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Are Sexual Minorities at an Increased Risk for Cardiovascular Disease?

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By

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Introduction

Among noncommunicable diseases, cardiovascular disease (CVD) is the leading cause of death worldwide, accounting for 17.9 million deaths in 2016.[1] In the United States the incidence of CVD deaths declined steadily from 1970 to 2014 but halted at 800,000 deaths a year in 2014 and since then has been trending upward.[2] Due to an aging population and a dramatic rise in obesity over the past 25 years, the prevalence of CVD in the US is expected to increase by 10% between 2010 and 2030.[3] Cardiovascular disease is a broad term that includes coronary heart disease, cerebrovascular disease, and peripheral vascular disease—3 anatomically distinct diseases that are unified by the pathogenesis of atherosclerosis. It is estimated that by year 2035, 45.1% of Americans (>130 million adults) will be diagnosed with some form of CVD.[2] This projection translates into an estimated 1.1 trillion dollars that the US healthcare system will pay for both the direct and indirect costs associated with CVD.[2] This increasing prevalence and rising burden of CVD has led many researchers to focus on primary prevention of the disease.

One way to bolster primary prevention of CVD is to identify patient populations that may be at an increased risk of developing this disease. As outlined in a 2011 report from the Institute of Medicine, sexual minorities experience a number of health disparities that are linked to worse health outcomes.[4] The minority stress model is commonly used to frame discussions surrounding these health disparities, whereby sexual and gender minorities experience chronic stress as a consequence of their stigmatization as a minority group.[4] Chronic psychological stress has been linked to chronic disease such as CVD and can also lead to behaviors such as tobacco and alcohol use, poor dietary choices, and decreased physical activity, all of which impact an individual's cardiovascular risk. Thus, sexual minorities (lesbian, gay, and bisexual) may have an even greater risk of developing CVD when compared to their heterosexual counterparts. If CVD

risk is indeed increased for sexual minorities, clinicians will need to implement earlier and more aggressive preventive measures for this population in order to achieve health equity.

Discussion

An important first step in determining if sexual minorities are at an increased risk of CVD would be to determine if any risk factors for CVD are more prevalent in this population. The World Health Organization defines a risk factor as any attribute, characteristic or exposure of an individual that increases the likelihood of developing a disease or injury.[5] The INTERHEART study found that 90% of CVD can be attributed to 9 modifiable risk factors: hypertension, abnormal lipids, smoking, diabetes, alcohol consumption, diet, physical activity, obesity, and psychological factors.[6] Researchers have consistently reported an increased prevalence of several of these modifiable risk factors for certain subsets of sexual minorities.

In a recent secondary analysis of National Health and Nutrition Examination Survey (NHANES) survey data from 2001-2012, sexual minority women (SMW) were found to have increased CVD risk based on elevated adjusted odds ratios for frequent mental distress (2.05), current tobacco use (2.11), binge drinking (1.66), obesity (1.61), and glycosylated hemoglobin consistent with prediabetes (1.56).[7] In this study, SMW were defined as self-identified lesbian and bisexual women. A weakness of this study was the combination of these two groups of women in all statistical analyses in order to achieve significant statistical power.[7] Another limitation of this NHANES survey was that frequent mental distress was determined by a non-specific question that was intended to measure acute rather than chronic stress. Nonetheless, the findings in this survey were consistent with results found in a systematic review of 31 studies that examined CVD risk for sexual minorities. Consistently higher rates of tobacco use, alcohol

consumption, poor mental health, illicit drug use, and obesity were found among SMW in this latter review.[8]

The evidence supporting increased CVD risk due to modifiable risk factors was less consistent for sexual minority men (SMM). The secondary analysis of the NHANES survey data from 2001-2012 showed that bisexual men had increased CVD risk due to higher rates of mental distress, obesity, elevated blood pressure, and glycosylated hemoglobin when compared to heterosexual men.[9] However, the data from this study did not reveal any increased risk for gay or heterosexual men who have sex with men when compared to exclusively heterosexual men.[9] In fact**,** the statistics showed that gay men had lower rates of binge drinking.[9] The findings in this study were strengthened by the fact that the sample of SMM was sufficiently large to divide them into groups based on their sexual identity and behavior —a luxury that did not exist when the same authors examined sexual minority women.[7,9] In the aforementioned systematic review of 31 studies examining CVD risk in sexual minorities, the results were in agreement with the NHANES data; SMM were found to have higher rates of tobacco use, illicit drug use, and poor mental health.[8] These findings did not distinguish between the different subsets of SMM, preventing the comparison of subgroups with the NHANES study. It is noteworthy that none of the previously mentioned studies found a significant difference in specific CVD diagnoses for sexual minorities.[7-9]

In addition to identifying individual CVD risk factors, calculation of CVD risk scores provides another means by which clinicians can predict risk. The Framingham General CVD risk scoring tool considers an individual's sex, age, total and high-density lipoprotein cholesterol, systolic blood pressure, treatment of hypertension, diabetes status, and smoking status.[10] This multivariable risk factor algorithm both predicts the likelihood that an individual will have a

future CVD event and provides an estimate of their vascular age.[10] Vascular age is described as the chronological age of an individual with an equal CVD risk and a normal set of risk factors. In other words, if an individual has a normal risk factor profile, then their vascular and chronological age will be the same. Multiple studies have used the Framingham General CVD risk score to determine if sexual minorities have a greater risk for CVD than heterosexuals.

Using data obtained from the 2001-2008 NHANES survey, Farmer et al found that on average, sexual minority women (SMW) had vascular systems that were 5.7% older than heterosexual women.[11] Here, SMW was broadly defined as those who either self-identified as lesbian, bisexual, or something else as well as those who reported having at least 1 same-sex partner in their lifetime.[11] When this definition of SMW was narrowed to include only those who identified as lesbian, bisexual, or something else, it was found that SMW had vascular ages that were 7.5% older than their heterosexual counterparts. A strength of this study was its inclusion of both sexual behavior and identity to operationalize sexual minority status. This strength is particularly notable, since subsequent studies have demonstrated that how we define sexual orientation changes our understanding of chronic disease and using at least two measurements of sexual orientation (sexual behavior and sexual identify) is optimal in order to identify subgroups that may have an increased risk.[12] Despite doing so, this study was still limited by the relatively small sample of SMW, which prevented examination of subgroups. The use of a validated multivariable algorithm to measure CVD risk was a strength in this study. However, when used for SMW, other variables not assessed with this algorithm, such as parity, may confer additional CVD risks that this tool did not consider.

A separate study using a similar method was conducted for sexual minority men (SMM) but produced different results. In this study, SMM as a group compared to heterosexual men had

no significant difference in CVD risk. Moreover, SMM had vascular systems that were 4.0% younger than heterosexual men, although that difference was no longer significant when controlled for education and hard drug use.[13] Differences in CVD risk were found when SMM were divided into subgroups. Bisexual men had vascular systems that were 8.1% older than heterosexual men, while homosexually-experienced heterosexual men had vascular systems that were 9.1% younger than heterosexual men.[13]

A separate group of researchers used the Framingham model to evaluate for differences in long-term CVD risk based on sexual identity. When calculating 30-year CVD risk, this study found a significantly increased risk for females who self-identified as "mostly heterosexual" and "mostly homosexual".[14] Although bisexual and homosexual females also had an increased risk of CVD, this increase was not statistically significant.[14] For males, there was no statistically significant difference in CVD risk based on sexual identity, although **"**mostly homosexual**"** men were found to have an elevated risk.[14] The results of this study are strengthened by its nationally representative sample of young adults and its use of a long-term risk prediction function, which is more accurate for predicting CVD risk among young adults. However, this study is limited since it only examined sexual identity and did not consider sexual behavior. Nevertheless, these findings suggest the need to further investigate the underlying mechanism that confers increased CVD risk for sexual minorities who identify as **"**mostly heterosexual**"** or **"**mostly homosexual**"**. The authors suggest that these individuals may be experiencing discordant identities or may be in the process of sexual orientation identity change—both of which have been shown to cause psychological distress.[14]

Chronic psychological stress has been linked to CVD and is an important risk factor to consider for sexual minorities. The American Heart Association recognized that a chronically

elevated allostatic load (i.e., the body's stress response) leads to a low-grade inflammatory response that negatively affects arterial circulation.[3] Based on differential vulnerability models, Hatzenbuehler et al hypothesized that lesbian, gay or bisexual (LGB) individuals would be more vulnerable to developing cardiometabolic risk when exposed to stressful life events compared to heterosexuals.[15] Using data obtained in the Add Health longitudinal study of adolescents and young adults, researchers showed that for gay and bisexual men a greater number of stressful life events predicted an elevated cardiometabolic risk score.[15] Similarly, for lesbian and bisexual women with 5 or more stressful life events**,** a statistically significant elevation in cardiometabolic risk was noted.[15] For both heterosexual men and women, no identifiable relationship between cardiometabolic risk and stressful life events was found.[15] This study was limited by the small sample size of LGB respondents who met the criteria, which prevented researchers from examining lesbian and gay respondents separately from bisexual respondents. Additionally, this study did not examine LGB-specific stressful life events such as concealment or disclosure**,** which may have revealed an even greater cardiometabolic risk.

A growing body of evidence suggests sexual minorities are at an increased risk for developing CVD. Sexual minority women exhibit increased CVD risk due to frequent mental distress, tobacco use, alcohol consumption, and obesity; furthermore, when tested against Framingham general CVD risk prediction models, SMW are found to have vascular systems that are 5.7% older than their heterosexual counterparts.[7,8,16] The evidence is conflicting with regard to sexual minority men (SMM) when considered as a group, with some studies suggesting higher rates of tobacco use and poor mental health.[8] When tested with Framingham CVD risk predication models, SMM were found to have vascular systems that were 4.0% younger when compared to heterosexual men.[13] When isolated from SMM as a whole, bisexual men had an

increased risk of CVD due to higher rates of mental distress, obesity, elevated blood pressure, and glycosylated hemoglobin—reflecting a vascular age that was 8.1% older than heterosexual men's.[9,13] Increased stressful life events were also shown to accurately predict an increased cardiometabolic risk for sexual minorities.[15]

Conclusion

The evidence in the current literature suggests that an increased risk of CVD is a health disparity of sexual minorities. Addressing this disparity will require a multi-pronged approach that considers the effects of public policy, addresses current gaps in research, and integrates current knowledge into clinical practice. From a public policy perspective, government agencies should include sexual minorities in population-based surveys. These agencies should include sexual identity, sexual behavior, and attraction in their assessment of sexual orientation in order to identify subgroups and further elucidate differences that may warrant further investigation. The stronger evidence for an increased CVD risk among lesbian and bisexual individuals as compared to gay men, highlights the need to consider these populations individually. Each sexual identity within the sexual minority community presents a unique set of social determinants that could carry differing risks for CVD. Given this variability, future research should consider these populations individually, rather than combining them, in order to avoid obscuring nuanced differences. Additional policy efforts that advocate for the oversampling of sexual minority populations would provide the statistical power necessary to allow researchers to examine these subgroups. In addition, the chronic psychological stress experienced by sexual minorities and its connection to increased CVD risk should be a focus of future research. Moreover, research regarding sexual minorities could be strengthened by policy efforts that work to incorporate sexual orientation into electronic health records. Doing so would provide objective

data that include biomarkers and clinical diagnoses. When establishing care with new patients, primary care clinicians need to foster trusting relationships that allow them to openly express their sexual orientation. Only when primary care clinicians are able to recognize their patients as sexual minorities will they be able to adequately treat the modifiable risk factors that place their sexual minority patients at an increased risk of CVD.

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