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Current research on health disparities among sexual minority women suggests that they may be at increased risk for chronic poor physical and mental health outcomes. However, as of this writing, the existing research typically does not 1) use large, population based samples (limiting the generalizability of those studies), 2) provide an intersectional analysis of disparities based on both sexual orientation and race and 3) adequately establish how risks based on sexual orientation and race can result in both mental and physical morbidity. The purpose of this study is to 1) provide a population-based analysis of cardiovascular risks and mental health disparities among sexual minority women and 2) provide an intersectional analysis of these disparities with a focus on sexual orientation and race.

Secondary data analysis was conducted using the National Health and Nutrition Examination Survey (NHANES) 2003-2012, which utilizes a nationally representative, complex, multi-stage sampling method to represent non-institutionalized adults in the United States. The study sample included 7811 women, 95.2% of whom identified as heterosexual, 1.3% identified as lesbian and 3.5% identified as bisexual.

Results show that across chronic physical and mental health outcomes, bisexual women fare worse than both lesbian and heterosexual women. Bisexual women are more likely to have an annual household income of less than $20,000, have no health insurance, have a higher log body mass index (BMI), to have been diagnosed with

diabetes (even when controlling for family history of diabetes), have poor report mental health days and trouble sleeping. Both lesbian and bisexual women are more likely to engage in nicotine use and binge drinking.

Race was also a significant predictor of poor chronic health outcomes. Both black and Hispanic women were more likely to have an annual household income of less than $20,000, have no health insurance, have higher log BMI and report a family history of diabetes (even after controlling for family history of diabetes). Race also seems to be a protective factor such that racially marginalized women were less likely to engage in substance use and less likely to report poor mental health.

Future research and chronic disease prevention efforts should focus on health disparities among bisexual women in particular. Population based research should focus on health disparities based on larger samples of both sexual minority and racial minority women. Further recommendations for future research and practice are discussed within the dissertation.

SEXUAL ORIENTATION AND VULNERABILITY TO CHRONIC DISEASE: UNDERSTANDING CARDIOVASCULAR RISK FACTORS AND MENTAL HEALTH DISPARITIES AMONG LESBIAN, BISEXUAL, AND HETEROSEXUAL WOMEN

by

Aleksandra Babic

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Approved by

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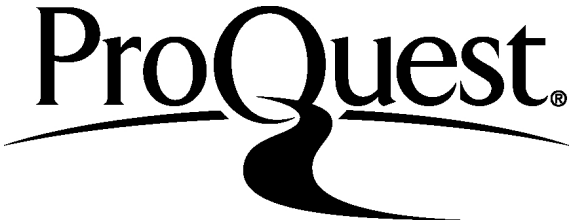
Committee Chair



APPROVAL PAGE

This dissertation written by Aleksandra Babic has been approved by the following committee of the Faculty of The Graduate School at The University of North Carolina at Greensboro.

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Date of Final Oral Examination

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For my parents, Ninoslava & Predrag Babić: Ovaj rad je posvećen vama, bez kojih ništa od ovoga ne bih bilo meni dostupno. Beskrajno vam se zahvaljujem što ste uvijek vjerovali u mene i podržavali me da dostignem šta god želim.

I am immensely grateful to Dr. Jennifer Toller Erausquin who served as my teacher, guide and support in the relatively short time that we worked together, and is the reason I am completing this degree. Thank you! Thank you Dr. Yorghos Apostolopoulos, my chair, Dr. Sharon Morrison and Dr. Sat Gupta, for remaining passionate and invested in my work throughout the years. To Kiki Hatzudis, KP and J. Tiffany Holland—thank you for all of the work dates, for feeding me and being gentle with me.

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CHAPTER I

INTRODUCTION

Statement of the Public Health Problem

Healthy People 2020, a guiding document drafted by the U.S. government that outlines national public health priorities, largely focuses on eliminating health disparities between population groups (U.S. Department of Health and Human Services, 2010). Health disparities are preventable health differences between population groups, particularly those groups defined by race, ethnicity, sex, sexual orientation, gender identity, educational level, socioeconomic status, and geography (Mensah, Mokdad, Ford, Greenlund, & Croft, 2005). Among sexual minority women, preventable causes of health disparities include poor education quality, employment opportunities that fail to offer living wages, inadequate health insurance, harassment, lack of equal rights laws, and social stigmas. Although health disparities in the United States persist, the social determinants of these disparities can be improved (U.S. Department of Health and Human Services, 2010).

Emerging population-based research with sexual minority women has shown disparities in cardiovascular health (Fredriksen-Goldsen, Kim, Barkan, Muraco, & Hoy-Ellis, 2013) and mental health outcomes (Operario et al., 2015). Cardiovascular problems and poor mental health are the leading causes of adult morbidity and mortality in the United States (Crook & Peters, 2008). However, as of this writing, nationally

representative studies have not provided an assessment of both physical and mental health outcomes for a more holistic understanding of health disparities among sexual minority women. Additionally, cardiovascular and mental health disparities are evident in racial minority populations (Adler & Rehkopf, 2008; Roger et al., 2012); however, sexual minority disparities research has not provided an intersectional analysis of sexual orientation and race. As such, the purposes of this dissertation were (a) to provide a population-based analysis of cardiovascular risks and mental health disparities among sexual minority women and (b) to provide an intersectional analysis of these disparities with a focus on sexual orientation and race.

In terms of physical health, cardiovascular disease (CVD) and its associated risks are the leading cause of morbidity and mortality for adults in the United States (Agency for Healthcare Research and Quality, 2013). Of all deaths, CVD accounts for approximately 1 in every 3 deaths (Roger et al., 2012). CVD health disparities research has primarily focused on the relationship between race and socioeconomic status (CDC, 2011b). However, emerging findings have shown that similar disparities exist for sexual minority groups (Fredriksen-Goldsen et al., 2013; Meyer, 2003). Although CVD has historically been associated with men, based on new findings about CVD disparities in this population, research should focus on women and on sexual minority women in particular (Roberts, Dibble, Nussey, & Casey, 2003).

Cardiovascular risk factors are disproportionately high among sexual minority women, compared to CVD risk factors among heterosexual women (Fredriksen-Goldsen et al., 2013; Institute of Medicine [IOM], 2011). These risk factors include obesity

(Boehmer, Bowen, & Bauer, 2007; Jun, Nichols, Spiegelman, & Austin, 2012); substance use, such as alcohol and tobacco consumption (Bye, Gruskin, Greenwood, Albright, & Krotki, 2005; Case et al., 2004; Dabble & Trocki, 2005); low education; low income; and limited healthcare access (Fredriksen-Goldsen et al., 2013; U.S. Department of Health and Human Services, 2010).

Mental health is also associated with cardiovascular risks; approximately 25% of adults in the United States have mental illness (CDC, 2011). Mental health has also been widely noted as a critical health disparity in sexual minority populations (Botswick, Boyd, Hughes, West, & McCabe, 2014; Meyer, 2003). These outcomes have been attributed largely to institutional and interpersonal discrimination, which results in chronic stress (Botswick et al., 2014). The impact of stigma and minority stress are discussed in greater detail in Chapter II.

Because sexual orientation indicators are not consistently collected in national data collection efforts, generalizable health disparities research is limited (IOM, 2011; Koh, 2000). Currently, only a few researchers have compared CVD risk factors and mental health outcomes among lesbian and bisexual women to the risk factors among heterosexual women using population-level data. Thus, further research focused on sexual minority women and their heterosexual counterparts is necessary (Farmer, Jabson, Bucholz, & Bowen, 2013; Cochran & Mays, 2007; Conron, Mimiaga, & Landers, 2010; Everett & Mollborn, 2013). Understanding population-level associations between marginalized identity and critical health disparities, such as cardiovascular risk factors

and mental health outcomes, is critical to agenda setting for future research and practice that will reflect the needs of sexual minority women.

Aims and Hypotheses of the Study

Overall Aim

The overall aim of this dissertation study was to understand the differential distributions of (a) mental health issues and (b) cardiovascular disease risk factors among lesbian, bisexual, and heterosexual women.

Specific Aims and Hypotheses

Specific Aim 1: To examine connections between sexual orientation and sociodemographic characteristics.

H1.1: Lesbian and bisexual women will be more likely to have an annual household income of less than $20,000 compared to the income levels of heterosexual women, controlling for race and age.

H1.2: Lesbian and bisexual women will have less access to healthcare than will heterosexual women, controlling for race and age.

Specific Aim 2: To examine connections between sexual orientation and cardiovascular risk factors.

H2.1: Lesbian and bisexual women will have higher BMI than will heterosexual women, controlling for race and age.

H2.2: Lesbian and bisexual women will have higher prevalence of high blood pressure than will heterosexual women, controlling for race, age, and usual source of health care.

H2.3: Lesbian and bisexual women will have higher prevalence of high cholesterol levels than will heterosexual women, controlling for race, age, and usual source of health care.

H2.4: Lesbian and bisexual women will have higher prevalence of diabetes than will heterosexual women, controlling for race, age, usual source of health care, and family history of diabetes.

H2.5: Lesbian and bisexual women will have higher prevalence of prediabetes than will heterosexual women, controlling for race, age, usual source of health care, and family history of diabetes.

Specific Aim 3: To examine connections between sexual orientation and familial risk of diabetes.

H3.1: Lesbian and bisexual women will have the same prevalence of family history of diabetes as will heterosexual women controlling for race and age.

Specific Aim 4: To examine connections between sexual orientation and substance use.

H4.1: Lesbian and bisexual women will have higher prevalence of tobacco use than will heterosexual women, controlling for race and age.

H4.2: Lesbian and bisexual women will have higher prevalence of alcohol use than will heterosexual women, controlling for race and age.

Specific Aim 5: To examine connections between sexual orientation and emotional health factors.

H5.1: Lesbian and bisexual women will have higher prevalence of mental health days that are not good than will heterosexual women, controlling for race and age.

H5.2: Lesbian and bisexual women will have higher prevalence of sleeping problems than will heterosexual women, controlling for race and age.

CHAPTER II

REVIEW OF THE LITERATURE

The purpose of this literature review is to provide an overview of health disparities among sexual minority women in terms of sociodemographic characteristics, cardiovascular risk factors, and mental health outcomes. Minority stress theory and a theory called *stigma as a fundamental cause of population health disparities* will be discussed as a way to contextualize these disparities based on stigmatized and marginalized identity such as sexual orientation and race. Stigma is defined as the "labeling, stereotyping, separation, status loss, and discrimination [that] occur together in a power situation that allows them" (Link & Phelan, 2001, p.367).

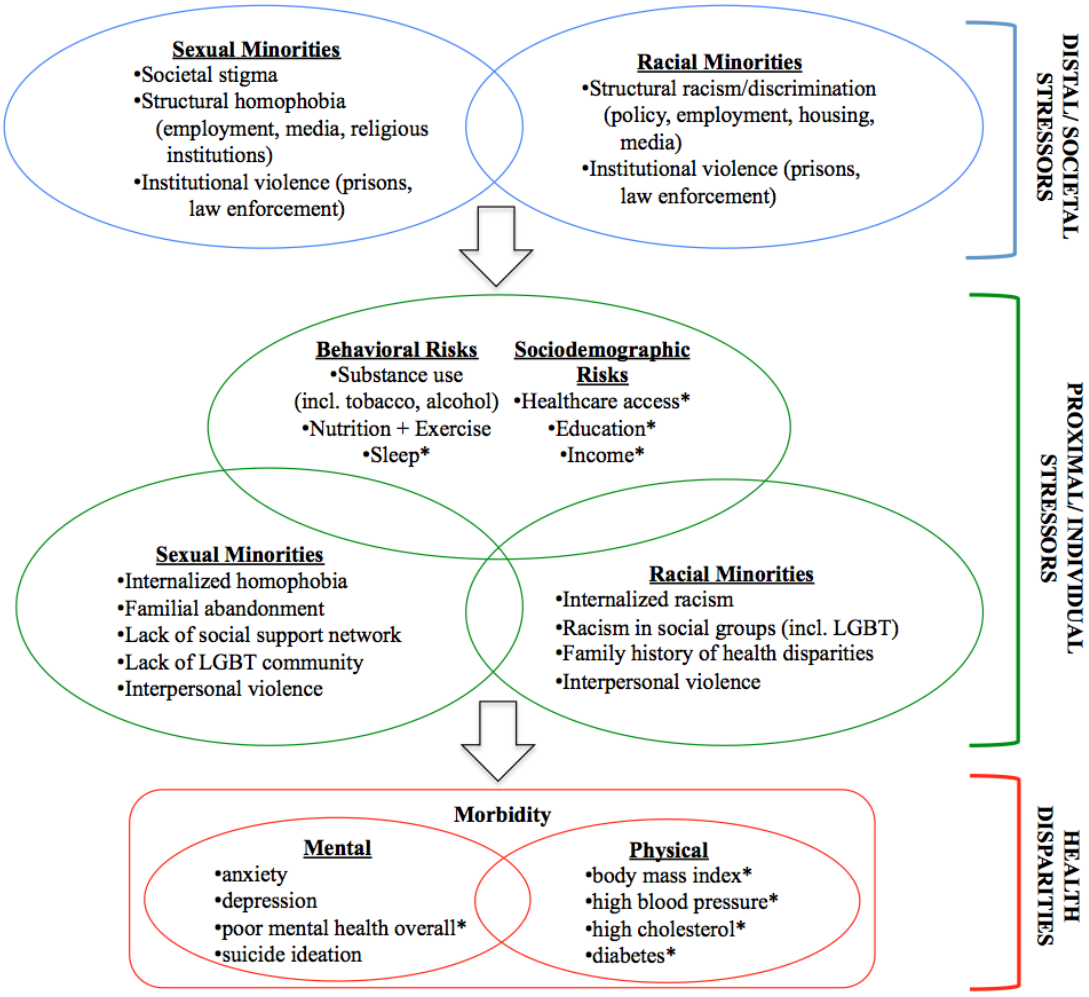
Health Disparities

The term *health disparities* refers to "systematic, plausibly avoidable health differences according to race/ethnicity, skin color, religion, or nationality; socioeconomic resources or position; gender, sexual orientation, gender identity; age, geography, disability, illness, political, or other affiliation; or other characteristics associated with discrimination or marginalization" (Braveman et al., 2011, p.S150). This definition means that health disparities are often based on individual characteristics such as race or sexual orientation because these characteristics determine individual experiences with systemic discrimination and marginalization (Diex Roux, 2012). As such, employment and housing discrimination are often seen as the "fundamental causes" of negative health

outcomes. Link and Phelan (2002) explained that even with a decrease in risk factors, health disparities often remain consistent over time and that this is the crux of health disparities research. The reason for persisting disparities is that improving risk factors does not dismantle the root causes of oppression (Diez Roux, 2012; Link & Phelan, 2002). In an effort to better understand risk factors and the related outcomes, disparities research requires continued oversight and monitoring of new findings. This literature review includes the existing research on cardiovascular risk factors and mental health outcomes among sexual minority women, taking into account racial identity.

Theoretical Perspectives

As discussed later in this chapter, cardiovascular and mental health disparities are evident among sexual minority women. However, the lack of population-based studies and inconsistent findings show that more research is needed to establish relationships between minority stress and chronic morbidity. The conceptual model, shown in Figure 1, maps out pathways that, according to the two theories discussed next, help explain these disparities. The conceptual model is guided by the minority stress theory and the stigma as the fundamental cause of population disparities theory. Based on these two theories, stigma is understood as a form of chronic stress that affects sexual minority and racial-minority populations regardless of their individual perceptions of stigma (Hatzenbuehler, Phelan, & Link, 2013b). Societal stigma can and often does manifest as individual stressors, such as the loss of or lack of access to higher SES status, increased social isolation and lack of social support, and internalized inferiority (Hatzenbuehler et al., 2013b).



*****denotes indicators analyzed in this dissertation

Figure 1. Conceptual Model for Understanding Health Disparities in Sexual Minority Populations.

Stigma as a Fundamental Cause of Population Health Disparities

Using a broad definition that decentralizes the individual, stigma is associated with social disadvantages against marginalized persons and has been identified as a major source of stress in their lives (Major & O'Brien, 2005). As such, stigma based on marginalized identity drives various forms of discrimination and therefore has a

substantial effect on population health and social relationships. In fact, Hatzenbuehler et al. (2013b) argued that stigma is the central driver of morbidity and mortality at the population level.

In the past, researchers have isolated the impact of stigma by focusing on one specific manifestation of stigma and a single outcome. For example, Hatzenbuehler et al. (2103b) developed a framework that synthesizes various forms of disparity and identifies the processes that generate health inequalities at a population level. This framework stipulates that stigma is a fundamental cause of negative health outcomes. These outcomes are enduring, and the fundamental cause can present itself in different ways over time. Different fundamental causes of stigma may lead to the same negative health outcomes. One way this can happen is through individual-level minority stress, such as social or job status loss attributable to stigmatized characteristics.

In their review of literature, Hatzenbuehler et al. (2013b) demonstrated that sexual minority status has led to negative outcomes with respect to housing, employment and income, social relationships, psychological and behavioral outcomes, healthcare, and overall health. This finding is also true for racial/ethnic minority status and for persons diagnosed with mental illness, which can be coinciding identities for individuals. In addition, stigma has been associated with social isolation from either fear of rejection or negative evaluation by others, which affects social support critical for overall wellbeing. Stigma is especially problematic when employed for the purpose of exploitation and norm enforcement aligned with heterosexuality, such as socially rejected public displays of affections. Stigma can also lead to the internalized fear that the marginalized person

will confirm the stereotypes assigned to them, which may lead to decreased educational or employment function and in turn lead to a confirmation of the negative stereotype.

Overall, the issue of stigma is complex; it exists even when an individual is not cognizant of it (e.g., lack of employment protection policies), and it can be felt even when it is not obvious (e.g., straight couples feeling safe to discuss their romantic partnerships and exhibit public displays of affection without fearing for their safety). Regardless, stigma as a form of chronic stress often results in negative health outcomes among sexual minorities and must be accounted for as such in the context of health disparities (Hatzenbuehler et al. 2013b).

Minority Stress Theory

Based on work with other marginalized groups, the minority stress theory has been widely adopted in lesbian, gay, and bisexual health disparities research (Meyer, 2003). The model underscores the idea that stressors affecting minority groups are unique and not experienced by the majority group (Conron et al., 2010; IOM, 2011; Sanford, 2006). In addition, stressors are chronic in the sense that they are enduring and socially based, occurring as part of heteronormative social processes, institutions, and systems (Meyer, 2003). In an ultimately homophobic or heteronormative society (one that stigmatizes marginalized groups), sexual minorities experience stress attributable to the constant behavioral negotiation and adaptation in their attempts to avoid stigmatization and other types of stressors (Meyer, 2003). Minority stressors include but are not limited to (a) external and objective stressful events and conditions, (b) expectations of stressful events and the vigilance that expectation requires, and (c) internalized negative societal

attitudes (Meyer, 2003). Examples of these stressors include employment discrimination, "coming out" or sexual identity disclosure, unequal protection and benefits under the law, and internalized homophobia or heterosexism (Huebner & Davis, 2007). Stress can be experienced as a result or in anticipation of these issues, ultimately resulting in chronic stress.

Negative health outcomes related to stress extend to physical health factors such as cardiovascular disease, breast and anal cancers, asthma, and disordered eating (Frost, Lehavot, & Meyer, 2012). Despite the adoption of policies that extend legal marriage and associated benefits to same-sex couples, opposing policies and "same-sex marriage" repeals continue to be proposed and adopted throughout the United States. Thus, it is evident that identifying as a lesbian or a bisexual woman continues to be socially and politically stigmatizing.

Although this dissertation research was not intended to test the societal mechanisms that lead to health disparities, the conceptual model was designed (a) to provide a visual framework for the theories guiding this research, (b) to help contextualize any significant relationships found in this study, and (c) to identify the understudied issues for future research.

Chronic Disease in the United States

In the United States, health disparities are often discussed in terms of race, socioeconomic status, gender, and geography (American Public Health Association, 2013). Chronic disease in particular accounts for two thirds of the national healthcare expenditure and is the leading causes of death and disability, accounting for 7 out of 10

deaths and affecting the lives of 90 million people nationwide (Crook & Peters, 2008). The most common chronic health issues include cardiovascular risk factors such as hypertension, diabetes, and obesity (Farmer, et al., 2013), as well as poor mental health outcomes (Operario, et al., 2015; Crook & Peters, 2008). These conditions are associated with marginalized racial and economic status. Racial minorities and low-income individuals across the United States have reported higher rates of disease, including obesity, disability, and overall poor health, compared to the rates reported by whites and those of higher income (American Public Health Association, 2013; Crook & Peters, 2008). Healthcare expenditures and additional health complications as a result of chronic disease often deplete economic resources and healthcare access, resulting in greater poverty in already marginalized groups (Crook & Peters, 2008).

Additional complexities related to chronic disease involve gender. Although women tend to live longer, they are also more likely than are men to suffer from disease and disability, including cardiovascular morbidity, during their lifetimes (American Public Health Association, 2013). The research on these gender-based disparities among sexual minority women in particular is relatively new and requires further investigation (IOM, 2011). The following sections provide an overview of known cardiovascular risks and mental health disparities.

CVD Disparities in the United States

In 2011, 11% of adults in the United States reported being diagnosed with heart disease by a medical professional (CDC, 2011b). Historically, cardiovascular outcomes such as heart disease, coronary heart disease, and hypertension have been higher among

men, increasing with age. However, emerging research has shown that associated mortality rates are higher among women and do not seem to be declining (Stock & Redberg, 2012).

Two out of every 3 women have at least one risk factor for CVD, including cigarette smoking, high blood pressure, obesity, and diabetes. The incidence and severity of CVD among women who are premenopausal are lower than are the rates of similar-aged men, even after adjustment for various risk factors. Once diagnosed with ischemic heart disease, women also have a worse prognosis than do men, and the cause for this outcome is unclear (Stock & Redberg, 2012). Further, women are more likely than are men to be hospitalized for unexplained chest pain (McSweeney et al., 2003). Most notably, women may experience a wide range of symptoms, which ultimately makes coronary disease diagnosis challenging. In fact, many women never experience chest pains and instead report unusual fatigue, sleep disturbance, shortness of breath, indigestion, and anxiety prior to their heart attacks (McSweeney et al., 2003). Given the impact of cardiovascular risk factors on women, it is important for researchers to examine disparities among marginalized women, particularly in terms of sexual orientation.

CVD Disparities among Sexual Minority Women

Researchers at the Centers for Disease Control and Prevention (CDC) reported that sexual orientation is a critical dimension of health disparity research. Sexual orientation is still inadequately accounted for in population health disparity studies in general and for cardiovascular disease in particular (CDC, 2011b). Although heart disease mortality rates among men have declined over the past 25 years, rates among

women have declined more slowly (American Heart Association, 2013). Researchers have suggested that CVD disparities are further pronounced among sexual minority women because of the higher likelihood of cardiovascular risk factors within this group (Roberts et al., 2003). Cardiovascular risk factors include smoking and tobacco use, high alcohol intake, poor diet, high cholesterol levels, high blood pressure, diabetes, obesity-related factors, and emotional and mental stressors (IOM, 2011). Research has shown that when compared to heterosexual women, lesbian and bisexual women are more likely to report multiple risk factors for cardiovascular disease (IOM, 2011). Given the limited availability of cardiovascular risk research among sexual minority women, obesity is discussed separately from other CVD risk factors. Based on the presented research on obesity among sexual minority women, my hypothesis in this study is that both lesbian and bisexual women will have higher BMI than heterosexual women.

CVD Risk Factors: Obesity

Over half the women in the United States are overweight or obese (Hedley et al., 2004; Ogden et al., 2006). Lesbians have consistently shown a higher body mass index (BMI), compared with BMI national averages for women overall (Aaron et al., 2001; Cochran et al., 2001; Lever, 2001; The Mautner Project, 2011), for heterosexual women (Boehmer et al., 2007; Case et al., 2004; Koh, 2000; The Mautner Project, 2011; Roberts et al., 2003; Rothblum, 2001; Valanis et al., 2001), and for all other sexual minority women (Boehmer et al., 2007; Aaron et al., 2001). When compared to their biological sisters, lesbians had a significantly higher BMI, waist circumference, and waist-to-hip ratio (Roberts et al., 2003). In terms of diet, lesbians were less likely to have eaten red

meat in the previous year and did not vary in terms of other nutritional variables when compared to their sisters (Roberts et al., 2003). In addition, a high percentage of lesbians reported engaging in vigorous physical activity, which may contribute to positive health outcomes (Aaron et al., 2001; Roberts et al., 2003).

Nonetheless, researchers have demonstrated that overweight and obesity rates are twice as high among lesbians, showing a 20% higher overweight prevalence and a 50% higher obesity prevalence compared to heterosexual women (Boehmer et al., 2007; Case et al., 2004; Cochran et al., 2001). In one study, the researcher noted that both white and African American lesbian and bisexual women had higher overweight rates at age 18 than did their heterosexual counterparts. However, only white women were more overweight than heterosexual women at their current age, whereas Latina, Asian, and African American women did not differ in current weight based on sexual orientation (Deputy & Boehmer, 2014). Overall, lesbians have seemed less concerned about their weight, compared to heterosexual women and have been less likely to perceive themselves as overweight (Cochran et al., 2001).

The greater prevalence of obesity among lesbians has been primarily attributed to chronic stress, which results from societal stigmas about sexual minorities, familial rejection related to sexual orientation, and societal standards of beauty for women (The Mautner Project, 2011). Notions about stigma and minority stress have particularly been highlighted as fundamental causes of chronic stress and resulting outcomes, discussed further in later sections (Hatzenbuehler et al., 2013b; Meyer, 2003).

Obesity-related research has largely failed to include the health outcomes of bisexual women (Boehmer et al., 2007; Cochran et al., 2001; Yancey et al., 2004). In one study, researchers demonstrated that bisexual women had a 40% higher prevalence of obesity, compared to heterosexual women (Case et al., 2004); however, other researchers found no significant differences in weight between bisexual and heterosexual women (Boehmer et al., 2007; Conron et al., 2010; Struble, Lindley, Montgomery, Hardin, & Burcin, 2010). Further research is clearly necessary to determine whether chronic stress is a social determinant of health for all sexual minority women or for lesbians in particular. Based on the presented research on obesity among sexual minority women, my hypothesis in this study is that both lesbian and bisexual women will have higher BMI than heterosexual women.

CVD Risk Factors: High Blood Pressure, Cholesterol, and Diabetes

Because sexual identity markers are often not collected in national cardiovascular health studies, findings about blood pressure, cholesterol, and diabetes in this population are limited or inconsistent (as discussed below). However, given the dietary and BMI outcomes of lesbian and bisexual women, as previously noted, these indicators are especially important. One study showed that lesbians were least likely to have cholesterol screenings (Koh, 2000), which may relate to unaddressed self-reported cholesterol levels. Given evidence on obesity-related outcomes, my hypothesis is that cholesterol outcomes will be higher among lesbian and bisexual women than heterosexual women. Lesbian and bisexual women have higher elevated systolic blood pressure compared to heterosexual women in unadjusted analyses, but these findings become insignificant once

socioeconomic status, health behaviors, medication use, and BMI are accounted for (Hatzenbuehler et al., 2013b). In another study, researchers found that bisexual women were approximately 50% more likely to report a high blood pressure diagnosis, compared to heterosexual women (Case et al., 2004). Research seems to indicate that additional risk factors among all women, including lesbian and bisexual women, encompass race and socioeconomic indicators in which greater marginalization corresponds with higher rates of high blood pressure (Mensah et al., 2005). The inconsistencies and overall lack of findings appear to be based on a lack of population-based research with sexual minority women (IOM, 2011). Based on the findings with bisexual women, my hypothesis is that both lesbian and bisexual women will have a higher prevalence of high blood pressure and diabetes than heterosexual women. Further, as per the conceptual model, high blood pressure and diabetes are associated with stress, and societal stress is an inherent part of stigmatized identity, leading to the expectation that these outcomes will be greater among marginalized groups.

Cardiovascular Disease

The Institute of Medicine's (IOM; 2011) *Health of Lesbian, Gay, Bisexual, and Transgender People* report indicated that research on cardiovascular disease in sexual minority women has mostly been conducted with HIV-infected participants. The research that explicitly addressed cardiovascular disease in non-HIV affected lesbian and bisexual women is outlined here. The literature search yielded five peer-reviewed articles, and the remaining relevant articles were identified through a review of the source references. As evidenced by the studies discussed below, much of the existing research came from

smaller-scale population-based studies, such as studies from a particular state in the United States or studies in which the sample sizes were too small for an in-depth intersectional analysis of health disparities.

In one study, National Health And Nutrition and Examination Survey (NHANES) data were used to determine vascular age relative to chronological age among sexual minority women, compared to heterosexual women (Farmer et al., 2013). Current and future CVD risk was estimated using the Framingham General CVD Risk Score, which focuses on age, sex, high-density lipoprotein (HDL), total cholesterol, systolic blood pressure, antihypertensive medication use, diabetes, and current smoking status as its key variables. Covariates included family history of CVD, BMI, education, annual household income, race/ethnicity, history of hard drug use, and alcohol use. On average, the vascular age of sexual minority women was 5.7% higher than the vascular age of heterosexual women (Farmer et al., 2013). However, it must be noted that the "sexual minority" sample in this study included participants who identified as "something else" other than lesbian, bisexual, or heterosexual, as well as women who had at least one lifetime same-sex sexual partner. Still, the findings are reflective of previous studies. For example, Diamant, & Wold (2003) reported that lesbian and bisexual women contacted through population-based telephone surveys were more likely than were heterosexuals to report a heart disease diagnosis. Further, bisexual women reported significantly more days of poor physical health than did heterosexual women (Diamant & Wold 2003). However, Diamant and Wold acknowledged the small subsample of sexual minority women as a significant limitation in their study.

These findings contrast with findings from a recent study by Hatzenbuehler et al. (2013b), who found that despite having more risk factors for cardiovascular disease, including smoking, heavy alcohol use, and higher BMI, lesbian and bisexual women had lower levels of C-reactive protein than did heterosexual women in fully adjusted models. The C-reactive protein test (CRP) is often used by medical providers to examine inflammation levels in the body by testing for the presence and amount of C-reactive proteins in the blood (Mayo, 2013b). Unfortunately, this research was unable to provide an intersectional analysis of health outcomes based on race and other potentially marginalizing factors. Further, the findings contrasted with findings from the population-based 2003–2010 Washington State Behavioral Risk Factor Surveillance System (Hatzenbuehler, McLaughlin, & Slopen, 2013a).

Similarly, the authors of a Massachusetts Behavioral Risk Factor Surveillance System study found that lifetime diabetes and heart disease did not vary by sexual orientation identity (Conron et al., 2010). Sexual minorities were no more likely to report diabetes or heart disease diagnoses than were their heterosexual counterparts (the authors found this to be surprising given the elevated rates of obesity among lesbians) . Underdetection and a relatively young sample may have been contributing factors to these findings. Bisexuals were more likely to report drug use, smoking, and former smoking, compared to heterosexuals (Conron et al., 2010).

A number of research limitations can help explain the varied results in overall cardiovascular health outcomes among sexual minority women. The first of these issues has to do with operationalizing and measuring sexual orientation as the key independent

variable. As discussed in the theoretical perspectives section, identifying with a key marginalized identity promotes stigma, perpetuates systemic marginalization such as discrimination and lack of appropriate and accessible healthcare, and ultimately contributes to negative health outcomes Hatzenbueler, et al. (2013b). As such, health disparities research should (a) focus on sexual orientation ("lesbian," "bisexual," and "queer") as indicators of marginalized identity, irrespective of sexual history (which allows for the recognition of asexual women), (b) utilize nationally representative population estimates rather than those that reflect individual states, and (c) measure race as a critical determinant of cardiovascular outcomes.

As research limitations continue to be addressed in this population, the emerging research is not evident in public health education practice. Current public health prevention efforts with sexual minorities are still largely focused on sexual health outcomes, such as the prevention of sexually transmitted infections (STIs), despite evidence that this population is well informed about sexual health issues (Blondeel, et al., 2016). As such, prevention efforts remain limited in the areas of healthy weight, cardiovascular health and substance use (though this last issue is being more actively addressed than the others) (Meyer, et al., 2008).

Mental Health

Emotional and mental health disparities are well documented among lesbian and bisexual women. A number of risk factors signify stress and poor mental health; a large number of the risk factors are significantly higher among sexual minority women than among heterosexual women (Fredriksen-Goldsen, 2013; Meyer, 2003). This dissertation

focuses on the impact of societal stigma and the resulting minority stress experienced by marginalized people such as sexual minority women.

Stress

Among sexual minorities, stress is often accepted as a part of life. However, the sources of stress for many sexual minorities often center around the ongoing process of "coming out," familial and intimate relationship tensions, financial and work-related issues, homophobia, and heterosexism directly associated with sexual minority status (Yoshitaka & Ristock, 2007). Although everyone is affected by daily stressors, minority stress is unique in the sense that it is not experienced by the majority, and it is often excessive (Meyer, 2003). An example of this excess stress is negotiating if and when to disclose one's sexual orientation at work or with new acquaintances, which can affect a person's participation in social situations. These internal negotiations and any resulting negative consequences can result in excess stress.

In terms of overall mental health, both lesbian and bisexual women have higher rates of poor mental health, compared to heterosexual women (Case et al., 2004). In fact, lesbians reported 40% higher rates of depression, and bisexual women reported 60% higher rates of depression, compared to rates for heterosexual women (Case et al., 2004). In addition, both groups are twice as likely to report higher rates of antidepressant use (Conron et al., 2010). However, even though in one study researchers found no difference in rates of depression between sexual minority and straight women (Case et al., 2004), in another study, researchers found significantly worse outcomes among bisexual women (Conron, et al., 2010). In fact, bisexual women are 2 to 3 times more likely to report

frequent tension, worry, or sadness and overall higher rates of suicide ideation (Conron et al., 2010).

Further, higher rates of poor mental health are often associated with higher rates of substance use (Conron et al., 2010). In particular, this dissertation focuses on tobacco and alcohol use, because these two practices are indicators of both poor mental health and cardiovascular risk, as discussed below. Consistent with these findings and the overall premise of chronic minority stress, my hypothesis is that poor mental health will be more likely among lesbian and bisexual women compared to their heterosexual counterparts.

Tobacco Use

Despite the fact that tobacco-related diseases are the most preventable health issues in the United States, and lung cancer is most prevalent in terms of cancer-related deaths (Gruskin & Gordon, 2006), rates of tobacco use among lesbian and bisexual women remain high. Sexual minority women are more likely to be current smokers or former smokers, have a history of drug use, be risky drinkers, and/or have a family history of premature CVD (Aaron et al., 2001; Farmer et al., 2013). Compared with their heterosexual counterparts, lesbians were more likely to have ever smoked, but were as likely to be current smokers (Roberts et al., 2003).

These higher rates of smoking among lesbians appear to be related to social marginalization, disenfranchisement, and prominence of socializing within the context of bar culture (Smith, Offen, & Malone, 2005, 2006). In fact, smoking is often shown in magazine editorials and advertising specifically targeting lesbian, gay, bisexual, and transgender (LGBT) populations (Smith, Thompson, Offen, & Malone, 2008). When

asked about their thoughts on the matter, many LGBT people indicated that this was a good sign: The tobacco companies were acknowledging a previously invisible community. More specifically, this type of advertising was seen as a socially and politically significant indicator of the results of LGBT advocacy for social acceptance in all realms of life (Smith, Thompson, Offen, & Malone, 2008).

When examining unadjusted rates, no differences in rates of smoking were found between lesbians and heterosexual women. However, once age, race/ethnicity, and education were accounted for, lesbians were significantly more likely to be smokers than were heterosexual women, and they were more likely to ever have smoked on a regular basis (Gruskin & Gordon, 2006). Higher rates of smoking were found among lesbians across all levels of education, and sometimes the rates were twice as high among lesbians and bisexual women than among heterosexual women (Bye et al., 2005; Case et al., 2004). Lesbians had 60% higher rates of reported smoking history, and bisexual women had 50% higher rates of reported smoking history, compared to heterosexual women (Conron et al., 2010; Gruskin & Gordon, 2006). It is my hypothesis that the sexual minority women in this study will also be more likely to be current users of tobacco and nicotine, compared to heterosexual women.

Alcohol Use

At first glance, the rates of alcohol use seem similar across women of different sexual orientations. However, after adjusting for demographics, lesbians were less likely than were heterosexual women to abstain from drinking and more likely to be heavy drinkers (Case et al., 2004; Cochran et al., 2000; Cochran & Mays, 2000; Diamant et al.,

2000; Gruskin & Gordon, 2006). In fact, lesbians were about twice as likely and bisexual women approximately 3 times as likely to report heavy drinking, compared to heterosexual women (Case et al., 2004).

The rates of current drinking among sexual minority women seem to be related to early life alcohol experiences or alcohol use during critical transitional experiences such as disclosure of one's sexuality to family, friends, and coworkers (Parks, Hughes, & Kinnison, 2007). Both lesbian and bisexual women had significantly greater odds of reporting current alcohol-related problems or hazardous drinking, including fights, arguments, spousal anger attributable to drinking, suggestion by a medical provider to reduce drinking, lost time at work, and trouble with the law when driving was not involved (Dabble & Trocki, 2005). Bisexual women reported the highest rates of hazardous drinking (Wilsnack et al., 2008). Of those who received treatment for alcohol related problems, lesbian and bisexual women were far more likely to be dissatisfied with the treatment (Dabble & Trocki, 2005). I expect that both lesbians and bisexual women will be more likely to engage in binge drinking behaviors than their heterosexual counterparts, particularly as a means of coping with societal stressors related to stigma.

Sociodemographic Risks

Sociodemographic risk factors as determinants of poor health outcomes are complex, and research on these these issues is largely inconsistent within sexual minority populations, as discussed below. Socioeconomic status (SES) can be measured using a number of different indicators. According to the Centers for Disease Control and Prevention (CDC; 2011), income as a SES indicator is a critical determinant of mortality,

morbidity, unhealthy behaviors, reduced access to care, and poor quality care. Specifically, family or household income is used to assess influence of socioeconomic status on health. However, no consensus exists on the socioeconomic status of the majority of sexual minority populations (IOM, 2011). Although some researchers have suggested lesbians have higher incomes than do heterosexual women (Black et al., 2007), others have found no difference (Badgett, 2001; Klawitter & Flatt, 1998).

Another indicator of SES is education. It is unclear whether sexual minority persons with more education are likely to disclose their sexual orientations given their nonstigmatized economic standing, compared to their less educated counterparts, potentially resulting in inaccurate or insufficient data (IOM, 2011). Regardless of SES indicators, historically, partnered sexual minority women did not receive tax and insurance benefits because they were not able to legally marry, unlike their married heterosexual counterparts. This is evident in the fact that lesbians are less likely to own their own homes than are heterosexual women (Black et al., 2007).

As with other outcomes, income-disparity research among bisexual women is limited (IOM, 2011), although the findings that do exist to date have indicated that bisexual women fare worse than do both heterosexual women and lesbians (Carpenter, 2005). The findings of one study confirmed this notion, showing that bisexual women experienced higher rates of poverty (in this case, defined as below 300% of the federal poverty level) than did heterosexual women or lesbians (Conron et al., 2010). In addition, when comparing sexual minorities (including men and women) to their heterosexual counterparts, bisexual persons are more likely to lack health insurance, a regular

healthcare provider, and dental care (Conron et al., 2010). Further, lower education and income were both significantly associated with emergency department utilization among sexual minority persons (Sanchez, Hailpern, Lowe, & Calderon, 2007). I expect that my findings will be similar—sexual minority women will be more likely to have lower incomes and, relatedly, be more likely to not have health insurance, when compared to their heterosexual counterparts.

CHAPTER III

METHODS

Sampling Issues with Sexual Minority Populations

Nonprobability sampling is widely utilized in the field of lesbian and bisexual women's health, resulting in nongeneralizable findings (IOM, 2011). Historically, this sampling method has led to a lack of comparable health disparities studies about lesbian and bisexual women. In order to assess cardiovascular risk factors and mental health adequately at the population level, this study utilized data from the nationally representative National Health and Nutrition Examination Survey (NHANES). Despite the fact that the NHANES collects sexual identity markers, a number of sampling issues were present regarding "invisible populations" such as sexual minority groups. For example, inconsistencies in operational definitions of sexual orientation are of particular concern across studies (IOM, 2011). In some cases, the definitions have relied on self-identification of sexual orientation, and in other cases, definitions have focused on sexual behavior (IOM, 2011).

The NHANES was ideally suited for this study because it not only collects information on sexual identity and sexual behaviors, but also collects the critical risk factors most relevant to cardiovascular disease (CDC, 2013c). The NHANES consists of annual household interviews and health examination data from a random probability sample of 5,000 people (CDC, 2013c). Because the NHANES also uses a validated

instrument that has been used and adapted since the 1960s, the data from NHANES have consistently been used in the study of health disparities in the United States. Further, the survey collects measures of sexual orientation, which facilitates the study of disparities in sexual minority populations (Farmer, et al., 2013). In conjunction with the collection of a number of CVD critical indicators, as specified in Figure 1, the NHANES produces the ideal dataset for the study. The complete datasets are available for public use because all the information has already been deidentified. The NHANES study has been approved on an ongoing basis by the NCHS research ethics review board (CDC, 2012). The Institutional Review Board of University of North Carolina Greensboro deemed this dissertation study's secondary data analysis exempt from human subjects review.

Participants

Sampling Design

The National Health and Nutrition Examination Survey (NHANES) data collection procedures have been used to gather data from a sample representative of the national parameters on a continuing basis since 1999 (CDC, 2013b). The NHANES utilizes a complex multistage probability sampling method. Over time, oversampling was conducted for specific demographic groups, described next.

First, as part of the sampling design, primary sampling units (PSUs), or individual counties, were selected (CDC, 2013b). Small counties were sometimes combined to account for the predetermined minimum population size. Since 2001, PSUs were randomly selected from all counties in the United States. Fifteen PSUs are surveyed annually. Next, in all cases, clusters of households were randomly selected and

individuals within these households were solicited for participation (CDC, 2013b). Once screened, if the individuals live in the household and were able to convey responses in either English or Spanish, they were invited for further participation.

Ultimately, the sampling methodology was designed such that 1 respondent represents approximately 50,000 individuals in the United States; 5,000 individuals are sampled each year (CDC, 2013e). For purposes of the current study, data included the oversampling of persons of color to represent more accurately the noninstitutionalized U.S. population. In addition, it must be noted that the terms *surveyed* and *interviewed* are used synonymously in this study because certain NHANES components are interviewer-administered and others, particularly the sensitive sexual behavior questions, were self-administered via an audio computer-assisted personal self-interview (ACASI).

The sample for the survey is selected to represent all ages of non-institutionalized individuals residing in households in the U.S. population. The United States has experienced dramatic growth in the number of older people during this century (CDC, 2013d). The aging population has major implications for healthcare needs, public policy, and research priorities. To produce reliable statistics, the NHANES oversamples people 60 and older, African Americans, and Hispanics (CDC, 2013d). As such, weights have been created to account for the survey design (inclusive of oversampling), survey nonresponse, and post-stratification. Thus, each person in the sample is given a sample weight to represent accurately the number of people in the population they are meant to represent (CDC, 2013d).

Recruitment

Letters informing the selected households about the study were sent prior to the initial interviewer visit to the household (CDC, 2013e). Upon arrival, the interviewers show their badges and ask if the participant received the letter informing them of the study. If the household member did not see the letter, they were presented with the letter at that time and told about the study (CDC, 2013e). The interviewer then proceeds to screen the household members for participation criteria. For eligible household members, the interviewer explains that participants must be at least 16 years old, that they have a right to decline participation at any time, and that all of their responses and information will be kept confidential. For individuals 16 years or younger, other household members can report on their behalf. For households in which no one was over the age of 16, those individuals can choose to self-report (CDC, 2013e).

After agreeing to participate, participants are presented with informed consent documents again and offered detailed information about the NHANES (CDC, 2013e). The NHANES consent form is shown in Appendix 1. Demographic and health survey data, such as sexual behaviors and prior diagnoses, were collected through prompts by the interviewer or through a self-interview. After the interview, respondents were scheduled for physical examinations to collect biomedical information (CDC, 2013e). However, because the majority of the individuals who answer questions about sexual identity do not participate in the physical examination portion of the survey, this information will not be examined in the current study, as discussed next.

Analytic Sample

This dissertation utilizes five waves of data, or the last 10 years of fully available data sets (2003-2012). The purpose for this is to provide a sufficient sample size to adequately compare subsamples and provide a snapshot of a decade rather than the single data collection period of two years. The analytic sample size is not weighted, but the associated percentages do represent weighted population estimates. Of the 7811 participants that provided information about their sexual orientation, 7435 (95.2%, weighted estimate) were heterosexual, 105 (1.3%) were lesbian-identified and 271 (3.5%) identified as bisexual. A total of 245 (3%) participants identified as "something else", "unsure" or indicated that they did not want to answer the question and were therefore excluded from the sample and counted as missing.

A chi-square test of independence shows that bisexual women tended to be younger than heterosexual and lesbian women (Table 1), $X^2(8, N=7811)=98.043$, $p<.001$. In fact, as shown in Table 2, a one way ANOVA shows that the average age for heterosexual women was approximately 38 years (SD=11.68), 36 years for lesbian women (SD=11.90) and 31 years for bisexual women (SD=10.21), $F(2,7808)=47.38$, $p<.001$. Of the 7811 women who answered the sexual orientation question, 95.3% (n=7425) were heterosexual, 1.4% (n=105) and 3.3% (n=271). In terms of race, a greater proportion of lesbian and bisexual participants were black, compared to heterosexual participants. Heterosexual women made up a greater proportion of the Hispanic sample than lesbian and bisexual women, $X^2(6, N=7811)=20,162$, $p<.005$. Table 1 shows that 3.2% (n=440) heterosexual women reported completing less than 9th grade, 10.4%

(n=1047) completed 9th-11th grade, 20.9% (n=1515) reported completing high school or a GED, 34.9% (n=2436) had some college experience or an AA degree and 30.5% (n=1779) were college graduates or above, $X^2(8, N=7810)=5.342$, $p<.05$. Among lesbian women, the distribution was similar, with 3.0% (n=5) women completing less than 9th grade, 10.3% (n=13) completed 9th-11th grade, 17.3% (n=19) completed high school or a GED, 36.1% (n=34) had some college experience or an AA degree and 33.3% (n=226) completed college or above. For bisexual women, the rates appeared to differ a bit such that 1.8% (n=6) of the women completed less than 9th grade, 52 (17.4% weighted estimate) completed between 9th-11th grade, 63 (23.1%) finishing high school or a GED, 95 (38.8%) completed some college or an AA degree and 39 (19.0%) were college graduates. A chi-square test of independence shows no difference in employment rates based on sexual orientation.

Table 1. Demographic Characteristics

	Heterosexual/ Straight (*n* = 7,425)		Homosexual/ Lesbian (*n* = 105)		Bisexual (*n* = 271)	
Demographic Variables	*n*	%	*n*	%	*n*	%
Age[a]						
18-24	1,237	13.4	23	12.3	97	32.6
25-34	1,874	22.6	26	23.5	87	30.4
35-44	1,816	25.3	28	33.7	47	18.0
45-54	1,824	27.7	19	19.1	33	16.5
55-64	684	11.0	9	11.4	7	2.5
Race[1]						
White	3,283	68.1	50	70.3	135	69.5
Black	1,660	12.6	29	15.4	74	15.6
Hispanic	1,988	13.3	20	10.2	43	9.5
Other, including multiracial	494	6.0	6	4.1	19	5.5
Education level[1]						
Less than 9th grade	440	3.2	5	3.0	6	1.8
9th–11th grade	1,047	10.4	13	10.3	52	17.4
High school grad/GED	1,515	20.9	19	17.3	63	23.1
Some COLLEGE or AA degree	2,436	34.9	34	36.1	95	38.8
College graduate or above	1,779	30.5	26	33.3	39	19.0
Employment Status						
Employed	4,812	70.6	69	70.6	157	63.5
Unemployed	2,622	29.4	36	29.4	114	36.5

Note: NHANES, 2003–2012 (*N* = 7,811); significance values based on chi-square analyses: [a] indicates p<.001; [1] indicates p<.05; %=weighted estimates

Table 2. Adjusted Age at the Time of Survey

Sexual Orientation	*n*	Mean Age	Standard Deviation
Heterosexual/Straight	7,435	38.01	11.68
Homosexual/Lesbian	105	36.06	11.90
Bisexual	271	31.09	10.21

Note: NHANES, 2003–2012; significance values based on an ANOVA: ***[a] indicates p<.001***

These demographic characteristics are consistent with those found in the Framingham Heart Index study that used the NHANES to examine sexual minority women's CVD health (Farmer, Jabson, et al., 2013). However, most notably, this dissertation focuses on disparities based on sexual orientation, parsing out differences between lesbian and bisexual women, rather than examining differences solely between sexual minority and heterosexual women. The main justification for this approach was that research with bisexual women is largely underdeveloped, and the findings that do exist show that bisexual women may fare worse than do lesbians (Carpenter, 2005). Additionally, unlike Farmer et al. (2013) study, which excluded individuals who had already been diagnosed with CVD, this study was designed to examine differences in cardiovascular and mental health risk factors among all participants.

Measurement

Instrument. The National Health and Nutrition Examination Survey (NHANES) is a program of the National Center for Health Statistics, which drafted and validated the survey items (CDC, 2012). Although the NHANES project has been gathering data since the 1960s, the current study utilized the last 10 years of aggregated data (five waves of data collection) in order to obtain a substantial sample large enough to offer a comparable analysis based on sexual orientation. This approach was reflective of former studies utilizing NHANES with this population (Farmer, Jabson, et al., 2013). Although the NHANES collects data using interviews, physical examinations, and questionnaires only, in this study, data from interviews and questionnaires were examined because the smaller subsample that completed the examination portion of the data collection was not large

enough to provide substantial subsample numbers representing lesbian and bisexual women adequately. These data allowed the estimation of the prevalence of chronic conditions in the population. Estimates for previously undiagnosed conditions, as well as those known to and reported by respondents, were produced using data from the NHANES (CDC, 2013a).

Independent variables. The primary (or focal) independent variable for this study is sexual orientation, indicated by whether the participant self-identified as "lesbian," "bisexual," or "heterosexual." Participants were excluded from the sample if they answered the sexual orientation prompt with "something else", "not sure", "refused", or "don't know", which resulted in 245 (3%), of the 8056 participants being excluded from the analysis. Though participants were able to identify as "something else," possibly indicating a sexual minority status, these responses were excluded from the analysis given the expansive and complicated possibilities of interpreting these responses. Main covariates include and age as racial marginalization is associated with more negative health outcomes and disease prevalence tends to increase with age. Further, it was important to include age as a covariate given that, on average, bisexual women in the analytic sample were younger than lesbian and heterosexual women. Age is a continuous variable collected from all respondents. In some analyses age was treated as a categorical variable using the following categories: 18-24, 25-34, 35-44, 45-54, 55-64. To determine whether to treat age as a continuous or a categorical variable, I first ran a model employing the continuous age variable, and then ran a model using both continuous and categorical age, and conducted a Wald test to determine whether the

model was improved by the addition of the categorical age term [indicating that age was not associated with the outcome in a purely linear manner]. If the Wald test was significant, categorical age (not continuous age) was retained and included in the final analysis; otherwise continuous age was used. Race was a categorical variable and was collapsed from five categories: "Mexican American", "Other Hispanic", "Non-Hispanic white", "Non-Hispanic Black", "Other Race—Including Multiracial", to four categories, grouping Mexican and Hispanic Participants into one category. The resulting categories were as follows: "white", "Black", "Hispanic" and "Other, including multiracial". As with all other estimates in this study (except where noted), sample weights were applied, with oversampling for race and age (the latter depended on the data collection period).

Dependent variables. In terms of cardiovascular risk factors, the dependent variables were body mass index (BMI), blood pressure, cholesterol levels, diabetes, and family history of diabetes. BMI was calculated from self-reported height and weight. Self-reported height was assessed using the following indicator: "How tall are you without shoes?" and estimated in inches with the range of values between 53 and 81. Self-reported weight was measured using the following indicator: "How much do you weigh without clothes and shoes?" and reported in pounds for a range between 66 and 470. BMI was calculated using the reported weight and height variables using the following formula: weight (lb) / [height (in)]^2 × 703; CDC, 2011a). The resulting BMI score was log-transformed because the BMI scores resulted in a skewed distribution.

The remaining cardiovascular indicators assessed medical condition diagnoses by a doctor or medical provider. Because the ability to see a provider may be contingent on

having a consistent place to seek care, "usual source of health care" was added as a covariate for the remaining cardiovascular indicators. Health insurance was first included in the analyses indicator: "Are you covered by health insurance or some other kind of health care plan? [Include health insurance obtained through employment or purchased directly as well as government programs like Medicare and Medicaid that provide medical care or help pay medical bills]." The response pattern options were "yes," "no," "refused," and "don't know." The responses were dichotomized as "yes" and "no," and the remaining responses were counted as missing. However, health insurance status was found to be an insignificant predictor of all outcomes. Health insurance coverage is not an indicator of health care access or having a usual source of care such as a doctor or clinic.

Understanding whether someone had a usual source of care was based on the following indicator: "Is there a place that you usually go when you are sick or need advice about your health?" The response options were "Yes," "There is no place," "There is more than one place," "Refused," and "Don't know". Responses were dichotomized into respondents who answered affirmatively (i.e., "Yes" or "There is more than one place") and respondents who answered "There is no place." Respondents who answered "Refused " or "Don't know" were counted as missing. Then for respondents who responded affirmatively, I further refined the usual source of health care variable by examining a follow-up question, "What kind of place do you go most often: is it a clinic, doctor's office, emergency room or some other place?" In the final usual source of health

care variable, only those who answered “clinic” or “doctor’s office” were categorized as having a consistent place to seek care.

High blood pressure was assessed using the following indicator question: “Have you ever been told by a doctor or other health professional that you had hypertension, also called high blood pressure?” High cholesterol was measured using the following indicator question: “Have you ever been told by a doctor or other health professional that your blood cholesterol level was high?”

Diabetes was measured using the following indicator question: “(Other than during pregnancy) have you ever been told by a doctor or a medical professional that you have diabetes or sugar diabetes?” Family history of diabetes was used as a covariate and measured using the following indicator: “Including living and deceased, were any of your biological, that is, blood relatives, including grandparents, parents, brothers, and sisters, ever told by a health professional that they had diabetes?” Family history of diabetes was also measured on its own using the same indicator. Prediabetes was measured using the following indicator question: “Have you ever been told by a doctor or other health professional that you have any of the following: prediabetes, impaired fasting glucose, impaired glucose tolerance, borderline diabetes, or that your blood sugar is higher than normal but not high enough to be called diabetes or sugar diabetes?” The response pattern options for all cardiovascular risk factor indicators in this section were the following: “yes,” “no,” refused,” and “don’t know.” The responses were dichotomized as “yes” and “no,” and the remaining responses were counted as missing for all indicators.

Mental health risks. Several mental health outcomes were assed using self-reported substance-use behaviors and reported mental health outcomes. Substance use was assessed using nicotine, tobacco, and alcohol measures. Nicotine and tobacco use was assessed using the following indicator: "During the past 5 days, did you use any product containing nicotine, including cigarettes, pipes, cigars, chewing tobacco, snuff, nicotine patches, nicotine gum, or any other product containing nicotine?" The response pattern was the following: "yes," "no," refused," and "don't know." The responses were dichotomized as "yes" and "no," and the remaining responses were counted as missing for all indicators.

The indicator for alcohol use was the following: "In the past 12 months, on those days that you drank alcoholic beverages, on average how many drinks did you have?" Alcohol use was dichotomized into "moderate drinking" and "binge drinking" based on CDC guidelines specifying "moderate drinking" as 3 drinks or fewer and "binge drinking" as 4 or more drinks consumed in one sitting (CDC, 2015).

Poor mental health was assessed using the following indicator: "Thinking about mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?" Mental health was dichotomized as "none" and "1 or more" mental health days that were not good. Responses such as "refused" or "don't know" were counted as missing. Trouble sleeping was measured using the following indicator question: "Over the last 2 weeks, how often have you been bothered by the following problems: trouble falling asleep, staying asleep,

or sleeping too much?" To test this hypothesis, sleep was dichotomized into "not at all" and "1 or more." Responses such as "refused" or "don't know" were counted as missing.

Sociodemographic risk factors. Income and health insurance coverage were measured as sociodemographic risk factors. Annual household income was measured using the following prompt: "I am going to ask you about the total income for you and [names of family members] in [last calendar year], including income from all sources we have just talked about such as wages, salaries, Social Security or retirement benefits, help from relatives and so forth. Can you tell me the amount before taxes?" The responses were collected and categorized as the following: 1 = $0 to 4,999, 2 = $5,000 to $9,999, 3 = $10,00 to $14,999, 4 = $15,000 to $19,999, 5 = $20,000 to $24,999, 6 = $25,000 to $34,999, 7 = $35,000 to $44,999, 8 = $45,000 to $54,999, 9 = $55,000 to $64,999, 10 = $65,000 to $74,999, 12 = $20,000 and over, 13 = under $20,000, 14 = $75,000 to $99,999, 15 = $100,000 and over, 77 = refused, 99 = don't know.

Annual household income was dichotomized as "under $20,000" and "$20,000 and over" by including all response choices that qualified as "under $20,000" into one category and the remaining responses into the "$20,000 and over" category. Those who chose "refused" or indicated "don't know" were counted as missing. Health insurance coverage was also measured as an outcome the same way as discussed above under CVD indicators.

Plan of Analysis

Specific Aims

All analyses were conducted using SPSS version 22. Five waves of data were aggregated in SPSS. A complex sampling plan was constructed using the "Masked Variance Pseudo—PSU" variable to designate the primary sampling units and the "Masked Variance Pseudo—Stratum" variable was used to indicate strata (defined by geography and proportions of minority populations) in the sampling design. Together, the PSU and strata variables represent the sampling units designed to represent sampling error. The interview weight variable was aggregated across five waves of data and included as a sample weight in the sampling plan. The sampling plan was applied in all analyses, except where indicated otherwise.

In all cases, dummy variables were used for sexual orientation and race. Age and race were included as covariates in all analytic procedures. To determine whether age as a continuous variable was sufficient to represent the data, a preliminary regression analysis was performed using age as a continuous variable and age as a categorical variable in the same model, as described above. Body mass index was analyzed using linear regression. All other outcomes were analyzed using multiple logistic regression. In addition to main effects, interactions for race and sexual orientation were examined. However, only one outcome had significant interactions, and that model was retained alongside the model with main effects only.

Specific Aim 1: To examine connections between sexual orientation and sociodemographic characteristics.

H1.1: Lesbian and bisexual women will be more likely to have an annual household income of less than $20,000, compared to the income levels of heterosexual women, controlling for race and age. To test this hypothesis, a multiple logistic regression was performed with age and race as covariates.

H1.2: Lesbian and bisexual women will have less access to healthcare than will heterosexual women, controlling for race and age. To test this hypothesis health insurance was analyzed using multiple logistic regression with age and race as covariates.

Specific Aim 2: To examine connections between sexual orientation and cardiovascular risk factors.

H2.1: Lesbian and bisexual women will have higher logBMI than will heterosexual women, controlling for race and age. To test this hypothesis, a simple linear regression was conducted with age and race as covariates.

H2.2: Lesbian and bisexual women will have higher prevalence of high blood pressure than will heterosexual women, controlling for race, age, and usual source of health care. To test this hypothesis, a multiple logistic regression was conducted with age, race, and "usual source of health care" as covariates.

H2.3: Lesbian and bisexual women will have higher prevalence of high cholesterol levels than will heterosexual women, controlling for race, age, and usual source of health care. To test this hypothesis, a multiple logistic regression was conducted with age, race, and "usual source of health care" as covariates.

H2.4: Lesbian and bisexual women will have higher prevalence of diabetes than will heterosexual women, controlling for race, age, usual source of health care, and

family history of diabetes. To test this hypothesis, a multiple logistic regression was conducted with age, race, "usual source of health care," and family history of diabetes as covariates.

H2.5: Lesbian and bisexual women will have higher prevalence of prediabetes than will heterosexual women, controlling for race, age, usual source of health care, and family history of diabetes. To test this hypothesis, a multiple logistic regression was conducted with age, race, "usual source of health care," and family history of diabetes as covariates.

Specific Aim 3: To examine connections between sexual orientation and familial risk factors for cardiovascular disease.

H3.1: Lesbian and bisexual women will have the same prevalence of family history of diabetes as will heterosexual women. To test this hypothesis, a multiple logistic regression was conducted with age and race as covariates.

Specific Aim 4: To examine connections between sexual orientation and substance use.

H4.1: Lesbian and bisexual women will have higher prevalence of tobacco use than will heterosexual women, controlling for race and age. To test this hypothesis, a multiple logistic regression was conducted with age and race as covariates.

H4.2: Lesbian and bisexual women will have higher prevalence of alcohol use than will heterosexual women, controlling for race and age. To test this hypothesis, multiple logistic regression was conducted with age and race as covariates.

Specific Aim 5: To examine connections between sexual orientation and emotional health factors.

H5.1: Lesbian and bisexual women will have higher prevalence of mental health days that are not good than will heterosexual women, controlling for race and age. To test this hypothesis, multiple logistic regression was conducted with age and race as covariates.

H5.2: Lesbian and bisexual women will have higher prevalence of sleeping problems than will heterosexual women, controlling for race and age. To test this hypothesis, multiple logistic regression was conducted with age and race as covariates.

Limitations

This study had several limitations. Despite being a population-based study of data from approximately 50,000 people collected within a 10-year period, the analytic sample was still small for sexual minority women, consisting of fewer than 400 participants. Some participants did not answer all the questions included in the study, which resulted in an even smaller subsample in some analyses. Recall ability may have also been an issue for questions that required participants to remember whether they had ever been diagnosed with a particular health outcome or whether they had a relative that was ever diagnosed with a particular health outcome.

Given the secondary nature of the data, the analysis was limited by the indicators already collected in NHANES. The study relied heavily on self-reports of sexual orientation, which a large number of participants did not answer. It is possible that the respondents who provided information about their sexual orientation were special in

some way and thus did not accurately represent the overall population. The analytic sample also did not include respondents who indicated they were "unsure" or "didn't know" their sexual orientation or respondents who identified as "something else" other than the given categories. It is possible these respondents were also sexual minority persons but the terms *lesbian* and *bisexual* did not accurately represent their identities. It is possible that these groups had different experiences with stigma, particularly if they felt they did not fit into the mainstream sexual minority groups examined in this study. Further, the data did not assess whether any participants identified as transgender. Particularly in cases where someone may identify as *genderqueer*, *agender*, or *nonbinary gender*, terms such as heterosexual, lesbian, and bisexual would be inadequate to describe their sexual orientation, if they are significantly affected by stigma.

Due to previous experiences with discrimination following "coming out" or sexual identity disclosure, it is possible that a number of participants simply did not want to identify themselves as sexual minorities, which may have resulted in the misreporting or abstaining from answering the sexual identity question. If either of these issues are true within the NHANES dataset, the presented results only represent a portion of sexual minority populations and do not adequately address those that did not disclose their sexual orientation. As the main premise of this study is the importance of sexual identity, the findings do not adequately represent the complex issue of stigma that leads to lack of sexual identity disclosure. Additionally, focusing only on sexual identity could be a limitation if self-identification is discordant with sexual behavior affecting individual experiences with stigma.

Additionally, the NHANES does not collect information about the amount of stigma participants either perceive or experience as a result of their identities. However, as noted in the theoretical framework, embodying a marginalized identity already establishes a social stigma whether the individual perceives it to be true or not (Hatzenbuehler, et al., 2013b).

This cross-sectional study did not track change over time across the same respondents. The descriptive nature of this study does not establish causal pathways between stigma based on marginalized identity and negative health outcomes. Instead, this study provides associations between these variables.

Strengths

The NHANES uses a serial cross sectional design. This sampling method is cost effective in that it allows for a snapshot of how the population is doing over time. Given the justification for sexual identity as the key predictor of health disparities, the NHANES is ideally suited for this study as sexual identity, Sociodemographic, cardiovascular and mental health indicators of interested are collected on an ongoing basis. When data waves are combined, samples are large enough to study even with the smaller subsample sizes. These subsamples are still larger than those analyzed in most sexual minority studies. Given the recent research that reveals differences between heterosexual and sexual minority women (IOM, 2011), this study was designed to examine whether these disparities are consistent or if they vary based on whether someone identified as lesbian or bisexual. This is important as public health researchers continue to study the pathways between stigma, stigmatized identity, and health

disparities. In particular, this study expands on the work of Farmer and colleagues (2013), who grouped all sexual minority women and compared their outcomes to heterosexual women. This did not allow for an understanding of whether the burden of disease is similar or different across sexual minority groups. Further, the researchers included participants who reported having at least one lifetime same sex partner into their sexual minority subsample. This dissertation only includes lesbian and bisexual women in the sexual minority sub-sample given the understanding the stigma, as a form of minority stress, is the fundamental cause of population health disparities, which would not apply to those who have experienced singular same-sex sexual relationships in the past but do not identify as a sexual minority.

Sexual minority and racial-minority status are both recognized as sources of chronic minority stress (Meyer, 2003). In this study, this impact was recognized in the analyses with the intent of providing an intersectional analysis.

CHAPTER IV

CHRONIC DISEASE DISPARITIES AMONG SEXUAL MINORITY WOMEN IN THE UNITED STATES: RESULTS FROM THE NATIONAL HEALTH AND NUTRITION EXAMINATION SURVEY (NHANES), 2003–2012

Abstract

Objectives. The purpose of this population-based study was to assess the association between cardiovascular and sexual minority status. *Methods.* Data from the National Health Nutrition and Examination Survey (NHANES) were analyzed based on those participants who identified as women and answered the sexual identity question, resulting in a sampling frame of 7,811 participants. Seven health outcomes, each a contributor to CVD vulnerability, were assessed: BMI, high blood pressure (HBP), high cholesterol, diabetes, prediabetes, household income, and health insurance status. Log body mass index (BMI) was analyzed using linear regression. The likelihood of a high blood pressure, high cholesterol, diabetes, or prediabetes diagnosis by a medical provider was analyzed using multiple logistic regression. *Results.* After controlling for sociodemographic factors and family history of disease, sexual minority women had higher log BMI than did heterosexual women. There was a higher likelihood of a diabetes diagnosis among bisexual, Black, and Hispanic women. There were no significant interactions. *Conclusions.* Most notably, bisexual, black, and Hispanic women are most likely to experience socioeconomic and health disparities. Future research should examine the relationship between cardiovascular disease risk factors and cardiovascular

disease outcomes. Special attention should be given to establishing capacity for an intersectional analysis focused on sexual orientation and race.

Introduction

An increasing number of researchers have recognized the need for (a) population-based research focused on chronic disease outcomes in sexual minority populations (IOM, 2011; Operario et al., 2015) and (b) greater understanding of racial/ethnic disparities in chronic diseases within these populations (Calabrese, Meyer, Overstreet, Haile, & Hansen, 2015). Although recent population-based studies have shown disparities in cardiovascular health outcomes between heterosexual and sexual minority women (Farmer, et al., 2013), further analysis is necessary in order to (a) examine differences between heterosexual, lesbian, and bisexual women, in contrast with previous studies focusing on heterosexual and sexual minority women as a group (Farmer et al., 2013), and (b) contribute to the existing research, which shows conflicting findings in terms of different cardiovascular outcomes (IOM, 2011).

In terms of cardiovascular risk factors, weight gain and the resulting increase in body mass index (BMI) have been noted as a significant health disparity among lesbian and bisexual women compared to heterosexual women in the United States (Fredriksen-Goldsen et al., 2013; Jun, Nichols, Spiegelman, & Austin, 2012). However, some research has shown that lesbians are more likely to have a higher BMI compared to heterosexual women, while no differences were found for other sexual minority groups, such as bisexuals (Boehmer et al., 2007; Conron et al., 2010; Struble et al., 2010). Similar outcomes are evident among racially marginalized groups; thus, race should be

considered a critical covariate in obesity-related outcomes (Boehmer et al., 2007). Although some studies have shown no significant difference in high blood pressure, high cholesterol, or diabetes outcomes for sexual minority women (Fredriksen-Goldsen et al., 2013; Hatzenbuehler et al., 2013b), others have shown that bisexual women are 50% more likely to report a high blood pressure diagnosis, compared to heterosexual women (Case et al., 2004). Public health education with sexual minorities continues to focus on sexual health, despite the emerging evidence pointing to the importance of cardiovascular health in this population (Blondeel, et al., 2016; Meyer, et al., 2008).

There are a number of ways to conceptualize and explain significantly different health outcomes based on sexual orientation. One widely utilized perspective frames stigma in particular as a specific cause of minority stress and a central driver of morbidity and mortality at the population level (Hatzenbuehler et al., 2013b). Stigma, as a form of chronic stress, is enduring because it can present itself in different ways over time, threatening employment, housing security, social relationships, healthcare access, and overall health. Further, stigma continues to affect populations regardless of individual perceptions of it.

Methods

Publicly available data from the National Health and Nutrition Examination Survey (NHANES) were analyzed using SPSS version 22. Five data collection cycles spanning 2003 to 2012 were combined to provide a sufficient sample size of sexual minority participants. Participants who identified as women and indicated their sexual orientation as (a) heterosexual or straight, (b) homosexual or lesbian, or (c) bisexual were

included in the analysis. Respondents who identified as “something else” or answered “refused” or “don’t know” were excluded from the sample and coded as missing (245 participants). The final analytic sample included *n* = 7,811 participants, aged 18 to 59.

Measures

Sociodemographic variables of interest included age, race, annual household income (AHI), and health insurance status. Annual household income was dichotomized as “under $20,000” and “$20,000 and over.” Body mass index was computed using a height and weight formula: weight (lb) / [height (in)]^2 × 703, and a log transformation was performed to deal with skewness in responses. Certain chronic disease indicators were assessed using the following questions:

- Have you ever been told by a doctor or other health professional that you had hypertension also called high blood pressure?”
- Have you ever been told by a doctor or other health professional that your blood cholesterol level was high?
- (Other than during pregnancy) have you ever been told by a doctor or a medical professional that you have diabetes or sugar diabetes?
- Including living and deceased, were any of your biological, that is blood relatives, including grandparents, parents, brothers, and sisters, ever told by a health professional that they had diabetes?

Analyses

Age and race were included as covariates in all analytic procedures because the likelihood of disease tends to increase with age, and racial health disparities are widely

noted in cardiovascular literature (Crook & Peters, 2008). Age was a covariate for all outcome variables. To determine whether age as a continuous variable was sufficient to represent the data, two preliminary regression analyses were performed: one model with age as a continuous variable and a second model with both age as a continuous variable *and* age as a categorical variable. A Wald test was conducted, and if the model that included both continuous and categorical age outcomes was significant, the final regression model included the categorical age variable, in order to more sufficiently describe the relationship between age and the outcome (Treiman, Johnson, & Grites, 2008). Log BMI was analyzed using simple linear regression. The remaining variables were analyzed using multivariate logistic regression. Complex samples and sample weights were applied throughout; all frequencies reported are unweighted but percentages reported are weighted.

Results

Demographics

Based on weighted estimates, a greater proportion of bisexual women were younger heterosexual and lesbian women (reported "n" values are not weighted), $X^2(8, N=7811)=98.043$, $p<.001$. In fact, the average age for heterosexual women was approximately 38 years (SD=11.68), 36 years for lesbian women (SD=11.90) and 31 years for bisexual women (SD=10.21), $F(2,7808)=47.38$, $p<.001$. Of the 7811 women who answered the sexual orientation question, 95.3% (n=7425) were heterosexual, 1.4% (n=105) were lesbian and 3.3% (n=271) were bisexual. There was a higher proportion of black women among lesbian (n=29, 15.4%) and bisexual participants (n=74, 15.6%),

compared to the heterosexual participants (n=1660, 12.6%). Conversely, among heterosexual participants, a higher proportion was Hispanic (n=1988, 13.3%) compared to lesbian (n=20, 10.2%) and bisexual participants (n=19, 5.5%) , $X^2(6, N=7811)=20,162$, $p<.005$. Table 3 shows that 3.2% (N=440) of heterosexual women reported completing less than 9th grade, 10.4% (n=1047) completed 9th-11th grade, 20.9% (n=1515) reported completing high school or a GED, 34.9% (n=2436) had some college experience or an AA degree and 30.5% (n=1779) were college graduates or above, $X^2(8, N=7810)=5.342$, $p<.05$. Among lesbian women, the distribution was similar, with 3.0% (n=5) women completing less than 9th grade, 13 (10.3%) completed 9th-11th grade, 17.3% (n=19) completed high school or a GED, 36.1% (n=34) had some college experience or an AA degree and 33.3% (n=226) completed college or above. For bisexual women, the rates appeared to differ a bit such that 1.8% (n=6) of the women completed less than 9th grade, 17.4% (n=52) completed between 9th-11th grade, 23.1% (n=63) finishing high school or a GED, 38.8% (n=95) completed some college or an AA degree and 19.0% (n=39) were college graduates. There was no difference in employment rates based on sexual orientation.

Table 3. Demographic Characteristics by Sexual Orientation

	Heterosexual/ Straight (*n* =7,425)		Homosexual/ Lesbian (*n* = 105)		Bisexual (*n* = 271)	
Demographic Variables	n	%	n	%	n	%
Age [a]						
18-24	1,237	13.4	23	12.3	97	32.6
25-34	1,874	22.6	26	23.5	87	30.4
35-44	1,816	25.3	28	33.7	47	18.0
45-54	1,824	27.7	19	19.1	33	16.5
55-64	684	11.0	9	11.4	7	2.5
Race[1]						
White	3,283	68.1	50	70.3	135	69.5
Black	1,660	12.6	29	15.4	74	15.6
Hispanic	1,988	13.3	20	10.2	43	9.5
Other, including multiracial	494	6.0	6	4.1	19	5.5
Education level[1]						
Less than 9th grade	440	3.2	5	3.0	6	1.8
9th-11th grade	1,047	10.4	13	10.3	52	17.4
High school grad/GED	1,515	20.9	19	17.3	63	23.1
Some college or AA degree	2,436	34.9	34	36.1	95	38.8
College graduate or above	1,779	30.5	26	33.3	39	19.0
Employment Status						
Employed	4,812	70.6	69	70.6	157	63.5
Unemployed	2,622	29.4	36	29.4	114	36.5

Note: NHANES 2003–2012 (*N* = 7,811) ; significance values based on chi-square analyses: [a] indicates p<.001; [1] indicates p<.05; %=weighted estimates; % = weighted estimates.

Chronic Disease

Cardiovascular risks were measured using high blood pressure (HBP), high cholesterol, diabetes, and prediabetes indicators. It should be noted that heart attack diagnosis was analyzed using logistic regression and yielded no significant results based on sexual orientation (controlling for age) and was thus excluded from the analysis. As

such, cardiovascular risk factors are assessed in detail. Similarly, coronary heart disease diagnosis was insignificant for all predictors except age.

Table 3 shows that with increasing age, there was a significant increase in log BMI (β = .002). Compared with heterosexual women, lesbians had a significantly higher log BMI (β = .04), as did bisexual women (β = .027). Similarly, there was a significantly greater log BMI for both black women (β = .051) and Hispanic women (β = .023), compared to white women. However, women who identified as multiracial or "other" had significantly lower log BMI (β = –.032) compared to white women. Similarly, lesbians who identified as Hispanic also had significantly lower log BMI (β = –.073). There were no other significant interactions between sexual orientation and race in predicting log BMI. Taken together, sexual orientation, race, and age explained approximately 9% of the variance in log BMI, $R^2 = .091$, $F(12, 7528) = 63.102$, $p < .001$.

Table 4 shows that having a usual source of care was a predictor of a high blood pressure diagnosis. The likelihood of a HBP diagnosis by a doctor was 1.078 times higher for each year of age. Similarly, the likelihood of a high cholesterol diagnosis by a medical provider was 1.061 times higher for each year of age. However, sexual orientation was not a predictor of a HBP or high cholesterol diagnosis. Most notably, black women were 2.223 times more likely than were white women to have received a HBP diagnosis by a medical provider. There were no significant differences in the likelihood of a HBP diagnosis for women who identified as Hispanic or for women who identified as "other, including multiracial," compared to white women. Similarly, race

was not a significant predictor of the likelihood of a high cholesterol diagnosis. There were no significant interactions.

Table 4. Linear Regression Results for Log BMI

Individual Characteristics	β	Std. Error	*p* value
(Constant)	1.354	.004	.000
Sexual orientation			
Heterosexual	1.000	-	-
Lesbian	.042	.014	.003
Bisexual	.027	.009	.002
Age	.002	.000	.000
Race			
White	1.000	-	-
Black	.051	.003	.000
Hispanic	.023	.003	.000
Other/including multiracial	–.032	.005	.000
Sexual orientation * Race			
Lesbian * Black	–.043	.024	.073
Lesbian * Hispanic	–.073	.028	.008
Lesbian * Other	.008	.043	.860
Bisexual * Black	–.016	.015	.269
Bisexual * Hispanic	–.001	.018	.949
Bisexual * Other/including multiracial	.005	.025	.831

Note: NHANES, 2003–2012 (*N* = 7,540)

A logistic regression analysis was conducted to determine the likelihood of having been diagnosed with diabetes or prediabetes by a doctor (or other medical professional), as shown in Table 5.

Table 5. Adjusted Multiple Logistic Regression Results for High Blood Pressure and High Cholesterol Diagnosis By a Doctor

	High Blood Pressure (n = 7,782)		High Cholesterol (n = 5,359)	
Individual Characteristics	AOR	p value	AOR	p value
(Intercept)	.010	.000	.034	.000
Sexual orientation				
Heterosexual	1.000	-	1.000	-
Lesbian	.769	.371	1.402	.313
Bisexual	1.067	.810	.806	.367
Usual Source of Health Care	.648	.001	.638	.020
Age	1.078	.000	1.061	.000
Race				
White	1.000	-	1.000	-
Black	2.223	.000	.961	.669
Hispanic	.988	.101	1.185	.142
Other/including multiracial	.956	.813	1.059	.727

Note: NHANES, 2003–2012; AOR = Adjusted odds ratios

An added covariate in this analysis was family history of diabetes. There was an inverse relationship, such that having a close relative with diabetes resulted in being 80.4% less likely to receive a diabetes diagnosis.

Having or not having a usual source of health care was a significant predictor of receiving a diabetes diagnosis, but not a significant predictor of receiving a prediabetes diagnosis. The likelihood of a diagnosis by a medical provider was 1.085 times higher for diabetes and 1.031 times higher for prediabetes for each year of age. Although there was no significant difference in the outcome for lesbians, bisexual women were 2.351 times more likely to report a diabetes diagnosis compared to heterosexual women. Similarly,

black women were 1.919 times more likely and Hispanic women were 2.110 times more likely to report a diabetes diagnosis than were white women. There were no significant differences in a diabetes diagnoses for women who identified as multiracial or "other" compared to white women. Additionally, neither sexual orientation nor race was a significant predictor of the likelihood of a prediabetes diagnosis (Table 6).

Table 6. Adjusted Multiple Logistic Regression Results for Diabetes and Prediabetes Diagnosis By a Doctor

	Diabetes (n = 7,698)		Prediabetes (n = 5,979)	
Individual Characteristics	AOR	p value	AOR	p value
(Intercept)	.010	.000	.032	.000
Sexual orientation				
Heterosexual	1.000	-	1.000	-
Lesbian	1.618	.480	2.219	.189
Bisexual	2.351	.022	1.291	.501
Usual Source of Health Care	.162	.000	.703	.258
Close relative has diabetes	.197	.000	.578	.004
Age	1.085	.000	1.031	.000
Race				
White	1.000	-	1.000	-
Black	1.919	.000	1.113	.484
Hispanic	2.110	.000	1.121	.526
Other/including multiracial	1.742	.060	1.691	.111

Note: NHANES, 2003–2012; AOR = Adjusted odds ratios

Table 7. Logistic Regression Results for Family History of Diabetes

	Family History of Diabetes			
	Model 1		Model 2	
Individual Characteristics	AOR	*p* value	AOR	*p* value
(Intercept)	.352	.000	.351	.000
Sexual orientation				
Heterosexual	1.000	-	1.000	-
Lesbian	1.381	.202	1.733	.107
Bisexual	1.355	.030	1.306	.155
Age	1.016	.000	1.016	.000
Race				
White	1.000	-	1.000	-
Black	1.809	.000	1.870	.000
Hispanic	1.450	.000	1.451	.000
Other/including multiracial	1.357	.006	1.300	.019
Sexual orientation* Race				
Lesbian * Black			.267	.020
Lesbian * Hispanic			.396	.140
Lesbian * Other			9.894	.055
Bisexual * Black			.717	.309
Bisexual * Hispanic			1.447	.466
Bisexual * Other/including multiracial			3.736	.063

Note: NHANES, 2003–2012 (*N* = 7,446); AOR = Adjusted odds ratios

Although there was no significant difference in the outcome for lesbians, bisexual women were 1.355 times more likely to report a family history of diabetes, compared to heterosexual women. Similarly, black women were 1.809 times more likely to report a family history of diabetes, Hispanic women were 1.450 times more likely to report a family history of diabetes, and women identifying as multiracial or "other" were 1.357 times more likely to report a family history of diabetes, compared to white women. Notably, although being a sexual minority or a racial minority was associated with a greater likelihood of reported family history diabetes, it appears that black lesbian women in particular were 73.3% less likely to have a family history of diabetes. There were no other significant interactions.

Discussion

This nationally representative study demonstrates cardiovascular health-related disparities by sexual identity among women. A greater proportion of bisexual women completed high school and some college, compared to heterosexual and lesbian women who, on average, had higher rates of college graduation. This finding contradicts previous research showing that both lesbian and bisexual women had higher educational attainment, compared to heterosexual women (Fredriksen-Goldsen, Kim, Barkan, Muraco & Hoy-Ellis, 2013). More research is needed to determine whether age and/or average education level is related to higher rates of unemployment among bisexual women. Although unemployment rate findings are consistent with previous research (Operario et al., 2015), it is important to note that higher rates of unemployment in this study are only

evident among bisexual women. This is consistent with previous research that shows bisexual women experience higher rates of poverty (Conron et al., 2010).

Consistent with previous research, lesbians were more likely to have higher (log) body mass index than were heterosexual women (Aaron et al., 2001; Cochran et al., 2001; Laska et al., 2015; Lever, 2001; The Mautner Project, 2011; Operario et al., 2015). These findings were also true for bisexual women, whose health outcomes have been understudied. It should be noted that among lesbians, Hispanic women had a significantly lower log BMI. Given the existing studies that group lesbians and bisexual into sexual minority women (Farmer, et al., 2013), it is important to recognize that the findings were similar for both sexual minority groups. Further, these findings show that race may be a protective factor for Hispanic women, whose BMI was lower than for white women.

Age was a significant predictor of both high blood pressure and high cholesterol diagnoses, which was to be expected given the general understanding that the likelihood of disease increases with age. Contrary to previous small-scale studies, there were no differences in high blood pressure and cholesterol level outcomes based on sexual orientation (Case et al., 2004). Similarly, although being Hispanic or multiracial was also not a predictor of these diagnoses, black women were more than twice as likely as were white women to have received a high blood pressure diagnosis. This may be explained by the unique, racially based stressors faced by black women even when compared to other marginalized groups (Calabrese et al., 2015).

Notably, although a family history of diabetes was a predictor of a diabetes diagnosis, identifying as bisexual, black, or Hispanic still significantly predicted the

likelihood of having a diabetes diagnosis. No such differences were found for prediabetes diagnoses. Disparities in diabetes outcomes among racially marginalized groups are consistent with previous research. These outcomes may be explained by chronic stressors of living with stigmatized and marginalized identities. Further inquiry is needed to understand environmental stressors, personal perceptions of those stressors, and their relationships to cardiovascular risk factors.

This study had several limitations. Although this analysis included a nationally representative sample, the subsample of sexual minority women was small, especially when broken down by race. Further, the sample was a cross-sectional analysis of different people at one point in time collected during five different data collection periods. In addition to "heterosexual," "lesbian," and "bisexual" identities, some women identified as "something else" and thus were excluded from this analysis. It is possible that these women preferred *queer* or another less mainstream term. In the context of stigmatized identity, it would be important to understand the impact of these women's identities, which this study was not intended to do.

Overall, although sexual orientation was a predictor of some chronic disease outcomes, it was not a predictor of others. Most notably, bisexual women had worse outcomes than did both heterosexual and lesbian women, consistent with past research (Carpenter, 2005). These findings are especially important for public health education with sexual minorities, which should dedicate more resources to cardiovascular health education in this population, as this is currently not the case (Blondeel, et al., 2016). Although race was a predictor of several chronic diseases, when analyzed together, race

and sexual orientation did not show any within-group variability except for family history of diabetes among black lesbian women. It is unclear whether this was attributable to a true lack of difference based on race among sexual minority women or whether the sample size was simply too small to account for these differences. Future population-based research should focus on sample sizes large enough to study the relationships between cardiovascular risks, sexual orientation, and race.

Although for the most part, these findings on cardiovascular risk factors were consistent with previous research, no link was established with history of cardiovascular disease outcomes such as coronary heart disease and heart attacks. Given the small subsample size of black lesbians, future research should focus on samples large enough to assess interactions between sexual orientation and race and cardiovascular outcomes. It is unclear whether cardiovascular risks persist but do not result in coronary heart disease and heart attacks or whether these outcomes were fatal. Future research should focus on the causal pathways between marginalized identity and cardiovascular outcomes. Further, sexual orientation categories should be retained as a separate categories rather than being grouped under the label *sexual minority women* to assess within-group variability.

CHAPTER V

MINORITY STRESS AND MENTAL HEALTH OUTCOMES AMONG SEXUAL MINORITY WOMEN: FINDINGS FROM THE NATIONAL HEALTH NUTRITION AND EXAMINATION SURVEY (NHANES), 2003–2012

Abstract

Objectives. The purpose of this population-based study was (a) to assess disparities based on sexual orientation for two mental health-related outcomes, using a population-based sample of U.S. women, (b) to provide an intersectional analysis of these disparities with a focus on sexual orientation and race, and (c) to assess sleep as a critical indicator of both mental and cardiovascular health. *Methods.* The National Health and Nutrition Examination Survey (NHANES) was used to assess mental health outcomes among 7,811 sexual minority women. *Results.* Sexual minority women and racially marginalized women were more likely to have an annual household income of less than $20,000 and no health insurance. Similarly, sexual minority women were more likely to use nicotine or tobacco and alcohol than were heterosexual women, and the same was true for racially marginalized women when compared to white women. Although the likelihood of reported mental health days that were not good was significantly higher among sexual minority women, racially marginalized women were less likely than were white women to report mental health days that were not good. Bisexual women in particular were more likely to experience trouble sleeping. *Conclusions.* More intersectional research is needed to explore variability in mental health outcomes among

sexual minority women based on race to obtain a better understanding of the disease burden in marginalized populations. Overall, substance use intervention efforts need to consider the importance of sexual orientation as well as race, with special focus on bisexual women, who consistently had negative mental health outcomes.

Introduction

Eliminating health disparities among populations such as sexual minorities is one of the U.S. governments' top *Healthy People 2020* initiatives (U.S. Department of Health and Human Services, 2010). Emotional and mental health disparities are well documented in sexual minority populations, including lesbian and bisexual women (Meyer, 2003). However, very few studies present population-based findings (IOM, 2011; Operario et al., 2015), which are critical for implementing appropriate intervention and policy efforts at the national level. As such, the purpose of this study was (a) to assess mental health disparities in sexual minority women at the population level, (b) to provide an intersectional analysis of these disparities with a focus on sexual orientation and race, and (c) to assess sleep as a critical indicator of both mental and cardiovascular health.

Many ways exist to conceptualize and measure mental health outcomes. Given the framework of societal stigma and minority stress (described below), self-reported poor mental health, substance use, and sleep, as indicators of distress, were the focus of this study. Coinciding with self-reported mental health status, it was important to considering the coinciding coping mechanisms, such as substance use and the capacity for quality sleep as underlying indicators of overall mental health wellness. Additionally, alcohol

and nicotine use in particular were given prominence due to many sexual minorities often socializing within the context of bar culture. Socioeconomic, stressors such as annual household income and healthcare coverage were also considered.

As shown in previous research, regardless of individual perception, marginalized groups face societal stigma (Hatzenbuehler et al., 2013b) and subsequent chronic minority stress, which is often associated with negative health outcomes (Meyer, 2003). Sexual minority women experience a number of identity-related stressors, including economic challenges. Although more distal research has shown no consensus on the average economic standing of sexual minority women (IOM, 2011; Schmitt, 2008), recent studies have shown that bisexual women have lower rates of employment than do lesbians (Fredriksen-Goldsen et al., 2013). Further, despite overall higher rates of employment, incomes were lower for sexual minority women than for heterosexuals (Fredriksen-Goldsen et al., 2013). One explanation might be that prior to the legalization of "gay marriage" in 2015, many sexual minority women did not qualify for legal partner benefits and subsequently had less disposable income than did heterosexual women. This disparity is evident in the fact that lesbian women are less likely to own their own homes than are heterosexual women (Black et al., 2007). Some researchers have suggested that bisexual women fare worse than do both heterosexual and lesbian women (Carpenter, 2005). Overall, income disparity research in this population continues to be limited (IOM, 2011).

In terms of mental health outcomes, lesbian women report 40% higher rates of depression, and bisexual women report 60% higher rates of depression, compared to

heterosexual women (Case et al., 2004). In addition, both groups are twice as likely to report higher rates of antidepressant use, compared to heterosexual women (Conron et al., 2010). Frequent tension, worry, or sadness are 2 to 3 times more prevalent, and suicide ideation is higher among bisexual women (Conron et al., 2010). As of this writing, sleep quality is understudied among sexual minority women, despite being an indicator of both mental health cardiovascular issues (McSweeney et al., 2003).

With regard to substance-use behaviors, sexual minority women are more likely to be current smokers or former smokers, to have a history of drug use, and to be risky drinkers (Aaron et al., 2001; Farmer, Jabson, et al., 2013). Compared to heterosexual and bisexual women, lesbians are more likely to have been smokers at some point in their lives (Roberts et al., 2003). Higher rates of smoking are found among lesbians across all levels of education, and sometimes the smoking rates are twice as high among lesbians and bisexual women than rates found among heterosexual women (Bye et al., 2005; Case et al., 2004; Gruskin & Gordon, 2006).

Similar outcomes are true for alcohol use. Lesbians are less likely than are heterosexual women to abstain from drinking and more likely to be heavy drinkers (Case et al., 2004; Cochran et al., 2000; Cochran & Mays, 2000; Gruskin & Gordon, 2006; Diamant et al., 2000). In fact, lesbians were twice as likely to report heavy drinking, and bisexual women were 3 times as likely to report heavy drinking, compared to heterosexual women (Case et al., 2004). This includes hazardous drinking, which indicates fights, arguments, and spousal anger. These higher rates of smoking among

lesbians appear to be related to social marginalization, disenfranchisement, and the prominence of socializing within the context of bar culture (Smith et al., 2005, 2006).

A widely used conceptual framework for understanding differences in chronic disease outcomes based on sexual orientation is the minority stress model (Meyer, 2003). Sexual minorities experience chronic and unique stress that majority groups do not experience. The minority stress model is based on a number of factors, including discrimination, lack of social support, sexual identity disclosure or "coming out," and internalization of negative stereotypes about sexual minority groups (Meyer, 2003).

Methods

Publicly available data from the National Health and Nutrition Examination Survey (NHANES) were analyzed using SPSS version 22. Five data collection cycles spanning 2003 to 2012 were combined to provide a sufficient sample size of sexual minority participants. Participants who identified as women and indicated their sexual orientation as (a) heterosexual or straight, (b) homosexual or lesbian, or (c) bisexual were included in the analysis. Respondents who identified as "something else" or answered "refused" or "don't know" were excluded from the sample and coded as missing (245 participants). The final analytic sample included n = 7,811 participants, aged 18 to 59.

Measures

Sociodemographic variables of interest included age, race, annual household income (AHI), and health insurance status. Health disparities tend to increase with age, and race has notably been a predictor of poor health outcomes, including mental health (Brown, 2003). As discussed previously, income and healthcare coverage are considered

possible stressors potentially related to mental health outcomes. Annual household income was dichotomized as "under $20,000" and "$20,000 and over." Tobacco and nicotine use was assessed using the following indicator: "During the last 5 days, did you use any product containing nicotine including cigarettes, pipes, cigars, chewing tobacco, snuff, nicotine patches, nicotine gum, or any other product containing nicotine?" Alcohol use was dichotomized into "moderate drinking" and "binge drinking" based on CDC guidelines specifying "moderate drinking" as 3 drinks or fewer and "binge drinking" as 4 or more drinks consumed in one sitting (CDC, 2015). The indicator prompted only those who consumed alcohol to respond with a number of drinks.

Mental health was dichotomized as "none" and "1 or more" mental health days that were not good, using the following indicator: "Thinking about mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?" Similarly, sleep was dichotomized into "not at all" and "1 or more" using the following indicator: "Over the last 2 weeks, how often have you been bothered by the following problems: trouble falling asleep, staying asleep, or sleeping too much?"

Analyses

Age and race were included as covariates in all analytic procedures. Age was a covariate for all outcome variables. To determine whether age as a continuous variable was sufficient to represent the data, a preliminary regression analysis was performed: one model with age as a continuous variable and a second model with both age as a continuous variable *and* age as a categorical variable. The Wald test was conducted, and

if the model that included both continuous and categorical age outcome was significant, the final regression model included the categorical age variable in order to more sufficiently describe the relationship between age and the outcome (Treiman, Johnson & Grites, 2008). All associations were analyzed using multivariate logistic regression. Complex samples analytic procedures and sample weights were applied throughout; all frequencies reported are unweighted but percentages reported are weighted.

Results

Demographics

Results in Table 1 show weighted population estimates and unweighted sub-sample sizes. Based on weighted estimates, a greater proportion of bisexual women were younger heterosexual and lesbian women. In fact, the average age for heterosexual women was approximately 38 years (SD=11.68), 36 years for lesbian women (SD=11.90) and 31 years for bisexual women (SD=10.21), $F(2,7808)=47.38$, $p<.001$. Of the 7811 women who answered the sexual orientation question, 95.3% (n=7425) were heterosexual, 1.4% (n=105) and 3.3% (n=271). Table 8 shows that 3.2% (n=440) heterosexual women reported completing less than 9th grade, 10.4% (n=1047) completed 9th-11th grade, 20.9% (n=1515) reported completing high school or a GED, 34.9% (n=2436) had some college experience or an AA degree and 30.5% (n=1779) were college graduates or above. Among lesbian women, the distribution was similar, with 3.0% (n=5) women completing less than 9th grade, 10.3% (n=13) completed 9th-11th grade, 17.3% (n=19) completed high school or a GED, 36.1% (n=34) had some college experience or an AA degree and 33.3% (n=226) completed college or above. For bisexual

women, the rates appeared to differ a bit such that 6 (1.8%) of the women completed less than 9th grade, 52 (17.4%) completed between 9th-11th grade, 63 (23.1%) finishing high school or a GED, 95 (38.8%) completed some college or an AA degree and 39 (19.0%) were college graduates. There were no significant differences in rates of (un)employment.

Table 8. Demographic Characteristics

	Heterosexual/ Straight (*n* = 7,425)		Homosexual/ Lesbian (*n* = 105)		Bisexual (*n* = 271)	
Demographic Variables	n	%	n	%	n	%
Age [a]						
18-24	1,237	13.4	23	12.3	97	32.6
25-34	1,874	22.6	26	23.5	87	30.4
35-44	1,816	25.3	28	33.7	47	18.0
45-54	1,824	27.7	19	19.1	33	16.5
55-64	684	11.0	9	11.4	7	2.5
Race[1]						
White	3,283	68.1	50	70.3	135	69.5
Black	1,660	12.6	29	15.4	74	15.6
Hispanic	1,988	13.3	20	10.2	43	9.5
Other including multiracial	494	6.0	6	4.1	19	5.5
Education level[1]						
Less than 9th grade	440	3.2	5	3.0	6	1.8
9th-11th grade	1,047	10.4	13	10.3	52	17.4
High school grad/GED	1,515	20.9	19	17.3	63	23.1
Some college or AA degree	2,436	34.9	34	36.1	95	38.8
College graduate or above	1,779	30.5	26	33.3	39	19.0
Employment status						
Employed	4,812	70.6	69	70.6	157	63.5
Unemployed	2,622	29.4	36	29.4	114	36.5

Note: NHANES 2003–2012 (*N* = 7,811); significance values based on chi-square analyses: [a] indicates p<.001; [1] indicates p<.05; % = weighted estimates.

Socioeconomic Status

A logistic regression analysis was conducted to determine the likelihood of an annual household income (AHI) less than $20,000 based on sexual orientation, race, and age. The same analysis was completed to assess lack of health insurance coverage.

Table 9 shows that age was a significant predictor of annual household income for only women between 18 and 24 years of age. This group was 2.037 times more likely to have an AHI of less than $20,000, compared to women 25 to 34 years of age. Although identifying as a lesbian was not a significant predictor of AHI, bisexual women were 1.919 times more likely to report an AHI of less than $20,000, compared to heterosexual women. Similarly, black women were 2.623 times more likely to report an AHI of less than $20,000, and Hispanic women were 2.147 times more likely to report an AHI of less than $20,000, compared to white women. There were no significant differences for women who identified as multiracial or "other" and white women.

Table 9. Adjusted Multiple Logistic Regression Results for Annual Household Income

	Annual Household Income Under $20,000	
Individual Characteristics	AOR	*p* value
(Intercept)	.110	.000
Age		
18-24	2.037	.000
35-44	1.051	.665
45-54	.882	.220
55-64	1.126	.422
Sexual orientation		
Lesbian	1.541	.161
Bisexual	1.919	.000
Race		
White	1.000	-
Black	2.623	.000
Hispanic	2.147	.000
Other/Including multiracial	1.112	.463

Note: NHANES 2003–2012 (*N* = 7,633); AOR = Adjusted odds ratios

With regard to health insurance, Table 10 shows that the likelihood of having no insurance coverage decreased by 1.8% with each year of age. Conversely, lesbian women were 2.063 times more likely to have no health insurance, and bisexual women were 1.980 times more likely to have no health insurance, compared to heterosexual women. Similarly, black women were 1.436 times more likely to have no health insurance, and bisexual women were 3.981 times more likely to have no health insurance, compared to white women. There were no significant differences for women who identified as multiracial or "other."

Table 10. Adjusted Multiple Logistic Regression Results for Having No Insurance Coverage

	No Insurance Coverage	
Individual Characteristics	AOR	*p* value
(Intercept)	.034	.000
Sexual orientation		
Heterosexual	1.000	-
Lesbian	2.063	.004
Bisexual	1.980	.000
Age	.338	.000
Race		
White	1.000	-
Black	1.536	.000
Hispanic	3.981	.000
Other/Including multiracial	1.108	.552

Note: NHANES 2003–2012 (*N* = 7,800); AOR = Adjusted odds ratios

A multiple logistic regression analysis was conducted to determine the likelihood of tobacco or nicotine use in the last 5 days based on sexual orientation, race, and age, as shown in Table 11. Although age was a significant predictor of the likelihood of tobacco or nicotine use, this appears to be true only for those 55 to 59 years of age (the oldest woman in the sample who answered the sexual orientation question was 59 years old). Within this age group, the likelihood of nicotine use decreased 37.4% with each year of age. However, lesbians were 2.163 times more likely to have recently used tobacco or nicotine, and bisexual women were 2.801 times more likely to have recently used tobacco or nicotine, compared to heterosexual women. Although there was no significant difference between black and white women in the likelihood of tobacco use, Hispanic

women were 45.5% less likely to have used tobacco or nicotine in the last 5 days. The same was true for women who identified as multiracial or "other," who were 33.7% less likely than were white women to have recently used tobacco or nicotine.

Table 11. Logistic Regression Results for Tobacco/Nicotine Use and Alcohol Use

	Tobacco/Nicotine Use		Binge Drinking	
Individual Characteristics	AOR	*p* value	AOR	*p* value
(Intercept)	.364	.000	.240	.000
Sexual orientation				
Heterosexual	1.000	-	1.000	-
Lesbian	2.163	.003	2.691	.003
Bisexual	2.801	.000	2.223	.000
Age				
18-24	1.019	.859	1.758	.000
35-44	1.054	.604	.604	.000
45-54	.932	.499	.479	.000
55-64	.626	.001	.198	.000
Race				
White	1.000	-	1.000	-
Black	.904	.263	.686	.004
Hispanic	.547	.000	1.467	.001
Other/Including multiracial	.663	.045	.734	.204

Note: NHANES 2003–2012 (*N* = 6,282); AOR = Adjusted odds ratios

Similarly, a multiple logistic regression analysis was conducted to determine the likelihood of binge drinking (consuming 4 or more drinks at a time) based on sexual orientation, race, and age. Age was a significant predictor of binge drinking for all age groups. Women between 18 and 24 years of age were 1.758 times more likely to binge drink than were women between 25 and 34 years of age. Conversely, the likelihood of binge drinking decreased in older groups. Women between 35 and 44 years of age were 39.6% less likely to report binge drinking, women between 45 and 54 were 52.1% less

likely to report binge drinking, and women between 55 and 54 years old were 80.2% less likely than women between 25 and 34 years of age to report binge drinking, compared to their younger counterparts.

Sexual orientation was also a significant predictor of the likelihood of reported binge drinking. Lesbian women were 2.691 times more likely to report binge drinking, and bisexual women were 2.223 times more likely to report binge drinking, compared to heterosexual women. Although the likelihood of reported binge drinking was significant for both black and Hispanic women, black women were 31.4% less likely to report binge drinking, and Hispanic women were 1.467 times more likely to report binge drinking, compared to white women. There were no significant differences for women who identified as multiracial or "other."

A logistic regression analysis was conducted to determine the likelihood of having one or more mental health days that were not good in the last 30 days based on sexual orientation, race, and age. Table 12 shows that the likelihood of mental health days that were not good decreased by 1% with each year of age. Most notably, bisexual women were 2.366 times more likely to report having 1 or more mental health days that were not good in the last 30 days, compared to heterosexual women. However, black women were 14.5% less likely to report having one or more mental health days that were not good in the last 30 days, and Hispanic women were 30.3% less likely to report having one or more mental health days that were not good in the last 30 days, compared to white women. There were no significant differences for women who identified as multiracial or "other."

Table 12. Logistic Regression Results for Tobacco/Nicotine Use and Alcohol Use

	Mental Health Days Not Good	
Individual Characteristics	AOR	*p* value
(Intercept)	1.620	.000
Sexual orientation		
Heterosexual	1.000	-
Lesbian	1.711	.058
Bisexual	2.366	.000
Age	.990	.001
Race		
White	1.000	-
Black	.855	.028
Hispanic	.697	.000
Other/Including multiracial	.909	.406

Note: NHANES 2003–2012 (*N* = 7,698); AOR = Adjusted odds ratios

A logistic regression analysis was conducted to determine the likelihood of having trouble sleeping in the previous 2 weeks based on sexual orientation, race, and age. Given the significant interactions between sexual orientation and race, both Model 1, which included only the main effects, and Model 2, which included the main effects as well as the interactions, are presented in Table 13.

Table 13. Logistic Regression Results for Trouble Sleeping in the Past 2 Weeks

	Trouble Sleeping			
	Model 1		Model 2	
Individual Characteristics	AOR	*p* value	AOR	*p* value
(Intercept)	1.620	.005	.736	.006
Sexual orientation				
Heterosexual	1.000	-	1.000	-
Lesbian	1.711	.694	1.175	.607
Bisexual	2.366	.000	1.514	.048
Age	.990	.298	1.003	.299
Race				
White	1.000	-	1.000	-
Black	.855	.348	.925	.251
Hispanic	.697	.292	.900	.169
Other/Including multiracial	.909	.139	.821	.068
Sexual orientation * Race				
Lesbian * Black			.579	.344
Lesbian * Hispanic			1.115	.852
Lesbian * Other			1.364	.735
Bisexual * Black			1.703	.203
Bisexual * Hispanic			2.291	.053
Bisexual * Other/including multiracial			3.453	.019

Note: NHANES 2003–2012 (*N* = 6,457); AOR = Adjusted odds ratios

Age was not a significant predictor of the likelihood of having trouble sleeping. Although there was no significant difference in the outcome for lesbians, bisexual women were 1.887 times more likely to report trouble sleeping in the previous 2 weeks, compared to heterosexual women. There was no significant difference in the likelihood of trouble sleeping based on race. However, the interactions show that among bisexual women, Hispanic bisexual women were 2.291 times more likely to report trouble sleeping, and bisexual women who identified as multiracial or "other" were 3.453 times more likely to report trouble sleeping, compared to white heterosexual women.

Discussion

This population-based study aimed to provide an intersectional understanding of mental health disparities among racially marginalized sexual minority women, because both groups experience stigma and minority stress (Hatzenbuehler, at al., 2013b). Younger women were more likely to have a household income of less than $20,000, compared to women older than 25. This may be explained by that fact that they are more likely to be students and less likely to have the breadth of employment experience that would result in higher salaries. Bisexual women were, on average, 7 years younger than were their heterosexual counterparts and 5 years younger than were the lesbians. A greater proportion of bisexual women completed high school and some college. In contrast, heterosexual women and lesbians, on average, had higher rates of college graduation. These findings are inconsistent with previous research, which has shown both bisexual women and lesbians have higher educational attainment than do heterosexual women (Fredriksen-Goldsen et al., 2013). The greater likelihood of bisexual women making less than $20,000 was consistent with previous research (Carpenter, 2005).

More research is needed to determine whether age and average education level are related to higher rates of unemployment among bisexual women. Black and Hispanic women were 2 times more likely to have income under $20,000, compared to white women, consistent with historic income trends (Browne & Askew, 2005). Despite differences in unemployment and annual household income, both lesbian and bisexual women were less likely than were heterosexual women to have health insurance, which may be linked to lower likelihood of benefiting from legal partner benefits. The link

between health insurance coverage and access to usual source of care from a doctor or clinic, should also be assessed in future research.

While there are a number of indicators associated with measuring mental health outcomes, this study focuses on self-reported mental health status, substance use as a coping mechanism to stress, and sleep quality. This study showed that both lesbians and bisexual women are much more likely to have used nicotine or tobacco, compared to heterosexual women, which is consistent with previous research (Bye et al., 2005; Case et al., 2004; Gruskin & Gordon, 2006). However, this may be a new finding specifically related to bisexual women—little research exists particularly focusing on this population. Previous studies have shown that when sexual minority participants were shown nicotine or tobacco advertisements targeting them, they perceived these advertisements to be a positive, politically significant symbol of inclusion (Smith et al., 2005, 2006). This finding, combined with the availability of coping mechanisms, may help explain nicotine use in this population. It should be noted that Hispanic and multiracial women were less likely than were white women to be nicotine users.

Higher likelihood of alcohol use among lesbian and bisexual women is consistent with previous research (Case et al., 2004; Cochran et al., 2000; Cochran & Mays, 2000; Diamant et al., 2000; Gruskin & Gordon, 2006) and may be understood in the context of bar culture in sexual minority communities (Smith et al., 2005) or as a coping mechanism for dealing with chronic minority stress (Meyer, 2003). Although black women were less likely to binge drink, compared to white women, Hispanic women were more likely to

binge drink. More research is needed to understand the intersection of sexual orientation and race in terms of substance-use behaviors (Bauer, 2014).

Bisexual women, black of any sexual orientation, and Hispanic women of any sexual orientation were more likely to indicate that they had at least 1 or more mental health days that were not good, consistent with previous findings (Case et al., 2004; Conron et al., 2010). Although the results for lesbian women were slightly greater than the critical significance value of $p \leq .05$, this outcome is worth exploring further because significant differences in mental health outcomes between lesbians and heterosexual women are consistent with previous research (Conron, et al., 2010).

Additionally, bisexual women who identified as Hispanic and bisexual women who identified as multiracial were much more likely than were white heterosexual women to report having trouble sleeping. As of this writing, this appears to be a new finding with potentially significant implications for mental and cardiovascular health outcomes. Although interaction terms were tested for sexual orientation and race within all outcomes, it is likely that the small sample size did not allow adequate variability for this type of analysis. The significant interaction terms related to trouble sleeping may signify a need to study these interactions with a larger nationally representative sample of sexual minority and racially marginalized women.

This study has several limitations. The subsample of sexual minority women was small, especially when broken down by race. Additionally, this sample was a cross-sectional analysis of different people measured at one point in time, and the analysis spanned five different data collection periods. This did not allow for the analysis of

disparities among the same people over time. Potential benefits to this type of analysis related to mental health outcomes may have to do with changes in federal legislation pertaining to lesbian and bisexual women. In addition to heterosexual, lesbian, and bisexual identities, some women identified as "something else" and thus were excluded from this analysis. It is possible that these participants identified as *queer* or another less mainstream term. In the context of minority stress, it would be important to understand the impact of these identities, which this study was not intended to do.

The study also has several important strengths. The NHANES is a nationally representative dataset using complex, multistage sampling methods. The survey also oversamples based on race and age to represent persons living in the United States. Additionally, analyses are based on self-reported sexual orientation, which is critical to understanding the impact of stigma on health outcomes. Racial identity was included in the analyses.

CHAPTER VI

EPILOGUE

The presented research is part of a growing effort to adequately understand and intervene on public health issues that most effect sexual minority populations. The purpose of this dissertation study was to 1) provide a population-based analysis of cardiovascular risks and mental health disparities among sexual minority women and 2) provide an intersectional analysis of these disparities with a focus on sexual orientation and race. This study builds on the need for more population-based research with sexual minority populations. It also brings together two critical health disparity topics relevant to sexual minority women: physical and mental health. While both cardiovascular (Farmer, et al., 2013) and mental health disparities (Operario, et al., 2015) are evident among sexual minority women, it is unclear whether the burden of disease is similar both for lesbians and bisexual women. Current research often shows conflicting findings, and health outcomes among bisexual women are entirely understudied.

Previous population based studies largely separated physical and mental health outcomes despite emerging evidence that health disparities exist for both among sexual minority women. Studies similar to this dissertation have also grouped lesbians, bisexual women and any women who reported at least one same-sex partner into sexual minority women and compared their outcomes to heterosexual women (Farmer, et al., 2013). This approach does now allow for clarification of whether the burden of disease is different or

similar among the different sexual minority groups. Further, although some relationships between sexual identity and health disparities have been established, there exists no consistent framework for understanding these disparities. The presented conceptual model aims to merge two critical health disparity theories: the Stigma as a Fundamental Cause of Population Health Inequalities (Hatzenbuehler, et al., 2013) theory and the Minority Stress Theory (Meyer, 2003). This model underscores how stigma, as a form of societal stress that impacts all aspects of social life, serves as a societal/distal level stressor for both sexual and racial minority groups. Sigma also impacts individual/proximal level stressors, such as social support and internalized inferiority related to one's marginalized status. Undoubtedly, stigma also impacts substance use behaviors and Sociodemographic factors such as income and healthcare access. It was important to underscore the ways in which stigma impacts not only sexual minority women but racial minority women as well. This is especially important as some sexual minority women are also racial minorities and experience stressors related to both identities at once, which is why it continues to be inappropriate for studies to separate these two issues.

This study aimed to provide a population-based intersectional analysis of health disparities, accounting for both sexual orientation and race. To do this, publically available data from the National Nutrition Health and Examination Survey were select because this ongoing data collection effort asks participants to identify their sexual orientation and collects many health indicators. This is one of the only national data collection efforts that do so. While a large number of participants did not answer this

question, the analytic sample included just under 8,000 participants, with a little less than 400 respondents identifying as lesbian or bisexual women. The key areas of interest were sociodemographic risks, cardiovascular risks and mental health risks.

Results showed that lesbian women were more likely to have no health insurance, have higher log BMI, be current tobacco users and engage in binge drinking compared to heterosexual women. However, the overall outcomes for bisexual women were even worse. Bisexual women were more likely to have an annual household income of less than $20,000, have no health insurance, have higher log BMI, have a diabetes diagnosis and reported family history of diabetes than did heterosexual women. Notably, bisexual women fared worse on all mental health incomes, including being more likely to be current tobacco/nicotine users, engage in binge drinking, have poor mental health and trouble sleeping, compared to heterosexual women. These findings are the most substantial contribution of this study to the field of health disparities among sexual minority women. It is no surprise that both black and Hispanic women were much more likely to experience negative health outcomes than white women as this is well noted in the literature (Boehmer, et al., 2007). However, race did appear to be a protective factor, particularly in terms of mental health, where racial minority women were less likely to report negative mental health outcomes than white women. Being a sexual minority was not identified as a protective factor for any outcome in this study.

In establishing relationships between sexual orientation and various indicators, two models were considered—one with sexual orientation as the primary predictor and racial identity as the covariate, and another with the same variables as well as an

interaction term between sexual orientation and race. For majority of the variables, the interaction terms were insignificant. Where significant results were found, the outcome was typically only significant for one group. Although this study aimed to provide an intersectional analysis using these interactions terms, the subsample sizes are likely too small to demonstrate any real differences in outcomes based on both sexual orientation and race. Based on the previous findings as well as those included in this study, it is evident that future national data collection efforts should considering oversampling for racial minority groups so that we are able to better understand disparities in this groups based on race.

While both lesbian and bisexual women had greater health disparities than heterosexual women, it is evident that special attention should be given to health disparities among bisexual women so as to better understand their unique stress and stigma and the resulting outcomes. This study confirms previous findings that bisexual women generally fare worse than both heterosexual and lesbian women (Carpenter, 2005). Future health disparities research with sexual minority women should take this into account and medical practitioners should be aware of these disparities in their practices. This study contextualizes the disparities among bisexual women as being attributable to the lacking affirmation and support within different social networks. However, more research is needed to establish these direct links. Public health education should also especially focus on disease prevention and health education with bisexual women in particular, with a focus on mental and cardiovascular health (Blondeel, et al., 2016).

Because this study is limited to “heterosexual”, “lesbian” and “bisexual women” it is unclear how the other participants who indicated their sexuality to be “something else” or “unsure”, are impacted by stigma in relation to health outcomes. It may be that these participants identify as sexual minorities but mainstream concepts of lesbian and bisexual identities do not adequately represent their experiences. If so, these individuals may experience stigma and minority stress in a unique way as their narratives are not part of mainstream cultural understanding. As such, NHANES should consider expanding their sexual orientation questions to clarify what participants might mean by indicating “something else” as their sexual orientation. These surveys should also collect information on gender identity, which would ultimately help researchers have a greater understanding of health outcomes based not only on stigma related to not only sexual orientation and race but also marginalized gender identity as well. However, this task comes with the challenge of gathering data from groups large enough to adequately compare the outcomes of one group to those of another. With that being said, perhaps oversampling these groups is one strategy that national data collection efforts could to consider.

Despite the contributions to the field of health disparities, this study only presents associations and does not establish causal relationship between stigma, as a form of minority stress, and negative health outcomes. This is reflective of the current field that is still uncovering and contextualizing health disparities in sexual minority groups. However, future research should aim to explain the causal pathways between stigma and poor health outcomes.

Stigma and the resulting minority stress is one way that we can explain health disparities among sexual minority populations. It is important to emphasize that while log BMI was the most common disparity and there was variability for other cardiovascular outcomes, there was no difference in heart attack and coronary heart disease histories, based on sexual orientation. This may be due to the fact that the findings in this study came from self-reported medical histories. It is possible that that these issues were either fatal or they are rare in this population. It could also point to a discrepancy in understanding and remembering health information rather than a lack of significant cardiovascular outcomes. However, it is difficult to imagine this being true for such significant health events. More research is needed to understand why there are disparities in reported cardiovascular risks but virtually no difference in the resulting heart attack and coronary heart disease rates.

More research is needed to understand the reasons behind high rates of substance use in sexual minority populations. Although there is a breadth of research on mental health outcomes among sexual minorities which suggest that substance use behaviors may be common coping mechanisms in response to stress (Meyer, 2003), more population-based studies are needed to address current discrepancies in research where there seems to be no consensus on the status of those population outcomes. This is particularly true for research with bisexual women, who continue to be largely understudied and when disparities have been identified, causal relationships have remained unexplored. Since this study affirms notable health disparities in racially marginalized populations, it is important to continue trying to understand how sexual

minority women who are also racial minorities, may be especially impacted by minority stress in terms of their health outcomes. Population-based data collection efforts should consider oversampling based on these variables.

Despite the inability to establish significant interactions between sexual orientation and race, this study provides a holistic overview of health outcomes based on sexual orientation as well as race. It substantially contributes to the field of sexual minority research particularly in terms of understanding population-based health outcomes among bisexual women. A conceptual framework that underscores importance of stigma and minority stress in contextualizing the present findings is presented. Lastly, future recommendations for public health research and practice are made based on these findings.

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APPENDIX A

NHANES CONSENT FORM

#1 OMB # 0920-0237

NATIONAL HEALTH AND NUTRITION EXAMINATION SURVEY
HOME INTERVIEW CONSENT

Print name of person questioned _____ _____ _____
First **Middle** **Last**

You have been chosen to take part in the National Health and Nutrition Examination Survey (NHANES), conducted by the National Center for Health Statistics, part of the Centers for Disease Control and Prevention (CDC). This research tells us about the health and nutrition of people in the United States. It combines an interview with a health exam. Our interviewer will ask questions about you and your family. Some questions are about your work and general health. Others are about health problems and other health topics. Health research using NHANES can be enhanced by combining your survey records with other data sources. The data gathered are used to link your answers to vital statistics, health, nutrition, and other related records. The questions today will take about one hour. We may contact you to check the work of your interviewer. We may contact you again for further studies.

Data gathered in this survey are used to study many health issues. We are required by law (read box below) to use your information for statistical research only and to keep it confidential. The law prohibits us from giving anyone any information that may identify you or your family without your consent.

You may take part in this survey or not. The choice is yours. You will not lose any benefits if you say no. If you choose to take part, you don't have to answer every question.

We can do additional health research by linking your interview and exam data to vital statistics, health, nutrition, and other related records. May we try to link your survey records with other records?
| Yes | No

Do you have more questions about the survey? You can make a toll-free call to Dr. Kathryn Porter at the U.S. Public Health Service at 1-800-452-6115, Monday-Friday, 8:30 AM-6:00 PM EST. If you have questions about your rights about being in the survey, call the Research Ethics Review Board at the National Center for Health Statistics, toll free, at 1-800-223-8118. Please leave a brief message with your name and phone number. Say that you are calling about Protocol # 2005-06. Your call will be returned as soon as possible.

SIGNATURE OF PERSON ANSWERING QUESTIONS:
I have read the information above. I agree to proceed with the interview.

_____ _____
Date

IF PERSON ABOVE IS 16 OR 17 YEARS OLD, A PARENT/GUARDIAN MUST ALSO SIGN BELOW:
(Unless participant is an emancipated minor |)

_____ _____
Signature of parent/guardian **Date**

I observed the interviewer read this form to the person named above and he/she agreed to participate by signing or marking this form.

_____ _____
Witness (if required) **Date**

Name of staff member present when this form was signed: _____

HOUSEHOLD ID ___ ___ ___ ___ ___ ___ ___ ___ ___ FAMILY # ___ ___
Which questionnaire(s) did person respond to? FAMILY | SP | (IF CHECKED, PRINT BELOW)

SP NAME	SP ID	SP NAME	SP ID
_____	_ _ _ _ _ _	_____	_ _ _ _ _ _
_____	_ _ _ _ _ _	_____	_ _ _ _ _ _
_____	_ _ _ _ _ _	_____	_ _ _ _ _ _

Assurance of Confidentiality – All information which would permit identification of an individual, a practice, or an establishment will be held confidential, will be used only by NCHS staff, contractors, and other agents authorized by NCHS to perform statistical activities, only when required and with necessary controls, and will not be disclosed or released to other persons without the consent of the individual or establishment in accordance with section 308(d) of the Public Health Service Act (42 USC 242m) and the Confidential Information Protection and Statistical Efficiency Act (PL-107-347). By law, every employee as well as every agent has taken an oath and is subject to a jail term of up to five years, a fine of up to $250,000, or both if he or she willfully discloses ANY identifiable information about you.

Public reporting burden of this collection of information may take up to 6.7 hours per response for total participation, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. An agency may not conduct or sponsor, and a person is not required to respond to collection of information unless it displays a currently valid OMB control number. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to CDC/ATSDR Reports Clearance Officer, 1600 Clifton Road, MS D-74, Atlanta, GA 30333, ATTN: PRA (0920-0237). 01/01