PERCEIVED CARDIOVASCULAR DISEASE RISK AMONG LESBIAN, GAY, AND BISEXUAL BLACK, INDIGENOUS, AND PEOPLE OF COLOR: THE INFLUENCE OF INTERSECTIONAL MICROAGGRESSIONS

A Thesis By

DYLAN G. SERPAS
ORCID iD: 0000-0001-5531-3280

California State University, Fullerton
Summer, 2021

In partial fulfillment of the degree:
Master of Science, Clinical Psychology

Department:
Department of Psychology

Committee:
Sawssan R. Ahmed, Department of Psychology, Chair
Laura Zettel-Watson, Department of Psychology
Barbara J. Cherry, Department of Psychology
James J. García, Department of Psychology, University of La Verne

DOI:
10.5281/zenodo.5114926

Keywords:
cardiovascular disease, minority stress, LGB health, intersectional microaggressions

Abstract:
Cardiovascular diseases (CVDs) are the leading cause of morbidity and mortality nationwide. Separate bodies of research indicate that Lesbian, Gay, and Bisexual (LGB) individuals and Black, Indigenous, and people of color (BIPOC) demonstrate a disproportionately higher risk for CVDs, and experiences of discrimination are implicated as a psychosocial mechanism. Within LGB communities, Bisexual individuals report more discrimination that contributes to a disproportionately greater CVD risk factor (RF) burden compared to their heterosexual, Lesbian, and Gay counterparts. However, research has not compared differences in CVD RF prevalence between Bisexual and Lesbian/Gay BIPOC, nor examined the influence of psychosocial stressors salient to this population including LGB BIPOC microaggressions on CVD risk perceptions. Thus, this study examined differences in the likelihood of reporting CVD RFs between Bisexual and Lesbian/Gay BIPOC. Secondly, the relationship between LGB BIPOC microaggressions and perceived CVD risk was investigated, with sexual orientation proposed as a moderator. Participants (N = 264; 76% Bisexual; 72% Hispanic) self-identified as LGB BIPOC and self-reported CVD RFs, CVD risk perceptions, and LGB BIPOC microaggressions. Findings revealed that Bisexual BIPOC reported similar odds for CVD RFs compared to their Lesbian/Gay BIPOC counterparts. Although, intersectional microaggressions were disproportionately associated CVD risk perceptions, where a significant relationship was detected among only Bisexual participants. Findings suggest no significant differences in CVD RF burden between Bisexual BIPOC and Lesbian/Gay BIPOC and support the influence of LGB BIPOC intersectional microaggressions on CVD risk perceptions. Results offer important implications for the CVD health of LGB BIPOC.
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ACKNOWLEDGMENTS

Thank you to Drs. Ahmed, Cherry, Zettel-Watson, and García for your continued support!
CHAPTER 1
INTRODUCTION

Research has acknowledged the influence of subjective social identities in health and disease (Major et al., 2013). This notion rejects the standard biomedical framework for disease conceptualization by accounting for the psychosocial and biobehavioral influences in the development and risk of disease (Engel, 1977). Social determinants of health, including minority stress, function as one mechanism in the development and maintenance of health disparities that impede health equity (Adler et al., 2008). Health disparities—as a metric of health equity—refer to differences in health risk and outcomes between vulnerable and non-vulnerable groups (Kilbourne et al., 2006). Importantly, these observations are driven by historically informed social conditions that predispose individuals with a minoritized social status to greater social, economic, and environmental disadvantage (Braveman, 2014). Health disparities within the United States (US) are well-documented in that the National Institute on Minority Health and Health Disparities has designated racial/ethnic minorities and sexual and gender minorities (SGM) as health disparities populations (NIMHHD, n.d.).

SGM and BIPOC in the US

The US census reports that the US racial/ethnic composition includes approximately 60% non-Hispanic White, 18% Hispanic or Latinx, 13% non-Hispanic Black/African American, 1% American Indian and Alaska Native, 6% Asian American, less than 1% Native Hawaiian and other Pacific Islander, and about 3% bi or multiracial (US Census Bureau, 2019). In addition, approximately 5% of the US population self-identifies as sexual and gender minorities (SGM) that include Lesbian, Gay, Bisexual, or transgender (LGBT; Williams Institute, 2019a). Among the LGBT population, it is estimated that 42% identify as Black, Indigenous, or people of color (BIPOC). The LGBT population is estimated to include approximately 21% Latinx, 12% African American, 2% Asian American, 1% American Indian or Alaska Native, 1% Native Hawaiian or other Pacific Islander, and 5% multiracial individuals (Williams Institute, 2019b); however, these estimates are likely underreported (Pachankis & Bränström, 2019). Nonetheless, it is projected that by the year 2045 non-Hispanic Whites will
represent less than 50% of the nation, indicating a majority representation of BIPOC, with the fastest growing groups being biracial and multiracial persons followed by Asian American and Hispanic/Latinx (Vespa et al., 2018). In sum, the projected exponential growth of the SGM BIPOC population confirms their epidemiological existence and that their health will likely be a key area of study.

The term BIPOC is an umbrella term used to collectively reference all people who do not self-identify as White or European American. BIPOC is preferred over POC because it identifies varying levels of discrimination and prejudice across different communities of color and, specifically, distinguishes between the experiences of Black and Indigenous people—the two groups that have faced the greatest discrimination and long history of oppression through slavery and genocide—from other groups of color in the US (Selvarajah et al., 2020). Throughout the 17th and 18th centuries European settlers sought Westward expansion during which they enslaved individuals of African descent and were responsible for the mass genocide of a large proportion of Native American and other indigenous populations who resided in the US prior to the European occupation (Alvarez, 2014). Over the course of these events, settlers subjected both groups to inhumane forms of violence with the intention of destroying their communities. Therefore, the term BIPOC provides a small, yet important distinction between the varying experiences that different communities of color have been subjected to over the course of US history.

**Minority Stress**

Early evidence indicates that privileged social groups hold negative beliefs, attitudes, and stereotypes against diverse marginalized groups (e.g., racial/ethnic minorities, sexual minorities; Crocker & Major, 1989). Consequently, such beliefs and attitudes create hostile environments in the form of minority stress for those holding marginalized identities. Minority stress refers to excess psychosocial stress derived from societal prejudice salient to minority status (Brooks, 1981), and functions as one well-documented and ongoing psychosocial mechanism contributing to health disparities (Adler et al., 2008).
Although many conceptual models contextualize the psychosocial, bio-behavioral, and physiological contributions to health disparities among minoritized populations (e.g., Clark et al., 1999; Myers et al., 2003), this study will prioritize the minority stress theoretical model developed by Meyer (2003), for its central focus on psychosocial adversities among SGM who represent a historically understudied population. The minority stress framework (Meyer, 2003) outlines the process by which adverse experiences contribute to poor health outcomes via proximal and distal stressors either directly or indirectly. Proximal minority stressors refer to internal perceptions and responses to negative external experiences based on self-stigmas (e.g., internalized homophobia), whereas, and more relevant to the current study, distal minority stressors include external stressors from society such as harassment and discrimination (e.g., microaggressions; Meyer, 2003) experienced in schools, workplaces, housing, and health care settings (Ramirez & Paz Galupo, 2019). As described, distal and proximal stressors impact the health of minoritized populations either directly or indirectly. For instance, minority stressors may affect physiological systems via stress response activation (García et al., 2020; Sawyer et al., 2012). They may also contribute to mental health problems (Krieger et al., 2008), increase the likelihood of adopting poor health behaviors (Krieger et al., 2008; Sawyer et al., 2016), function as barriers to accessing health services (Hausmann et al., 2008), and impact health service use outcomes (e.g., delays in receiving treatment; Ben et al., 2017). Thus, experiences of discrimination represent a pathogenic social determinant of health (Paradies et al., 2015) affecting psychological and physiological well-being, and increasing the risk of chronic diseases, such as cardiovascular diseases (CVDs).

Individuals who identify as both LGB and BIPOC experience unique stressors related to their multiple minority status. Importantly, it is posited that LGB and BIPOC identities are not mutually exclusive but rather inherently interconnected (Bowleg, 2013; Collins, 1995; Cyrus, 2017) such that prejudice permeates LGB, heterosexual, BIPOC, and White communities (Balsam et al., 2011). Although, theoretical scholarship has yet to comprehensively detail the processes that contribute to adverse health outcomes among LGB BIPOC populations. For instance, Meyer (2003) centers the
experiences of LGB by outlining the pathways through which adverse inter and intrapersonal experiences of LGB-targeted discrimination affect psychological health. More recent theoretical scholarship has called to extend Meyer’s (2003) framework and account for the cumulative psychosocial stressors related to the intersection of sexual orientation minority and racial/ethnic minority status (Cyrus, 2017). Doing so may better contextualize the association between experiences of sexual orientation and racial/ethnic minority psychosocial stressors and mental health outcomes (Cyrus, 2017; Williams & Serpas, 2021).

Furthermore, Lick and colleagues (2013) proposed a minority stress model that prioritizes the physical health of LGB by illustrating the processes through which adverse psychosocial experiences (e.g., discrimination) repeatedly activate physiological stress responses that contribute to bodily dysregulation, and eventually allostatic load, a mechanism in CVD development (Lick et al., 2013). Jointly, Meyer’s (2003) and Lick and colleagues’ (2013) minority stress models more completely illustrate minority stress processes and adverse psychological and physiological health outcomes (e.g., CVDs) among LGB and possibly LGB BIPOC (Cyrus, 2017; Williams & Serpas, 2021). Together, the complementary frameworks described have the capacity to account for multiple marginalized identities and describe how adverse psychosocial experiences contribute to reduced mental health (Meyer, 2003) and physical health (Lick et al., 2013) disparities among LGB BIPOC (Cyrus, 2017; Williams & Serpas, 2021).

**Monosexism**

A growing body of literature indicates that sexual minority individuals experience excess stigma, prejudice, and discrimination salient to their sexual orientation that increases their risk of adverse psychological and physiological health outcomes (Cochran et al., 2009; Frost et al., 2015; Hsieh & Ruther, 2016; Institute of Medicine, 2011; Mays & Cochran, 2001; Meyer, 2003). As such, the consequences of sexual orientation-based discrimination on the health of LGB individuals is of increasing importance (Institute of Medicine, 2011). Early research on LGB minority stress and mental health has assumed equivalence between these groups (Balsam & Mohr, 2007). However,
within sexual minority communities, non-Monosexual groups such as Bisexual individuals represent a minority and face further alienation and stigmatization from both their heterosexual and Monosexual (i.e., Lesbian, Gay) counterparts (Persson et al., 2015; Roberts et al., 2015). In conjunction with minority stressors that can be experienced across all sexual orientation minorities (e.g., heterosexism), Bisexual individuals face unique Bisexual-targeted stressors (Bostwick & Hequembourg, 2014; Dodge et al., 2016). Bisexual-targeted marginalization is a form of sexual orientation-based discrimination known as monosexism or discrimination based on the prejudicial assumption that sexual orientations occur only between persons of same or different sex or gender identities (Klesse, 2011; Ross et al., 2010). Monosexism assumes that individuals can identify as either heterosexual, Gay, or Lesbian, whereas any other sexual orientations are perceived and treated as illegitimate.

The marginalization of Bisexuality is rooted in the binary polarization of sexuality that divides individuals into either heterosexual or Lesbian/Gay; consequently, Bisexuality is conceived as sexual confusion or uncertainty (Diamond, 2008a; Firestein, 2007; Rust & Firestein, 2007). Subsequently, monosexual ideology through reductionism has created stereotypes that assume Bisexual people are confused and will eventually settle in one of two sexual orientation categories of the sexuality spectrum as either Gay/ Lesbian or heterosexual (Dennis, 2014; Whisman, 2012). Furthermore, the monosexism belief system also encompasses bi-negative attitudes such as the concept of bi-erasure or the complete rejection that Bisexuality is of permanent existence (Diamond, 2008a; Diamond, 2008b; Eliason, 2000). For example, one experimental study found that heterosexual undergraduates, heterosexual community-dwellers, and Lesbian and Gay participants rated Bisexual research confederates less favorably compared to their Lesbian and Gay counterparts in terms of stability in relationships and relationship quality, indicating bi-negative views among participants (Dyar et al., 2017). Another study found that perceived bi-negative discrimination and internalized bi-negativity was associated with lower self-esteem and more depressive symptoms among Bisexual women (Lambe et al., 2017). In sum, monosexism permeates Lesbian and Gay communities
(Bostwick & Hequembourg, 2013; Lambe et al., 2017; McLean, 2008), heterosexual communities (i.e., heterosexism; Diamond, 2008a; Klesse, 2011; Lambe et al., 2017), and contributes to internalized bi-negativity that adversely affects identity development among Bisexual people (Callis, 2013; Firestein, 2007; Knous, 2006).

Past research has revealed that Bisexual individuals report feeling less connected to their SGM community compared to their Lesbian and Gay counterparts (Balsam et al., 2007; Roberts et al., 2015). Moreover, research has suggested that Bisexual individuals’ qualitatively distinct sexual-orientation-based discrimination (Brewster & Moradi, 2010), invisibility/erasure, and low access to Bisexual-affirmative support from SGM communities (Ross et al., 2018) are associated with disproportionately poorer mental and physical health (Bostwick & Hequembourg 2014; Kertzner et al., 2009; Smalley et al., 2015). In support of this notion, systematic review and meta-analytic evidence documents a higher prevalence of depression, anxiety (Ross et al., 2018), suicide (Pompili et al., 2014), and more relevant to the current study, CVD risk and incidence (Caceres et al., 2017) among Bisexual individuals compared to their Gay, Lesbian, and heterosexual counterparts. Thus, examining the Bisexual experience independent from—and in comparison to—heterosexual, Lesbian, and Gay experiences is critical to garner a deeper understanding of how cumulative marginalization and discrimination affect Bisexual health.

Social stress from Bisexual-targeted discrimination may become magnified when considering societal discrimination against one’s racial/ethnic minority identity. In support of this concept, a growing body of research on discrimination among Bisexual BIPOC shows that LGB BIPOC experiences differ when considering the intersection of their racial/ethnic minority status (Bostwick et al., 2014; Szymanski & Sung, 2010). Moreover, Bisexual BIPOC experience a disproportionate magnitude and prevalence of discrimination targeted against their interlocking minority statuses (Balsam et al., 2011; Whitfield et al., 2014). In sum, investigating psychosocial stressors salient to the intersection of LGB and BIPOC identity and its relationship to health will enhance the empirical understanding of the mechanisms contributing to CVD health disparities among this population.
Microaggressions

Research has documented that gradually, more contemporary forms of discrimination in the US have transitioned from overt and blatant transgressions to more subtle and concealed forms of prejudice. This covert phenomenon is referred to as microaggressions, which are characterized as brief and subtle interpersonal verbal or non-verbal slights that communicate bias, hostility, or denigration towards a person or group holding or with assumed minority status (Pierce, 1970; Sue, et al., 2007; Sue, 2010). While subtle, microaggressions are considered contemporary forms of discrimination due to their pervasiveness (Sue, 2010). Currently, experiences of discrimination are designated as a unique psychosocial stressor and social determinant of health (Brondolo et al., 2011; Paradies et al., 2015). Indeed, microaggressions—as a unique psychosocial stressor—are consistently associated with poorer psychological and physiological health and permeate a variety of social environments including academic, medical, and community settings (Cruz et al., 2019; Nadal et al., 2014; Nadal et al., 2017). Initially conceived to refer to subtle forms of racism (Pierce, 1970), unique microaggressions exist for individuals depending on their minority status. For instance, research has examined microaggressions salient to a person’s racial/ethnic minority status (Nadal et al., 2014), sexual orientation minority status (Nadal, 2013; Shelton & Delgado-Romero, 2013), disability status (Kattari, 2020), and, relevant to the current study, joint racial/ethnic and sexual orientation minority status (Balsam et al., 2011). Therefore, research has examined microaggressions among diverse marginalized groups, including Lesbian, Gay, and Bisexual individuals (Nadal, 2013; Nadal et al., 2010, 2011, 2016), and more recently, among LGB BIPOC (Balsam et al., 2011).

Intersectionality and LGB BIPOC

LGB BIPOC encounter distinct stigma, prejudice, and discrimination perpetrated by broader SGM, heterosexual, and racial/ethnic minority communities (Balsam et al., 2011; Cyrus, 2017; Meyer, 2010; Williams & Serpas, 2021). Importantly, holding minoritized social statuses is not inherently stressful; rather society’s perceptions, communication of bias, and marginalization against such identities create stressful experiences for people with visible and invisible minoritized identities.
Consistent with this position, pathology and other health risks among minority groups do not lie within the individual but rather with the socio-ecological context that creates and maintains harmful social contexts (Riggs & Treharne, 2016). Thus, evaluating unique psychosocial stressors that individuals with joint minority identities encounter is critical to accurately identify factors that affect their CVD risk.

To this end, intersectionality denotes the joining of institutional systems of oppression and inequity (Crenshaw, 1989). This concept was originally developed to contextualize experiences of African American women who experience oppression at the intersection of their ethnic minority and gender status through the joining of racism and sexism (Crenshaw, 1989). Currently, there are competing theoretical and methodological approaches to conceptualizing and quantifying the intersection of multiple systems of privilege and oppression that can be used to illustrate the experiences of LGB BIPOC. Some researchers support the use of an additive or multiplicative model of intersectionality to examine the joining of minority statuses (Cole, 2009; Fattoracci et al., 2020; Velez et al., 2019). The additive model postulates that multiple forms of oppression—considered separately—sum together and affect health, whereas the multiplicative model suggests that one form of marginalization compounds or reduces the effect of another (Cole, 2009). Additive and multiplicative models of intersectionality suggest that the rank ordering and separation of multiple marginalized identities is possible. Methodologically, these approaches are carried out by measuring forms of social marginalization and oppression separately (e.g., racism, heterosexism) and subsequently adding or multiplying the factors together. Notably, these models have revealed that investigating the influence of more than one social identity is more predictive of criterion-related outcomes compared to studying one identity in isolation.

Other scholars reject the additive and multiplicative intersectionality approaches for their simplification of the human experience in defining a persons’ minoritized identities as mutually exclusive and with the ability for multiple identities to be ranked (Bowleg, 2008, 2013; Collins 1995; Cuadraz & Uttal 1999; Weber & Parra-Medina 2003). Additive and multiplicative methods also, by design assume that separate identities pose an equal effect; however, this logic is flawed when
considering invisible social identities. For instance, a Gay African American’s race/ethnicity may influence their experiential reality more than their sexual orientation. Therefore, theorists have posited that a person’s experiences of discrimination and social marginalization related to their multiple minority statuses cannot be described accurately if each identity is considered separate from one another (Collins, 1991). That is, a standalone minoritized identity (e.g., LGB status) cannot accurately estimate one’s experiential reality without considering other social identities that influence day-to-day experiences (e.g., BIPOC status; Collins, 1991). To empirically measure the notion of constitutive intersectionality, it is recommended to use questions/instruments that capture interdependent experiences of social marginalization (e.g., heterosexist racism vs heterosexism added with or multiplied by racism; Bowleg, 2008). Further, Scheim and Bauer (2019) propose the notions of intracategorical and intercategorical intersectionality measurement. Intracategorical measures such as Balsam and colleague’s (2011) capture experiences of individuals at particular sociodemographic intersections (e.g., LGB BIPOC) whereas intercategorical instruments measure experiences of discrimination across a range of intersections (Scheim & Bauer, 2019). Taken together, employing a constitutive intersectionality approach to examine LGB BIPOC intersectional microaggressions and their association with CVD risk will justifiably better estimate the experiential reality and health risk among LGB BIPOC compared to additive or multiplicative approaches.

**Integrating LGB BIPOC Intersectionality in Minority Stress Frameworks**

Meyer (2003) and Lick and colleagues (2013) offer complementary minority stress frameworks that, if extended, can account for intersectional LGB BIPOC minority stress and its subsequent impact on health outcomes (e.g., cardiovascular risk). A substantial body of research shows that exposure to racial/ethnic discrimination uniquely affects physiological systems and processes that subsequently increases the risk for adverse mental and physical health outcomes including smoking, alcohol consumption, depression, and CVDs (Benjamin et al., 2019; Gil-González et al., 2014; Panza et al., 2019). Relatedly, experiences of sexual orientation-based discrimination are associated with similar outcomes such as depression, substance use, suicide (Lee et al., 2016; Plöderl & Tremblay, 2015),
and overall poor physical health among LGB compared to their heterosexual counterparts (Gonzales & Henning-Smith, 2017). Despite this, there has yet to exist a singular theoretical model that illustrates the unique psychosocial experiences and health outcomes among LGB BIPOC.

Recent empirical scholarship has begun examining the unique interplay of sexual orientation-based and race/ethnicity-based discrimination, guided by established minority stress frameworks. For example, Fattoracci and colleagues (2020) compared differences in the predictive capacity of LGB BIPOC microaggressions on mental health using additive, multiplicative, and constitutive approaches to intersectionality. Findings demonstrated that a constitutive approach to operationalizing race-based and sexual orientation-based microaggressions offered a stronger association to mental health outcomes compared to other approaches. Fattoracci and colleagues (2020) argue for future research to employ constitutive models of intersectionality to quantify microaggression research among LGB BIPOC. Thus, a constitutive intersectional lens (e.g., Balsam et al., 2011; Bowleg, 2013) guided by minority stress frameworks (Lick et al., 2013; Meyer, 2003) holds the capacity to accurately describe the relationship between LGB BIPOC intersectional microaggressions and perceived CVD risk. However, the relationship between constitutive intersectional minority stress and perceived CVD risk is not well documented for LGB BIPOC.

**Intersectional Microaggressions for LGB BIPOC**

Separate bodies of literature have established taxonomies of racial/ethnic (Sue et al., 2007) and LGB (Nadal et al., 2010) microaggressions and support their adverse impact on wellness. Relevant to the current study, Bisexual individuals—as a non-Monosexual group—represent a minority within the broader SGM minority population and they subsequently experience social marginalization through experiences of sexual orientation-based discrimination (Borgogna et al., 2020; Persson et al., 2015; Roberts et al., 2015). Among LGB, hostile and stressful social experiences—including Bisexual-targeted microaggressions—are associated with a greater prevalence of depression, anxiety, substance use disorders, suicide (Lee et al., 2016; Nadal et al., 2016; Plöderl & Tremblay, 2015; Pompili et al., 2014; Roberts et al., 2015; Ross et al., 2018), chronic
health conditions, obesity, and overall poorer physical health compared to their heterosexual counterparts (Caceres et al., 2017; Gonzales & Henning-Smith, 2017). Therefore, it is reasonable to hypothesize that the joining of sexual orientation-based discrimination (heterosexism, monosexism) and racial/ethnic discrimination exacts a unique toll on Bisexual mental and physical health. Despite this supposition, there is limited literature that has examined LGB BIPOC microaggression experiences with a focus on Bisexual BIPOC.

A growing body of research has indicated that the intersection of multiple minority statuses contributes to distinct and more experiences of stigma, prejudice, and discrimination from society (Bowleg, 2013; Fattoracci et al., 2020). Such hostile and invalidating experiences may further exacerbate mental and physical disparities among LGB BIPOC. For instance, past research using additive approaches to intersectionality indicated that reporting more than one source of discrimination (e.g., sexual orientation-based and race/ethnicity-based) was related to poorer mental and physical health (Cormack et al., 2018; Ramirez & Paz Galupo, 2019). Another study using an additive intersectional approach found that individuals with more marginalized identities with respect to gender, race, sexual orientation, and social class identities had worse health outcomes (Remedios & Snyder, 2018). Lastly, using a multiplicative model, English and colleagues (2018) found that the interaction of racial discrimination and Gay rejection was uniquely associated with emotion regulation difficulties, which were subsequently associated with more anxiety and depressive symptoms among Latinx and multiracial Gay and Bisexual men. Another study using a multiplicative intersectionality approach found a significant three-way interaction between sexual orientation, gender identity, and race where LGB Black and Latinx demonstrated higher rates of substance abuse compared to their heterosexual Black and Latinx counterparts (Mereish & Bradford, 2014). Additional multiplicative evidence also found that race-based and sexual orientation-based discrimination uniquely predicted alcohol-related outcomes among Lesbian, Queer, and Bisexual Latinx and Blacks (Cerezo et al., 2019).
While limited, some research has also investigated LGB BIPOC intersectional microaggression experiences among LGB BIPOC using a constitutive intersectional approach (Bowleg, 2013). To this end, researchers have aimed to quantify the intersectional microaggression experiences salient to LGBT BIPOC. For example, Balsam and colleagues (2011) developed the LGBT people of color (PoC) intersectional microaggressions scale that purports to measure the unique microaggression experiences salient to LGBT BIPOC. Specifically, the instrument aims to measure the ways in which racism and heterosexism (and monosexism) intersect and mold together to create distinct experiences. Importantly, the development and validation of this measure identified three primary areas in which LGB BIPOC report intersectional microaggressions that include a) racism in LGB communities, b) heterosexism (and monosexism) in racial/ethnic minority communities, and c) relationship racism in LGBT communities. However, in the context of experiences salient to Bisexual people, Balsam and colleagues (2011) do not directly capture monosexist discrimination, but rather incorporate the assumption of monosexism within a broader discrimination context.

To date, much of the literature examining LGB BIPOC experiences with microaggressions does not consider cardiovascular health. There is a further gap in knowledge in that a bulk of research on Bisexuality and discrimination is qualitative in nature (Lim & Hewitt, 2018; Serpe et al., 2020). While research has connected LGB BIPOC microaggression experiences to general physical health (Nadal et al., 2017) and health behaviors (Cerezo et al., 2019; Mereish & Bradford, 2014) using a constitutive intersectional approach (Fattoracci et al., 2020), its association with CVD risk perceptions and whether Bisexual status moderates the association is largely unknown. Despite overwhelming evidence of CVD RF and incidence disparities among BIPOC (Benjamin et al., 2019) and LGB (Caceres et al., 2017) populations, research has yet to connect LGB BIPOC intersectional microaggressions and CVD risk while considering the variability among Bisexual people (Dyar et al., 2019).
Sexual Orientation as a Moderator of LGB BIPOC Microaggressions

Meyer’s (2003) framework provides a visual guide for researchers to empirically examine the minority stress processes that contribute to adverse health outcomes among LGB individuals. Specifically, Meyer (2003) posits that the relationship between minority status (e.g., LGB) and adverse health outcomes is mediated by distal stressors (LGB BIPOC microaggressions); however, if within minority group differences are of interest, moderation is an acceptable conceptualization with appropriate justification. To this end, Bisexual individuals face unique minority stress experiences (e.g., mono-sexism, bi-erasure) compared to their Lesbian and Gay counterparts, which, therefore, provides reason to hypothesize that the relationship between LGB BIPOC microaggression experiences and a given health outcome would be moderated by one’s Bisexual status.

Indeed, past research has employed moderation to examine within-group differences in minority stress processes among LGB individuals. For example, one study examined the relationship between workplace discrimination and psychological distress among LGB adults and found that gender identity moderated the relationship, with women demonstrating a stronger association (Velez et al., 2013). Moreover, Borgogna and McDermott (2020) found that the association between perceived discrimination and mental health symptoms were only significant among non-monosexual (85% Bisexual) participants and not among Lesbian and Gay participants. Taken together, the strength of the association between LGB BIPOC microaggressions and a given health outcome is suggested to differ between Bisexual and Lesbian/Gay individuals, and, therefore, a moderation theoretical conceptualization of Meyer’s (2003) minority stress framework is employed in the current study.

Centering LGB BIPOC Experiences

BIPOC are often understudied in the SGM literature (Moradi et al., 2010). This observation is attributed to intersectional invisibility or the lack of acknowledgment of people having multiple minority group memberships (Purdie-Vaughns & Eibach, 2008). However, LGB BIPOC encounter distinct forms of race-based and sexual orientation-based oppression often through contemporary forms of color-
blind racial ideologies and heterosexism (Elia, 2014; Neville et al., 2013), and Bisexual BIPOC navigate a connected layer of prejudice driven by bi-erasure ideology.

Color-blind racial ideology aims to maintain the oppression of BIPOC by reinforcing belief systems that ignore racial and ethnic nuances across groups (Neville et al., 2013). Additionally, bi-erasure ideology seeks to deny, invalidate, and silence Bisexualism by reinforcing Monosexual identities (McLean, 2015; Brewster & Moradi, 2010; Nutter-Pridgen, 2015). Coupled together, these adversities disproportionately burden Bisexual BIPOC with more experiences of discrimination that increase the risk of adverse health outcomes and ultimately magnify LGB BIPOC health disparities.

Though research on LGBTQ BIPOC health is emerging, minimal empirical studies have focused on the impact of LGB BIPOC intersectional psychosocial stressors on health. Justifiably, this research is critical to better understand LGB BIPOC experiences within the US to identify factors that disproportionately affect the health of this population. Thus, enhancing the empirical knowledge of the health and health risk of the understudied LGB BIPOC population will aid in the development and dissemination of interventions to reduce and eliminate their health disparities.
CHAPTER 2
LITERATURE REVIEW

CVDs encompass a cluster of clinical diseases of the heart and blood vessels (e.g., coronary heart disease; World Health Organization, 2017). Recent estimates from the National Vital Statistics System indicate that heart diseases remain the leading cause of death in the US (Murphy et al., 2018). It is estimated that by the year 2035, approximately 45% of the US will have at least one type of CVD, which is expected to more than double medical costs associated with CVD healthcare (American Heart Association, 2017). Specifically, from 2015 to 2035, direct CVD costs (e.g., medical services, medications) are estimated to increase from $318 billion to $749 billion and indirect CVD costs (e.g., premature mortality, long-term disability) are estimated to increase from $237 billion to $368 billion (Khavjou et al., 2016). Although total CVD costs are projected to continue to be highest among White individuals, total CVD costs among African American and Hispanic individuals are projected to increase by 117% and 203%, respectively, whereas an 83% increase is projected among White individuals.

CVD Risk Factors

CVD risk factors (RFs) can be divided into two distinct categories: traditional and non-traditional (Sarnak & Weiner, 2019). Traditional CVD RFs include diabetes and hypertension whereas non-traditional RFs consist of those not originally described in the original Framingham heart studies such as stress and depression (Sarnak & Weiner, 2019). Importantly, depression represents an independent CVD RF, accounting for a comparable risk to cigarette use (Yusuf et al., 2004). Furthermore, while diabetes is a distinct condition, it is recognized as a metabolic risk factor for CVD and is treated as such in the present study (Lloyd-Jones et al., 2010; Yusuf et al., 2004).

A majority of CVD risk among men and women is linked to modifiable RFs such as psychopathology (e.g., stress, depression), tobacco use, alcohol consumption, dietary habits, physical activity, obesity, high cholesterol, and hypertension (Yusuf et al., 2004). The population attributable risk (i.e., the proportion of CVD incidence in the population due to a risk factor) for each
CVD risk factor is as follows: 32.5% for psychosocial factors (depression, locus of control, perceived stress, and life events), 35.7% for current and former smoking, 6.7% for alcohol consumption, 13.7% for fruit and vegetable consumption, 12.2% for physical activity, 20.1% for obesity, 17.9% for hypertension, and 9.9% for diabetes (Yusuf et al., 2004). Thus, the association between lifestyle behaviors and CVDs is well-documented such that obesity, alcohol use, smoking, and high dietary fat intake are designated as independent CVD RFs (Anderson et al., 1990; Pollitt et al., 2005). Importantly, these factors are categorized as modifiable CVD RFs given that the adoption of healthy lifestyle behaviors reduces CVD risk (Takahara & Shimomura, 2014). In sum, CVD risk factors include components based on genetic predisposition as well as health or lifestyle behaviors.

CVD Risk Perception

Disease risk perception generally refers to a person’s belief of their probability of developing illness if preventive action is not taken (Weinstein, 2000). Specifically, CVD risk perception or perceived CVD risk is a central tenet in disease prevention and control and refers to the level of knowledge of one’s CVD risk in terms of the understanding of biological predisposition and lifestyle behaviors (Homko et al., 2008). Furthermore, assessing CVD risk perception is critical in estimating population health since individuals who perceive greater CVD risk are more likely to engage in CVD risk-reducing behaviors (Brewer et al., 2007), whereas the converse is reported among those underestimating their CVD risk (Everett et al., 2016; Claassen et al., 2010, 2012).

Measures of CVD risk perception are frequently used in empirical research in conjunction with or independent from measuring specific self-report or objective CVD risk factors (e.g., hypertension, diabetes). Importantly, research shows that self-reported CVD risk perception correlates with objective CVD risk indicators in the general population cross-sectionally (Barnhart et al., 2009; Homko et al., 2008) and across time (Vornanen et al., 2020); however, this association is moderated by heath literacy (Azahar et al., 2017; Robinson et al., 2018) and subjective social status (Tang et al., 2016). To this end, underserved populations, such as BIPOC and LGB individuals are more likely to underestimate their CVD risk perception than their less disenfranchised counterparts (Homko et al.,
this observation is associated with lower levels of health risk knowledge and health literacy (Cioe et al., 2014). Nonetheless, measuring CVD risk perception is a common practice used to estimate the health of racial/ethnic minority (Caceres et al., 2021; Wright et al., 2010) and SGM (Caceres et al., 2021) populations.

Racial/ethnic differences in CVD risk perceptions are documented. For example, while research indicates that African American and Hispanic adults have greater CVD risk (Havranek et al., 2015), further evidence shows that they report lower perceptions of risk compared to their White counterparts (Flink et al., 2013; Fussman et al., 2009; McGruder et al., 2001). Less research has focused on other racial/ethnic groups such as Asian Americans (Fukuoka et al., 2017) and Native Americans (Van Hooser et al., 2020). Despite established literature documenting racial/ethnic differences in CVD risk perceptions, far less is known about LGB and even less on LGB BIPOC.

Related to CVD risk perceptions, a recent study examined sexual orientation and racial/ethnic differences in heart attack and stroke symptom awareness from the 2014 and 2017 National Health Interview Study. Findings revealed that Hispanic and Asian LGB reported the poorest awareness of heart attack and stroke symptoms compared to their heterosexual white counterparts (Caceres et al., 2021). At present, no study has examined minority stressors salient to LGB BIPOC that can influence CVD risk perceptions, such as experiences of intersectional microaggressions.

**Psychosocial Adversity and Cardiovascular Health**

The functioning of the heart is influenced by socio-environmental factors such as experiences of discrimination (Lewis et al., 2014). Over the past several decades, a growing body of literature has demonstrated that experiences of discrimination—as a unique psychosocial stressor—function through an acute sympathetic and parasympathetic cardiovascular reactivity pathway, affecting heart functioning and health (Ahmed et al., 2007; Brondolo et al., 2009; Brondolo et al., 2011; Clark et al., 1999; Hill et al., 2017; Mays et al., 2007; Myers, 2009; Krieger, 1990; Williams et al., 2019; Williams & Mohammed, 2009; Wyatt et al., 2003).
Psychosocial Stress and Cardiovascular Health Among LGB BIPOC

Several laboratory-based experimental studies have linked psychosocial stressors such as discrimination with sympathetic reactivity as evidenced by physiological stress and inflammatory responses among separate samples of BIPOC and LGB (Huynh et al., 2017; Lucas et al., 2017; Saban et al., 2018). While limited, some experimental research has found non-significant trends in blood pressure and electrical heart functioning to racial/ethnic microaggressions in Latinx (García et al., 2020), whereas other research has found significant cardiovascular reactivity to both overt and covert (i.e., microaggressions) discrimination among Latinx (Sawyer et al., 2012). In LGB research, studies have shown increased blood pressure in response to stress tasks among Gay and Bisexual males compared to their heterosexual counterparts (Juster et al., 2019). Other studies considering the role of discrimination have also found that greater physiological reactivity was associated with sexual orientation-based discrimination among LGB participants (Jacobson et al., 2016; Juster et al., 2015). An additional body of research highlights a similar reactivity pathway using parasympathetic indicators such as heart-rate variability (Hill et al., 2017; Williams et al., 2019). In sum, empirical evidence supports experiences of discrimination as one psychosocial pathway that initiates greater physiological reactivity for BIPOC and LGB and eventually contributes to allostatic load.

Unsurprisingly, scholars have emphasized the importance of assessing experiences of discrimination in LGB and BIPOC cardiovascular health and risk disparities research (Caceres et al., 2016).

Allostasis and Allostatic Load

Experiences of discrimination exact a toll on the physiological health and functioning of the body (Lick et al., 2013) that, over time, contributes to the development of chronic health issues among LGB BIPOC such as CVDs. This gradual deterioration and ultimate physiologic compromise of the body is mediated by a process known as allostatic load.

In the absence of threat, the body maintains homeostasis or its baseline physiological functioning. During times of stress, the body initiates a stress response to meet the external demands of stimuli. Following the resolved threat, the body suppresses the stress response and returns the
body to baseline or homeostatic equilibrium; this process is referred to as allostasis (Sterling & Eyer, 1988). With added stress, increased allostasis activation dysregulates the body’s functioning and contributes to a gradual physiologic compromise or allostatic load (McEwen & Stellar, 1993). The allostatic load framework can be used to contextualize the physiological toll of social marginalization on the body. Many researchers have developed theories to explain disparities in physical health outcomes among historically marginalized populations (Clark et al., 1999; Geronimus, 1992; James et al., 1983), and it is generally accepted that adverse environmental experiences (i.e., discrimination) negatively affect physical health (e.g., Forde et al., 2019; Lewis et al., 2014). This study prioritizes the allostatic load framework for its conceptualization of health disparities processes using a biological basis.

Researchers have commonly applied the allostatic load framework to assess the health of LGB (Mays et al., 2018) and BIPOC (Beckie, 2012; Langellier et al., 2021; Van Dyke et al., 2020) and report that these populations have generally higher allostatic load (measured using physiologic biomarkers) compared to their heterosexual and White counterparts. Furthermore, studies have implicated discrimination as a mechanism to increased allostatic load (Cuevas et al., 2019; Flentje et al., 2019; Van Dyke et al., 2020). Additional recent research has introduced the notion of social allostasis and social allostatic load, which emphasize the negative impact of adverse interpersonal experiences on physical health (Saxbe et al., 2020). In sum, experiences of discrimination represent a psychosocial mechanism that negatively affects the physiological functioning of the body, thereby increasing the risk of adverse health outcomes (e.g., CVDs).

**LGB in Cardiovascular Health Research**

Over the past several years, research has advanced the understanding of the disproportionate burden of CVD risk and incidence among minoritized populations, largely communities of color. Though, only recently has the study of LGB individuals captured the attention of CVD health disparities researchers. There is currently only a small body of research that has examined
cardiovascular health risk among LGB people and even less among LGB BIPOC populations (Rosendale & Albert, 2020).

LGB individuals represent an understudied population within cardiovascular health research. While LGB people have greater all-cause mortality compared to their heterosexual counterparts (Cochran et al., 2016), research on their cardiovascular risk and outcomes is limited. The dearth of LGB cardiovascular health literature is attributable to several limitations in this area of research. For instance, sexual orientation and gender identity are not systematically assessed in electronic health records or other repositories from which investigators draw data. Additionally, researchers do not consistently measure sexual orientation and gender identity such that some studies may assess sexual behavior whereas others assess sexual orientation, thus limiting effective comparisons across studies to create pooled samples (Rosendale & Albert, 2020).

Past research once claimed that LGB subgroups encounter equivalent psychosocial experiences (Balsam & Mohr, 2007), whereas a more recent body of literature highlights the differences in the experiences of Bisexual people and their disproportionately higher rates of CVD RFs compared to other sexual orientation groups. For example, Bisexual people generally have higher rates of psychopathology (e.g., depression) compared to their Monosexual counterparts (Heterosexual and Gay/Lesbian; Borgogna et al., 2018; McNair & Bush, 2016; Sanders & Chalk, 2016). This is of clinical concern given that psychopathology including depression, anxiety, and stress are designated as unique CVD RFs (Yusuf et al., 2004).

Trends in the scientific literature show not only an underrepresentation of SGM but also a long-standing disregard of Bisexuality that is related to the often heterosexist nature of empirical literature and the dominant focus on Lesbian and Gay identities within SGM research (Monro et al., 2017). While an empirical understanding of the distinct psychosocial experiences of Bisexual people has gradually increased, several limitations in current LGB research practices have limited this growth (Kaestle & Ivory, 2012; Monro et al., 2017). For instance, many studies collapse Bisexual people with all other sexual orientation minorities (e.g., LGB) to make comparisons with heterosexual
counterparts, or code Bisexual individuals as either Lesbian/Gay or heterosexual, based on the sex or the gender identity of their current romantic partner (Ulrich, 2011). It is evident that the issues described underestimate the ability to estimate and understand LGB cardiovascular health in general as well as possible within-group differences among Bisexual adults. Without reliable and valid estimates of LGB CVD risk, policy modifications and risk-reducing interventions cannot be developed for specific LGB subgroups. Therefore, it is imperative to consider Bisexual experiences independent from other sexual orientations to better estimate their health in the context of CVD health disparities (Bey et al., 2019; Erqou et al., 2017; Grollman, 2014; Kanchi et al., 2018).

Cardiovascular Health Among LGB

Research has consistently shown that LGB report CVD RFs at higher rates compared to their heterosexual and non-transgender counterparts (Elliott et al., 2015; Gonzalez et al., 2016; Institute of Medicine, 2011). Moreover, LGB individuals demonstrate a disproportionately greater incidence of several modifiable CVD RFs (Caceres et al., 2017). For instance, findings from the 2014-2016 Behavioral Risk Factor Surveillance System (BRFSS), indicated that Gay and Bisexual men had higher odds of reporting mental distress and lifetime depression, with the highest odds among Bisexual men across all indicators compared to heterosexual men (Caceres et al., 2019). Moreover, Lesbian and Bisexual women reported higher odds of several CVD RFs including mental distress, lifetime depression, current smoking, heavy drinking, and obesity compared to heterosexual women. Notably, Bisexual women reported the highest odds of mental distress and depression and higher odds of stroke compared to heterosexual women (Caceres et al., 2019). Additionally, Caceres and colleagues (2018a) used data from the 2001-2012 National Health and Nutrition Examination Survey (NHANES) to investigate sexual orientation differences in modifiable CVD RF and CVD diagnoses among men aged 18 to 59. Findings indicated that Gay men reported lower odds of binge drinking compared to heterosexual men, and Bisexual men had higher rates of mental distress (i.e., 14+ days of stress, depression, and problems with emotions), hypertension, and glycosylated hemoglobin (consistent with pre-diabetes) compared to heterosexual men (Caceres et al., 2018a). In a similar
study, Caceres and colleagues (2018b) also used 2001-2012 NHANES data to examine the prevalence of self-report modifiable CVD RFs and CVD incidence in Lesbian and Bisexual women. Findings indicated that, compared to their heterosexual counterparts, Lesbian/Bisexual women had higher rates of frequent mental distress, current tobacco use, binge drinking, and glycosylated hemoglobin (Caceres et al., 2018b).

Furthermore, one study using data from the 2014-2016 (BRFSS examined self-reported CVD RF prevalence among LGB adults and found that compared to heterosexual men, Gay and Bisexual men reported higher odds of frequent mental distress and lifetime depression (Caceres et al, 2019). Also, compared to heterosexual women, Lesbian and Bisexual women reported higher rates of frequent mental distress, lifetime depression, current tobacco use, and heavy drinking wherein Bisexual women reported the highest odds of frequent mental distress, lifetime depression, and heavy drinking (Caceres et al., 2019). Another study examined data from the 2014-2015 BRFSS and found that while differences in CVD incidence among LGB males and females were not found, there were differences in specific CVD RFs (Gonzales & Henning-Smith, 2017). For instance, Gay and Bisexual men reported higher rates of mental distress and depression, where Bisexual participants had the highest odds, and only Bisexual participants had higher odds of poor/fair health and activity limitations compared to their heterosexual counterparts. Among women, Lesbian and Bisexual individuals had higher odds of frequent mental distress, depression, activity limitations, tobacco use, and binge-drinking wherein Bisexual participants had the highest odds of all variables except for tobacco use and only Bisexual participants reported higher rates of poor/fair health and cancer compared to their heterosexual counterparts (Gonzales & Henning-Smith, 2017). Similar findings are echoed among nationally representative population studies (Gonzales et al., 2016). While studies comparing LGB subgroups in odds of CVD RF are limited, available findings show that Bisexual individuals report higher CVD RFs relative to their heterosexual and Lesbian/Gay counterparts (Dilley et al., 2010).
Systematic review evidence indicates that higher CVD risk among LGB individuals is associated with mental distress and tobacco and alcohol consumption, with higher RF burden consistently found among Bisexual people (Caceres et al., 2017; Dilley et al., 2010). Findings are also echoed across the lifespan such that LGB older adults have higher rates of mental distress, with Lesbian and Bisexual women more likely to report heart attack, stroke, and poor general health, and Gay and Bisexual men more likely to report ischemic chest pain and cancer compared to their heterosexual counterparts (Fredriksen-Goldsen et al., 2017). In sum, Bisexual people report consistently higher rates of specific CVD RFs (i.e., depression, current smoker, hazardous/binge drinking) compared to their heterosexual and Gay/Lesbian counterparts.

While research highlights disparities in CVD RF burden between LGB and their heterosexual counterparts (e.g., Caceres et al., 2019), a dearth of evidence has investigated the CVD RF disparities that exist within LGB subgroups without making comparisons to their heterosexual counterparts (e.g., Dilley et al., 2010). Disparities in CVD RF burden among Bisexual individuals are partly attributable to the stigmatization experienced by Bisexual individuals that is qualitatively distinct from the experiences of their Lesbian and Gay counterparts (Bostwick & Hequembourg, 2014; Bränström et al., 2016; Brewster & Moradi, 2010). Thus, researchers have recommended for future studies to consider experiences of discrimination in the investigation of within-group LGB CVD RF disparities (Morgan et al., 2019). Thus, considering the role of discrimination among LGB subgroups may better account for CVD RF disparities among Bisexual individuals and Bisexual BIPOC.

**LGB BIPOC CVD Risk**

Research has consistently indicated a disproportionately higher CVD RF burden among BIPOC compared to their White counterparts in the US (Benjamin et al., 2019; Virani et al., 2020). A separate and more recent body of research has shown that LGB people experience a greater CVD RF burden compared to their cisgender and heterosexual counterparts wherein Bisexual people have the highest CVD RF burden (Caceres et al., 2017; Caceres et al., 2019b). An overwhelming majority of CVD RF research has examined either racial/ethnic or LGB differences in CVD RF burden.
However, the study of LGB BIPOC CVD RF disparities is of growing concern given emerging evidence reporting racial/ethnic differences in CVD RF burden within LGB communities (Caceres et al., 2019).

To this end, studies show that within LGB communities, there are racial/ethnic differences in CVD RFs. For instance, in a study of men who have sex with men (MSM), Black MSM had higher odds of hypertension compared to White MSM and depression was uniquely associated with greater risk (Hirshfield et al., 2018). Moreover, using 2001-2016 NHANES data, Caceres and colleagues (2020a) investigated physiological CVD risk among Gay/Lesbian, Bisexual, and non-conforming individuals aged 18 to 29. Intersectional findings revealed that Black Bisexual women had higher objective systolic blood pressure and higher hemoglobin A1c (index of diabetes risk), and black Gay/Bisexual men had higher hemoglobin A1c compared to their white heterosexual counterparts (Caceres et al., 2020a).

In another study, Caceres and colleagues (2019) used data from the Chicago Health and Life Experiences of Women study to investigate racial/ethnic differences in CVD RF in community-dwelling Lesbian and Bisexual women. Findings indicated that black Lesbian/Bisexual individuals reported higher rates of hypertension and diabetes compared to their white Lesbian/Bisexual counterparts. Intersectional analyses showed that black Lesbian and Bisexual women had the highest odds of hypertension and diabetes across Latinx and White heterosexual and Bisexual counterparts (Caceres et al., 2019). Furthermore, Tuthill and colleagues (2017) used data from 2005-1010 BRFSS to examine CVD RFs (poor health, current cigarette use) by sexual orientation within racial/ethnic subgroups. Findings revealed an overall disadvantage for Lesbian and Bisexual women across all racial/ethnic groups, and Asian/Pacific Islander Lesbian and Bisexual women had higher odds of smoking compared to their heterosexual counterparts (Tuthill et al., 2017). Lastly, Trinh and colleagues (2017) found that when compared to their heterosexual counterparts, Black LGB women were more likely to report heavy drinking, and Latinx, Black LGB women had a greater prevalence of stroke. As demonstrated above, there is a disproportionate CVD RF burden among LGB
communities. Furthermore, research focused on CVD RF burden among LGB BIPOC as well as the unique health differences among Bisexual individuals is critical. However, research has not examined the differences in CVD RF burden within LGB subgroups among the broader BIPOC population.

**Current Study**

There is emerging empirical scholarship that shows differences in CVD RF burden by LGB and BIPOC status. However, little research has examined differences in CVD RF burden among persons who identify as both LGB and BIPOC in general nor within LGB subgroups. The available research shows inflated rates of CVD RF burden among LGB and LGB BIPOC populations compared to their heterosexual and White counterparts, with the largest discrepancies among Bisexual people (Caceres et al., 2017; Caceres et al., 2019). Although, to the author’s knowledge, no published research has compared CVD RF burden between Bisexual and Lesbian/Gay or Monosexual SGM. Moreover, the extent to which LGB BIPOC microaggression experiences are associated with CVD risk perceptions remains largely unexplored among LGB BIPOC. Thus, this study sought to a) identity differential CVD RF burden between Bisexual BIPOC and Lesbian/Gay BIPOC, b) examine the association between LGB BIPOC intersectional microaggressions and CVD risk perceptions, and c) if the strength of the association between LGB BIPOC intersectional microaggressions and CVD risk was dependent on sexual orientation.

**Hypotheses**

**Hypothesis One**

Bisexual BIPOC will demonstrate greater overall odds for self-reported CVD RFs compared to their Lesbian/Gay (Monosexual) BIPOC counterparts, after accounting for covariates.

**Hypothesis Two**

LGB BIPOC intersectional microaggression experiences will be positively associated with perceived CVD risk, after adjusting for covariates.
Hypothesis Three

Bisexual BIPOC will report greater perceived CVD risk compared to their Lesbian/Gay BIPOC counterparts.

Hypothesis Four

Sexual orientation (Bisexual and Lesbian/Gay) will moderate the association between LGB BIPOC intersectional microaggression experiences and perceived CVD risk such that the relationship will be stronger among Bisexual BIPOC compared to their Lesbian/Gay BIPOC counterparts.

The hypothesized model of the proposed associations in hypotheses two, three, and four is provided in Figure 1.

![Figure 1](hypothized_model.png)

*Figure 1. Hypothesized Model with Sexual Orientation Moderating the Association Between LGB BIPOC Microaggressions and CVD Risk Perceptions*
The study sample was drawn from Amazon’s Mechanical Turk (MTurk), an online survey platform that compensates participants for their research participation. The analytic sample consisted of 264 self-identifying LGB BIPOC whose ages ranged from 19 to 68 ($M = 34.70, SD = 9.94$).

Participants self-reported their sexual orientation to be Gay (15%), Lesbian (9%), or Bisexual (76%). Participants’ gender identities included male (59%), female (34%), trans male/trans man (4%), trans female/trans woman (2%), and genderqueer/gender non-conforming (1%). The sample’s sex assigned at birth included male (61%) and female (39%). The sample was primarily employed (93%), had a bachelor’s degree (56%), and most reported an annual income of $49,999 or less (38%). Complete sociodemographic characteristics of the study sample are provided in Table 1.

Table 1. Sample Demographic Characteristics

<table>
<thead>
<tr>
<th>Biological sex</th>
<th>Pooled sample (N = 264)</th>
<th>Bisexual (n = 202)</th>
<th>LG a (n = 62)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>%</td>
<td>Frequency</td>
</tr>
<tr>
<td>Male</td>
<td>162</td>
<td>61.4%</td>
<td>124</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Hispanic</td>
<td>73</td>
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<td>49</td>
</tr>
<tr>
<td>Hispanic</td>
<td>191</td>
<td>72.3%</td>
<td>153</td>
</tr>
<tr>
<td>Central American</td>
<td>76</td>
<td>39.8%</td>
<td>66</td>
</tr>
<tr>
<td>Cuban American</td>
<td>13</td>
<td>6.8%</td>
<td>7</td>
</tr>
<tr>
<td>Dominican American</td>
<td>5</td>
<td>2.6%</td>
<td>4</td>
</tr>
<tr>
<td>Mexican American</td>
<td>37</td>
<td>19.4%</td>
<td>27</td>
</tr>
<tr>
<td>Puerto Rican American</td>
<td>45</td>
<td>23.6%</td>
<td>37</td>
</tr>
<tr>
<td>Two or more groups</td>
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<td>7.9%</td>
<td>12</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White/European American b</td>
<td>35</td>
<td>13.3%</td>
<td>25</td>
</tr>
<tr>
<td>Black/African American</td>
<td>152</td>
<td>57.6%</td>
<td>127</td>
</tr>
<tr>
<td>Asian American</td>
<td>26</td>
<td>9.8%</td>
<td>16</td>
</tr>
</tbody>
</table>

a. LG refers to Lesbian, Gay, or Bisexual.

b. White/European American includes those who identify as White or European American.
<table>
<thead>
<tr>
<th></th>
<th>Pooled sample ((N = 264))</th>
<th>Bisexual ((n = 202))</th>
<th>LG (^a) ((n = 62))</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>%</td>
<td>Frequency</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Native American/Alaska Native</td>
<td>16</td>
<td>6.1%</td>
<td>14</td>
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<tr>
<td>Hawaiian/Pacific Islander</td>
<td>1</td>
<td>0.4%</td>
<td>0</td>
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<td>Bi/Multiracial</td>
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<td>5</td>
</tr>
<tr>
<td>Hispanic only</td>
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<td>9.8%</td>
<td>15</td>
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<tr>
<td><strong>Sexual Orientation</strong></td>
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<td></td>
<td></td>
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<tr>
<td>Gay</td>
<td>39</td>
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<td>Lesbian</td>
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<td></td>
</tr>
<tr>
<td>Bisexual</td>
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<td>76.5%</td>
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<td><strong>Gender Identity</strong></td>
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<td></td>
</tr>
<tr>
<td>Man/Male</td>
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<td>59.1%</td>
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</tr>
<tr>
<td>Woman/Female</td>
<td>91</td>
<td>34.5%</td>
<td>70</td>
</tr>
<tr>
<td>Trans male/Trans Man</td>
<td>10</td>
<td>3.8%</td>
<td>5</td>
</tr>
<tr>
<td>Trans female/Trans woman</td>
<td>5</td>
<td>1.9%</td>
<td>2</td>
</tr>
<tr>
<td>Gender queer/Gender nonconforming</td>
<td>2</td>
<td>0.8%</td>
<td>2</td>
</tr>
<tr>
<td><strong>Income</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$24,999 or below</td>
<td>58</td>
<td>22.0%</td>
<td>38</td>
</tr>
<tr>
<td>$25,000-$49,999</td>
<td>103</td>
<td>39.0%</td>
<td>83</td>
</tr>
<tr>
<td>$50,000-$74,999</td>
<td>77</td>
<td>29.2%</td>
<td>62</td>
</tr>
<tr>
<td>$75,000 or more</td>
<td>26</td>
<td>9.9%</td>
<td>19</td>
</tr>
<tr>
<td><strong>Education level</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school/GED or less</td>
<td>12</td>
<td>4.6%</td>
<td>7</td>
</tr>
<tr>
<td>Some college, no degree</td>
<td>12</td>
<td>4.5%</td>
<td>6</td>
</tr>
<tr>
<td>Associates</td>
<td>8</td>
<td>3.0%</td>
<td>5</td>
</tr>
<tr>
<td>Bachelor’s</td>
<td>149</td>
<td>56.4%</td>
<td>110</td>
</tr>
<tr>
<td>Master’s</td>
<td>81</td>
<td>30.7%</td>
<td>83</td>
</tr>
<tr>
<td>Doctorate/professional degree</td>
<td>2</td>
<td>0.8%</td>
<td>1</td>
</tr>
<tr>
<td><strong>Employment status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Working full or part time</td>
<td>245</td>
<td>92.8%</td>
<td>190</td>
</tr>
<tr>
<td>Unemployed or seeking work</td>
<td>9</td>
<td>3.4%</td>
<td>5</td>
</tr>
<tr>
<td>Student</td>
<td>10</td>
<td>3.8%</td>
<td>7</td>
</tr>
</tbody>
</table>

\(^a\) – LG = Lesbian, Gay
\(^b\) – All participants who selected White/European American as their race also selected Hispanic as their ethnicity.
**Measures**

**LGBT-POC Microaggression Scale**

The LGBT People of Color Microaggression Scale (LGBTPCMS; Balsam et al., 2011) was used as a measure of distal intersectional minority stress. This instrument contains 18 self-reported items assessing the unique types of microaggressions experienced by racial/ethnic minority LGBT adults. The measure includes three subscales containing six items each: (a) Racism in LGBT communities, (b) Heterosexism in Racial/Ethnic Minority Communities, and (c) LGBT Relationship Racism. Response options are rated on a 6-point Likert scale (0 = *Did not happen/Not applicable to me*, 5 = *It happened and it bothered me EXTREMELY*). Mean scores were calculated for each subscale with higher scores reflecting greater frequency and more distressing impact of LGBT PoC intersectional microaggressions. The Racism in LGBT communities (α = .875), Heterosexism in Racial/Ethnic Minority Communities (α = .872), and LGBT Relationship Racism (α = .880) subscales demonstrated good internal consistency in the current study. Past research has verified strong psychometric properties of the LGBTPCSM among LGB BIPOC (e.g., Elias et al., 2017). Descriptive statistics are provided in Table 2.

**Self-Rated CVD Risk**

Self-rated instruments of CVD risk are among the most common type of self-assessment health risk surveys. They can be used to predict 10-year risk of cardiovascular events (e.g., heart attack; D’Agostino et al., 2008; Goff et al., 2013), and have demonstrated acceptable levels of agreement with objective CVD risk factor measurements (Goldman et al., 2003; Johansson et al., 1999; Okura et al., 2004). Moreover, major national longitudinal studies have relied exclusively on self-rated CVD risk factors such as the Behavioral Risk Factor Surveillance System (BRFSS; Caceres et al., 2018) and National Health Interview Survey (NHIS; Gonzales et al., 2016). Lastly, the relevance of assessing CVD risk factors among younger age populations is of importance given that CVD risk factors can emerge as early as in utero, but frequently become clinical issues around 25 years of age (Srivastava et al., 2007).
**Attitudes and Beliefs about Cardiovascular Disease Risk Perception Questionnaire**

The Attitudes and Beliefs about Cardiovascular Disease Risk Perception Questionnaire (ABCD; Woringer et al., 2017) is a validated self-report measure of perceived CVD risk. The ABCD questionnaire consists of three subscales: 1) Perceived risk of heart attack/stroke used to assess the perceived probability of developing a CVD, 2) Perceived benefits and intentions to change, and 3) Healthy eating intentions. For the purpose of this study, only the perceived CVD risk subscale was used. This subscale is comprised of eight items anchored on a 4-point Likert scale with response options ranging from 1 (Strongly disagree) to 4 (Strongly agree) with higher scores reflecting greater perceived CVD risk. Sample items include “I feel I will suffer from a heart attack or stroke sometime during my life” and “It is likely I will have a heart attack or stroke because of my past and/or present behaviors”. One item was reverse scored. Items were summed and mean scored to compute a composite perceived CVD risk score. Although the ABCD questionnaire has yet to be used among LGB BIPOC, the current study yielded good internal consistency ($\alpha = .898$). Descriptive statistics are provided in Table 2.

**Table 2. Descriptive Statistics of Primary Study Variables**

<table>
<thead>
<tr>
<th>Pooled sample (N = 264)</th>
<th>Bisexual (n = 202)</th>
<th>Lesbian/Gay (n = 62)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>M(SD)</strong></td>
<td><strong>M(SD)</strong></td>
<td><strong>M(SD)</strong></td>
</tr>
<tr>
<td>Age</td>
<td>34.70(9.94)</td>
<td>35.92(10.28)</td>
</tr>
<tr>
<td>LGBT PCMS a total</td>
<td>35.66(17.17)</td>
<td>37.17(17.27)</td>
</tr>
<tr>
<td>Racism in LGBT</td>
<td>17.76(8.89)</td>
<td>18.46(8.99)</td>
</tr>
<tr>
<td>Heterosexism in PoC</td>
<td>11.58(5.83)</td>
<td>12.21(5.75)</td>
</tr>
<tr>
<td>Racism in relationships</td>
<td>11.97(6.08)</td>
<td>12.44(6.16)</td>
</tr>
<tr>
<td>CVD Risk</td>
<td>21.79(5.55)</td>
<td>21.41(5.57)</td>
</tr>
<tr>
<td>PHQ-9</td>
<td>11.73(6.61)</td>
<td>12.53(6.58)</td>
</tr>
<tr>
<td>AUDIT-C</td>
<td>3.73(2.55)</td>
<td>3.93 (2.62)</td>
</tr>
</tbody>
</table>

a – LGBT PCMS = LGBT People of Color Microaggression Scale  
b – PHQ-9 = Patient health questionnaire-9  
c – AUDIT-C = Alcohol use disorders identification test-C
Self-Rated CVD Risk Factors

Past research was used to inform the selection of CVD risk factors that are most frequently examined in LGB CVD RF research, specifically ones that are more prevalent among Bisexual individuals compared to their heterosexual, Lesbian, and Gay counterparts (Caceres et al., 2017; Caceres et al., 2019). A total of eight self-report CVD risk factors were measured that included high blood pressure (i.e., hypertension), high cholesterol, diabetes, current CVD diagnosis, depressive symptoms (PHQ-9), harmful/hazardous alcohol consumption and binge drinking behavior (AUDIT-C), and current cigarette use. For the first four self-reported CVD RFs, participants were asked “Have you ever been told by a medical professional that you have [diabetes]” and responded either yes or no. Frequencies of CVD RFs for the sample are provided in Table 3.

Patient Health Questionnaire-9. The Patient Health Questionnaire-9 (PHQ-9; Kroenke et al., 2001) was used to measure depressive symptoms over the past two weeks. Participants responded to nine items rated on a 4-point Likert scale with response options ranging from 0 (not at all) to 3 (nearly every day). The PHQ-9 demonstrated strong internal consistency in the current study ($α = .909$). Scores were dichotomized into high and low scores. While PHQ-9 cutoff values for LGB BIPOC are not established, meta-analytic evidence suggests a cutoff of $≥10$ (Manea et al., 2015) for the general population. Therefore, participants were categorized into high (68%; scores $≥10$) and low (32%; scores $<10$) PHQ-9 scores. Descriptive statistics of scale scores are provided in Table 2 and frequencies for dichotomized scores are provided in Table 3.

Alcohol Use Disorder Identification Test-C. The AUDIT-C (Bush et al., 1998) is a brief three-item self-report screener used to assess hazardous alcohol consumption. The AUDIT-C is a shortened 3-item version of its 10-item predecessor, the AUDIT, and performs equally well in detecting alcohol use behavior (Reinert & Allen, 2007). The three items of the AUDIT-C assess: (1) overall drinking frequency in the past month, (2) typical quantity of drinks consumed (in the past month), and (3) frequency of drinking five or more drinks at a time (in the past month). Each item is rated on a numeric rating scale ranging from 0 to 4 with higher scores reflecting more hazardous
drinking. Scores are summed with possible scores ranging from 0 to 12. The three items showed good internal consistency reliability (α = .803) in the current study. A cutoff value of 3 or greater for females and 4 or greater for males is used to suggest possible hazardous drinking behavior (Babor et al., 2001; Bush et al., 1998). Thus, scores were dichotomized into scores of 3 or greater (65%) and below 3 (35%) for women and 4 or greater (50%) and below 4 (50%) for males. The third item was also analyzed separately to investigate binge drinking behavior as evidenced by a positive score on this item (73%) (Babor et al., 2001). Descriptive statistics are provided in Table 2 and frequencies for dichotomized scores are provided in Table 3.

Table 3. Cardiovascular Disease Risk Factor Prevalence among the Pooled Sample and Stratified by Sexual Orientation

<table>
<thead>
<tr>
<th>CVD risk factor</th>
<th>Pooled sample (%)</th>
<th>Bisexual (%)</th>
<th>Lesbian/Gay (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>40.5%</td>
<td>41.6%</td>
<td>37.1%</td>
</tr>
<tr>
<td>High cholesterol</td>
<td>39.4%</td>
<td>41.1%</td>
<td>33.9%</td>
</tr>
<tr>
<td>Diabetes</td>
<td>40.2%</td>
<td>43.6%</td>
<td>29.0%</td>
</tr>
<tr>
<td>Current CVD diagnosis</td>
<td>31.4%</td>
<td>33.7%</td>
<td>24.2%</td>
</tr>
<tr>
<td>Depressive symptoms (high scores; ≥10)</td>
<td>67.8%</td>
<td>71.3%</td>
<td>56.5%</td>
</tr>
<tr>
<td>Harmful/hazardous alcohol consumption</td>
<td>64.8%</td>
<td>67.3%</td>
<td>56.5%</td>
</tr>
<tr>
<td>Female (≥3)</td>
<td>64.8%</td>
<td>67.3%</td>
<td>56.5%</td>
</tr>
<tr>
<td>Male (≥4)</td>
<td>50.4%</td>
<td>52.5%</td>
<td>43.5%</td>
</tr>
<tr>
<td>Binge drinking</td>
<td>73.1%</td>
<td>75.2%</td>
<td>66.1%</td>
</tr>
<tr>
<td>Current cigarette smoker</td>
<td>81.1%</td>
<td>79.2%</td>
<td>87.1%</td>
</tr>
</tbody>
</table>

**Demographic Questionnaire**

Participants completed a demographic questionnaire that captured their age, ethnicity, sex assigned at birth, sexual orientation, gender identity, income, education level, and current employment status. Sexual orientation and gender identity (Park, 2016), and race/ethnicity were collected based on national recommendations (Office of Management and Budget, 1997).

**Procedure**

A university’s institutional review board approved the current study prior to data acquisition. Participants were recruited online through Amazon’s Mechanical Turk (MTurk). MTurk is a
crowdsourcing website where researchers can hire volunteer remote crowd workers to complete survey questionnaires in exchange for monetary compensation. Virtually any individual 18 years or older who can use a computing device with internet connectivity can sign up and access Amazon’s MTurk system (Buhrmester et al., 2011). MTurk is desirable by social science researchers for its ability to sample diverse populations in an expedited and financially inexpensive manner (Buhrmester et al., 2011). When accessing the MTurk system, users are presented with possible study enrollment opportunities. Prospective participants complete pre-screening eligibility enrollment criteria set forth by both MTurk and the study researchers to determine if participants can proceed and complete the study. Strict pre-screening eligibility is used as an essential tool to prevent fraudulent responses (Chandler & Paolacci, 2017).

Prior to study enrollment, prospective participants were screened with qualifying questions that identified them as non-heterosexual (Lesbian, Gay, or Bisexual) people of color (non-white/European American), who were 18 years or older and who permanently resided in the US. Individuals who did not meet the screening criteria were not allowed to proceed with the study. Once potential participants were determined to have met eligibility criteria, they were presented with a consent form that highlighted the voluntary and anonymous nature of their participation. Participants were also advised of their right to withdraw at any time during the study. After participants acknowledged and understood their rights as research subjects and consented to participate, they completed the study questionnaires. Survey questionnaires were randomly presented to each participant. Participants were compensated 10 cents for their participation upon verification of reliable and accurate responses. Compensation typically averages 5 to 10 cents for 5- to 10-minute tasks on MTurk (Buhrmester et al., 2011). Participants took between 15 and 20 minutes to complete the questionnaire.

To assess participant response accuracy and reliability, a series of nine attention checks were inserted randomly throughout the study survey to help assess participant responsiveness to the survey questions, a procedure that can enhance survey response quality (Abbey et al., 2017). It was
determined that seven out of nine successful attention checks would warrant acceptable levels of responding to ensure approximately 80% response accuracy. Participants were also provided with a randomly generated number-letter code at the conclusion of the survey and were instructed to insert the code into a text box. Correctly inputting the code assessed participant attentiveness and linked their survey responses to their MTurk identification profile for compensation to be provided.

**Data Analysis**

Descriptive statistics were calculated using the Statistical Package for the Social Sciences (SPSS) Version 27. Participant characteristics were examined using frequencies and proportions or means and standard deviations, as appropriate.

To test the first study hypothesis, multivariable binomial logistic regression analyses were conducted using block entry for each CVD RF to compare the likelihood of endorsement between Bisexual BIPOC and Lesbian/Gay BIPOC. Adjusted odds ratios (AOR) were computed to control for relevant covariates.

To test hypotheses two, three, and four, three hierarchical moderated multiple regression analyses (Aiken & West, 1991) were used to examine the main effects and an interaction effect of sexual orientation and LGBTPCMS subscales on perceived CVD risk. Covariates were included in block one, LGBTPCMS subscale and sexual orientation in block two, and the interaction term in block three. LGBTPCMS subscales were mean centered (i.e., transformed into deviation units by subtracting their sample means to produce revised sample means of zero) before computing interaction terms (Frazier et al., 2004). Significant interaction effects were inspected using simple effects tests at each level of sexual orientation (Bisexual and Lesbian/Gay) (Aguinis, 2004). Interaction effects are expected to only account for approximately 1% to 3% of additional variability in the criterion and are demonstrated by a significant incremental $R^2$ (Aguinis, 2004; Cohen, 1992; McClelland & Judd, 1993). Given the difficulty with detecting moderation effects in non-experimental research, it is recommended to use a liberal alpha adjusted for multiple comparisons (i.e., .10; $\alpha_{current study} = .10/3 = .033$; McClelland & Judd, 1993).
Analytic Assumptions

Assumptions for the proposed analyses were inspected prior to data analysis. Binary logistic regression does not require some standard parametric assumptions such as normality of distribution of residuals and homoscedasticity (Schreiber-Gregory & Jackson, 2018); however, a large sample size is required with a recommendation of 100+50i cases where i is the number of predictors in the model (Bujang et al., 2018). Moderated multiple regression follows similar assumptions as ordinary least squares regression such as data normality, independence of observations, and homoscedasticity, although assumptions of multicollinearity are thwarted due to the inclusion of interaction effects (Tabachnik & Fidell, 2018). In multiple regression, it is recommended to have sample sizes exceed 50+ 8m cases where m equals the number of predictors in the model (Green, 1991).

Covariates

Based on past research, biological sex and age were examined as a-priori covariates, given their designation as non-modifiable determinants of cardiovascular health (Mikkola et al., 2013; North & Sinclair, 2012). Socioeconomic status (SES)—operationalized as level of education, employment status, and annual income—was also examined as an a-priori covariate, due to its association with CVD risk (Clark et al., 2009). Due to power limitations, logistic regression models were restricted to include only biological sex and age as covariates, given the sizeable literature on these factors as covariates in logistic regression models (e.g., Caceres et al., 2019); however, all relevant covariates were screened for inclusion in the hierarchical multiple regression models, given the available statistical power (Green, 1991).
CHAPTER 4
RESULTS

Preliminary Analyses

Data Screening

Nine attention checks were included in the study survey to assess participant response accuracy. Approximately 12% \( (n = 30) \) of participants failed more than two attention checks. Researchers strongly caution against removing participants for solely failing any attention checks, as this is likely to bias the sample (Chmielewski & Kucker, 2020). Rather, it is encouraged to use multimodal normality assumption checks to assess for normality violations in the sample data such as by inspecting skewness, kurtosis, and the presence of multivariate outliers (Abbey & Meloy, 2017). Therefore, all continuous variables were inspected for normality assumption violations.

The obtained sample yielded 307 participants. Forty-three cases were removed from the initial sample for having incomplete responses or for not meeting qualifying study participation criteria. Missing responses in the initial sample were determined to be missing completely at random (MCAR) as evidenced by Little's MCAR test, \( \chi^2(3) = 1.68, p = .641 \), and separate variance t-tests showed no systematic relationship between missing and non-missing responses \( (p's > .05) \). Taken together, the pattern of missing data was unrelated to variables in the current study, therefore, permitting the feasibility of performing a complete case analysis \( (N = 264; \text{Tabachnik & Fidell, 2018}) \).

Normality Assumptions

Among the analytic sample \( (N = 264) \), all continuous variables used in the current study \( (\text{i.e., LGBTPCMS subscales, ABCD CVD risk questionnaire, PHQ-9, AUDIT-C}) \) were screened for normality assumption violations. Skewness and kurtosis values of the variables were all within acceptable ranges of +/-1 (Hair et al., 2010). Furthermore, no multivariate outliers were detected \( (\text{Mahalanobis distance} < 22.46, p < .001; \text{Tabachnik & Fidell, 2018}) \). Therefore, participants who failed attention checks did not detract from sample normality for the proposed analyses and thus, all cases were retained in the final sample to conserve power \( (N = 264) \).
Variable Intercorrelations

Bivariate correlations were calculated using Pearson product-moment correlations and indicated that age was associated with depressive symptoms and perceived CVD risk \( (p\'s < .05) \). The LGBTPCMS subscales were modestly correlated with each other and with perceived CVD risk \( (p\'s < .05) \). Thus, age was included as a covariate for analyses using the perceived CVD risk variable (hypotheses two-four). Complete bivariate associations are provided in Table 4.

Table 4. Pearson Bivariate Correlations among Continuous Study Variables

<table>
<thead>
<tr>
<th>Variable a</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Age</td>
<td></td>
<td>0.087</td>
<td>0.111</td>
<td>0.076</td>
<td>0.136*</td>
<td>0.114</td>
<td>0.182**</td>
</tr>
<tr>
<td>2. Racism in LGBT</td>
<td>-</td>
<td>0.918***</td>
<td>0.938***</td>
<td>0.577***</td>
<td>0.449***</td>
<td>0.474***</td>
<td></td>
</tr>
<tr>
<td>3. Heterosexism in PoC</td>
<td>-</td>
<td>0.897***</td>
<td>0.568***</td>
<td>0.452***</td>
<td>0.504***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Racism in relationships</td>
<td>-</td>
<td>0.570***</td>
<td>0.439***</td>
<td>0.490***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. PHQ-9 b</td>
<td>-</td>
<td></td>
<td>0.479***</td>
<td>0.693***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. AUDIT-C b</td>
<td>-</td>
<td></td>
<td></td>
<td>0.402***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Perceived CVD risk</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a – *p < .05, **p < .01, ***p < .001.
b – Patient health questionnaire-9
c – Alcohol use disorder identification test-C

Bivariate Analyses

Independent samples t-tests indicated that between Bisexual BIPOC and Lesbian/Gay BIPOC, Bisexual participants were older, reported more LGBT PoC intersectional microaggressions, CVD risk perceptions, depressive symptoms, and hazardous alcohol consumption \( (p\'s < .05) \). Results of the independent samples t-tests between Bisexual and Lesbian/Gay participants are provided in Table 5. Next, differences in primary study variables between males and females (sex assigned at birth) were examined. Independent samples t-tests revealed no differences across primary study variables between male and female participants \( (p\'s > .05) \), with an exception of age. Results of the independent samples t-tests between male and female participants are provided in Table 6. Associations between sociodemographic variables and CVD risk perceptions were also examined.
One-way ANOVAs showed that CVD risk perceptions did not differ across levels of income, $F(7,256) = 1.35, p = .226$ or employment status $F(5,258) = 1.09, p = .367$, but did differ across levels of education, $F(6,257) = 3.53, p = .002$. Thus, education was included as a covariate for multiple regression analyses (hypotheses two-four).

Table 5. Independent Samples t-tests Comparing Differences in Sociodemographic and Primary Study Variables Between Bisexual and Lesbian/Gay BIPOC

<table>
<thead>
<tr>
<th>Sexual Orientation</th>
<th>Bisexual M(SD)</th>
<th>Lesbian/Gay M(SD)</th>
<th>t a</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>35.92(10.28)</td>
<td>30.85(7.81)</td>
<td>-4.30***</td>
<td>138</td>
</tr>
<tr>
<td>LGBT PCMS total b</td>
<td>37.17(17.27)</td>
<td>30.74(16.03)</td>
<td>-2.61*</td>
<td>262</td>
</tr>
<tr>
<td>Racism in LGBT</td>
<td>18.46(8.99)</td>
<td>15.50(8.24)</td>
<td>-2.31*</td>
<td>262</td>
</tr>
<tr>
<td>Heterosexism in PoC c</td>
<td>12.21(5.75)</td>
<td>9.52(5.68)</td>
<td>-3.24**</td>
<td>262</td>
</tr>
<tr>
<td>Relationship racism</td>
<td>12.44(6.16)</td>
<td>10.44(5.62)</td>
<td>-2.29*</td>
<td>262</td>
</tr>
<tr>
<td>Perceived CVD risk</td>
<td>22.41(5.57)</td>
<td>19.77(5.02)</td>
<td>-3.33***</td>
<td>262</td>
</tr>
<tr>
<td>PHQ-9 d</td>
<td>12.53(6.58)</td>
<td>9.15(6.07)</td>
<td>-3.61***</td>
<td>262</td>
</tr>
<tr>
<td>AUDIT-C e</td>
<td>3.94(2.62)</td>
<td>3.11(2.24)</td>
<td>-2.21*</td>
<td>262</td>
</tr>
</tbody>
</table>

a – *p < .05, **p < .01, ***p < .001.
b – LGBT PCMS = LGBT People of Color Microaggression Scale
c – PoC = People of Color
d – PHQ-9 = Patient health questionnaire-9
e – Alcohol use identification test-C
Table 6. Independent Samples t-tests Comparing Differences in Primary Study Variables Between Male and Female Participants

<table>
<thead>
<tr>
<th>Sex Assigned at Birth</th>
<th>Male</th>
<th>Female</th>
<th>t</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M(SD)</td>
<td>M(SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>35.76(9.56)</td>
<td>33.03(10.34)</td>
<td>2.19*</td>
<td>262</td>
</tr>
<tr>
<td>LGBT PCMS a total</td>
<td>35.55(18.12)</td>
<td>35.84(15.63)</td>
<td>-.14</td>
<td>262</td>
</tr>
<tr>
<td>Racism in LGBT</td>
<td>17.72(9.45)</td>
<td>17.82(7.98)</td>
<td>-.09</td>
<td>265</td>
</tr>
<tr>
<td>Heterosexism in PoC</td>
<td>11.75(6.04)</td>
<td>11.31(5.51)</td>
<td>.59</td>
<td>262</td>
</tr>
<tr>
<td>Relationship racism</td>
<td>11.81(6.35)</td>
<td>12.23(5.66)</td>
<td>-.54</td>
<td>262</td>
</tr>
<tr>
<td>Perceived CVD risk</td>
<td>21.86(5.90)</td>
<td>21.68(4.98)</td>
<td>.27</td>
<td>262</td>
</tr>
<tr>
<td>PHQ-9 b</td>
<td>11.84(6.54)</td>
<td>11.57(6.75)</td>
<td>.32</td>
<td>262</td>
</tr>
<tr>
<td>AUDIT-C c</td>
<td>3.86(2.59)</td>
<td>3.54(2.48)</td>
<td>.99</td>
<td>262</td>
</tr>
</tbody>
</table>

a – LGBT PCMS = LGBT People of Color Microaggression Scale  
b– PHQ-9 = Patient health questionnaire-9  
c – Alcohol use identification test-C

Hypothesis Testing

Hypothesis One: CVD RF Burden Among Bisexual BIPOC and Lesbian/Gay BIPOC

To test hypothesis one, a series of two-block binary logistic regression analyses were performed to compare the likelihood of endorsing CVD RFs between Bisexual BIPOC and Lesbian/Gay BIPOC participants. Age and biological sex were entered in block one as covariates and sexual orientation were included in block two. Due to limited power, only age and biological sex were included as covariates in all binary logistic regression analyses.

In adjusted models, compared to Lesbian/Gay BIPOC, there were no differences in odds for Bisexual BIPOC self-reporting hypertension, high cholesterol, diabetes, a current CVD diagnosis, depressive symptoms, harmful/hazardous alcohol consumption, binge drinking, nor being a current cigarette smoker. Whereas in unadjusted models, Bisexual participants demonstrated higher odds for diabetes and depressive symptoms. Complete results are provided in Table 7.
Table 7. Binary Logistic Regression Analyses for Cardiovascular Disease Risk Factors

<table>
<thead>
<tr>
<th>CVD Risk factor</th>
<th>AOR (^{ab})</th>
<th>95% CI</th>
<th>OR (^a)</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>1.11</td>
<td>0.61-2.03</td>
<td>1.21</td>
<td>0.67-2.17</td>
</tr>
<tr>
<td>High cholesterol</td>
<td>1.29</td>
<td>0.70-2.37</td>
<td>1.36</td>
<td>0.70-2.47</td>
</tr>
<tr>
<td>Diabetes</td>
<td>1.79</td>
<td>0.95-3.36</td>
<td>1.89(^*)</td>
<td>1.02-3.49</td>
</tr>
<tr>
<td>Current CVD diagnosis</td>
<td>1.51</td>
<td>0.77-2.93</td>
<td>1.59</td>
<td>0.83-3.05</td>
</tr>
<tr>
<td>Depressive symptoms</td>
<td>1.73</td>
<td>0.95-3.16</td>
<td>1.92(^*)</td>
<td>1.07-3.45</td>
</tr>
<tr>
<td>Hazardous alcohol consumption(_{female})</td>
<td>0.88</td>
<td>0.34-2.28</td>
<td>0.97</td>
<td>0.39-2.46</td>
</tr>
<tr>
<td>Hazardous alcohol consumption(_{male})</td>
<td>1.68</td>
<td>0.79-3.57</td>
<td>0.73</td>
<td>0.85-3.72</td>
</tr>
<tr>
<td>Binge drinking</td>
<td>1.47</td>
<td>0.78-2.78</td>
<td>1.56</td>
<td>0.84-2.88</td>
</tr>
<tr>
<td>Current cigarette smoker</td>
<td>0.68</td>
<td>0.29-1.58</td>
<td>0.56</td>
<td>0.25-1.28</td>
</tr>
</tbody>
</table>

a – *p < .05. **p < .01. ***p < .001  
b – Covariates included age and biological sex

Hypotheses Two, Three, and Four: Main Effects and Moderations

To test hypotheses two, three, and four, a series of three hierarchical moderated multiple regression analyses were performed to examine associations between each LGBTPCMS LGBT PoC intersectional microaggression subscale and CVD risk perceptions as moderated by sexual orientation (Bisexual and Lesbian/Gay). Based on bivariate analyses, age and years of education were included as covariates for all analyses. Hypotheses two and three expect a significant main effect of each LGBTPCMS subscale and of sexual orientation on CVD risk perceptions. Hypothesis four predicts a two-way interaction effect of each LGBTPCMS subscale and sexual orientation on perceived CVD risk across all models. The hypothesized model is provided diagrammatically in Figure 1.

Racism in LGBT Communities

The complete three-block moderated multiple regression model was significant, \(F(5,258) = 19.54\), \(p < .001\), and explained approximately 26% of the variability in perceived CVD risk.
**Main Effects**

Consistent with predictions, the main effect of the Racism in LGBT Communities LGBTPCMS subscale on perceived CVD was significant, $\beta = .44, p < .001$, whereas the main effect of sexual orientation on perceived CVD risk was not significant, $\beta = .10, p = .063$, after adjusting for covariates.

**Interaction Effect**

As hypothesized, sexual orientation moderated the association between the Racism in LGBT Communities LGBTPCMS subscale and perceived CVD risk, $\beta_{interaction} = .28, p = .018$, after controlling for covariates. The interaction effect accounted for an additional 2% of the unique variability in perceived CVD risk. Follow-up simple effects tests at each level of sexual orientation indicated that the Racism in LGBT Communities LGBTPCMS subscale and perceived CVD risk were associated among Bisexual participants, $\beta = .50, p < .001, F(3,258) = 27.27, p < .001$, but not among Lesbian/Gay participants $\beta = .21, p = .114, F(3,258) = 1.13, p = .325$. Results are provided descriptively in Table 8 and graphically in Figure 2.

Table 8. Results of Hierarchical Moderated Multiple Regression Examining the Association between the Racism in LGBT Communities LGBTPCMS $^a$ Subscale and Perceived CVD $^b$ Risk as Moderated by Sexual Orientation

<table>
<thead>
<tr>
<th>Variable</th>
<th>$b$</th>
<th>$\beta$</th>
<th>$t^c$</th>
<th>$adjR^2$</th>
<th>$\Delta R^2$ $^c$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>0.10</td>
<td>.18</td>
<td>2.99**</td>
<td>.05</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>0.90</td>
<td>.16</td>
<td>2.56*</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td></td>
<td></td>
<td></td>
<td>.25</td>
<td>.20***</td>
</tr>
<tr>
<td>Racism in LGBT</td>
<td>0.27</td>
<td>.44</td>
<td>7.97***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sexual orientation</td>
<td>1.37</td>
<td>.10</td>
<td>1.87</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td></td>
<td></td>
<td></td>
<td>.26</td>
<td>.02*</td>
</tr>
<tr>
<td>Racism in LGBT x Sexual orientation</td>
<td>0.20</td>
<td>.28</td>
<td>2.38*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$a$ – LGBT People of Color Microaggression Scale  
$b$ – CVD = Cardiovascular Disease  
$c$ – $^*p < .05$. $^{**}p < .01$. $^{***}p < .001$
Heterosexism in Racial/Ethnic Minority Communities

The final three-block moderated multiple regression model was significant, $F(5,258) = 21.96, p < .001$, and was estimated to explain about 29% of the variability in perceived CVD risk.

Main Effects

Consistent with predictions, the main effect of the Heterosexism in Racial/Ethnic Minority Communities LGBTPCMS subscale on perceived CVD risk was significant, $\beta = .47, p < .001$, whereas, contrary to predictions, the main effect of sexual orientation on perceived CVD risk was not significant, $\beta = .08, p = .166$, after adjusting for covariates.

Interaction Effect

As hypothesized, sexual orientation moderated the association between the Racism in LGBT communities LGBTPCMS subscale and perceived CVD risk, $\beta_{interaction} = .29, p = .008$, after accounting for intervening variables. This interaction accounted for an additional 2% of the variability in perceived CVD risk. Follow-up simple effects tests at each level of sexual orientation showed that the Heterosexism in Racial/Ethnic Minority Communities LGBTPCMS subscale and perceived CVD

![Figure 2. The Relationship Between Racism in LGBT Communities Intersectional Microaggressions LGBTPCMS Subscale and CVD Risk as Moderated by Sexual Orientation](image)

**Figure 2.** The Relationship Between Racism in LGBT Communities Intersectional Microaggressions LGBTPCMS Subscale and CVD Risk as Moderated by Sexual Orientation
risk were associated among Bisexual participants, $\beta = .53, p < .001, F(3,258) = 30.78, p < .001$, but not among Lesbian/Gay participants, $\beta = .24, p = .064, F(3,258) = 1.52, p = .221$. Results are provided descriptively in Table 9 and graphically in Figure 3.

Table 9. Results of Hierarchical Moderated Multiple Regression Examining the Association between the Heterosexism in Racial/Ethnic Minority Communities LGBTPCSM$^a$ Subscale and Perceived CVD$^b$ Risk as Moderated by Sexual Orientation

<table>
<thead>
<tr>
<th>Variable</th>
<th>$b$</th>
<th>$\beta$</th>
<th>$t$ $^d$</th>
<th>$\text{adj}R^2$</th>
<th>$\Delta R^2$ $^d$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>0.08</td>
<td>0.14</td>
<td>2.22$^*$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>0.90</td>
<td>0.16</td>
<td>2.56$^*$</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td></td>
<td></td>
<td></td>
<td>.27</td>
<td>.22***</td>
</tr>
<tr>
<td>Heterosexism in PoC $^c$</td>
<td>0.44</td>
<td>0.47</td>
<td>8.53***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sexual orientation</td>
<td>1.01</td>
<td>0.08</td>
<td>1.39</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td></td>
<td></td>
<td></td>
<td>.29</td>
<td>.02**</td>
</tr>
<tr>
<td>Heterosexism in PoC x Sexual orientation</td>
<td>0.32</td>
<td>0.29</td>
<td>2.66**</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a – LGBT People of Color Microaggression Scale  
b – CVD = Cardiovascular Disease  
c – PoC = People of Color  
d – $^*p < .05$. $^**p < .01$. $^***p < .001$

**LGBT Relationship Racism**

The complete three-block moderation regression model was significant, $F(5,258) = 21.36, p < .001$, and explained 28% of the variance in perceived CVD risk.

**Main Effects**

Consistent with predictions, the main effect of the LGBT Relationship Racism LGBTPCMS subscale on perceived CVD risk was significant $\beta = .46, p < .001$, whereas the main effect of sexual orientation on perceived CVD risk was not significant $\beta = .10, p = .071$, after accounting for covariates.
As hypothesized, sexual orientation moderated the relationship between the Racism in LGBT communities subscale and perceived CVD risk, $\beta_{interaction} = .29, p = .015$, after accounting for covariates. This interaction accounted for an additional 2% of the unique variability in perceived CVD risk. Follow-up simple effects tests at each level of sexual orientation showed that the LGBT Relationship Racism LGBTPCMS subscale and perceived CVD risk were associated among Bisexual participants, $\beta = .52, p < .001$, $F(3,258) = 31.39, p < .001$, but not among Lesbian/Gay participants $\beta = .22, p = .098$, $F(3,258) = 1.25, p = .288$. Results are provided descriptively in Table 10 and graphically in Figure 4.
Table 10. Results of Hierarchical Moderated Multiple Regression Examining the Association between the LGBT Relationship Racism LGBTPCSM\textsuperscript{a} Subscale and Perceived CVD\textsuperscript{b} Risk as Moderated by Sexual Orientation

<table>
<thead>
<tr>
<th>Variable</th>
<th>$b$</th>
<th>$\beta$</th>
<th>$t$\textsuperscript{c}</th>
<th>$\text{adj}R^2$</th>
<th>$\Delta R^2$\textsuperscript{c}</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>0.08</td>
<td>0.14</td>
<td>2.22*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>0.90</td>
<td>0.16</td>
<td>2.56*</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LGBT relationship racism</td>
<td>0.42</td>
<td>0.476</td>
<td>8.44***</td>
<td>0.27</td>
<td>0.22**</td>
</tr>
<tr>
<td>Sexual orientation</td>
<td>1.31</td>
<td>0.10</td>
<td>1.81</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relationship racism x Sexual orientation</td>
<td>0.30</td>
<td>0.29</td>
<td>2.46*</td>
<td>0.28</td>
<td>0.02*</td>
</tr>
</tbody>
</table>

\textsuperscript{a}– LGBT People of Color Microaggression Scale  
\textsuperscript{b}– CVD = Cardiovascular Disease  
\textsuperscript{c}– *$p < .05$. **$p < .01$. ***$p < .001$  

Figure 4. The Relationship Between the LGBT Relationship Racism Intersectional Microaggressions LGBTPCMS Subscale and CVD Risk as Moderated by Sexual Orientation While Controlling for Age
CHAPTER 5
DISCUSSION

This study examined the CVD RF burden and the influence of LGB BIPOC microaggressions on CVD risk perceptions among Bisexual and Monosexual (Lesbian and Gay) BIPOC. The first study objective sought to compare differences in odds for reporting CVD RFs between Bisexual BIPOC and Lesbian/Gay BIPOC. Contrary to predictions, Bisexual participants did not report higher odds across any CVD RF indicators in adjusted models. Although, Bisexual participants did report higher odds for diabetes and depressive symptoms in unadjusted models. Past research has indicated that when Bisexual, Lesbian, and Gay individuals are compared to their heterosexual counterparts, the discrepancies in odds for the CVD RFs under study is largest among Bisexual individuals (Caceres et al., 2017, 2019). However, in the present study, when a Lesbian/Gay reference group was used, differences in CVD RF burden were not observed. This finding suggests that CVD RF disparities are not apparent within LGB subgroups across the CVD RFs under study. Contrary to present findings, past research comparing Bisexual CVD RF burden to their Lesbian/Gay counterparts has revealed significant differences (Dilley et al., 2010), although the authors did not exclusively examine BIPOC. To the best of the author’s knowledge, this is the first study to evaluate within-group differences in CVD RF prevalence between Bisexual BIPOC and Lesbian/Gay BIPOC.

The discrepancy in CVD RF burden depending on whether a heterosexual reference group is used brings attention to an important measurement consideration in LGB BIPOC health research. While it is common practice for researchers to use White and heterosexual participants as reference groups in health research, doing so suggests that these dominant groups represent ideal or aspirational health. This study does not support significant within-group LGB CVD RF disparities in the absence of a heterosexual reference group. In other words, Bisexual participants did not demonstrate a higher incidence of CVD RF prevalence compared to their Lesbian and Gay counterparts. This observation may be attributable to the overall high presence of CVD RFs within the analytic study. To this end, nearly the entire sample reported at least one CVD RF (99%), and most
(57%) reported at least four out of eight CVD RFs under study which suggests that there is a high presence of CVD RFs among this segment of the population (Caceres et al., 2017).

The second study objective was comprised of the final three study hypotheses (hypotheses two, three, and four). The second study hypothesis predicted that LGB BIPOC intersectional microaggressions would be associated with greater CVD risk perceptions. Consistent with predictions and minority stress frameworks (Cyrus, 2017; Lick et al., 2013; Meyer, 2003; Williams & Serpas, 2021), each LGBT BIPOC intersectional microaggression subscale was positively and strongly associated with perceived CVD risk. This finding corroborates the wealth of research that confirms an association between racial/ethnic discrimination (Brondolo et al., 2011 Krieger, 1990; Lewis et al., 2014; Paradies et al., 2015; Panza et al., 2019) and sexual orientation-based discrimination (Cerezo, 2016; Jacobson et al., 2016; Juster et al., 2015) and CVD risk. However, there are currently no published studies that have examined the association between microaggressions salient to LGB BIPOC using a constitutive intersectional approach (Bowleg, 2013) and perceived CVD risk among LGB BIPOC. Therefore, the current study extends previous research by documenting a strong positive association between constitutive LGB BIPOC intersectional microaggressions and CVD risk perceptions. These observations contribute to the developing knowledge of intersectional discrimination and its sizeable relationship to CVD risk perceptions among LGB BIPOC.

Next, the third hypothesis predicted higher CVD risk perceptions among Bisexual participants compared to their Lesbian/Gay counterparts. Given the evidence indicating a disproportionately higher CVD RF burden among Bisexual individuals (e.g., Caceres et al., 2017, 2019, 2020a), it was expected that Bisexual BIPOC would also report greater CVD risk perceptions. Counter to predictions, this hypothesis was not supported such that there was not a significant main effect of sexual orientation on CVD risk perceptions, after adjusting for covariates. After accounting for relevant sociodemographic characteristics in statistical models, Bisexual and lesbian/Gay participants reported comparable CVD risk perceptions. Interestingly, preliminary bivariate analyses showed that Bisexual participants reported significantly higher CVD risk perceptions (reflecting more CVD risk).
Furthermore, in models unadjusted for covariates (age and level of education), there was a significant main effect on CVD risk perceptions where Bisexual participants reported greater risk, highlighting the influential role of the model covariates in the current study findings. Notably, income was unrelated to CVD risk perceptions despite a wealth of evidence suggesting otherwise (e.g., Caceres et al., 2019; Clark et al., 2009), which may be related to the current study examining CVD risk perceptions compared to objective risk. To the author’s knowledge, there is only one published study that has examined LGB BIPOC CVD risk perceptions where null findings were found among Bisexual participants compared to their heterosexual counterparts (Caceres et al., 2021). Therefore, the current findings are inconsistent with past CVD RF research (Caceres et al., 2017, 2019, 2020a) but are consistent with the available evidence on CVD risk perceptions (Caceres et al., 2021).

Lastly, it was hypothesized that sexual orientation would moderate the association between LGB BIPOC intersectional microaggressions and CVD risk perceptions. In support of this prediction, a moderation effect was found such that an association between the variables was only detected among Bisexual participants. In other words, LGB BIPOC microaggressions only influenced perceived CVD risk among Bisexual participants. Therefore, this study raises questions as to whether Bisexual BIPOC—compared to Lesbian/Gay BIPOC—either have unique CVD risk vulnerabilities with respect to LGB BIPOC microaggressions or if their disproportionately higher report of microaggressions is contributing to this observation.

To clarify either possibility, present study findings must be further evaluated. Preliminary bivariate analyses showed that Bisexual participants reported more LGB BIPOC microaggressions compared to their Lesbian/Gay counterparts; this observation is consistent with past research (Balsam et al., 2011; Nadal et al, 2010, 2011, 2016). Furthermore, among Lesbian/Gay participants, LGB BIPOC microaggressions and perceived CVD risk were unrelated. Taken together, this suggests that the variance in perceived CVD risk accounted for by LGB BIPOC microaggressions was driven by a disproportionately stronger association among Bisexual participants. Thus, it is not that Bisexual BIPOC have more CVD risk vulnerabilities with respect to LGB BIPOC microaggressions, but rather
discrimination is inherently harmful, and Bisexual individuals encounter more instances of these experiences that subsequently impact CVD risk.

**Limitations and Future Research**

To the author’s knowledge, this study is the first to compare CVD RF between Bisexual and Lesbian/Gay BIPOC and empirically investigate the association between LGB BIPOC constitutive intersectional microaggressions and CVD risk perceptions. A major strength of this study was the homogenized BIPOC demographic of the sample. In this way, the CVD RF burden among LGB subgroups was studied exclusively within the broader racial/ethnic minority context; this measurement strategy is of increasing importance (Caceres et al., 2017, 2020a, 2021).

Despite a collection of strengths, this study also contains notable limitations. For example, data were captured cross-sectionally and consequently, temporal stability of the patterns of relationships under study cannot be inferred; future research should examine the associations under study across time. Also, CVD risk constructs were self-reported and thus, are vulnerable to recall bias. Further research should use objective indicators of CVD risk to potentially yield more precise results. Data were also collected with MTurk, and while research supports its reliability (Rouse, 2015) and validity (Kim & Hodgins, 2017) in health research, studies also show differences between MTurk samples and traditional community-based samples (Thompson et al., 2020), such as higher rates of depression compared to the general population (Ophir et al., 2020). Indeed, much of the sample reported elevated depressive symptoms (68%) according to recommended cutoff values (Manea et al., 2015) which restricted the range and measurement variability among the sample. In addition, the use of MTurk yielded a national sample but not a nationally-representative sample. Therefore, future research should replicate current findings among traditional community-based participants.

Although past research shows differential risk by biological sex among LGB subgroups (Caceres et al., 2019), power limitations restricted the stratification of analyses by males and females in the current study. In addition, while this study focused on comparing Bisexual BIPOC to Lesbian/Gay BIPOC, analyzing Lesbian/Gay and BIPOC as monolithic groups obscured important
differences in CVD risk across the sexual orientation and racial/ethnic minority spectrum (Bostwick & Hequembourg, 2013). Taken together, future research should draw larger samples to allow for the stratification of the sample by important characteristics including biological sex, SGM identity (e.g., transgender), racial/ethnic minority identity, and age. Regarding age, there is a dearth of research available on the general health of SGM BIPOC older adults (Chen et al., 2020). This area of research represents an important direction for future research to investigate how microaggressions salient to the intersection between ageism, racism, and heterosexism (and mono-sexism) affect CVD health (Laganá et al., 2020).

Moreover, this study used the Patient Health Questionnaire-9 (PHQ-9; Kroenke et al., 2001) to measure depressive symptoms among the study sample of LGB BIPOC participants. To test the study hypothesis, a dichotomous variable was created using a cutoff value recommended for the general adult population (≥10; Manea et al., 2015). However, PHQ-9 cutoffs are not yet established for SGM, BIPOC, or SGM BIPOC populations and evidence shows conflicting configural, metric, and scalar invariance test results for the PHQ-9 among diverse SGM (Borgogna et al., 2021) and racial/ethnic groups (Harry et al., 2021; Keum et al., 2018). Therefore, a standard cutoff value of 10 was likely an underestimate for depression among the present sample given that initial preliminary analyses showed that Bisexual participants quantitatively reported significantly greater depressive symptoms compared to their Lesbian/Gay counterparts. Whereas, using a standardized cutoff value of 10 did not yield significant differences, suggesting that an underestimated threshold was used. This signals the need for future research to explore PHQ-9 cutoff scores with sensitivity and specificity analyses for SGM BIPOC.

Past research has shown that CVD RF burden is disproportionately higher among individuals who are both non-Monosexual and non-Bisexual such as pansexual people (e.g., anxiety and depression; Borgogna et al., 2018). Hence, studying how experiences of discrimination may vary across non-Monosexual groups and differentially impact their CVD risk will provide important, nuanced information that may inform clinical services. To this end, the LGBT PoC intersectional
microaggressions measure (Balsam et al., 2011) used in the current study did not overtly capture experiences of monosexism. Although there are instruments that measure experiences with binegativity (Morrison et al., 2019) and Bisexual microaggressions (Fredrick, 2017), there are none that constitutively measure microaggressive experiences of heterosexism, monosexism, and racism salient to Bisexual individuals. To address this need, future measurement validation may be of interest, and more practically, researchers should test for measurement invariance of Balsam and colleague’s (2011) LGBT people of color microaggression scale across LGB subgroups to determine the strength of its psychometric properties. In addition, the LGBT PCMS (Balsam et al., 2011)—as an intracategorical instrument—is confined to measuring experiences salient to LGB BIPOC, and therefore, future research is needed to examine intercategorical associations of the variables under study among LGB BIPOC as described by Scheim and Bauer (2019) to improve the quality of intersectional research. Exploring and establishing measurement properties of existing instruments will augment health disparities research.

In addition, this study revealed that experiences of LGB BIPOC microaggressions were disproportionately associated with CVD risk among Bisexual participants. Thus, future researchers should consider investigating protective resources among Bisexual and other non-Monosexual groups. One avenue would be to examine resilience through a multidimensional and intersectional definition for the study of non-Monosexual BIPOC (Aguilera & Barrita, 2021).

Clinical and Practical Implications

Research

Present findings offer important implications for future LGB BIPOC CVD research. Fundamentally, it is important to assess sexual orientation, gender identity, and gender expression because of the differences in health risk and outcomes among the SGM population. This study revealed a sizeable association between LGB BIPOC minority stress and perceptions of CVD risk and, therefore, it is critical for researchers to extend beyond a traditional biomedical framework of conceptualizing CVD risk and prevalence (Engel, 1977) and recognize the contributions that minority
stressors have on cardiovascular health. Lastly, while investigating disparities in health risk is important to inform areas in need, it is equally important to study the sources of strength, resilience, and grit among LGB BIPOC necessary to endure systemic marginalization. Doing so would promote models of strength instead of pathology (Aguilera & Barrita, 2021).

Practice

Findings from this study offer important clinical implications for healthcare professionals since they have an obligation to provide culturally-informed care. A wealth of research has identified the presence of racial/ethnic and sexual orientation-based microaggressions in medical and therapeutic settings among BIPOC and sexual minority populations (Cruz et al., 2019; Dean et al., 2016; Feagin & Bennefield, 2014; Howard et al., 2019; Snyder et al., 2018). Thus, microaggressions—both unidimensional (e.g., Dale et al., 2019) and constitutive (Dale & Safren, 2020)—within healthcare settings function as one barrier to care that contributes to worse health outcomes among minoritized populations. Inadequate healthcare delivery exacerbates LGB BIPOC health disparities and signals the need to integrate standardized curricula on racial/ethnic minority and sexual and gender minority health into healthcare training programs, given the poor progress in this regard (Carabez et al., 2015).

Furthermore, mental health practitioners should recognize the rich, varying, and complex experiential reality of the LGB BIPOC population and be mindful of the destructive harm that experiences of discrimination have on this population’s health. Clinicians may also consider drawing psychotherapeutic interventions from the field of cardiac psychology to reduce CVD RF burden. Indeed, mental health practitioners may consider integrating cardiac rehabilitation into sessions which involves exercise training, emotional support, and psychoeducation on lifestyle behaviors and change that comprise the behavior and health relationship (Halperin, 1996). For instance, systematic review and meta-analytic evidence supports mindfulness interventions to reduce the impact of psychosocial stress on elevated blood pressure (Rainforth et al., 2007), and on physiological and psychological outcomes among adults with CVD diagnoses (Scott-Sheldon et al., 2020).
To aid in the harmful effects of discrimination, many empirically-supported psychotherapeutic interventions tailored for ethnically-diverse LGB exist (e.g., Pachankis et al., 2015), with some psychotherapeutic interventions targeting CVD RFs (depression, alcohol consumption; Pachankis et al., 2020). In addition, a randomized controlled trial with young adult Gay and Bisexual men demonstrated efficacious psychotherapeutic outcomes from LGB-affirmative psychotherapy with better outcomes among participants reporting greater minority stress (Millar et al., 2016). Collectively, these intervention modalities have the capacity to be tailored for targeting the impact of intersectional discrimination on LGB BIPOC CVD health. Intervention efforts may be particularly effective in health promotion efforts to reduce the incidence of modifiable CVD RFs among LGB BIPOC individuals.

**Policy**

This study also calls attention to important policy implications for government agencies concerned with the growing health disparities among LGB BIPOC populations. For instance, because of inaccurate LGB prevalence estimates (Pachankis & Bränström, 2019) it is important for legislators to take action in advocating for the assessment of sexual orientation, gender identity, and gender expression in national surveys. The present study as well as the bulk of existing empirical literature focuses on interpersonal experiences of discrimination (e.g., microaggressions) whereas national-level surveys have the capacity to investigate structural-level prejudice (e.g., macroaggressions; Sue, 2010) on CVD health and risk.

The presence of structural and systemic-level stigma against SGMs within the US has existed in the form of anti-sodomy laws, immigration policies, and government employment discrimination (Hatzenbuehler, 2014). Through persistent campaigning and advocacy from SGMs and allies, government and federal legislators have enacted some changes aimed to combat health inequity among the SGM population. For example, California state legislature recently passed California Assembly Bill 2218 Transgender Equity and Wellness Fund which provides funding to existing community-based organizations that serve SGM, including SGM BIPOC (California Legislative Information, 2020). Funds are indicated for enhancing access to healthcare, health education
resources, housing, and food among SGM people. This initiative represents an important step in enhancing health equity among historically marginalized populations at the policy level. While addressing health disparities and promoting resilience is important to enhance health equity for LGB BIPOC, exclusively doing so disregards the root of the issue at hand—societal prejudice. Long-standing pervasive institutions of power and prejudice have enveloped this nation for centuries and fostered the acceptance of social marginalization and oppression of LGB BIPOC populations. Thus, augmenting systemic and community-level knowledge to facilitate an adjustment in nationwide prejudice is of equal importance to deconstruct institutions of power. For instance, providing education and enhancing health literacy of the overwhelming health disparities within the US is an important target given that less than half of US adults are estimated to be aware of the health disparities between African Americans and White/European Americans (Booske et al., 2011). Indeed, health disparities researchers have signaled the need for research to investigate effective methods of communication that can create conditions for change and subsequently adjustments in sociopolitical ideology (Williams, 2012). For instance, one study found that from 1999 to 2010 awareness of African American and Latinx health disparities among the general US population only increased from 55% to 59%, with lower levels of awareness among BIPOC (Benz et al., 2011). Moreover, research has also indicated that when removing cost, access, and knowledge barriers across racial/ethnic groups, health disparities reduce (Goodman et al., 2017). Collectively, this evidence supports the value of health education and health literacy particularly among BIPOC populations as a step towards improving community knowledge and population health. Thus, considering the macro- and micro-level contributions to LGB BIPOC population health is an important step in reducing social inequalities and improving health equity.

**Conclusion**

Results from this study contribute to the developing LGB BIPOC cardiovascular health disparities scholarship. Continued research is needed to accurately estimate CVD RF burden and explore factors that may exacerbate or buffer the negative influence of experiences of discrimination
on CVD risk. Strengthening the quality of CVD research among LGB BIPOC is an important step in effectively addressing health disparities among this population.


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