physically or mentally incapable of answering, a caretaker or knowledgeable adult in the family could answer the questions for them.
4. No physical measurements were taken; all information, including height and weight, were self-reported data.

Limitations

The limitations for this study are as follows:

1. The information reported in the NHIS is self-reported data gathered from interviews conducted in the participant's house. Thus, bias (e.g., recall bias and prevarication bias) may have occurred in responding to certain questions. Additionally, as one member of the household may have provided responses for other residents, sexual minority status could be underreported.
2. Certain individuals were excluded from the survey including persons in long-term care institutions, correctional facilities, and U.S. nationals living in foreign countries (National Center for Health Statistics [NCHS], 2017a).

Assumptions

The assumptions for this study are as follows:

1. Respondents answered the interview questions accurately and honestly.
2. Participants have a sincere interest in the survey.
3. The inclusion criterion of the sample is appropriate, and they are a representative sample of U.S. adults.

Importance of the Study

Population-based research is limited for LGB individuals, especially for PA-related factors. With the inclusion of sexual orientation on the NHIS, it is now possible to provide a more accurate representation of the behavioral risk factors, protective factors, and associated health outcomes for LGB individuals. This research explored the effect of sexual orientation on PA, cigarette smoking, alcohol use, health status, and

mental/emotional health status as well as evaluate the effect of PA on self-reported behavioral risk factors, health status, and mental/emotional health status for LGB participants. The information obtained from this research will enable health educators and public health practitioners to create tailored prevention and intervention programs to improve the health of those in the LGB community.

CHAPTER II

REVIEW OF THE LITERATURE

A report was published in 1999 from the Institute of Medicine (IOM) highlighting the need for research focusing on sexual minorities to understand the specific needs and thus reduce health disparities (Rosario et al., 2014). In the 20 years prior to this report, only 0.1% of studies on physical health included sexual minorities (Boehmer, 2002). Even several years later, a 2011 report by the IOM showed little progress on existing data for sociodemographic and health-promoting factors among sexual minorities (Calzo et al., 2014). The need for national and state data collection on sexual orientation and gender identity was also listed as national objectives in the Healthy People 2020 goals (Gonzales & Henning-Smith, 2017). As a result of this research gap, precise demographics of LGB individuals were difficult to gather since sexual orientation and sexual identity were not usually asked on most state and national surveys until recently (ODPHP, 2014).

Since the publication of Healthy People 2020 highlighted the need for an "Increase [in] the number of population-based data systems used to monitor Healthy People 2020 objectives which collect standardized data that identify lesbian, gay and bisexual populations" (ODPHP, 2014, para. 1), local and national surveys have included questions regarding sexual orientation. The NHIS administered in 2013 was one of the first U.S. national surveys to include questions on sexual orientation (Gonzales &

Henning-Smith, 2017). The creation of these questions spanned over 11 years and were based upon results of eight cognitive testing studies and 386 comprehensive interviews (Eliason, Radix, McElroy, Garbers, & Haynes, 2016).

In the data release report, 3.4% of participants identified themselves as something other than heterosexual (Ward et al., 2016). When using this percentage (3.4%) for the entire United States population, currently at 323,127,513 (U.S. Census Bureau, 2017), it could be estimated that approximately 10,986,335 Americans identify as LGB or another sexual minority classification. Gates (2011) found even higher estimates of those who reported same-sex behavior and attraction than those who identified as LGB. Approximately 8.2% (19 million) of Americans reported engaging in same-sex behavior and 11% (25.6 million) reported same-sex attraction (Gates, 2011). Brown (2017) claimed these numbers have increased in recent years as social stigma has diminished, thus allowing for more suitable environments for individuals to "come out." Even with a safer social environment and decrease in social stigma, Anteby and Anderson (2014) argued that many sexual minorities still hide their sexual orientation in places such as work in order to avoid discrimination or termination.

Information pooled from multiple smaller state surveys has shown LGB individuals include members from all races and ethnicities, religions, social classes (ODPHP, 2014), ages, socioeconomic status (SES), and geographic location (IOM, 2011). Information from state-specific Behavioral Risk Factor Surveillance System (BRFSS) data from 2014-2015 shows LGB populations to be younger, less likely to be married or cohabitating, and racially and ethnically diverse (Gonzalez & Henning-Smith,

2017). Gay and bisexual men and lesbian women were less likely to have a child in the household when compared to heterosexuals, but bisexual women were more likely to have a child in the household when compared to heterosexual women (Gonzalez & Henning-Smith, 2017). Gay men and bisexual men and women were more likely to be unemployed, whereas lesbian women were more likely to have high levels of education and employment (Gonzalez & Henning-Smith, 2017). All LGB populations were more likely to be uninsured when compared to their heterosexual counterparts (Gonzalez & Henning-Smith, 2017). Additionally, lesbians and gay men are more likely to possess a bachelor's degree than heterosexuals or bisexuals, but gay men and bisexuals are more likely to be unemployed and bisexuals are more likely to live in poverty (Conron, Mimaiga, & Landers, 2010).

As LGB individuals are representative of varied backgrounds, more precise data is critical to address specific needs of this population. Additionally, over 1% of respondents on national surveys identified as "something else" or "I don't know" (Dahlhamer, Galinsky, Joestl, & Ward, 2014). Respondents who chose these answers were more likely to have lower education, but consistent follow-up remarks also included the need to avoid labels when asking about sexual orientation (Dahlhamer et al., 2014; Eliason et al., 2016). These responses could suggest misunderstanding of terminology, misuse of labels, or respondent denial of their own sexuality, which are all important factors to consider when collecting information on national trends. There has also been no standardization of sexual orientation questions at this point, which could cause

additional confusion of respondents when answering these questions (Eliason et al., 2016).

Health Disparities

The recent inclusion of sexual orientation monitoring in health surveys reveals the descriptive factors of individuals who identify as LGB, as well as the alarming health disparities. When compared to heterosexuals, LGB individuals have historically experienced health disparities related to social stigma, discrimination, marginalization (ODPHP, 2014), and antigay victimization (Lick, Durso, & Johnson, 2013). Research on LGB health-related quality of life is still limited, but recent studies suggest a poor overall health status (Lick et al., 2013) and overall lower quality of life for LGB individuals when compared to heterosexuals (Gonzales & Henning-Smith, 2017; Marti-Pastor et al., 2018).

Additionally, LGB populations have substantially higher rates of depression, anxiety, suicidal attempts (Rainbow Health Ontario [RHO], 2014), headaches, allergies, chronic diseases, asthma, osteoarthritis, gastro-intestinal problems (Lick et al., 2013), and behavioral risk factors of alcohol use, smoking, and drug use (ODPHP, 2014; Rosario et al., 2014). Reported drug abuse is 10-20% higher and alcohol abuse is 15-20% higher among LGB individuals (NAMI, 2018). Also, LGB individuals have higher rates of chronic disease such as CVD, asthma, obesity, and some cancers (Gorczynski & Brittain, 2016). Young adult LGB individuals are more likely to engage in unhealthy weight control behaviors and have higher negative self-perceptions about their weight compared to their heterosexual peers (Fenway Institute, 2016). Previous studies identified a higher

proportion of LGB individuals with eating disorders, body image distortion, and overweight/obesity (Fenway Institute, 2016; ODPHP, 2014). These physical health disparities inhibit activities of daily living and participation in PA and result in a higher prevalence and younger onset of physical disabilities requiring assistance such as a wheelchair or cane (Lick et al., 2013).

Even with these alarming health disparities for LGB populations overall, it is important to understand the unique disparities and challenges with each population. For instance, Gonzales and Henning-Smith (2017) analyzed data from the 2014-2015 BRFSS and discovered lesbian women were more likely to report frequent mental distress and fair or poor overall health. Lesbians were also more likely to be diagnosed with depression, chronic obstructive pulmonary disease (COPD), and asthma, and were more likely to be obese, current smokers, and binge drinkers (Gonzales & Henning-Smith, 2017). Bisexual women were more likely to report frequent mental distress and depression when compared to heterosexual women; in fact, nearly half (49%) of all bisexual women respondents reported a depression diagnosis at some point in their lives compared to only 22% of heterosexual women (Gonzales & Henning-Smith, 2017). Bisexual women were also more likely to report poor or fair health, activity limitations, poor physical health days, arthritis, COPD, and asthma, and were more likely to be obese, current smokers, and binge drink (Gonzales & Henning-Smith, 2017).

VanKim, Austin, Jun, and Corliss (2017) assessed data collected from nearly 100,000 women respondents in the Nurse's Health Study II from 1989, 1991, 1997, 2001, 2005, and 2009 to determine the differences in sedentary behaviors between lesbian and

bisexual women compared to heterosexual women. VanKim et al.'s research was consistent with similar findings in that lesbians and bisexual women were more likely to be obese and overweight; however, these higher obesity rates can be a result of sedentary behaviors (VanKim et al., 2017). Although findings showed higher PA levels among lesbian and bisexual women in young adulthood when compared to heterosexual women, these levels decreased during middle adulthood and beyond (VanKim et al., 2017). Another interesting finding revealed, when compared to heterosexual women, lesbian and bisexual women were more active in aerobic PA and bisexual women participated in more strengthening activities; however, lesbian and bisexual women were more sedentary overall than heterosexual women (VanKim et al., 2017). Lesbian and bisexual women reported sitting approximately four to five hours more per week than heterosexual women, which could explain the difference in obesity rates (VanKim et al., 2017).

Bisexual women are also more likely to report decreased PA levels as a result of mental, emotional, or physical problems (Blosnich, Farmer, Lee, Silenzio, & Bowen, 2014). Blosnich et al. (2014) examined data from 2010 BRFSS to compare results of mental and physical health, risk and preventive behaviors, and medical diagnoses. Blosnich et al. (2014), found no difference in mental health between lesbian, bisexual, and heterosexual women after adjusting for demographics, which is inconsistent with previous findings. However, they did find bisexual women were more likely to report PA limitations when compared to heterosexual women, which were due to physical, mental, or emotional problems (Blosnich et al., 2014). Lesbians were also nearly twice as likely to smoke and bisexual women were more than twice as likely to smoke when compared

to heterosexual women (Blosnich et al., 2014). Lesbian and bisexual women also reported higher rates of binge drinking, drinking and driving, and smokeless tobacco use (Blosnich et al., 2014).

Conron et al. (2010) collected data from the 2001-2008 Massachusetts BRFSS to examine health disparity patterns among LGB participants. They found lesbian and bisexual women had a higher prevalence of reporting multiple risks for heart disease and were more likely to smoke, use illegal drugs, and binge drink (Conron et al., 2010). Bisexual women were also two to three times more likely to report frequent feelings of worry, tension, or sadness and more likely to report thoughts of suicidal ideation when compared to heterosexual women (Conron et al., 2010). Sexual minority women were also more likely to report lifetime sexual assault victimization and bisexual women were more likely to report lifetime intimate partner violence (Conron et al., 2010). Consistent with previous findings, results showed lesbians had higher rates of overweight and obesity when compared to heterosexual women (Conron et al., 2010).

The prevalence of overweight and physical inactivity is less consistent with gay and bisexual men (Rosario et al., 2014). For example, some studies have found gay and bisexual men to have a lower prevalence of overweight and obesity when compared to heterosexual men (Conron et al., 2010; Deputy & Boehmer, 2010). However, Guadamuz et al. (2012) found higher rates of overweight and obesity among gay and bisexual men. Guadamuz et al. (2012) examined data from the Pitt's Men Study (PMS) to explore the relationship between obesity and risky sexual behaviors among gay and bisexual men. Although their study did not yield any correlation between obesity and risky sexual

behaviors, results indicated a high prevalence of overweight and obesity among gay and bisexual men (Guadamuz et al., 2012). In fact, over 50% of gay and bisexual respondents were overweight or obese, which could increase the risk of developing chronic illnesses such as heart disease, cancer, stroke, and type II diabetes (Guadamuz et al., 2012).

Deputy and Boehmer (2010) pooled data from the 2005 California Health Interview Survey (CHIS) and found strikingly different results than Guadamuz et al. (2012). Gay and bisexual men participating in the CHIS had a lower prevalence of overweight and obesity when compared to heterosexual men (Deputy & Boehmer, 2010). Although these differences may be attributed to geographic location, one in Pittsburg and the other in California, it requires further investigation to ascertain the true difference in weight status among sexual minority and heterosexual men. Inconsistencies in PA levels are also common when comparing sexual minority men to heterosexual men. For instance, Conron et al. (2010) found higher rates of physical inactivity among gay and bisexual men; however, Gonzales and Henning-Smith, (2017) found higher rates among bisexual men, but not gay men. Deputy and Boehmer (2010) found no difference in PA levels between gay, bisexual, and heterosexual men.

Despite the inconsistencies in associations between PA and weight status for gay and bisexual men, the health disparities are definitive when compared to heterosexual men. For example, Conron et al. (2010) found bisexual men were more likely to report poor or fair health, activity limitations, recent suicidal ideations, and ranked poorly on all three indicators of mental health (frequent tension, worry, or sadness). Both gay and

bisexual men were more likely to smoke currently or formerly, use drugs, drink, and report lifetime sexual assault victimization (Conron et al., 2010). Gonzales and Henning-Smith (2017) yielded similar findings of gay and bisexual men as more likely to smoke, but only gay men showed a higher rate of cancer and COPD diagnoses when compared to heterosexuals. Gonzales and Henning-Smith (2017) also revealed gay men were more likely to report frequent mental distress and depression; in fact, approximately 33% of gay men had been diagnosed with depression, compared to only 13% of heterosexual men (Gonzales & Henning-Smith, 2017). Results also indicated bisexual men were more likely to report mental distress, depression, poor/fair health, limitations to PA, asthma (Blosnich et al., 2014; Gonzales & Henning-Smith, 2017), and gay and bisexual men were more likely to report low quality of life (Blosnich et al., 2014).

Minority Stress

Past and current experiences of harassment, social stigma, victimization, bullying, violence, and other stressors experienced by LGB members are related to these aforementioned health disparities. A result of the heightened experiences of stigma and discrimination is a stressful social environment that culminates in mental and physical health problems, known as minority stress (Meyer, 2003). Meyer's minority stress model suggests individuals of disadvantaged social status (race, gender, sexual orientation) are exposed to social stress (discriminatory events, harassment, violence) and resources (social support) related to that status (Meyer, 2003).

According to Meyer (2003), LGB individuals experience three processes of minority stress: distal, objective stressful events and conditions which can be either

chronic or acute; expectations of these events and the vigilance required as a result; and the internalization of negative social stigma and attitudes, which includes the suppression or hiding of one's sexual orientation. Distal, objective stressors can be any event or situation that is not dependent on the individual's perceptions or personal identification (Meyer, 2003). For instance, a man can be sexually attracted to or participate in sexual activities with another man, yet he may not identify as gay or bisexual. However, if others categorize him as gay or bisexual, he could still experience the same stressors and stigma LGB individuals experience.

The second process, expectations of stressful events and resulting alertness, is more subjective as it includes the individual's perceptions and attributions (Meyer, 2003). If one identifies as LGB, this identity can result in various feelings and experiences. For instance, tensions and hostility towards sexual minorities are prevalent, especially in southern regions of the US where the representation of sexuality is more conservative in nature (Gill, Morrow, Collins, Lucey, & Schultz, 2010). This could result in chronic heightened vigilance and cautious interactions with others and at social gatherings. Rejection is another common experience for LGB individuals in all geographic locations, which can result in elevated expectations of rejection in all relationships including family, peers, and partners (Meyer, 2003).

In addition to heightened vigilance and expectations of rejection, sexual minorities can also internalize the stigma, creating a feeling of self-hate or internalized homophobia (Meyer, 2003). When society labels certain behaviors or feelings as "bad" or "wrong," individuals can feel shame for experiencing them. When a behavior or

"lifestyle" is characterized as wrong or abnormal, those who participate in these behaviors are marginalized as "others" within society (Wyatt-Nichol, 2014). These thoughts then become cultural values and norms of that time, which shapes society's way of thinking (Wyatt-Nichol, 2014). In spite of the tremendous efforts to shape the norms and protect the rights of lesbian, gay, bisexual, and transgender (LGBT) members such as partner benefits, marriage laws, and legal protections for LGB who experience hate crimes, most states still allow discrimination in housing, employment, public transportation, and other areas of basic human rights. Sexual orientation and gender identity have been in the media spotlight showing key figures such as high-ranking government officials using religion and other platforms as a method for discrimination, which can increase these feelings and behaviors among members of the dominant culture. As a result, many LGB individuals might conceal their identity for fear of harm from others (Meyer, 2003) or for fear of loss of basic rights such as termination of employment. In fact, recent studies discovered a higher prevalence of mood and anxiety disorders among LGB in areas without LGBT protective policies (Wyatt-Nichol, 2014).

These internal feelings of hatred or shame are also combined with the societal and psychiatric history of homosexuality and the role they play in current opinions and beliefs of same sex thoughts and behaviors. In the 20th century, mental health professionals sought to cure homosexuality due to the labeling of homosexuality as a disorder in the *Diagnostic and Statistical Manual of Mental Disorders* (DSM; Meyer, 2003; Molerio & Pinto, 2015). In the 50s, homosexuality was listed as a "sociopathic personality disturbance" in DSM-1 and then reclassified as a "sexual deviation" in the DSM-2

(Molerio & Pinto, 2015). It was not until 1973 when the classification of homosexuality was removed from the DSM as a mental disorder, but it was extremely controversial among mental health professionals and the American Psychiatric Association (APA) members (Meyer, 2003; Wyatt-Nichol, 2014). Although "homosexuality" was removed from the DSM, a compromise was made, and it was simply repackaged and replaced with "sexual orientation disturbance", which was later replaced with "ego dystonic disturbance" in 1980 (Molerio & Pinto, 2015). These diagnoses allowed for the practice of sexual conversion therapies and other treatment options in an effort to remove same-sex attractions (Molerio & Pinto, 2015). After several criticisms, "ego dystonic disturbance" was ultimately removed in 1987 (Molerio & Pinto, 2015), but was then relabeled as "sexual disorder not otherwise specified" and remained as such even in the 2000 revision of the DSM (Wyatt-Nichol, 2014). Homosexuality was also listed as an illness by the World Health Organization in the Internal Classification of Diseases (ICD) and was not removed until 1992 (Molerio & Pinto, 2015).

As a result of the history and disagreement among professionals, the heritage and stigma of homosexuality as a mental disorder and illness still lingers to this day. For instance, though the classification of "homosexuality" is no longer listed as a psychiatric disorder or disease, treatment is still available by mental health professionals, known as "conversion therapy" or sexual orientation change efforts (SOCE; Wyatt-Nichol, 2014). In years past, treatment options for homosexuality included pharmaceuticals, lobotomies, aversion therapy experiments, and psychoanalysis (Wyatt-Nichol, 2014). Despite the minimal effectiveness and risk of harm during SOCE, some mental health professionals

still attempt to convert LGB clients to heterosexuality (Molerio & Pinto, 2015). Methods can range from nontraditional experiments to support groups to psychotherapy, and providers can include mental health professionals (licensed and unlicensed), life coaches, and religious counselors (Wyatt-Nichol, 2014). In fact, since the initial declassification and relabeling of homosexuality in the DSM, religious organizations have taken the lead on societal norms and beliefs regarding sexual orientation (Wyatt-Nichol, 2014), shifting from a medical model approach to a moral issue.

Behavioral Risk Factors

Chronic diseases are the leading causes of death and disease worldwide, contributing to approximately 57 million deaths in a single year (Linardakis et al., 2015). Chronic diseases are noncommunicable diseases, with a large percentage preventable with healthy lifestyle behaviors. In the United States, the 10 leading causes of death accounted for 74% of all deaths in 2016, with chronic diseases accounting for 6 of the 10 (NCHS, 2017c). Approximately 67% of all healthcare costs and 93% of Medicare spending increases in the US are associated with adults diagnosed with multiple chronic diseases (Adams, Grandpre, Katz, & Shenson, 2017).

Habits or behaviors that can increase an individual's risk of one or multiple chronic diseases are known as behavioral risk factors, which can include smoking, alcohol use, overweight or obesity, and physical inactivity (NCHS, 2017c; Linardakis et al., 2015). These risk factors are responsible for millions of preventable deaths and numerous health problems each year. For instance, approximately 3.4 million deaths annually are a result of smoking and smoking-related deaths are predicted to double by

2030 (Linardakis et al., 2015). Overweight and obesity contribute to an additional 2.8 million deaths annually, which could be prevented with PA and a healthy diet (Linardakis et al., 2015).

Adams et al. (2017) evaluated the relationship between certain behavioral risk factors and chronic diseases of over 400,000 respondents from the 2013 BRFSS. Results showed 71.5% of American adults reported at least one chronic disease (i.e., heart disease, stroke, COPD, cancer, cognitive impairment, arthritis, asthma, chronic kidney disease), 17.1% reported four or more chronic diseases, and 96.4% reported at least one behavioral risk factor (i.e., smoking, obesity, sedentary lifestyle, inadequate fruit and vegetable consumption, lack of sleep; Adams et al., 2017). Results also showed risk factors were steadily linked to higher prevalence of multiple chronic diseases; when the number of risk factors increased, so did the diagnoses of chronic diseases (Adams et al., 2017). Researchers also discovered a link between the risk of CVD and other chronic diseases; many of the risk factors associated with CVD risk were also associated with a higher likelihood of other conditions (Adams et al., 2017). These results indicate the importance of public health efforts targeting behavioral risk factors to reduce the nation's leading causes of death.

Linardakis et al. (2015) looked at the relationship of four main behavioral risk factors (smoking, risky alcohol consumption, overweight or obesity, and physical inactivity) with physical and mental health among 26,026 adults aged 50 and over in 11 European countries. Linardakis et al. (2015) discovered similar findings as Adams et al. (2017), linking behavioral risk factors with poor health outcomes. Even though results

showed a high prevalence of risk factors among men and women, overweight or obesity, smoking, and risky alcohol consumption were higher among men with overweight and obesity being the most prevalent (Linardakis et al., 2015). Physical inactivity was higher among women than men and was the most prevalent risk factor for women (Linardakis et al., 2015). Men were more likely to have more than one risk factor, and these men were more likely to have more than one chronic disease (Linardakis et al., 2015). Additionally, researchers found adults had higher numbers of chronic diseases if they were physically inactive and high blood pressure was the most prevalent disease among adults with more than one risk factor (Linardakis et al., 2015).

Cigarette Smoking

Smoking is currently the leading cause of preventable death, disease, and disability in the United States (NCHS, 2017c) and is the leading cause of preventable death worldwide (Linardakis et al., 2015). Smoking is also associated with numerous chronic diseases such as stroke, heart disease, chronic lung diseases, and certain cancers (NCHS, 2017c). In the US, smoking results in approximately $289 billion in healthcare expenditures and losses in productivity and more than 480,000 deaths annually (Jamal et al., 2014). Globally, smoking is responsible for over 3.4 million deaths each year and this number is expected to double to 6.8 million preventable deaths by 2030 (Linardakis et al., 2015).

Although overall smoking rates have declined over the years, certain demographic groups continue to be at risk. For instance, adults without a high school diploma were more than 4 times as likely to smoke than those who obtained a 4-year degree from a

higher educational institution (NCHS, 2017c). Men were also more likely to smoke than women (Jamal et al., 2014), but these rates were more similar for men and women with some college education (NCHS, 2017c). LGB adults were also nearly twice as likely to smoke as heterosexuals, and individuals living in the South or Midwest had higher rates of smoking than other regions (Jamal et al., 2014).

Smoking has been linked to numerous diseases such as diabetes, COPD, pneumonia, 12 types of cancer, CVD, and influenza (Carter et al., 2015). Additionally, smoking increases the risk of mortality by two to three times, but this number is reported by investigating only the deaths that have formally established cause of death as smoking-related (Carter et al., 2015). Carter et al. (2015) investigated additional diseases that could be associated with smoking by pooling data from five U.S. cohort studies with 954,029 participants over an 11-year period. As predicted, results showed a higher mortality rate among smokers as a result of established smoking-related diseases, but researchers also discovered 17% more deaths among smokers as a result of non-established smoking-related deaths (Carter et al., 2015). For example, the mortality rate from renal failure and from infections were individually both twice as high among participants who smoked than those who never smoked, mortality rates decreased as time since quitting increased (Carter et al., 2015). Additionally, men who smoked were more likely to die from prostate cancer and women who smoked were more likely to die from breast cancer than non-smokers (Carter et al., 2015). Men and women who smoked also had a higher mortality rate from intestinal ischemia, hypertensive heart failure, respiratory diseases not listed in the Surgeon Generals list, rare digestive diseases, and all

rare cancers combined (Carter et al., 2015). These results indicate the number of smoking-related deaths in the U.S. is much larger than current estimates (Carter et al., 2015), making smoking even more dangerous than previously believed.

Alcohol Use

Alcohol consumption is another behavioral risk factor associated with chronic disease risk. In fact, the World Health Organization lists it as one of the leading health risk factors for disease burden in the world (Rehm et al., 2014). As the fourth leading cause of death in the US, excessive or heavy alcohol use costs approximately $249 billion in annual healthcare expenditures and productivity losses (Centers for Disease Control and Prevention [CDC], 2018). Heavy alcohol use is defined by the SAMHSA as binge drinking on five or more days within the past 30 days; binge drinking is defined as having five or more standard alcohol drinks for males or four or more alcohol drinks for females on the same occasion at least one day in the past month (National Institute on Alcohol Abuse and Alcoholism [NIAAA], 2017). Low-risk drinking is defined as no more than 3 drinks a day and no more than 7 drinks a week for women, and no more than 4 drinks a day and no more than 14 drinks a week for men (NIAAA, 2017).

Heavy drinking has been associated with more than 200 diseases and injuries, with more than 30 including "alcohol" in their name (Rehm et al., 2014). Short-term risks include violence (suicide, homicide, sexual assault, and intimate partner violence), injuries (motor vehicle crashes, burns, drownings, and falls), risky sexual behaviors (unprotected sex or sex with multiple partners), alcohol poisoning, and miscarriages among pregnant women (CDC, 2018). Long-term consequences of heavy alcohol

consumption include hypertension, heart disease, stroke, liver disease, digestive problems, various cancers, mental health problems such as depression and anxiety, learning and memory problems, social problems, and alcohol dependence (CDC, 2018).

Rehm et al. (2014) sought to measure the relationship of alcohol use disorders (AUD), which includes heavy alcohol use and alcohol dependence, with the associated disease and injury burden by utilizing data from the National Epidemiological Survey on Alcohol and Related Conditions. Results showed men had a higher prevalence of AUD than women in every age category, but AUD for both men and women decreased with age (Rehm et al., 2014). Results also showed approximately 53,000 male deaths and 12,000 female deaths annually (65,000 total deaths) were related to AUD, which was 4.5% of total mortality for men and 1.0% of total mortality for women (Rehm et al., 2014). Years of potential life lost due to premature mortality (YLL) and years of life lost due to disability (YLD) were also measured and showed alarmingly high numbers as well. Approximately 923,000 male YLL and 229,000 female YLL were associated with AUD, and 1,785,000 male YLD and 658,000 female YLD were discovered (Rehm et al., 2014).

Stahre, Roeber, Kanny, Brewer, and Zhang (2014) also wanted to investigate the burden of alcohol related morbidity and mortality, but they used the CDC's Alcohol-Related Disease Impact application for 2006–2010. Using this dataset, Stahre et al. (2014) found an average of 87,798 alcohol-related deaths annually from 2006 to 2010, an average of 9.8% of total deaths, which was significantly higher than those reported by Rehm et al. (2014). The most common cause of chronic alcohol-related death was liver

disease and the most common acute alcohol-related disease was motor vehicle crashes (Stahre et al., 2014). Stahre et al. (2014) also discovered 2,560,290 YLL during this timeframe, with 72% of cases involving males.

White et al. (2015) took a slightly different direction by investigating the patterns of alcohol use between men and women in the US utilizing data from the National Survey on Drug Use and Health. Previous studies (Rehm et al., 2014; Stahre et al., 2014) showed men have higher rates of alcohol use and associated outcomes. Additionally, men drink about twice as much alcohol per year than women and are more likely to experience alcohol poisoning, be arrested for driving under the influence, have alcohol use disorders at some point in lives, and are more likely to die from alcohol-related accidents (White et al., 2015). Results from their study indicated these gender gaps narrowed between 2002 and 2012. The overall prevalence of alcohol abuse for women remained stable, but decreased for men (White et al., 2015). Additionally, rates of self-reported driving under the influence decreased for men and women, but it was greater for males; binge drinking among young adults aged 18 to 25 who were not currently in college declined for males, but increased for females (White et al., 2015). These shifts in patterns have narrowed the gender gap of alcohol use and associated outcomes, which indicates further research is needed to explore reasons behind the sudden shift.

Body Mass Index

Body Mass Index (BMI) uses height and weight to measure an individual's weight category as underweight, healthy weight, overweight, or obese (National Heart, Lung, and Blood Institute [NHLBI], 2019). Adults are considered underweight if their

BMI is below 18.5 kg/m^2, healthy weight if their BMI is 18.5 to 24.9 kg/m^2, overweight if their BMI is 25 to 29.9 kg/m^2, and obese if their BMI is 30 kg/m^2 or greater (NHLBI, 2019). Overweight can increase the chances of certain health complications and obesity can cause complications such as metabolic syndrome, which increases the risk for heart disease and other health problems such as diabetes and stroke (NHLBI, 2019). Other complications include type 2 diabetes, high cholesterol, respiratory problems, back pain, diseases of the heart and blood vessels (hypertension, atherosclerosis, stroke, and heart attack), non-alcoholic fatty liver disease, osteoarthritis, urinary incontinence, gallbladder disease, certain cancers, and emotional health issues (NHLBI, 2019).

Overweight and obesity are becoming increasingly common in the US with nearly a 15% increase in obesity rates over the past 15 years, with nearly 38% diagnosed as obese in 2014 (CDC, 2018). Additional rises over the years include the percentage of adults aged 20 and over with Grade 1 obesity (BMI of 30.0–34.9 kg/m^2) increasing from 14.8 to 20.7% between 1988-1994 and 2013-2014, Grade 2 obesity (BMI of 35.0–39.9 kg/m^2) increasing from 5.2 to 9.5%, and those with Grade 3 obesity (BMI of 40 kg/m^2 or higher) increasing from 2.9 to 7.6% (NCHS, 2017c). Obesity in children also increased from 10.0% to 17.2% over the same time period (NCHS, 2017c). Current linear time trend forecasts of obesity predict 51% of the population will be obese by 2030 (Finkelstein et al., 2012).

Finkelstein et al. (2012) took a different approach than previous researchers to predict future obesity and severe obesity levels. Using data from the BRFSS over a 19-year period, Finkelstein et al. (2012) used nonlinear regression modeling to predict trends

in individual and state-level variables expected to impact obesity prevalence. Individual-level variables included demographic characteristics such as gender, age, race/ethnicity, education, marital status, and annual household income (Finkelstein et al., 2012). State-level variables were chosen based upon prior studies that revealed an effect on obesity prevalence, including annual unemployment rates, access to the Internet, number of fast food and full-service restaurants, and prices of groceries, healthy foods, alcohol, gas, and fast food (Finkelstein et al., 2012).

Throughout the time of the study, self-reported obesity and severe obesity prevalence more than doubled over 19 years (Finkelstein et al., 2012). Unemployment decreased at first but then increased, and increases were also seen in alcohol and gas prices, restaurants, and access to the Internet; other variables remained relatively stable or decreased slightly (Finkelstein et al., 2012). These results allowed researchers to create forecasts based on nonlinear time trends which suggest an obesity prevalence of 42%, 9% less than originally predicted, in 2030 (Finkelstein et al., 2012). Although this new prediction of obesity is lower than others, severe obesity prevalence is expected to be higher than originally predicted at 11% (Finkelstein et al., 2012). These results estimate a 33% increase in obesity and a 130% increase in severe obesity over the next 20 years, which will have a tremendous impact on the health of the nation and healthcare expenditures (Finkelstein et al., 2012).

Physical Activity

A promising strategy to address health disparities in LGB populations is the inclusion of PA, which has been shown to promote feelings of wellbeing (RHO, 2014),

control weight, and decrease risks for heart disease, diabetes, and some cancers (Calzo et al., 2014; HHS, 2008). Psychological health is one of the top health issues for LGB populations (RHO, 2014), and PA is associated with numerous psychological health benefits such as elevated mood, decreased stress, less anxiety, decreased risk for depression, improved body image, and an increased feeling of overall wellbeing (CDC, 2017; HHS, 2008). Lesbians and bisexual women are more likely to be overweight or obese and have higher levels of physical inactivity when compared to heterosexual women (ODPHP, 2014). Regular PA is associated with a leaner body composition and reduction of overweight and obesity, which could significantly decrease negative health outcomes for sexual minorities.

Despite these benefits, very limited data is available on PA programs designed specifically for LGB communities even though tailored programs are shown to be successful for other groups (Bopp, 2018). Participation rates in PA are lower among LGB individuals; therefore, tailored approaches could yield promising results (Gorczynski & Brittain, 2016). In addition to the typical reasons for inactivity, including lack of time and motivation, LGB individuals may experience discrimination, judgment, and unsafe environments. For example, gyms and locker rooms are common places where LGB members do not feel safe because of the potential for bullying and assault (Gill et al., 2010; RHO, 2014). Due to the environment where the abuse or negative experiences occurred (gyms and locker rooms), negative thoughts and emotions can be associated with PA in general (Dishman, Heath, & Lee, 2013).

This discrimination typically begins at a very early stage in life. Homophobic and heterosexist remarks and behaviors are very common in the school setting especially during physical education (PE) class; however, studies show less than 50% of teachers actually confront homophobia (Gill et al., 2010). The lack of teacher intervention may be due to the lack of guidance on how to address these topics in addition to the comfortability of teachers in discussing sexuality. Tension and hostility towards sexual minorities are more prevalent in southern schools (Gill et al., 2010) where the discussion of sex and sexuality is more conservative in nature. PE is supposed to provide students with the necessary knowledge base and skillset to live healthy and active lives, and participation in PE has been linked to higher academic success, social skills, and mental health (Greenspan, Griffith, & Murtagh, 2017). However, LGB students may not be receiving these vital skills and reaping the benefits due to the hostile environment many LGB students experience (Greenspan et al., 2017). In fact, these experiences might lead to discouragement of PA involvement altogether (Greenspan et al., 2017), which carries into adulthood.

In addition to the hostile climate, homophobia and social stigma are prevalent in PA environments, especially organized sports. For example, athleticism is often associated with masculinity, which is associated with heterosexuality for men and homosexuality for women. For men, this results in the creation of a specific masculine identity where any deviation may result in mockery, harassment, and violence (Gill et al., 2010). For women, a common stereotype is that good athletes are masculine, therefore, they are lesbian (Calzo et al., 2014; Gill et al., 2010). Although this stigma may result in

ridicule and discrimination, especially for younger athletes, sexuality-driven physical violence is less prevalent in women's sports than in male sports (Gill et al., 2010). These stereotypes may result in gay or bisexual male athletes hiding their sexual orientation or avoiding organized sports altogether. Similarly, lesbian and bisexual females might avoid organized sports for fear of being labeled a lesbian (Gill et al., 2010). Nonetheless, both male and female sexual minorities are less likely to participate in PA and organized sports than their heterosexual counterparts (Calzo et al., 2014), which may be a result of the social stigma.

Hegberg and Tone (2015) looked specifically at the relationship between PA and stress resilience among 222 undergraduate students at a Southern university. Similar to previous research, Hegberg & Tone (2015) found PA to be a protective factor for mental health by enhancing participants' response to stress. More specifically, a significant positive relationship was discovered between PA and self-perceived resilience among those with high-trait anxiety (Hegberg & Tone, 2015). These results indicate that PA can serve as a protective factor by enhancing resilience and reducing the likelihood of stress-related disorders for those who are at risk for mental health problems (Hegberg & Tone, 2015), such as LGB populations.

White et al. (2017) dove a little deeper with their investigation of the relationship of PA with mental health by reviewing 98 studies over a 27-year period. Researchers defined mental health in a positive manner associating it with healthy coping responses, positive emotions, and maintaining interpersonal relationships; whereas, mental ill-health was characterized with low self-esteem, inability to maintain relationships, and high risk

of infectious and non-infectious diseases (White et al., 2017). The results were consistent in showing PA to be associated with a reduced risk of mental ill-health, specifically anxiety and depression, and greater mental health (White et al., 2017). In their review, White et al. (2017) found a difference in positive mental health association with the type of PA. For example, leisure-time PA had a positive relationship with mental health and an inverse association with mental ill-health; however, other types of PA such as work-related PA, school sport, physical education, and household PA had mixed results (White et al., 2017). Work-related PA even had a positive association with mental ill-health (White et al., 2017). These results indicate the importance of PA type when considering PA as a method to combat mental health ailments such as anxiety and depression.

Rebar and Taylor (2017) agreed with the stance of PA promotion as a key strategy to enhance mental health, stressing the importance of a tailored, evidence-based program unique to the individual's situation. In order to effectively combat mental health problems with PA, health professionals should focus on the unique barriers, resources and opportunities, and willingness and commitment of the individual to participate in PA (Rebar & Taylor, 2017). For instance, individuals with depression frequently reported emotion-related barriers to initiation and adherence to PA programs, which indicates a need for emotion-focused PA programs instead of cognitive-focused programs typically used (Rebar & Taylor, 2017). Without this tailored approach, PA will not directly lead to the health benefits and protective factors outlined previously since adherence will likely suffer (Rebar & Taylor, 2017). What works for one population may not work for another

and what once worked may not work for the same people at a different time (Rebar & Taylor, 2017).

Although evidence-based, tailored PA is a promising strategy to address the many health disparities for LGB individuals, it is important that interventions meet the recommended guidelines for optimal health outcomes. Key guidelines for adults are outlined in the 2008 PA Guidelines for Americans, including the participation in a minimum of 150 minutes of moderate-intensity aerobic PA, 75 minutes of vigorous-intensity aerobic PA per week, or a comparable combination of the two (HHS, 2008). According to HHS (2008), muscle strengthening activities are important as well, recommending at least 2 or more days a week of moderate to high-intensity activities focusing on all major muscle groups. Adhering to these guidelines can result in numerous health benefits including improved overall fitness and muscular strength, improved quality of life, enhanced psychological health, stronger bones, and lower risk of chronic disease such as CVD, diabetes, depression, and certain cancers (Gorczynski & Brittain, 2016).

Kim et al. (2012) put these recommended levels to the test by investigating the correlation between mental health and the optimal level of PA. Researchers gathered information from 7,674 adult respondents in the 2008 U.S. Health Information National Trends Survey (HINTS) and looked at reported mental and physical health status and weekly participation in PA, both leisurely and non-leisurely (Kim et al., 2012). Results were promising in that participants with higher levels of mental health were more likely to have optimal participation in PA (Kim et al., 2012). Individuals who participated in

approximately two to four hours of PA a week experienced the highest levels of mental health; however, beyond four hours of PA, the trend started to reverse (Kim et al., 2012). These results indicate two to four hours of PA a week is best for overall mental health (Kim et al., 2012), which is consistent with current recommendations for PA.

Summary

Due to the historical exclusion of LGB individuals in research, there is a gap in knowledge regarding PA adoption and adherence which prevents public health professionals from creating evidence-based interventions tailored to fit the specific needs and barriers for LGB populations. This is a major public health concern because, until recently, national surveys did not gather information on sexual orientation. Smaller studies have shown low PA participation rates for LGB (Gorczynski & Brittain, 2016). Given these lower rates, further investigation is needed so LGB members can enjoy the same health benefits and outcomes as their heterosexual peers.

Even with the need for further investigation, known health disparities do exist for this population. LGB individuals face similar barriers as their heterosexual peers; however, specific health disparities affect LGB individuals as a result of discrimination and societal stigma such as mental health disorders, substance abuse, and suicide (ODPHP, 2014). LGB members also have higher prevalence of smoking, drinking, substance abuse, obesity, and associated comorbidities (Cochran et al., 2016; Fenway Institute, 2016; Ward et al., 2014), and are more likely to report worse overall health, monthly binge drinking, and frequent mental distress (Cochran et al., 2016). As a result of these behaviors and associated comorbidities, all members of the LGB community are

at greater risk for early mortality than heterosexual men and women (Cochran et al., 2016).

Positive health benefits of PA spread across physical, psychological, and social dimensions of health can include decreased risk of heart disease, type 2 diabetes, some cancers, and obesity (HHS, 2008). PA also promotes improved mental health by reducing symptoms of depression, improving self-esteem and health-related quality of life, and reducing the risk of premature death (HHS, 2008). A comprehensive approach is needed to examine the unique experiences of LGB individuals, including the effect of PA on general health status, chronic disease, and psychosocial health (Gorczynski & Brittain, 2016) as well as risk factors associated with those health outcomes (ODPHP, 2014).

CHAPTER III

METHODOLOGY

This study utilized data collected as part of the 2016 NHIS conducted by the CDC's National Center for Health Statistics (NCHS). Participants were chosen based on multistage sampling techniques in the 2016 U.S. NHIS, which is a cross-sectional survey conducted through personal household interviews offered in English or Spanish (NCHS, 2017a).

NHIS has monitored the health in the United States since 1957, beginning with the National Health Survey Act of 1956. This Act initiated data collection on a broad range of health topics to provide accurate and relevant statistical information. The U.S. Census Bureau has been the data collection agent for the National Health Interview Survey for over 50 years, and the information collected has been key in tracking health status, health problems, health behaviors, health disparities, health care access, and evaluating health programs and progress towards the nation's health objectives (NCHS, 2017a).

Population and Sample

Prior to initiation of the study, the researcher received exempt approval from Texas Woman's University's Institutional Review Board (IRB). Current PA guidelines are different for children and adolescents than for adults (individuals 18 and over), so only adults were included in this study. To address public health research needs, questions regarding sexual orientation were added to the 2013 NHIS to begin collecting

vital information on LGB populations (CDC, 2016). There is a gap in data for sexual minorities, especially for PA-related factors, so LGB populations are the target population for this study.

NHIS sampling and interviews continue throughout the year for all states and the District of Columbia (NCHS, 2018). Information is collected from one sample adult and one sample child (if applicable) who are randomly selected from each family in the NHIS, which is included in the Sample Adult and Sample Child component (NCHS, 2018). Any adult household members who were present at the time of the interview were eligible to take part. Information regarding adults not participating in the interview, as well as household members under 18, was provided by a knowledgeable adult member of the household. Participation in the survey is voluntary and the confidentiality of responses is guaranteed under Section 308(d) of the Public Health Service Act (NCHS, 2018). The response rate of NHIS is approximately 70% of the eligible households in the sample (NCHS, 2018).

Data Collection Procedures

NHIS questionnaires are completed in a personal household interview by trained U.S. Census Bureau employees using NCHS-specified procedures (NCHS, 2018). The interviewers use a laptop computer and enter the information at the time of the interview, which saves time and improves data quality and accuracy (NCHS, 2018).

The 2016 NHIS questionnaire consisted of two parts: Core Questions and Supplements. The Core Questions include basic health and demographic items that have changed very little over the years, thus allowing for trend analyses (NCHS, 2018). The

Core includes four major components: Household, Family, Sample Adult, and Sample Child. The Household component collects the demographics on individuals living in a particular house; the Family component verifies this information and collects additional information on each member including topics such as health status and income; and the Sample Adult (and Sample Child if applicable) component collects information on one adult selected randomly from each family in the NHIS (NCHS, 2018). The Supplements adapt to emerging public health needs and focus on information required to assess progression of the current Healthy People objectives (NCHS, 2018).

This study used information collected mostly in the Sample Adult Questionnaire, which had a response rate of 80.9% and includes 33,028 respondents (NCHS, 2017a). The variables for this study included sexual orientation, health status, PA, BMI, cigarette smoking, alcohol use, mental health status, and demographic variables: sex, race, ethnicity, armed forces status, age, and income. Each component of the questionnaire is then further broken down into specific sections. Sexual orientation was gathered in the Adult Selected Items (ASI) section, questions regarding occupation and employment were gathered in the Adult Socio-Demographics (ASD) section, and other demographics such as sex, race, ethnicity, armed forces status, age, and income were included in the Household Composition Section (HHC) of the Family Core. Health status is included in the Adult Health Status and Limitation of Activity (AHS) section, and information regarding cigarette use, leisure-time PA, alcohol use, height, and weight were included in the Adult Health Behaviors (AHB) section. Information regarding current mental or

emotional health and the extent to which these feelings interfere with daily activities were included in the ASI section.

When gathering information on the respondent's sexual orientation, the question asked, "Which of the following best represents how you think of yourself?" Responses included, "Lesbian" (if respondent was female) or "Gay" (if respondent was male), "Straight," "Bisexual," "Something else," "I don't know the answer," or refused to answer (NCHS, 2017a). Health status was measured by asking respondents to assess their own health as "excellent," "very good," "good," "fair," or "poor" (NCHS, 2017a).

Leisure-time PA was assessed by asking adult respondents how often they participated in vigorous-intensity leisure PA, light-moderate leisure PA, and strengthening activities (NCHS, 2017b). These responses were compared to the 2008 federal PA guidelines to determine if the minimum amount of PA was obtained for optimal health benefits. Respondents were considered *healthy* if they met the guidelines of 150 minutes per week of moderate-intensity aerobic PA, 75 minutes of vigorous-intensity aerobic PA, or an equivalent combination of moderate- and vigorous-intensity aerobic activity AND participated in strengthening activities at least two days per week (HHS, 2008).

Cigarette smoking was assessed by asking, "Have you smoked at least 100 cigarettes in your ENTIRE LIFE?" Participants who answered "yes" were then asked, "Do you NOW smoke cigarettes every day, some days or not at all?" To assess alcohol use, respondents who confirmed having 5+ (males) or 4+ (females) drinks in one day at least once in the past year, were asked, "Considering all types of alcoholic beverages,

DURING THE PAST 30 DAYS, how many times did you have [fill: 5 or more/4 or more] drinks on an occasion?" These questions were selected to assess binge drinking and heavy alcohol use. Binge drinking is defined as drinking five or more alcohol beverages for males and four or more alcoholic drinks for females on one occasion at least one day in the past 30 days (SAMHSA, 2015). Heavy alcohol use is defined as binge drinking at least five days in the past 30 days (SAMHSA, 2015). Lastly, questions about depression and anxiety were asked to respondents who had experienced difficulties participating in daily activities, such as going out in public, participating in social activities, and relaxing or participating in leisure activities. Depression and anxiety were measured by asking, "What condition or health problem causes you to have difficulty?", which was followed by a list of various health conditions including depression and anxiety.

Data Analysis

The statistical software R (R) was used to analyze the data for this study. Only respondents identified as LGB were used for H01-H03. For H04, an equally sized matching random sample of heterosexual respondents for comparative analysis with LGB respondents, the function "sample" in R software was used, which takes a sample of the specified size (331) from the specified population (heterosexual participants) without replacement (R Documentation, n.d.). Descriptive statistics were used to evaluate sociodemographic variables (sex, age, race, ethnicity, armed forces status, income), health behaviors (PA, cigarette smoking, alcohol use), and health outcomes (BMI).

Hypotheses were analyzed using chi-square, ANOVA, ANCOVA, logistic regression, and multinomial logistic regression.

Summary

Due to the scarcity of research on PA and health outcomes based on sexual orientation, this study sought to determine if sexual orientation is a predictive factor of certain health behaviors and outcomes. Utilizing data from the 2016 NHIS, this research study focused on the following: (1) to evaluate the effect of PA on self-reported behavioral risk factors, and health status for LGB participants; and (2) to evaluate the effect of sexual orientation on PA, cigarette smoking, alcohol use, and health status.

CHAPTER IV

RESULTS

The purpose of this research study had a two-pronged focus: 1) to evaluate the effect of PA on self-reported behavioral risk factors, and health status for LGB participants; and 2) to evaluate the effect of sexual orientation on PA, cigarette smoking, alcohol use, and health status. Descriptive variables of sex, race, ethnicity, armed forces status, age, BMI, and income were included as covariates in the analyses.

The final sample used for Hypotheses One, Two, and Three included 331 LGB participants, and Hypothesis Four included a comparative non-LGB sample resulting in 662 total participants. The original sample included 33,028 participants from the 2016 NHIS (NCHS, 2017a). The sample was 54.6% female and 45.4% male, and the mean age of the sample was 50.77 years of age. The sample was 77.8% White, 11.3% Black/African American, 1.2% Indian American (includes Eskimo), 1.2% Filipino, 1.1% Asian Indian, 1.0% Chinese, and 6.4% Other/multiple races. Ethnicity was asked separately; the sample was 88.5% non-Hispanic, 3.9% Mexican, 2.8% Mexican-American, and 4.8% Other ethnicity. Region of residence for the sample was 16.9% Northeast, 22.2% Midwest, 34.8% South, and 26.1% West.

Of the total sample, 93.7% (n = 30,952) of participants identified as "straight, that is, not gay," 2.6% identified as LGB (1.6% Gay/Lesbian and 1.0% Bisexual), and 0.4% identified as "Something else," 0.8% answered "I don't know the answer," and 0.6% refused to answer. The demographic characteristics of the sexual minority subsample (n

= 850) indicate an average age of 42.49 for respondents. This subsample was 44.9% male and 55.1% female. Approximately 80.7% of the subsample was White, 9.9% Black/African American, 1.4% Indian American (includes Eskimo), 1.1% Filipino, 5.3% Other races, and .8% Multiple races.

For this study, 519 respondents in the subsample who were missing responses to the study outcome questions were excluded resulting in 331 participants. Frequencies and percentages for categorical demographic variables are shown in Table 1. Region of residence for this sample (n = 331) was 18.1% from the Northeast, 18.1% from the Midwest, 29.9% from the South, and 33.8% from the West. Of the 331 participants, 50.2% were female and 49.8% were male, with most identifying as non-Hispanic (90.3%) and Caucasian (84.9%). The level of total combined family income was more diverse with a large percentage (36%) of low income (less than $34,999), followed by low medium income (27.5%; $35,000 - $74,999), high income (26%; $100,000 and over), and medium high income (10.6%; $75,000 - $99,000). Those with a combined family income of less than $75,000 accounted for 63.5% of the sample.

Table 1

Frequencies and Percentages for Categorical Demographic Variables

Categorical Variable	*n*	%
Sex		
Female	166	50.2
Male	165	49.8
Ethnicity		
Not Hispanic or Latino	299	90.3

Table 1 Continued

Other	32	9.7
Race		
Caucasian	281	84.9
Other	50	15.1
Armed Forces Status		
No	305	92.1
Yes	26	7.9
Income		
High	86	26.0
Medium High	35	10.6
Low Medium	91	27.5
Low	119	36.0
Region		
Northeast	60	18.1
Midwest	60	18.1
South	99	29.9
West	112	33.8

Note. Frequencies not summing to $N = 331$ reflects missing data

Means and standard deviations for the continuous demographic variables are outlined in Table 2. Participant ages ranged from 18 to 82 years ($M = 39.11$, $SD = 15.0$). BMI ranged from 18.02 to 67.44 ($M = 28.03$, $SD = 6.92$). Healthy BMI is 18.5-24.9, overweight is 25-29.9, and obese is 30 or greater (NHLBI, 2019). The mean BMI for participants was 28.03, which is overweight.

Table 2

Means and Standard Deviations for Continuous Demographic Variables

	n	Minimum	Maximum	Mean	Std. Deviation
Age	331	18	82	39.11	15.0
BMI	331	18.02	67.44	28.03	6.92

Frequencies and percentages for categorical independent and dependent variables are shown in Table 3. Smoking status for participants included 59.2% who never smoked, 16.9% who currently smoke, and 23.9% who were former smokers. Alcohol use showed 54.4% of participants to be light drinkers (12 or more drinks in lifetime and 3 drinks or fewer per week in the past year), 30.5% who were moderate drinkers (12 or more drinks in lifetime and 3 to 14 [male] / 3 to 7 [female] drinks per week in the past year), and 15.1% who were heavy drinkers (12 or more drinks in lifetime and more than 14 [male] / 7 [female] drinks per week in the past year). Self-reported health status ranged from fair/poor to excellent: 5.1% fair/poor, 24.5% good, 39.6% very good, and 30.8% excellent. There were a lot of missing values for self-reported depression and anxiety, but 6.7% reported depression and anxiety affected their daily activities while 22.7% reported it did not.

Table 3

Frequencies and Percentages for Categorical Independent and Dependent Variables

Categorical Variable	*n*	%
Smoking status		
Never smoked	196	59.2
Current smoker	56	16.9
Former smoker	79	23.9
Alcohol		
Light drinker	180	54.4
Moderate drinker	101	30.5
Heavy drinker	50	15.1
Health status		
Excellent	102	30.8
Very good	131	39.6
Good	81	24.5
Fair/Poor	17	5.1
Participate in recommended amount of PA		
Yes	25	7.5
No	303	91.5
Daily activities affected by depression/anxiety		
Yes	22	6.7
No	75	22.7

Note. Frequencies not summing to $N = 331$ reflects N/A or missing data.

Means and standard deviations for continuous independent and dependent variables are outlined in Table 4. Frequency of vigorous activity ranged from 0 to 21 times per week ($M = 3.35$ $SD = 3.27$). The duration of vigorous activity ranged from 10 to 300 minutes ($M = 50.49$ $SD = 37.58$). Frequency of moderate activity ranged from 0 to 28 times per week ($M = 5.0$, $SD = 3.68$). The duration of moderate activity ranged from 10 to 360 minutes ($M = 43.57$, $SD = 39.24$). Strength training participation ranged

from 0 to 21 times per week (M = 1.28, SD = 1.73). Binge drinking was the number of times the participant had 5+ (males) or 4+ (females) drinks on one single occasion within the past 30 days, which ranged from 0 to 99 (M = 3.06, SD = 8.36).

Table 4

Means and Standard Deviations of Continuous Independent and Dependent Variables

	n	Minimum	Maximum	Mean	Std. Deviation
Frequency of vigorous exercise	331	0	21	3.5	3.27
Duration of vigorous exercise	331	10	300	50.5	37.58
Frequency of moderate exercise	331	0	28	5	3.68
Duration of moderate exercise	331	10	360	43.5	39.24
Strength training	331	0	21	2	2.63
Binge Drinking	183	0	99	3	8.36

Note. Frequencies not summing to N = 331 reflects N/A or missing data.

Hypothesis 1: There will be no statistically significant relationship between physical activity and health status, cigarette smoking, alcohol use, and obesity for LGB participants

Respondents were considered *healthy* if they met the recommended PA guidelines for Americans which includes 150 minutes per week of moderate-intensity aerobic PA, 75 minutes of vigorous-intensity aerobic PA, or an equivalent combination and participated in strengthening activities at least two days per week (HHS, 2008). Vigorous-intensity aerobic PA was measured by combining the frequency (VIGFREQW) and duration (VIGMIN) of self-reported vigorous-intensity PA per week. Moderate-intensity aerobic PA was measured by combining the frequency (MODFREQW) and duration (MODMIN) of self-reported vigorous-intensity PA per week. Strengthening activities were measured using the frequency (STRFREQW) of strength activities (times per week).

Chi-square tests of independence were performed to examine the relation between PA and smoking, alcohol, and health status (see Table 5). Since two of the expected values were less than five for each dependent variable (smoking, alcohol, and health status), the requirements were not met. Thus, Monte-Carlo simulation was done to simulate the *p*-value for 2000 replicates of the data. The relation between smoking and PA was not significant, $\chi 2$ (1, N = 331) = 1.835, p = 0.4193. The relation between alcohol status and PA was not significant, $\chi 2$ (1, N = 331) = 2.632, p = 0.3128. The relation between health status and PA was not significant, $\chi 2$ (1, N = 331) = 2.351, p = 0.5282.

Table 5

Pearson's Chi-Squared Test

	X^2	*df*	*p*
Smoking	1.835	-	0.419
Alcohol	2.632	-	0.313
Health status	2.351	-	0.528

Note. Simulated *p*-value based on 2000 replicates

When assessing individual quantitative PA variables (VIGFREQW, VIGMIN, MODFREQW, MODMIN, STRFREQW), at 0.05 significance level, the *p*-value of multivariate linear regression model of 0.2248 suggests there is no significant linear relationship between PA and alcohol use. However, at significance level 0.05, there seems to be a significant linear relationship between alcohol use and vigorous activity duration holding other variables constant (see Table 6). A significant regression equation was found ($F(5,325) = 1.397$, $p < .225$), with an R^2 of .021. Minutes of vigorous PA was a significant predictor of alcohol use. This indicates that as the minutes of vigorous PA increases, alcohol use increases.

Table 6

Alcohol use and Physical Activity Variables

	B	St. Error	*t*	Sig.
VIGFREQW	0.14	1.01	0.14	0.89
VIGMIN	0.15	0.07	2.10	0.04*

Table 6 Continued

MODFREQW	-0.37	0.86	-0.43	0.67
MODMIN	0.06	0.07	0.80	0.43
STRFREQW	-0.68	1.06	-0.64	0.52

*Note. *p < .05. **p < .01. ***p < .001*

Multinomial logistic regression suggests that frequency of strength training has a significant relationship with smoking status (see Table 7). For current smokers, the associated *p*-value Wald test statistic for the predictor STRFREQW is 0.036. Thus, at significance level 0.05, we reject the null hypothesis and conclude that for current smokers the regression coefficient for STRFREQW has been found to be statistically significant, indicating that as an individual increases their strengthening activities, he or she is more likely to be a non-smoker versus a current smoker.

Table 7

Smoking and Physical Activity Variables

	(Intercept)	VIGFREQW	VIGMIN	MODFREQW	MODMIN	STRFREWQ
Current smoker vs never smoked	0.000	0.253	0.908	0.864	0.097	0.036*
Former smoker vs never smoked	0.038	0.481	0.294	0.432	0.672	0.062

*Note. *p < .05. **p < .01. ***p < .001*

Results of BMI with a *p*-value of 0.109 suggest there is no significant linear relationship between BMI and PA. However, with significance level of 0.05, there seems to be a significant linear relationship between the frequency of vigorous activity and BMI (see Table 8). A multiple linear regression was calculated to predict BMI based on PA. A significant regression equation was found ($F(5,325) = 1.817$, $p = .109$), with an R^2 of .027. Frequency of vigorous PA was a significant predictor of BMI, indicating that as the frequency of vigorous PA increases, BMI decreases.

Table 8

BMI and Physical Activity Variables

	B	St. Error	*t*	Sig.
VIGFREQW	-39.49	14.49	-2.73	0.007**
VIGMIN	-1.04	1.05	-0.99	0.32
MODFREQW	15.18	12.31	1.23	0.22
MODMIN	0.28	1.0	0.28	0.78
STRFREQW	20.16	15.16	1.33	0.18

*Note. *p < .05. **p < .01. ***p < .001*

Hypothesis 2: There will be no statistically significant relationship between physical activity and sociodemographic factors for LGB participants of the 2016 NHIS

A chi-square test of independence was performed to examine the relationship between sex and PA. The requirement of expected values being greater than 5 was met.

Thus, the relation between these variables was not significant, χ^2 (1, N = 331) = 0.719, p = 0.3966. The requirements to run chi-square test of independence to examine the relationship between PA and other sociodemographic factors such as race, ethnicity, income, armed force status, and region were not met. Thus, Monte-Carlo simulation of 2000 replicates of the data was done to simulate the *p*-values. No significant relationship was found between PA and region (p = 0.302), armed forces status (p = 1), ethnicity (p = 0.308), or income (p = 0.665). However, the relationship between race and PA was significant, χ2 (1, N = 331) = 28.704, p = 0.0005 (see Table 9), indicating Caucasian participants were less likely to participate in the recommended amount of PA than Other races.

Table 9

Pearson's Chi-squared Test

	X^2	*df*	*p*
Race	28.704	-	0.0005*
Sex	0.719	1	0.397
Ethnicity	1.242	-	0.308
Income	1.726	-	0.665
Armed forces status	0.0007	-	1
Region	3.65	3	0.302

Note. simulated *p*-value based on 2000 replicates

Logistic regression was conducted with dependent variable PA and independent variable age. At significance level of 0.05, the test suggests there is a significant

relationship between age and PA, *p*-value = 0.038, indicating that as age increases, PA decreases (see Table 10).

Table 10

Age and Physical Activity

	B	St. Error	z	Sig.
Age	-0.035	.017	-2.074	0.038*

*Note. *p < .05. **p < .01. ***p < .001*

Hypothesis 3: Physical activity will not increase nor decrease cigarette smoking, alcohol use, BMI, and health status for LGB participants of the 2016 NHIS (with and without controlling for other sociodemographic factors)

A one-way analysis of variance (ANOVA) was calculated on participants' reports of BMI and PA. The model contained BMI as the dependent variable, one independent fixed factor (PA), and seven covariates (sociodemographic factors). Results of ANOVA with a *p*-value of 0.644 were run to check if sociodemographic factors have a significant relationship in predicting BMI using PA. With significance level of 0.05, multiple regression models show frequency of vigorous activity is significant in predicting BMI (see Table 11). A multiple linear regression was calculated to predict BMI based on PA. A significant regression equation was found ($F(16,314) = 1.112$, $p = 0.343$), with an R^2 of 0.054. Frequency of vigorous PA was a significant predictor of BMI, indicating that as the frequency of vigorous PA increases, BMI decreases.

Table 11

BMI and Physical Activity Variables

	B	St. Error	t	Sig.
VIGFREQW	-41.26	14.72	-2.80	0.005**
VIGMIN	-0.85	1.09	-0.78	0.44
MODFREQW	16.68	12.65	1.32	0.19
MODMIN	0.28	1.03	0.27	0.78
STRFREQW	20.36	15.60	1.31	0.19

*Note. *p < .05. **p < .01. ***p < .001*

An ANOVA was conducted for Alcohol Use as well. The sociodemographic factors were not statistically significant (p >.05), which indicates that the groups were not initially different between the two groups of PA. Thus, controlling for sociodemographic factors, the average alcohol use is not significantly different between the two levels of PA (F = 0.075, p = 0.7846). Table 12 shows the multiple linear regression output used to predict alcohol use based on PA. PA was not a statistically significant predictor of alcohol use.

Table 12

Alcohol Use and Physical Activity Variables

	B	St. Error	t	Sig.
VIGFREQW	0.17	1.03	0.17	0.87

Table 12 Continued

VIGMIN	0.14	0.07	1.90	0.06
MODFREQW	-0.53	0.89	-0.60	0.55
MODMIN	0.04	0.07	0.56	0.57
STRFREQW	-0.31	1.09	-0.28	0.78

*Note. *p < .05. **p < .01. ***p < .001*

Multinomial logistic regression was used to test the predictability of alcohol use from PA, but no significant relationship was found (see Table 13). At significance level 0.05, we fail to reject the null hypothesis and conclude that PA is neither predictive nor protective of alcohol use for LGB participants.

Table 13

Predicting Alcohol Use Using PA, Multinomial Logistic Regression

	(Intercept)	VIGFREQW	VIGMIN	MODFREQW	MODMIN	STRFREWQ
Light drinker vs heavy drinker	0.0	0.976	0.192	0.657	0.726	0.438
Moderate drinker vs heavy drinker	0.044	0.541	0.602	0.388	0.695	0.856

*Note. *p < .05. **p < .01. ***p < .001*

Multinomial logistic regression suggests that frequency of strength training has a significant relationship with smoking status (see Table 14). For current smokers, the associated *p*-value Wald test statistic for the predictor STRFREQW is 0.050. Thus, at significance level 0.05, we reject the null hypothesis and conclude that for current smokers, the regression coefficient for STRFREQW has been found to be statistically significant. This indicates that as individuals increase their frequency of strength activities, they would be more likely to be a non-smoker versus a current smoker.

Table 14

Predicting Smoking Status Using PA, Multinomial Logistic Regression

	(Intercept)	VIGFREQW	VIGMIN	MODFREQW	MODMIN	STRFREWQ
Current smoker vs non-smoker	0.020	0.322	0.788	0.742	0.207	0.050*
Former smoker vs non-smoker	0.068	0.498	0.640	0.426	0.560	0.075

*Note. *p < .05. **p < .01. ***p < .001*

Multinomial logistic regression suggests that duration of vigorous activity has a significant relationship with health status (see Table 15). For participants who rated their health status as "good," the associated *p*-value Wald test statistic for the predictor VIGMIN is 0.044. Thus, at significance level 0.05, we reject the null hypothesis and conclude that for individuals with good health, the regression coefficient for VIGMIN has been found to be statistically significant. This indicates that as individuals increase

their duration of vigorous PA, they would be more likely to be in excellent health versus good health.

Table 15

Predicting Health Status Using PA, Multinomial Logistic Regression

	(Intercept)	VIGFREQW	VIGMIN	MODFREQW	MODMIN	STRFREWQ
Fair vs Excellent	0.002	0.760	0.558	0.718	0.865	0.533
Good vs Excellent	0.559	0.345	0.044*	0.156	0.062	0.734
Very Good vs Excellent	0.586	0.731	0.166	0.419	0.098	0.079

*Note. *p < .05. **p < .01. ***p < .001*

Hypothesis 4: Sexual orientation will not increase nor decrease physical activity, cigarette smoking, alcohol use, BMI, and health status for participants of the 2016 NHIS

A total of 331 LGB participants were included in the sample after controlling for missing values. To test this hypothesis, 331 heterosexual participants were randomly selected for comparison (N = 662). To obtain an equally sized matching random sample of heterosexual respondents for comparative analysis with LGB respondents, the function "sample" in R software was used, which takes a sample of the specified size (331) from

the specified population (heterosexual participants) without replacement (R Documentation, n.d.).

Frequencies and percentages for categorical demographic variables for both groups are shown in Table 16 for comparison. Heterosexual participants were 47.9% female and 52.1% male, mostly non-Hispanic (91.4%) and Caucasian (86.7%). Of the LGB participants, 50.2% were female and 49.8% were male, with most identifying as non-Hispanic (90.3%) and Caucasian (84.9%). The level of total combined family income for heterosexual participants was diverse with 29.3% identifying as low income (less than $34,999), 27.5% identifying as low medium income ($35,000 - $74,999), 13.9% identifying as medium high income ($75,000 - $99,000), and 29.3% identifying as high income ($100,000 and over). For LGB participants, a large percentage (36%) were of low income (less than $34,999), followed by low medium income (27.5%; $35,000 - $74,999), medium high income (10.6%; $75,000 - $99,000), and high income (26%; $100,000 and over). Those with a combined family income of less than $75,000 accounted for 63.5% of the LGB sample and 56.8% of the heterosexual sample. Region of residence for the heterosexual sample was 22.4% from the Northeast, 17.5% from the Midwest, 28.4% from the South, and 31.7% from the West; LGB was 18.1% from the Northeast, 18.1% from the Midwest, 29.9% from the South, and 33.8% from the West.

Table 16

Frequencies and Percentages for Categorical Demographic Variables

Categorical Variable	*LGB*	*%*	*Hetero.*	%
Sex				
Female	166	50.2	151	45.6
Male	165	49.8	180	54.4
Ethnicity				
Not Hispanic or Latino	299	90.3	306	92.4
Other	32	9.7	25	7.6
Race				
Caucasian	281	84.9	293	88.5
Other	50	15.1	38	11.5
Armed Forces Status				
No	305	92.1	301	90.9
Yes	26	7.9	30	9.1
Income				
High	86	26.0	108	32.6
Medium High	35	10.6	57	17.2
Low Medium	91	27.5	91	27.5
Low	119	36.0	75	22.7
Region				
Northeast	60	18.1	56	16.9
Midwest	60	18.1	88	26.6
South	99	29.9	89	26.9
West	112	33.8	98	29.6

Note. Frequencies not summing to $N = 331$ reflects missing data

Means and standard deviations for the continuous demographic variables are outlined in Table 17. Heterosexual participant age ranged from 18 to 85 years (M =

41.16, *SD* = 15.73), and LGB age ranged from 18 to 82 years (*M* = 39.11, *SD* = 15.0). Body mass index (BMI) for heterosexual participants ranged from 15.3 to 52.88 (*M* = 27.14, *SD* = 5.43), which was lower than LGB participants which ranged from 18.02 to 67.44 (*M* = 28.03, *SD* = 6.92). Healthy BMI is 18.5-24.9, overweight is 25-29.9, and obese is 30 or greater. The average BMI for LGB (28.03) and heterosexual (27.14) participants were both classified as overweight, but mean LGB participant BMI was 0.89 higher than their heterosexual counterparts.

Table 17

Means and Standard Deviations for Continuous Demographic Variables

	Minimum	Maximum	Mean	Std. Deviation
Age	18	85	41.16	15.73
Age (LGB)	18	82	39.11	15.0
BMI	15.30	52.88	27.14	5.43
BMI (LGB)	15.30	52.88	27.14	5.43

Frequencies and percentages for categorical independent and dependent variables are shown in Table 18. Smoking status for heterosexual participants included 62.2% never smoked, 13.3% currently smoke, and 24.5% were former smokers, compared to 59.2% of LGB participants who never smoked, 16.9% who currently smoke, and 23.9% who were former smokers. This indicates heterosexuals were more likely to have never smoked or be former smokers and LGB participants were more likely to be current smokers.

In reference to alcohol use, light drinkers were those who reported having 12 or more drinks in their lifetime and 3 drinks or fewer per week in the past year, moderate drinkers were those who had 12 or more drinks in lifetime and 3 to 14 [male] / 3 to 7 [female] drinks per week in the past year, and heavy drinkers were those who had 12 or more drinks in lifetime and more than 14 [male] / 7 [female] drinks per week in the past year. For heterosexual participants, 56.8% were light drinkers, 34.7% were moderate drinkers, and 8.5% were heavy drinkers. For LGB participants, 54.4% were light drinkers, 30.5% were moderate drinkers, and 15.1% were heavy drinkers. This showed heterosexual participants had slightly higher rates of light and moderate drinking, but LGB participants had a 6.6% higher prevalence of heavy drinking.

Self-reported health status ranged from fair/poor to excellent. Heterosexual participants rated 4.2% fair/poor, 17.5% good, 41.4% very good, and 36.9% excellent; LGB participants: 5.1% fair/poor, 24.5% good, 39.6% very good, and 30.8% excellent. These numbers indicate LGB participants were 6.1% less likely to report excellent health and 0.9% more likely to report fair/poor health. To receive optimal health benefits, the recommended weekly amount of PA includes 150 minutes per week of moderate-intensity aerobic PA, 75 minutes of vigorous-intensity aerobic PA, or an equivalent combination of moderate- and vigorous-intensity aerobic activity and participated in strengthening activities at least two days per week (HHS, 2008). Overall, heterosexuals were more likely to participate in the recommended amount of PA, 11.2% compared to 7.5% for LGB participants.

Table 18

Frequencies and Percentages for Categorical Independent and Dependent Variables

Categorical Variable	*LGB*	*%*	*Hetero*	%	Total %
Smoking status					
Never smoked	196	59.2	206	62.2	60.7
Current smoker	56	16.9	44	13.3	15.1
Former smoker	79	23.9	81	24.5	24.2
Alcohol					
Light drinker	180	54.4	188	56.8	55.6
Moderate drinker	101	30.5	115	34.7	32.6
Heavy drinker	50	15.1	28	8.5	11.8
Health status					
Excellent	102	30.8	122	36.9	33.8
Very good	131	39.6	137	41.4	40.5
Good	81	24.5	58	17.5	21.0
Fair/Poor	17	5.1	14	4.2	4.7
Participate in recommended PA					
Yes	25	7.5	37	11.2	9.4
No	303	91.5	294	88.8	90.6

Note. Frequencies not summing to $N = 331$ reflects missing data

Means and standard deviations for continuous independent and dependent variables are outlined in Table 19. For heterosexual participants, the frequency of vigorous activity ranged from 0 to 28 times per week ($M = 3.83$, $SD = 3.65$), which was higher than LGB activity which ranged from 0 to 21 times ($M = 3.50$, $SD = 3.27$). The duration of vigorous activity for heterosexual participants was also higher ranging from 10 to 720 minutes ($M = 57.08$, $SD = 62.91$), compared to LGB activity ranging from 10 to 300 minutes ($M = 50.49$, $SD = 37.58$)

Frequency of moderate activity was a little closer between the two groups, ranging from 0 to 28 times per week (*M* = 4.79, *SD* = 3.71) for heterosexuals and 0 to 28 times (*M* = 5.0, *SD* = 3.68) for LGB. The duration of moderate activity for heterosexual participants ranged from 10 to 600 minutes (*M* = 53.40, *SD* = 65.89). This was much higher than LGB activity which ranged from 10 to 360 minutes (*M* = 43.57, *SD* = 39.24). For heterosexual participants, strength training participation ranged from 0 to 21 times per week (*M* = 2.15, *SD* = 2.65), which was similar to LGB activity ranging from 0 to 21 (*M* = 1.97, *SD* = 2.63). Lastly, binge drinking was the number of times the participant had 5+ (males) or 4+ (females) drinks on one single occasion within the past 30 days, which ranged from 0 to 30 for heterosexuals (*M* = 2.28, *SD* = 4.25) and 0 to 99 for LGB (*M* = 3.06, *SD* = 8.36).

Table 19

Means and Standard Deviations of Continuous Independent and Dependent Variables

	n	Minimum	Maximum	Mean	Std. Deviation
Frequency of vigorous exercise	331	0	28	3.83	3.65
LGB	331	0	21	3.50	3.27
Duration of vigorous exercise	331	10	720	57.08	62.91
LGB	331	10	300	50.49	37.58

Table 19 Continued

Frequency of moderate exercise	331	0	28	4.79	3.71
LGB	331	0	28	5	3.68
Duration of moderate exercise	331	10	600	53.40	65.89
LGB	331	10	360	43.57	39.24
Strength training	331	0	21	2.15	2.65
LGB	331	0	21	1.97	2.63
Binge Drinking	155	0	30	2.28	4.25
LGB	183	0	99	3.06	8.36

Note. Frequencies not summing to $N = 331$ reflects missing data

ANOVA was conducted for dependent variable (alcohol use) and contained one independent fixed factor (sexual orientation). There were four levels for sexual orientation (LGB male, LGB female, heterosexual male, and heterosexual female). Alcohol use was therefore measured across four different levels of sexual orientation. The assumptions for the analysis were not met for normality, Shapiro-Wilk = 0.3667, $p <$ 0. 0001. However, sexual orientation did have an effect on alcohol use ($F = 4.507$, $p =$ 0.0039). In other words, the mean alcohol use is different between sexual orientation groups. Analysis of covariance (ANCOVA) test suggests that only income factor was statistically significant ($F = 3.566$, $p = 0.014$), which indicates that groups were different among income levels which requires adjustment on the means. Thus, controlling for the

sociodemographic factors, sexual orientation affects alcohol use differently (see Table 20). To explore these differences further, a multinomial regression was completed (see Table 21).

Table 20

Effect of Sexual Orientation on Alcohol Status, Controlling for Sociodemographic Factors

	df	Sum Sq	Mean Sq	F	Sig
Sexual orientation	3	24057	8019	4.531	0.0037**
Race	1	1567	1567	0.886	0.347
Ethnicity	1	413	413	0.234	0.629
Age	1	821	821	0.464	0.496
Region	3	1877	626	0.354	0.787
Income	3	18932	6311	3.566	0.014*
Armed Forces	1	391	391	0.221	0.638

*Note. *p < .05. **p < .01. ***p < .001*

Multinomial logistic regression suggests that sexual orientation has a significant relationship with alcohol status (see Table 21). For LGB males, the associated *p*-value Wald test statistic for moderate drinkers is 0.0008. For heterosexual males, the associated *p*-value Wald test statistic for light drinkers is 0.0094 and for moderate drinkers it is 0.0000. Thus, at significance level 0.05, we reject the null hypothesis and conclude that for moderate drinkers, the regression coefficient for LGB males and heterosexual males has been found to be statistically significant. The regression

coefficient for light drinkers and heterosexual males has been found to be statistically significant as well. In other words, heterosexual males are more likely to be heavy drinkers than light drinkers when compared to baseline (LGB females). Also, LGB males are more likely to be heavy drinkers than moderate drinkers when compared to baseline.

Table 21

Effect of Sexual Orientation on Alcohol Status

Heavy drinker vs **light drinker**	B	SE	df	p	95% Confidence Interval for β		OR	95% Confidence Interval for OR	
					Lower Bound	Upper Bound		Lower Bound	Upper Bound
Intercept (base level for LGB female)	1.129	0.203	1	0.0	-1.976	-1.053	3.094	2.077	4.609
LGB male	0.374	0.331	1	0.257	-0.129	1.081	1.454	0.761	2.780
Straight female	0.612	0.332	1	0.066	-0.603	0.706	1.844	0.961	3.538
Straight male	0.984	0.378	1	0.009*	-0.754	0.545	2.674	1.274	5.615
Heavy drinker vs **moderate drinker**									
Intercept (base level for LGB female)	0.090	0.245	1	0.714	-1.176	-0.466	1.094	0.677	1.766
LGB male	1.210	0.361	1	0.001*	-0.713	0.337	3.352	1.651	6.806
Straight female	0.688	0.382	1	0.071	-0.735	0.322	1.990	0.942	4.205
Straight male	1.870	0.404	1	0.000*	-0.530	0.454	6.483	2.934	14.323

*Note. *p < .05. **p < .01. ***p < .001*

ANOVA was conducted for dependent variable BMI. The model contained four levels of sexual orientation as the independent fixed factor, so BMI was measured across each level of sexual orientation. The assumptions for the analysis were not met for normality, Shapiro–Wilk = 0.8977, $p < 0.0001$. Results indicated sexual orientation significantly affects BMI ($F = 6.845$, $p = 0.000152$). In other words, the mean BMI is significantly different for the different sexual orientation groups (see Table 22). A healthy BMI ranges from 18.5 to 24.9, overweight is 25 to 29.9, and obese is 30 or greater (NHLBI, 2019). In order from lowest to highest BMI, heterosexual females had an average BMI of 25.76 kg/m^2, LGB males had an average BMI of 27.44 kg/m^2, heterosexual males had an average BMI of 28.30 kg/m^2, and LGB females had an average BMI of 28.62 kg/m^2. Even though all sexual orientation groups were classified as overweight according to their BMI, LGB participants had an average BMI of 28.03 kg/m^2, which was higher than the average for heterosexual participants at 27.03 kg/m^2.

Table 22

Sexual Orientation and BMI

Sexual orientation	Mean BMI
Hetero. female	25.76
LGB male	27.44
Hetero. male	28.30
LGB female	28.62

Post-hoc comparisons using the Tukey HSD test indicated the score for BMI was statistically different (see Table 23). Significant differences were found between heterosexual females and LGB females ($p < .001$) and between heterosexual males and heterosexual females ($p = 0.001$).

Table 23

Tukey Post-hoc Analysis

Sexual Orientation	Diff	95% CI		p
		Lower Bound	Upper Bound	
LGB male-LGB female	-118.8	-293.0	55.4	0.296
Het female-LGB female	-286.4	-464.7	-108.2	0.000***
Het male-LGB female	-32.7	-203.2	137.9	0.961
Het female-LGB male	-167.6	-346.1	10.9	0.075
Het male-LGB male	86.1	-84.7	257.0	0.564
Het male-Het female	253.8	78.9	428.7	0.001***

*Note. *p < .05. **p < .01. ***p < .001*

The ANCOVA test suggests region and age were statistically significant ($p < 0.05$), indicating the age groups and region the participants were living in were not equal. These results suggest that for different sexual orientation, BMI is affected when controlling for other factors (see Table 24). In general, ANCOVA test suggests the effect of Sexual Orientation on BMI is significant ($p < 0.05$), even after controlling for the

covariates such as age and region. These results also suggest age has a significant effect on BMI ($p = 0.045$), as does the region where the individual resides ($p = 0.013$).

Table 24

Effect of Sexual Orientation on BMI, Controlling for Sociodemographic Factors

	df	Sum Sq	Mean Sq	F	p
Sexual orientation	3	7772696	2590899	6.953	0.0001***
Race	1	394	394	0.001	0.974
Ethnicity	1	684	684	0.002	0.966
Age	1	1500290	1500290	4.026	0.045*
Region	3	4076198	1358733	3.646	0.013*
Income	3	2074129	691376	1.855	0.136
Armed Forces	1	45463	45463	0.122	0.727

*Note. *p < .05. **p < .01. ***p < .001*

Multinomial logistic regression suggests that sexual orientation does not have a significant relationship with smoking status (see Table 25). The associated *p*-value Wald test statistic is 0.050. Thus, at significance level 0.05, we fail to reject the null hypothesis and conclude that sexual orientation is neither a predictive nor a protective factor for smoking status.

Table 25

Effect of Sexual Orientation on Smoking Status

Never smoked vs **current smoker**	B	SE	df	p	95% Confidence Interval for β		OR	95% Confidence Interval for OR	
					Lower Bound	Upper Bound		Lower Bound	Upper Bound
Intercept (base level for LGB female)	-1.514	0.235	1	0.0	-1.976	-1.053	0.220	0.139	0.349
LGB male	0.476	0.309	1	0.123	-0.129	1.081	1.610	0.879	2.948
Straight female	0.0513	0.334	1	0.853	-0.603	0.706	1.053	0.547	2.025
Straight male	-0.104	0.332	1	0.753	-0.754	0.545	0.901	0.470	1.725
Never smoked vs **former smoker**									
Intercept (base level for LGB female)	-0.821	0.181	1	0.0	-1.176	-0.466	0.440	0.309	0.627
LGB male	-0.188	0.268	1	0.483	-0.713	0.337	0.829	0.490	1.401
Straight female	-0.207	0.270	1	0.468	-0.735	0.322	0.813	0.480	1.380
Straight male	-0.038	0.251	1	0.945	-0.530	0.454	0.962	0.588	1.574

*Note. *p < .05. **p < .01. ***p < .001*

Regarding health status, multinomial logistic regression suggests that sexual orientation has a significant relationship with health status (see Table 26). For heterosexual males, the associated *p*-value Wald test statistic for *good* health is 0.0137. Thus, at significance level 0.05, we reject the null hypothesis and conclude that for participants who recorded their health status as *good*, the regression coefficient for

heterosexual males has been found to be statistically significant. In other words, heterosexual males are more likely to be report *excellent* health than *good* health when compared to baseline (LGB females).

Table 26

Effect of Sexual Orientation on Health Status

Excellent vs **fair health**	B	SE	df	p	95% Confidence Interval for β		OR	95% Confidence Interval for OR	
					Lower Bound	Upper Bound		Lower Bound	Upper Bound
Intercept (base level for LGB female)	-1.852	0.380	1	0.0	-2.597	-1.107	0.157	0.074	0.331
LGB male	0.118	0.525	1	0.823	-0.911	1.146	1.125	0.402	3.146
Straight female	-0.288	0.575	1	0.617	-1.415	0.840	0.750	0.243	2.316
Straight male	-0.331	0.533	1	0.534	-1.375	0.713	0.718	0.253	2.040
Excellent vs **good health**									
Intercept (base level for LGB female)	-0.125	0.205	1	0.541	-0.526	0.276	0.882	0.591	1.317
LGB male	-0.223	0.299	1	0.455	-0.809	0.362	0.780	0.445	1.437
Straight female	-0.474	0.312	1	0.128	-1.085	0.136	0.622	0.338	1.146
Straight male	-0.736	0.299	1	0.014*	-1.322	-0.151	0.479	0.267	0.860
Excellent vs **very good health**									

Table 26 Continued

Intercept (base level for LGB female)	0.195	0.189	1	0.302	-0.175	0.566	1.216	0.839	1.761
LGB male	0.107	0.264	1	0.686	-0.411	0.625	1.113	0.663	1.868
Straight female	0.063	0.266	1	0.814	-0.458	0.583	1.065	0.633	1.791
Straight male	-0.195	0.253	1	0.440	-0.691	0.300	0.823	0.501	1.350

Note. $*p < .05$. $**p < .01$. $***p < .001$. *OR* = Odds Ratio

Each variable contained multiple categories enabling multinomial regression to be used; however, more categories resulted in smaller sample sizes per each, which reduced the strength of the results. To regain strength, these variables were combined to use logistic regression from dichotomous data. The two categories for sexual orientation were (1) LGB and (2) heterosexual; BMI: (1) healthy/overweight/underweight (16-29.9) and (2) obese (30 or greater); smoking status: (1) never smoked and (2) former/currently smoke; alcohol status: (1) light drinkers and (2) moderate/heavy drinkers; health status: (1) fair/poor/good and (2) very good/excellent; physical activity: (1) healthy and (2) unhealthy (using recommended values of PA).

BMI ranged from 15.3 to 67.4 with a mean of 27.6. Due to this wide range in values, numbers in the healthy, overweight, and underweight categories were combined (LGB $n = 117$, Straight $n = 108$) and obese was by itself (LGB $n = 214$, Straight $n = 223$). Since smoking can impact an individual's health even after quitting, smoking status had two variables consisting of current or former smoker (LGB $n = 135$, Straight $n = 125$) and never smoked (LGB $n = 196$, Straight $n = 206$). Alcohol can also have a negative impact

on one's health, so alcohol status variables were combined for moderate and heavy drinkers (LGB n = 151, Straight n = 143) and compared with light drinkers (LGB n = 180, Straight n = 188). Self-reported health status was separated into two variables consisting of fair, poor, and good health (LGB n = 98, Straight n = 72) and very good and excellent health (LGB n = 233, Straight n = 259). Using the national recommended levels of PA (VIGMIN ≥ 75 or MODMIN ≥ 150 and STRFREQ ≥ 2), healthy (LGB n = 25, Straight n = 37) and unhealthy (LGB n = 306, Straight n = 294) variables were used.

Controlling for sociodemographic factors indicated sexual orientation did not significantly affect alcohol status (OR = 1.19, p = 0.11, 95% CI [0.96, 1.48]). However, sexual orientation significantly affected BMI, smoking status, health status, and PA (see Table 27). In other words, LGB individuals were 83% more likely than their straight counterparts to have BMIs in the obese category (OR = 1.83, p < .0001, 95% CI [1.46, 2.30]) and 45% more likely to be current or former smokers (OR = 1.45, p = .001, 95% CI [1.17, 1.81]). LGB participants were also 58% less likely to report very good or excellent health (OR = 0.42, p < .0001, 95% CI [0.33, 0.53]). Lastly, LGB participants were significantly less likely to meet the recommendations for PA when compared to their heterosexual counterparts (OR = 0.08, p < .0001, 95% CI [0.05, 0.12]).

Table 27

Effect of Sexual Orientation on Dependent Variables Using Dichotomous Data

	B	*SE*	*OR*	*p*
BMI	0.604	0.115	1.829	<.0001***
Smoking status	0.373	0.112	1.452	0.001***
Alcohol status	0.176	0.110	1.19	0.111
Health status	-0.866	0.120	0.421	<.0001***
Physical activity	-2.505	0.208	0.082	<.0001***

*Note. *p < .05. **p < .01. ***p < .001. OR* = Odds Ratio

Summary of Results

Overall, 331 LGB participants were included in the study for the first 3 hypotheses. When looking at the impact of PA on behavioral outcomes, the duration of vigorous PA had a direct, positive relationship with alcohol use. This indicates that as the minutes of vigorous PA increases, alcohol use also increases. PA also had an impact on smoking; as an individual increases their strengthening activities, he or she is less likely to smoke. Additionally, as participants increased the frequency of vigorous PA, their BMI decreased.

Results revealed a direct link between race and PA, indicating Caucasians do not participate in an adequate amount of PA for optimal health benefits. In addition to race, results also showed that as participants got older, they were less likely to be active, decreasing the health benefits from PA. These are alarming since results showed as

individuals increase their duration of vigorous PA, they were more likely to be in excellent health versus good health.

For Hypothesis Four, 331 heterosexual participants were included for comparative analysis. Heterosexual participants lived in all regions of the U.S., but they made more money when compared to LGB participants. Even though the mean averages revealed participants from both sexual orientations to be overweight, LGB individuals had higher BMI when compared to heterosexual counterparts. Additionally, LGB participants were more likely to be current smokers and heterosexuals were more likely to have never smoked. LGB participants were more likely to be heavy drinkers and less likely to report excellent health and participate in the recommended levels of PA. Binge drinking was also more prevalent for LGB participants. The following chapter further discusses the implications of these findings.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

The purpose of this research study was to: 1) evaluate the effect of physical activity on self-reported behavioral risk factors and health status for LGB participants; and 2) evaluate the effect of sexual orientation on physical activity, cigarette smoking, alcohol use, and health status. Descriptive variables of sex, race, ethnicity, armed forces status, age, BMI, and income were included as covariates in the analyses. Secondary data from the 2016 NHIS was utilized. Statistical procedures included Pearson's chi-square analysis, linear regression, multinomial logistic regression, one-way ANOVA, and ANCOVA.

Summary

The final sample for this study consisted of 331 participants for hypotheses 1-3, and 662 participants for comparative analysis in hypothesis 4. Most participants (n = 331) self-reported as Caucasian (84.9%) with an average age of 39 years. Participants were 50.2% female and 49.8% male, mostly non-Hispanic, and the region of residence was 18.1% Northeast, 18.1% Midwest, 29.9% South, and 33.8% West. The level of total combined family income was more diverse with a large percentage, 36%, reporting low income, 27.5% reporting low medium income, 10.6% reporting medium high income, and 26% reporting high income. The average BMI for participants was 28.03; 59.2% never smoked, 16.9% currently smoke, and 23.9% were former smokers; 54.4% were light drinkers, 30.5% were moderate drinkers, and 15.1% were heavy drinkers. General

health of the participants ranged from a score of 1 (poor) to a score of 5 (excellent), with an average general health score of 3.96. The average frequency of vigorous activity was 3 times per week at an average of 51 minutes. The average frequency of moderate activity was 5 times per week at an average of 44 minutes. The average participation in strength activities was 1 day a week. The average amount respondents reported binge drinking (5+ [males] or 4+ [females] drinks on one single occasion) was 3 days in the past 30 days. There were a lot of missing values for self-reported depression and anxiety, but 6.7% reported depression and anxiety affected their daily activities while 22.7% reported it did not.

Comparisons of LGB and heterosexual participants show some differences and similarities with sociodemographic factors. For instance, the average age for heterosexual participants was 41, and slightly younger for LGB participants at 39. Healthy BMI is 18.5-24.9, overweight is 25-29.9, and obese is 30 or greater. The average BMI for LGB (28.0) and heterosexual (27.1) participants were both classified as overweight, but mean LGB participant BMI was higher than their heterosexual counterparts. Additionally, results showed heterosexuals were more likely to have never smoked (62% versus 59%) or be former smokers (24.5% versus 24%), and LGB participants were more likely to be current smokers (17% versus 13%). Heterosexual participants had slightly higher rates of light (57% versus 54.5%) and moderate drinking (35% versus 30.5%), but LGB participants had a much higher prevalence of heavy drinking (15% versus 8.5%). LGB participants were also 6.1% less likely to report excellent health and 0.9% more likely to report fair/poor health. Lastly, heterosexuals

were more likely to participate in the recommended amount of PA (11.2% versus 7.5% for LGB participants).

Conclusions

Hypothesis 1: There will be no statistically significant relationship between physical activity and health status, cigarette smoking, alcohol use, and BMI for LGB participants.

Respondents were considered *healthy* if they met the weekly guidelines of recommended PA (strengthening activities twice and 150 minutes moderate and/or 75 minutes vigorous). Results from chi-square tests showed no relationship between PA and health status, cigarette smoking, or alcohol use when assessing *healthy* as the PA variable. However, when assessing individual quantitative PA variables (frequency of strength activities, frequency and duration of moderate PA, and frequency and duration of vigorous-intensity PA) using linear regression, results showed a relationship between alcohol use and vigorous activity duration indicating that as the minutes of vigorous PA increases, alcohol use increases. Results from multinomial logistic regression indicated that as an individual increased strengthening activity, he or she was more likely to be a non-smoker versus a current smoker.

Results from linear regression showed no relationship between PA and BMI when assessing *healthy* as the PA variable. However, when assessing individual quantitative PA variables, frequency of vigorous PA was a significant predictor of BMI, indicating as the frequency of vigorous PA increases, BMI decreases.

Hypothesis 2: There will be no statistically significant relationship between physical activity and sociodemographic factors for LGB participants of the 2016 NHIS.

A chi-square test of independence was performed to examine the relationship between PA and sex, race, ethnicity, income, armed force status, and region. No significant relationship was found between PA and sex ($p = 0.30$), region ($p = 0.302$), armed forces status ($p = 1$), ethnicity ($p = 0.308$), or income ($p = 0.665$). However, the relationship between race and PA was significant ($p = 0.0005$, indicating *Caucasian* participants were less likely to participate in the recommended amount of PA than *Other* races. Results from logistic regression showed a relationship with PA and age, indicating that as age increases, PA decreases.

Hypothesis 3: Physical activity will not increase nor decrease cigarette smoking, alcohol use, BMI, and health status for LGB participants of the 2016 NHIS (with and without controlling for other sociodemographic factors).

Results from multiple linear regression show frequency of vigorous PA to be a significant predictor of BMI, indicating that as the frequency of vigorous PA increases, BMI decreases. Results from ANOVA and linear regression indicate PA is neither predictive nor protective of alcohol use for LGB participants. However, results from multinomial logistic regression did show that as individuals increase their frequency of strength activities, they would be less likely to be a current smoker. When assessing health status and PA, regression results indicated that as individuals increase their duration of vigorous PA, they would be more likely to be in excellent health versus good health.

Hypothesis 4: Sexual orientation will not increase nor decrease physical activity, cigarette smoking, alcohol use, BMI, and health status for participants of the 2016 NHIS.

To recognize the differences between groups, participants were split into four groups to test this hypothesis: LGB female (166), LGB male (165), heterosexual female (151), and heterosexual male (180). Results from ANCOVA indicate alcohol use among groups were different based on income level which required an adjustment on the means. Thus, controlling for the sociodemographic factors, results from ANOVA indicate sexual orientation affects alcohol use differently. To see what these differences were, a multinomial logistic regression was conducted which showed heterosexual males were more likely to be heavy drinkers than light drinkers, and LGB males are more likely to be heavy drinkers than moderate drinkers.

Results from ANCOVA indicate BMI among groups were different based on region and age, which required an adjustment on the means. Thus, controlling for the sociodemographic factors, results from ANOVA indicate sexual orientation affects BMI differently. In order from lowest to highest BMI, heterosexual females had an average BMI of 25.76, LGB males had an average BMI of 27.44, heterosexual males had an average BMI of 28.30, and LGB females had the highest average BMI at 28.26. Even though all sexual orientation groups were classified as overweight according to their BMI, LGB participants had a higher average BMI (28.03) compared to heterosexual participants (27.03).

Surprisingly, multinomial logistic regression suggests that sexual orientation does not have a significant relationship with smoking status, indicating sexual orientation is neither a predictive nor protective factor for smoking status. Health status, on the other hand, showed a positive relationship with sexual orientation. Results from multinomial

logistic regression showed heterosexual males were more likely to be report *excellent* health than *good* health when compared to baseline.

To increase the same size and strength, sexual orientation was coded to dichotomous variable for LGB and heterosexual. Logistic regression tests were completed to test the hypothesis. With these combined variables, results indicated sexual orientation did not significantly affect alcohol status or use. However, sexual orientation significantly affected BMI, smoking status, health status, and PA. Results showed LGB participants were more likely than their straight counterparts to have higher BMI and to be current or former smokers and less likely to have never smoked. LGB participants were also less likely to report very good or excellent health status. Lastly, LGB participants were less likely to meet the recommendations for PA when compared to their heterosexual counterparts.

Discussion and Implications

Demographics of LGB participants in this study were consistent with those of previous findings in that LGB members are comprised of all races and ethnicities (ODPHP, 2014; Gonzalez & Henning-Smith, 2017), ages, socioeconomic status (SES), and geographic location (IOM, 2011). Previous data from 2014-2015 BRFSS showed LGB populations to be younger and racially and ethnically diverse (Gonzalez & Henning-Smith, 2017). However, demographic characteristics of the sexual minority subsample (n = 850) in the 2016 NHIS indicate an average age of 42.49 for respondents and mostly white (80.7%). Additionally, past research of SES for LGB showed higher unemployment rates for bisexuals and gay men (Gonzalez & Henning-Smith, 2017) with

bisexuals more likely to live in poverty (Conron et al., 2010). Even though this study did not investigate employment, results showed a lower combined family income for LGB participants than for heterosexuals with 63.5% making less than $75,000 total compared to 56.8% for heterosexuals.

For the current study, approximately 93.7% of participants identified as "straight, that is, not gay," 2.6% identified as LGB (1.6% Gay/Lesbian and 1.0% Bisexual), and 0.4% identified as "Something else," 0.8% answered "I don't know the answer," and 0.6% refused to answer. Excluding the 0.6% who did not even answer this question, 5.7% of participants identified themselves as something other than heterosexual. Approximately 3.4% of 2013 NHIS participants identified as something other than heterosexual (Ward et al., 2014), which means there has been a 2.3% increase in three years. Even with these increased numbers of self-identified LGB individuals, Gates (2011) found even higher estimates of those who reported same-sex behavior and attraction. Approximately 8.2% of Americans reported engaging in same-sex behavior and 11% reported same-sex attraction (Gates, 2011). According to the CDC (2011), information on sexual behavior describes behavior instead of attraction or identity, which can also be used to investigate health outcomes and characteristics across population groups. Unfortunately, these questions were not asked on the 2016 NHIS for comparison nor typically collected on national and state-level surveys (CDC, 2011).

Brown (2017) argued the social stigma surrounding LGB has diminished allowing for more open environment for individuals to "come out," which could be a reason for the increased numbers reported in the NHIS over the years. Even with a safer social

environment and decrease in social stigma, Anteby and Anderson (2014) argue that many sexual minorities still hide their sexual orientation in places such as work in order to avoid discrimination or termination, which can result in underreporting of sexual orientation or same-sex behaviors.

Dahlhamer et al. (2014) discovered over 1% of respondents identified as "something else" or "I don't know" on national surveys. For this study, approximately 1.2% of respondents identified as "Something else" or answered the question with "I don't know the answer." An additional 0.6% refused to answer the question altogether, resulting in 1.8% of respondents answering with something other than heterosexual, gay, lesbian, or bisexual. This could be due to respondents' uneasiness with labels regarding sexual orientation (Dahlhamer et al., 2014; Eliason et al., 2016), misunderstanding of terminology, misuse of labels, or respondent denial of their own sexuality, which are all important factors to consider when collecting information on national studies and trends.

Social desirability bias, which is the inclination to over report socially desirable attitudes and behaviors and underreport undesirable traits (Latkin, Edwards, Davey-Rothwell, & Tobin, 2017), could also have an impact on the responses. Since there is typically only one question asking respondents about their sexuality on surveys such as the NHIS, respondents could report their sexuality as straight when they are not due to the societal pressures of heterosexuality. There has also been no standardization of sexual orientation questions at this point, which could cause additional confusion of respondents when answering these questions (Eliason et al., 2016).

Previous research highlights the alarming health disparities for LGB individuals (Lick et al., 2013; ODPHP, 2014; Gonzales & Henning-Smith, 2017; Marti-Pastor et al., 2018). For instance, Rosario et al. (2014) discovered substantially high rates of behavioral risk factors among LGB populations including alcohol use, smoking, and drug use. Alcohol abuse is approximately 15-20% higher among LGB individuals and reported drug use is approximately 10-20% higher (NAMI, 2018). Data from the 2014-2015 BRFSS also showed a higher prevalence of smoking and binge drinking among lesbians specifically (Gonzales and Henning-Smith, 2017). Blosnich et al. (2014) and Conron et al. (2010) also discovered higher rates of smoking, drinking, and binge drinking among lesbian and bisexual women. Current data was consistent with previous research. LGB participants were more likely to be current smokers and heterosexuals are more likely to have never smoked or to be former smokers. LGB participants were also more likely to be heavy drinkers or binge drinkers when compared to their heterosexual counterparts.

According to Fenway Institute (2016) and ODPHP (2014), LGB individuals also experience higher rates of body image issues and overweight and obesity. VanKim et al. (2017) collected data from nearly 100,000 women respondents from 1989 to 2009 in order to determine the differences in sedentary behaviors between lesbian and bisexual women compared to heterosexual women. Their research was consistent with similar findings in that lesbians and bisexual women were more likely to be obese and overweight as a result of higher sedentary behaviors (VanKim et al., 2017). Results from these studies were also consistent with the results of the current study. For instance, LGB

individuals had higher BMI when compared to heterosexual counterparts. LGB participants were also less likely to report excellent health and participate in the recommended levels of PA, and more likely to report fair/poor health.

Theoretical Application

Minority stress is the result of unique stressors experienced by a minority group or population, which can lead to adverse health outcomes. For instance, LGB populations frequently experience discrimination, harassment, social stigma, victimization, bullying, and violence (Meyer, 2003). A result of these heightened experiences is a stressful social environment that culminates in mental, emotional, and physical health problems (Meyer, 2003). Meyer's minority stress model suggests individuals of disadvantaged social status (race, gender, sexual orientation) are exposed to social stress (discriminatory events, harassment, violence) and resources (social support) related to that status (Meyer, 2003). Utilizing the minority stress model, researchers and other health professionals can focus on the root cause of adverse health outcomes and behaviors in addition to current intervention efforts that focus on individual behavior change.

In order to target factors contributing to minority stress, prevention efforts focusing on environmental and systematic changes are needed. The ecological perspective is a valuable framework for understanding the multiple levels of influence on health behaviors and overall wellbeing (Glanz, Rimer, & Viswanath, 2008). According to Glanz et al. (2008), the levels of influence on health behaviors in ecological models include intrapersonal factors, interpersonal factors, community factors that include

institutional and organizational factors and public policy factors. Intrapersonal factors focus on influences within the individual such as attitudes, beliefs, knowledge, skills, motivation, and past experiences (Glanz at al., 2008). Individuals, however, are influenced by their social environment, including family, friends, colleagues, and other social networks, which are interpersonal factors (Glanz at al., 2008). Institutional and organization factors at places such as school, work, healthcare facilities, and faith-based institutions also have a heavy influence on behaviors, as do community factors such as cultural and societal values and norms. Public policy also plays a vital role in systemic change, and includes the local, state, and federal laws and policies set in place (Glanz at al., 2008). Some sociocultural factors and physical environments may span across and apply to more than one level; however, researchers should include all levels of influence when looking to make an innovative, systematic adjustment (Glanz et al., 2008). These multi-level interventions address interactions across all levels and specifically target behavior change.

Intrapersonal factors are those within an individual and can include self-acceptance, coming out, fear of discrimination and harassment, isolation, depression, self-rated health, resiliency, and behaviors such as smoking, drinking, drug use, and PA. Health education specialists and other health professionals should account for the skills, knowledge, beliefs, attitudes, development, and behavior to promote positive mental, emotional, and physical health outcomes for LGB populations. The objective at this level is to understand the motivation and individual factors to implement a tailored behavior

change program to reduce the risk of health challenges such as poor self-reported health and mental health.

For example, Klein and Lomonaco (2016) created a sexual health intervention tailored specifically for Black men who have sex with men (MSM). They examined the stigma, discrimination, and intersectionality commonly experienced by black MSM, and created an evidence-based HIV prevention program aimed to increase knowledge, skills, and behaviors of safe sex practices such as condom use and HIV testing, treatment, and pre-exposure prophylaxis (PrEP; Klein & Lomonaco, 2016).

In fact, Fredriksen-Goldsen et al. (2014b) argued that most existing interventions are exclusively focused on the individual or small group. Examples include smoking cessation for lesbian and bisexual women by Doolan and Froelicher (2006), suicide prevention support groups for LGBT youth (Remafedi, 1994), and an intervention created by McCree, Jones, and O'Leary (2010) called *d-up: Defend Yourself!*, which is for black MSM to promote condom use for HIV/STI prevention (Fredriksen-Goldsen et al., 2014b).

Even though interventions focusing on intrapersonal and interpersonal factors can yield promising results, public health efforts should pursue a systematic change by targeting policy and structural change initiatives (Graves, Like, Kelly, & Hohensee, 2007). These large-scale goals could promote health equity for sexual minorities and lead to reduced health disparities and improved health outcomes (Fredriksen-Goldsen et al., 2014b).

Fredriksen-Goldsen et al. (2014a) introduced a new model, the Health Equity Promotion Model (see Figure 1), which concentrates on sexual minority health as it relates to resiliency and risk factors uniquely affecting LGBT populations. The premise of the Health Equity Promotion Model is for all individuals to reach their full health potential, which can vary in the developmental process for each individual (Fredriksen-Goldsen et al., 2014a). Similar to the ecological perspective, this model highlights structural, environmental, community, and individual-level factors as well as resilience, resources, human agency, and risk (Fredriksen-Goldsen et al., 2014a). Although research studies highlight the adverse outcomes of historical and societal marginalization and oppression for LGBT populations, this population has discovered ways of building their own coping skills and support systems creating a "family of choice" and sense of pride in their own identity and community (Fredriksen-Goldsen et al., 2014a).

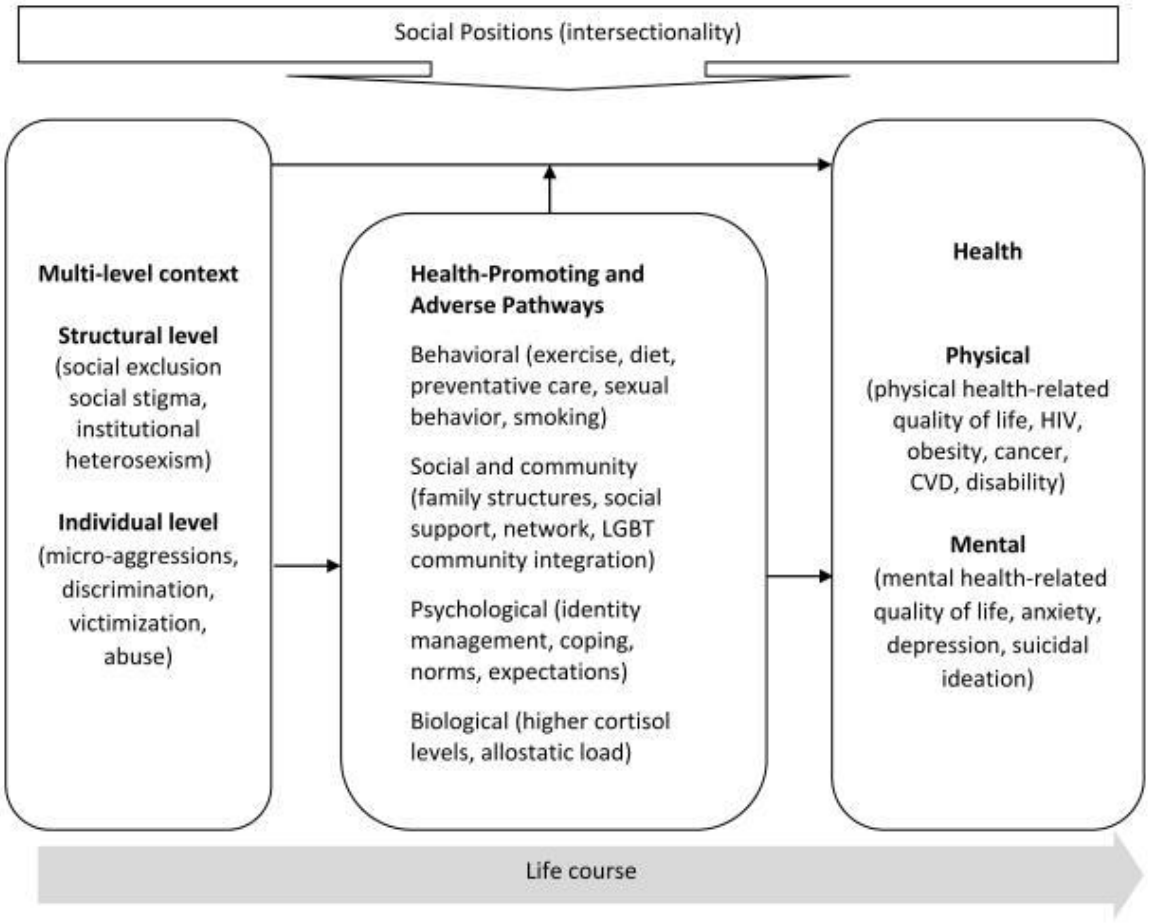

Figure 1. Health Equity Promotion Model (Fredriksen-Goldsen et al., 2014a)

Four mechanisms (behavioral, social and community, psychological, and biological) can be health-promoting or adverse pathways (see Figure 1), which explains why some health behaviors and outcomes differ among LGBT populations who share similar life experiences (Fredriksen-Goldsen et al., 2014a). Behavioral pathways are observable health behaviors which change or maintain health and can include nutrition, PA, smoking, and drinking; however, how these pathways work and interact with experiences of marginalization and oppression and societal norms for LGBT populations is still unknown (Fredriksen-Goldsen et al., 2014a). For instance, obesity has continued

to increase throughout the years and discrimination has shown to be associated with higher obesity rates (Hunte & Williams, 2009), which is consistent with findings of higher rates of obesity and overweight for lesbians (Conron et al., 2010; Gonzales & Henning-Smith, 2017; VanKim et al., 2017) and bisexual women (Gonzales & Henning-Smith, 2017; VanKim et al., 2017). Although gay and bisexual men experience discrimination, they have a lower prevalence of overweight and obesity (Conron et al., 2010; Deputy & Boehmer, 2010), but have higher prevalence of moderate to heavy drinking. Further investigation is needed to understand how these experiences and behaviors interact and what this means for public health efforts.

Social pathways include the effect of social relationships on health and how they intersect (Fredriksen-Goldsen et al., 2014a). Social isolation is commonly experienced by LGBT populations as a result of social exclusion and discrimination; however, the impact this has on health is largely dependent on the social resources and relations experienced throughout the individual's lifespan. Fredriksen-Goldsen et al. (2014b) found the quality of social relationships has a positive association with physical health outcomes versus quantity. Therefore, public health interventions for LGBT adults should aim at creating opportunities for smaller, meaningful connections with other sexual minority members. This could be accomplished through gay-straight alliances, support groups, and frequent community social events welcoming and celebrating individuals with all sexual orientations and gender identities.

Psychological and cognitive pathways consist of positive and negative psychological processes experienced specifically by sexual minorities, which can mediate

the connection between life stressors and psychological health (Fredriksen-Goldsen et al., 2014a). For instance, harassment and victimization can result in active coping, critical thinking, and problem solving or these experiences could alternatively lead to avoidant coping, expectations of rejection, or concealment of identity (Fredriksen-Goldsen et al., 2014a; Meyer, 2003). It is currently unknown why some individuals develop a positive stress-coping capacity while others create negative coping strategies such as drinking, smoking, and drug use. How these actions and reactions intersect with health outcomes should be further explored to identify effective programs to reduce health disparities.

The fourth pathway discussed by Fredriksen-Goldsen et al. (2014a) includes biological influences, which are the biological and physiological responses to situations and experiences. For instance, chronic stress commonly experienced by LGB adults is directly linked to depression and negative psychological health outcomes (Meyer, 2003; Parra, Benibgui, Helm, & Hastings, 2016) as well as CVD, cancer, cognitive decline, accelerated aging, and death (Meyer, 2003; Wolkowitz, Reus, & Mellon, 2011). However, PA has been shown to have a positive relationship on individual responses to stress (Fredriksen-Goldsen et al., 2014a; Hegberg & Tone, 2015). Although data was limited in the present study on psychological health outcomes, PA did have a protective effect on adverse responses to stress such as smoking and overweight and obesity. PA was also related to the individual's likelihood of reporting excellent health as opposed to good health.

Since PA can serve as a protective factor by enhancing resilience and reducing the likelihood of stress-related disorders for LGB populations (Hegberg & Tone, 2015), PA

efforts should focus on the multiple levels of influence mentioned previously. The current findings support previous research in that PA has numerous positive effects on physical, psychological, and social health (ODPHP, 2018), yet data are limited on PA programs designed specifically for LGB communities (Bopp, 2018). A comprehensive approach is needed to examine the unique experiences of LGB individuals, including the effect of PA on general health status, chronic disease, and psychosocial health (Gorczynski & Brittain, 2016) as well as risk factors associated with those health outcomes (HHS, ODPHP, 2014).

Limitations

Using data from the NHIS, one of the nation's leading health surveys, should have yielded many significant health outcomes and behaviors for LGB participants since it is a top-tiered survey; however, significant lack of data limited analyses. For instance, mental health outcomes, which are a well-documented health disparity for LGB individuals, could not be assessed due to missing values. This indicates essential changes are needed in the data collection process. Sexual orientation is a relatively new variable for NHIS and including this variable shows progress in closing the research gap. To fully realize the findings related to this variable, training and care are needed to ensure minimal missing values when collecting information. The 2013 NHIS was one of the first U.S. national surveys to include questions on sexual orientation (Gonzales & Henning-Smith, 2017). Substantial time, testing, and resources were utilized to develop the questions on sexual orientation (Eliason et al., 2016), but these efforts are fruitless if sufficient data are not available for researchers to study.

The NHIS uses self-reported data gathered from interviews conducted in the participant's house. Thus, recall bias, interviewer bias, social desirability bias, and prevarication bias may have occurred in responding to certain questions. Additionally, as one member of the household may have provided responses for other residents, sexual minority status could be underreported. Some participants may be reluctant to answer honestly if they participate in a behavior many consider undesirable, which could lead to inaccurate estimates of alcohol use, tobacco use, health status, BMI, and PA. The number of alcoholic beverages consumed or cigarettes smoked are subject to the respondents' rounding and estimation error. These errors are also likely to occur when respondents reported their PA as well. With self-reported BMI, which uses height and weight estimates, men and women are more likely to over-report their height and women are more likely to under-report their weight, which can significantly impact the BMI results (Chernenko, Meeks, & Smith, 2019; Merrill & Richardson, 2009; Wen & Kowaleski-Jones, 2012). In addition to misreported key health measures and behaviors, sexual orientation could be inaccurately reported due to social desirability response bias (Latkin et al., 2017).

Another limitation is the study's need to collapse certain variables into categories, such as all non-Caucasian races into "other" and all Hispanic ethnicities into "other" due to the minimal population representation. This may prevent researchers from investigating racial health differences in participants, as well as hide discrepancies in sexual orientation question response by race and ethnicity. Fredriksen-Goldsen et al. (2014b) highlighted key differences such as Asian Americans identifying themselves as

"queer" as opposed to "gay" or "lesbian" and African Americans using "same-gender-loving."

There were many missing values for certain health behavior questions, which could be due to misunderstanding the questions, reluctance to answer, or other factors. For instance, 850 respondents identified as gay/lesbian or bisexual; however, 519 were missing responses to the study outcome questions resulting in 331 participants. In this study, the researcher was unable to assess mental and emotional health, PA restrictions due to psychological health, substance abuse (other than alcohol and tobacco), and binge drinking due to missing values. Additionally, certain individuals were excluded from the survey including persons in long-term care institutions, correctional facilities, and U.S. nationals living in foreign countries (NCHS, 2017a).

Recommendations

Results of this study reveal several focal areas where recommendations and further research are needed. A significant research gap was highlighted in the literature review showing a need for more information on LGB populations. IOM (2011) has identified LGBT populations as underserved and health disparate; however, gaps in data collection to identify key characteristics of this population make efforts challenging to reduce overall health disparities. To date, most state and national surveys do not ask participants to disclose their sexual orientation (Calzo et al., 2014). Even the surveys that address this important variable do not have a specific method of asking since there has been no standardization of sexual orientation questions at this point, which could cause confusion of respondents when answering these questions (Eliason et al., 2016).

According to ODPHP (2014), only six data systems used to monitor Healthy People 2020 collected data on LGB populations in 2008, but the goal is to increase this number to 12 by 2020. Additionally, only 31 states and territories included questions about sexual orientation or gender identity in the 2014 BRFSS, only 20 states and territories included the provided module on sexual orientation and gender identity in the 2014 BRFSS, and only 28 states and territories used the provided module on sexual orientation and gender identity in the 2015 YRBSS (ODPHP, 2014). The goal before the next year is to have a 10% improvement; however, adopting modules and questions about sexual orientation and gender identity are currently voluntary (ODPHP, 2014).

Healthy People 2020 is the most recent set of evidence-based, national objectives aimed at improving the health of all Americans. The goal to "improve the health, safety, and well-being of lesbian, gay, bisexual, and transgender (LGBT) individuals" (ODPHP, 2014, para. 1) was an addition in the 2020 objectives. Before health outcomes of LGB individuals can be enhanced, evidence-based information including demographics, health behaviors, and other pertinent variables should be collected. This information is difficult to gather since sexual orientation and sexual identity were not usually asked on most state and national surveys until recently (ODPHP, 2014). The following section highlights the Healthy People 2020 objectives specifically related to LGBT populations followed by recommendations for the objective based upon study results.

1. LGBT-1: Increase the number of population-based data systems which include a standardized set of questions to identify LGBT populations.

a. Excluding the participants who self-identified as either straight (93.7%), gay/lesbian (1.6%), or bisexual (1.0%), a remaining 3.7% said "Something else" or "I don't know the answer" or simply refused to answer. This could be due to refusal to self-label, confusion of the question or terminology, or other factors listed previously. There is currently no standardization of sexual orientation questions, which could cause a multitude of problems for researcher and for respondents when answering these questions (Eliason et al., 2016).

b. Based upon the study results and Healthy People 2020 objectives, question standardization is crucial for data collection. To accomplish such a feat, researchers, health education specialists and other health professionals, LGB members, and key stakeholders must collaborate and use evidence-based information to create a standardized set of questions to use on population-based data systems. Extensive time and effort was placed into the creation of the NHIS questions regarding sexual orientation; however, these questions remained in-house and the 2016 survey only asked once. Joint collaboration is necessary to unify the questionnaire for consistent implementation across the larger data systems.

2. LGBT-1.1: Increase the number of large-scale data systems which collect data on (or for) LGB populations.

   a. Current data systems used to monitor Healthy People 2020 only include 6 surveys which ask respondents about their sexual orientation with the goal of reaching 12;

however, including questions about sexual orientation and gender identity are voluntary (ODPHP, 2014).

b. Recommendations to accomplish this objective are to no longer allow questions about sexual orientation and gender identity to be voluntary for federally funded programs. Similar to applications requiring a program purpose and budget, requirements should also include the need to address specific demographical questions such as sexual orientation and gender identity. By using a reliable, standardized set of questions, adequate research can be gathered to work toward health equity for LGBT populations.

3. LGBT-1.2: Increase the number of population-based data systems which collect standardized data identifying LGB populations.

   a. Similar to the need of creating standardized questions for sexual orientation is the need for standardized data. The NHIS is a comprehensive survey with several different sections including many codes and recodes of variables. Even though accessing and cleaning the data was time consuming and challenging due to inconsistencies between sections in one survey (NHIS), the process was certainly not impossible. However, since surveys collect and report data differently, using information from multiple data sources for comparative reasons or to show trends could prove to be challenging enough for some researchers to avoid interpreting it or using it in their research.

   b. In order to increase systems collecting standardized data, a standardized process should be identified. A baseline set of questions should be included on these data

systems for consistency, and additional questions can be implemented if the institution desires. This recommendation will take extensive collaboration across a multitude of levels, which will take time; however, these efforts are vital in accomplishing the national health goals.

4. LGBT-2.1: Increase the number of state level surveys that include questions on sexual orientation and gender identity in the BRFSS.
    a. Previous goals target larger population-based surveys such as the NHIS, which require extensive time and policy or structural change initiatives; however, state-level surveys have the opportunity for a quicker turnaround due to fewer stakeholders and more localized efforts. Adopting questions and information regarding sexual orientation and gender identity are currently voluntary.
    b. Recommendations to accomplish this objective include advocacy efforts with those responsible for survey item revisions and implementation such as the BRFSS State Coordinators and other team members. Until policy is changed to no longer allow questions that identify sexual orientation and gender identity to be voluntary, advocacy efforts are needed to still meet the objectives while making changes at a lower level.
5. LGBT-2.2: Increase the number of state level surveys that use the provided module on sexual orientation and gender identity in the BRFSS.
    a. In 2014, only 20 states, territories, and the District of Columbia used the module created by the CDC in 2013 (ODPHP, 2014). The goal for Healthy People was to increase this number to 22, which is a 10% improvement (ODPHP, 2014);

however, states currently have the option to implement the question module in their survey. Baker and Hughes (2016) analyzed data from the 2015 BRFSS and discovered 25 states and territories used the module, which was a significant increase from 20 the year before. Although the goal has been met, data is still limited to accurately address health disparities for LGB individuals. Currently, more than half of the states in the U.S. do not ask questions about sexual orientation or gender identity on the BRFSS.

b. With the steady increase in implementation of the provided module on sexual orientation and gender identity in the BRFSS and surpassing the goal, recommendations are to continue in advocacy efforts focusing on states who do not use the provided module or who do not currently ask any questions regarding sexual orientation.

6. LGBT-2.3: Increase the number of state level surveys that use the provided module on sexual orientation and gender identity in the YRBSS.

   a. In 2014, 28 states and territories used the module created by the CDC in the YRBSS, and the goal for Healthy People was to increase this number to 31, which is a 10% improvement (ODPHP, 2014). In 2015, questions about sexual behavior and orientation were included for all states in the national YRBSS questionnaire, but gender identity and gender expression are still not mandated (Baker & Hughes, 2016).

   b. With the recent change including sexual orientation questions on all standard YRBSS questionnaires, steps are being taken in the right direction. In order to get

true insight of the health needs for all LGBT individuals, questions regarding gender identity and expression should also be included in the questionnaire.

Future Research

Due to low sample size and missing values in this study, LGB participants were grouped together for most analyses, but major differences were noted between them. Further research should study each subgroup separately to highlight key differences between groups. For instance, if obesity is higher for lesbians but lower rates are shown for gay and bisexual men, creating programs for all LGB populations would not be nearly as beneficial as creating tailored obesity prevention programs for lesbian and bisexual women. In fact, promoting calorie reduction or weight loss for gay and bisexual men may be harmful since body image issues could outweigh concerns of obesity (Fredriksen-Goldsen et al., 2014a).

To effectively address the needs of all LGB populations, there must be a well-grounded understanding of those specific needs. Future studies assessing health behaviors for LGB participants should combine data from 2013 NHIS until present release to increase sample size and allow for true comparisons that may reveal potential trends or patterns. Additionally, state and federal surveillance systems should include and uphold standardized items on sexual orientation. The present study focused on sexual orientation, but there is an even larger information gap on gender identity and expression. Even with the progress of including a sexual orientation survey item on the NHIS, there are still no questions regarding gender identity. Furthermore, the NHIS and

similar surveys have concentrated on risk behaviors such as smoking, drinking, and drug use; however, very little focus has been given to the burdens associated with morbidity and mortality (Fredriksen-Goldsen et al., 2014a).

Lastly, special attention should be given to the social factors contributing to the aforementioned disparities. For instance, Meyer's minority stress theory postulates that past and current experiences of harassment, social stigma, victimization, bullying, violence, religious intolerance and persecution, and other stressors often experienced by LGB members are directly linked to many of the physical and mental health problems disproportionately affecting sexual minorities (Meyer, 2003; Fredriksen-Goldsen et al., 2014a). These experiences may differ depending on other factors such as geographic location, age, support system, and other social determinants of health. Future research should explore these experiences and how they affect the health throughout the individual's lifespan. For instance, health disparities related to sexual orientation occur across adulthood, and oftentimes throughout childhood and teenage years as well, but vary in strength by age (Rice, Vasilenko, Fish, & Lanza, 2019). Therefore, further research should investigate the timing of experiences so researchers can create time-based interventions focused on critical ages and time periods for LGB. These public health efforts to promote health equity and improved health outcomes for LGB populations will take considerable time and effort from health educators and key stakeholders; however, these changes are long overdue. The first step towards reducing health disparities experienced by LGB populations is to collect relevant, meaningful data. Only then can effective, tailored interventions be created.

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