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Examining the Relationship between Perceived Neighborhood Context on Sexual Risk Behaviors among Black Men who Have Sex with Men in the South

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ABSTRACT

EXAMINING THE RELATIONSHIP BETWEEN PERCEIVED NEIGHBORHOOD CONTEXT ON SEXUAL RISK BEHAVIORS AMONG BLACK MEN WHO HAVE SEX WITH MEN IN THE SOUTH

By

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Background: The burden of HIV in the South remains disproportionate among Black MSM, who account for 48% of HIV diagnoses among MSM. Reasons for these disparities include higher-level structural and social factors, as well as psychosocial factors, that influence individual sexual risk behaviors, including neighborhood conditions, discrimination, depression, resilience, and religiosity/spirituality. The purpose of this dissertation is to examine the relationship between perceived neighborhood context and sexual risk behaviors among Black MSM in the South**.**

Methods: The dissertation utilized data from the MARI study, which included 412 Black MSM from Jackson, MS and Atlanta, GA. The theoretical framework was based on the modified social ecological model. Statistical methods include exploratory factor analysis, bivariate and multivariable logistic regression, and simple mediation and parallel multiple mediation analyses.

Results: A 4-factor solution was identified in the exploratory factor analysis, which translated to 4 domains measuring the latent construct, perceived neighborhood context: neighborhood problems, social cohesion and safety, neighborhood violence, and LGBT-friendliness. In the multivariable logistic regression analyses, social cohesion and safety was significantly associated with consistent condom use during anal sex in the past 12 months with both a main and a casual partner, consistent condom use during vaginal sex in the past 12 months, and using alcohol or drugs before or during sex. LGBT-friendliness was significantly associated with consistent condom use during anal sex in the past 12

months with a casual partner, and asking the last casual sex partner's HIV status prior to sex. Neighborhood violence was significantly associated with exchanging sex for money. In both the simple mediation and parallel multiple mediation analyses, depression significantly mediated the relationship between 2 domains of perceived neighborhood context (i.e., social cohesion and safety, and LGBT-friendliness), and consistent condom use during anal sex in the past 12 months with a casual partner. **Conclusions:** Salient domains of perceived neighborhood context may be determinants of sexual risk behaviors through depression. Structural interventions are needed to improve neighborhood infrastructure to increase social cohesion and safety, reduce violence, provide an LGBT-friendly environment, and include mental health resources to reduce HIV burden among Black MSM in the South.

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AUTHOR'S STATEMENT PAGE

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Chapter 1: Introduction

HIV among Black Men who have Sex with Men

Gay and bisexual men (hereafter referred to as men who have sex with men (MSM)) bear the greatest burden of Human Immunodeficiency Virus (HIV) in the United States (US), despite recent advancements in treatment and resources.[1] From 2008 to 2015, the estimated annual HIV incidence in the US decreased by 14.8% overall, and decreased for each transmission risk group, except for MSM.[2, 3] Although HIV incidence remained relatively stable among MSM, at approximately 26,000 infections per year from 2008 to 2015, HIV incidence was disproportionately higher among MSM compared to other transmission risk groups.[2, 3] In 2016, MSM accounted for 67% of all 40,324 HIV diagnoses, and 68% of new HIV infections in the US.[1, 3, 4] The proportion of new HIV diagnoses remained high among MSM, who accounted for 69% of all 37,968 new HIV diagnoses in 2018. [5]

Black/African-American MSM (hereafter referred to as Black MSM) are disproportionately affected by HIV, and are the current face of the HIV burden in the US. In 2018, Black MSM accounted for the highest number of MSM who received an HIV diagnosis (37%; n=9,712), compared to other racial/ethnic groups.[1, 3, 4] Although the estimated HIV incidence has remained stable for Black MSM from 2008 to 2015, HIV incidence remained higher for Black MSM compared to White and Hispanic/Latino MSM within this time period. [1, 3, 4] These differences by race/ethnicity were especially observed among young MSM ages 13 to 24, as Black MSM made up 52% of HIV diagnoses among young MSM in 2018, compared to 27% Hispanic/Latino MSM and 16% White MSM.[1, 3, 4, 5] If current trends in HIV among Black MSM persist, 1 in 2 Black MSM will be diagnosed with HIV in their lifetime.[3, 6]

HIV in the South

The South currently experiences the greatest burden of HIV. In 2017, the South (i.e., Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia and West Virginia) consisted of 38% of the U.S. population, but accounted for more than half (51%) of new HIV infections, 45% of persons with HIV, and 50% of undiagnosed HIV infections. [1] The South continued to account for more than half (51%) of the 37,968 new HIV diagnoses in 2018. [5] Additionally, the rates (per 100,000) of HIV diagnoses were highest in the South at 16.1, compared to 10.6 in the Northeast, 9.4 in the West and 7.4 in the Midwest.[1] Lifetime risk of an HIV diagnosis was also highest in Southern states, including Georgia (1 in 57), Maryland (1 in 56), and Florida (1 in 58). [6]

In line with national statistics, the burden of HIV in the South is disproportionate by race/ethnicity and by risk group. Whereas Black/African Americans account for 53% of new HIV diagnoses in the South, Black MSM in the South account for 6 out of every 10 new HIV diagnoses among all Black/African Americans in this region.[1] Additionally, 48% of HIV diagnoses in the South were among Black MSM, compared to 26% Hispanic/Latino MSM and 23% White MSM. [1, 4, 5] From 2008 to 2014, the proportion of new HIV diagnoses increased only among Black MSM in the South, compared to MSM of other races/ethnicities.[7] Among Black MSM, 1 in 4 and 1 in 5 were diagnosed with HIV in Mississippi and Georgia, respectively, and nearly 60% of new HIV diagnoses were among Black MSM in each state. [8-10]

Disparities in rates among Black MSM in the South continue to persist. As the new national initiative "Ending the HIV Epidemic: A Plan for America" seeks to reduce new HIV infections in the US by at least 90% in 10 years, there is a critical need to examine and address the factors associated with HIV in order to eliminate disparities in HIV, especially among Black MSM in the South. [4, 11]

Factors attributing to the HIV Burden among Black MSM

Prevention efforts aimed at reducing HIV risk among Black MSM have primarily targeted individual-level factors including condomless anal sex, having multiple sex partners, exchanging sex for goods and services, using alcohol and illicit substances (e.g., marijuana, cocaine, methamphetamines), or having a sexually transmitted infection (STI). [12-15] [13, 16, 17] [14, 15, 18] However, individual sex or drug risk behaviors may not solely explain the high and disparate burden of HIV among Black MSM. Compared to White MSM, Black MSM were found as likely to engage in serodiscordant condomless anal sex, receptive condomless anal sex, sex with a partner with known HIV serostatus, and sex for goods and services, and less likely to have a history of substance use or have more sex partners. [18, 19] Thus, recent studies have focused on addressing higher-level factors that influence individual behaviors in order to reduce HIV risk among Black MSM. These studies often utilize the modified social ecological model as a framework, which supports reviewing social and structural factors in order to adequately address behaviors that are associated with acquiring or transmitting HIV at the individual level. [20] Higher-level factors that influence HIV risk at the individual level among Black MSM include social and sexual networks characteristics (e.g., homophily), community norms and values (e.g., homophobia), and laws and policies (e.g., criminalization of homosexuality). [21-30]

Neighborhood Context and HIV Risk

Neighborhood context is another higher-level factor that influences HIV risk. Several neighborhood characteristics have been identified as influencers of HIV risk among MSM, including HIV prevention behaviors and care outcomes. For example, the physical structure of the neighborhood, which include the geographic layout and physical appearance of streets and buildings, may impede access to HIV prevention and care services (e.g., HIV clinics, pharmacies, or HIV service organizations). [31-39] Distance to healthcare facilities, as well as accessing public transportation to access

healthcare facilities create barriers to care and affect HIV-related outcomes, such as late HIV testing, ART non-adherence, low CD4 count, low maintenance of viral suppression, and HIV mortality. [31, 33-40] Aspects of the neighborhood physical environment, such as having access to public transportation are shaped by neighborhood economic conditions (e.g., neighborhood-level poverty and income inequality), and racism-related policies (e.g., redlining) that facilitate segregation, and hinder access to quality healthcare and additional resources (e.g. housing, employment). These structural issues can further influence HIV risk through dimensions of the neighborhood social environment, including social cohesion (e.g., being a close knit neighborhood, having trust in neighbors, and getting along with one another). [38, 41, 42] For example, areas with high concentrations of residential racial segregation, poverty, and income inequality can result in social disorganization, in which social cohesion is weakened and the ability to enforce social norms within the community are reduced. [38, 41, 42] This disruption can result in increased crime and violence, and lead individuals to engage in maladaptive behaviors, such as engaging in substance use and/or risky sexual behaviors to cope with exposure to the negative environment. [38, 41-44] Additionally, the neighborhood may not be a supportive environment for the lesbian, gay, bisexual, and transgender (LGBT) community, and may facilitate homophobic social norms. [38, 41, 42, 45] As social norms can influence an individual's behaviors, negative social norms and overall social environment may also result in engagement in maladaptive behaviors as a coping mechanism. [38, 41, 42, 45] Lastly, individuals living in these neighborhoods are more likely to partner with others who have HIV or are at risk for HIV infection due to residing in areas that are concentrated with high poverty, low access to resources, and living within close proximity to others within the same sexual networks, further affecting the HIV burden. [46-48]

Research Gaps

Although there is substantial evidence to support the effect of neighborhood context on HIV prevention and care behaviors among MSM, neighborhood context has various operationalizations in the literature, and may include variables related to physical or social characteristics of the neighborhood (e.g., physical disorder, social disorganization, social norms) [38, 41, 49-52]. Few studies have been conducted to determine if variables measuring physical characteristics (e.g., neighborhood violence and crime) or social characteristics (e.g., social cohesion, LGBT-friendliness) are consistent with the construct of neighborhood context as a driver of HIV risk among MSM. [42, 45] In addition, few studies have explored the relationship between neighborhood context and HIV risk among Black MSM , especially among Black MSM in the South, despite research suggesting various individual, social, and structural factors that contribute to the racial and ethnic disparities in HIV among Black MSM. [15, 18, 38, 42] Also, studies that have explored the association of neighborhood context on HIV risk have primarily focused on Black MSM residing in other U.S. regions, such as cities in the Northeast or West, and these findings may not be generalizable to Black MSM in other regions, especially Black MSM in the South. [42, 45, 51, 53] The lack of generalizability may be due to regional differences in structural, political, and social factors that affect health. For this reason, there may be additional factors that may better explain the relationship between neighborhood context and HIV risk among Black MSM in the South. As racism is prevalent in the South and continues to drive racial and ethnic disparities in HIV prevalence and risk behaviors, experiences of racial discrimination can affect individual HIV risk and prevention behaviors, as well as mental health outcomes (e.g., depression) among Black MSM in the South. [2, 11, 13, 53-60] Stigmatizing attitudes against sexual minorities and those with HIV are also more prevalent in the South, and experiences of these stigmatizing attitudes and discrimination can affect access to healthcare and additional resources (e.g., employment, housing). [2, 55, 58, 61-73] Also, the South is commonly referred as the "Bible Belt," due to its socially conservative and evangelical Protestantism within the region, and the

Black/African American community in the South value religious beliefs and spiritual practices. [3, 74-80]Yet, anti-gay sentiments are espoused by Southern religious institutions, especially within Black/African American churches. [3, 74-80] As such, religiosity and spirituality can influence the attitudes and behaviors of Black MSM residing in Southern neighborhoods, including internalized homophobia and engaging in condomless anal sex to cope with negative feelings and heighten intimacy. [3, 74-80] However, Black MSM's resilience in being able to cope with negative neighborhood factors may be protective against HIV risk. [13, 38, 81-84] Exploring these potential factors that may influence the relationship between neighborhood context and HIV sexual risk can be important in addressing the burden of HIV among Black MSM in the South. [13, 38, 81-84]

Purpose

The purpose of this dissertation was to examine the relationship between perceived neighborhood context and sexual risk behaviors among Black MSM in the South. The dissertation utilized data from The Ecological Study of Sexual Behavior and HIV/STI among African American men who have sex with men in the Southeastern US (known as the MARI study). The theoretical framework for this dissertation was based on the modified social ecological model. [20, 85-87] This research can be used to better inform HIV prevention strategies and efforts among this vulnerable population to help reduce disparities in the HIV burden. The dissertation addressed the following research questions:

1) Do the observed variables, physical disorder (e.g., safety, violence, problems), social cohesion, and LGBT-friendliness, hold together as measures of the latent construct, perceived neighborhood context?

Hypothesis: The three observed variables, physical disorder (e.g., safety, violence, problems), social cohesion, and LGBT-friendliness, are measures of the latent construct, perceived neighborhood context.

2) Is there a relationship between perceived neighborhood context and sexual risk behaviors among Black MSM in the South?

Hypothesis: Perceived neighborhood context will be associated with high-risk sexual behaviors among Black MSM in the South, controlling for age, drug use within the past year (e.g., marijuana, cocaine), study site (e.g., Jackson, MS, or Atlanta, GA), STIs within the past year, sexual orientation (e.g., gay/homosexual, bisexual, or straight/heterosexual/questioning/other), HIV status (HIV-negative, HIV-positive), and socioeconomic status (i.e., employment status, education status, annual household income, history of incarceration, and transportation status).

3) Is the relationship between perceived neighborhood context and sexual risk behaviors best understood through discrimination, depression, religiosity/spirituality, and resilience among Black MSM in the South?

Hypothesis: Perceived neighborhood context will be associated with high-risk sexual behaviors among Black MSM in the South through discrimination, depression, religiosity/spirituality, and resilience, controlling for age, drug use, study site, STIs within the past year, sexual orientation, HIV status, and socioeconomic status.

Chapter 2: Review of the Literature

Neighborhood Context

Emerging literature has explored the relationship between neighborhood context and sexual risk behaviors. The pathway between neighborhood context and sexual risk behaviors has primarily been theorized as constructs related to physical characteristics, social characteristics, and social norms of the neighborhood. [41, 88-91] Physical disorder theory, also known as the "broken windows" theory, has been used to understand the influence of neighborhood physical characteristics, such as vandalism, vacant houses, or litter, on sexual risk behaviors. [41, 88-90] This theory posits that exposure to negative physical characteristics can lead to experiences of personal stress, as well as engaging in alcohol and drug use to cope with stressful events. Exposure to negative neighborhood physical characteristics can also decrease the ability of the neighborhood residents to control social problems, such as crime or drug use within the neighborhood. [41, 88-90] Social disorganization theory posits that disruptive effects of urbanization and industrialization alter structural characteristics, including residential mobility, concentrated poverty, and ethnic heterogeneity. [41, 88, 89] This disruption results in diminished collective efficacy, as social problems are increased due to weakened neighborhood social cohesion (e.g., lack of trust or belonging within the neighborhood), and a reduction of social norms and controls used to regulate deviant behavior. [41, 88, 89] Social norms theory posits that peer norms and behaviors of one's network, such as peer attitudes about condom use, can influence engagement in sex and drug risk behaviors. [32, 41, 92] As these theoretical pathways were based on the neighborhood conditions and sexual risk behaviors among heterosexual populations, Frye and colleagues argued that additional factors should be considered in the theoretical pathways of neighborhood urban environment and sexual risk behaviors that are specific to MSM. [41] For example, socioeconomic status and race/ethnicity can influence neighborhood selection, which can determine whether MSM reside in neighborhoods with varying degrees of homophobia or have a presence of MSM and LGBT-supportive venues. [41] Additionally, social norms associated with identity,

including race/ethnicity and sexual orientation, can determine acceptance or exclusion by the dominant group within the neighborhood, affecting proximal stressors and mental health outcomes such as self-esteem and/or inducing stress-related coping behaviors related to HIV risk (e.g., drug use, multiple sex partners). [41]

Few studies have explored indictors of physical disorder on sexual risk behaviors among MSM. Yet, study findings support the physical disorder theory, and suggest a positive association between physical disorder and sexual risk behaviors. For example, neighborhoods with high physical disorder, such as excessive noise, trash/litter, or large proportions of vacant housing have been associated with high prevalence of HIV and with more drug use before and during sex among Black MSM. [93, 94] Conversely, neighborhoods with lower levels of physical disorder have been considered as protective in engaging in serodiscordant condomless anal sex. [42] These findings support the theory that exposure to physical disorder may lead to enagegement in drug abuse and risky sexual behaviors as a coping mechanism. [41, 42] Additionally, as physical disorder is correlated with poverty, crime, and low social disorganization, these outcomes may be due to neighborhood destabilization that impedes the presence of necessary HIV prevention and care resources within the neighborhood (e.g., clinics offering HIV testing). [41, 94]

As aforementioned, social disorganization within the neighborhood can result in weakened social cohesion, which can reduce the neighborhood's ability to enforce social norms and controls, and increase social problems, such as drug abuse. [41, 42] Many studies have measured social cohesion as an indicator of social disorganization within the neighborhood to determine if connectedness among neighborhood residents and their shared social norms will improve health outcomes and conditions for one another. [95, 96] Research suggests that social cohesion is associated with neighborhood physical disorder. For example, residents of neighborhoods with high social cohesion reported greater feelings of perceived safety and lower perceived crime within the neighborhood. [40, 97] Findings regarding the

relationship between social cohesion and HIV outcomes are mixed. For example, neighborhoods with high social cohesion were associated with increased HIV testing, and neighborhoods with low social cohesion were associated with increased sexual risk behaviors (e.g., serodiscordant condomless anal sex, and multiple sex partners). [42, 98] However, neighborhoods with high social cohesion may espouse negative social norms, such as stigmatizing or discriminatory attitudes about race, sexual orientation, or HIV status, resulting in many residents feeling unsafe and unsupported in the neighborhood. [99-101] For this reason, Black MSM may socialize and develop sexual partnerships outside of their residential neighborhood, where they may engage in risky sexual behaviors (e.g., condomless anal sex) to cope with the lack of support from their home community, or due to lowered controls of using condoms or having access to condoms in places where sex occurs outside of their neighborhood (e.g., sex venues). [50, 100]

Neighborhoods with a gay community may foster a sense of support, belonging, and acceptance to Black MSM. [102] Conversely, a lack of gay presence within the neighborhood can be associated with social norms and values that are homophobic, resulting in mental distress, internalized homophobia, and engagement in risky sex or drug behaviors as a coping mechanism. [102, 103] As such, most studies exploring social norms of the neighborhood and its influence on sexual risk behaviors among MSM have primarily focused on the neighborhood gay presence (i.e., percentage of households headed by same-sex partners), gay community attachment, and experiences of homophobic discrimination. [42, 45, 50] For example, MSM residing in neighborhoods with a large gay presence had greater odds of consistent condom use during anal sex, and MSM residing in neighborhoods with lower levels of gay presence or high levels of homophobia had greater odds of engaging in risky sexual behaviors (e.g., condomless anal sex, multiple partners). [42, 45] Yet, these findings are in contrast to findings regarding neighborhood gay presence and sexual risk behaviors among Black MSM, as Black MSM may not reside in neighborhoods with large gay presence or may lack attachment to the gay community due to experiences

of racial or sexual stigma and discrimination. [42, 45, 50, 104] Additional research is needed to determine whether and how neighborhood gay presence influences sexual risk behaviors among Black MSM.

Despite the evidence showing the relationship between neighborhood context and sexual risk behaviors among MSM, few studies have explored this relationship among Black MSM, nor Black MSM in the South. [34, 42, 45, 50, 83, 93, 100] To date, only one study has explored the relationship between neighborhood context and sexual risk behaviors among Black MSM in the South. Baseline study results revealed that Black MSM in the South were more likely to be adherent to HIV medication, but were also more likely to have paid someone for sex, and also more likely report their neighborhood as safe and having a good reputation. [34] Although these preliminary findings provide some insight on Black MSM regarding neighborhood characteristics and HIV-related outcomes, additional research is needed that explores this relationship among Black MSM overall and by U.S. region.

Potential Mediators

The theoretical pathways explaining the influence of neighborhood context on sexual risk behaviors among MSM include several mediating factors, such as stressful life events or financial insecurity. [15, 18, 38, 41, 42] However, few studies have explored whether or how these factors explain the relationship between neighborhood context and sexual risk behaviors. [38, 41, 42] Also, there may be additional factors related to neighborhood context and sexual risk behaviors among Black MSM in the South that should be explored to address the HIV burden among this population.

Discrimination, for example, may explain the relationship between neighborhood context and HIV risk among Black MSM in the South. Emerging literature supports the association between discrimination and neighborhood physical disorder. For example, higher physical disorder (e.g., vandalism, litter, burglary) was associated with more frequent experiences of discrimination based on racial/ethnic or sexual orientation, which may be due to an increased police presence intended to control

disorder in neighborhoods with higher crimes, but discriminate against neighborhood residents. [53] Additionally, the social composition of the neighborhood can create norms that consider individuals who do not match the racial and ethnic groups of the neighborhood as "outsiders", or same-sex relationships or gender non-confirming identities as deviant, resulting in experiences of racial discrimination, and exposure to homophobic attitudes [100, 105, 106] However, there have been no studies that have explored how discrimination influences the relationship between neighborhood context and sexual risk behaviors among Black MSM, especially those in living in the South.

Racial and ethnic discrimination against Black/African-Americans has been embedded in American society due to the legacy of slavery and Jim Crow laws. [107-109] Institutionalized racism and discriminatory policies, such as redlining and racial residential segregation, contribute to the development of areas with low access to basic resources, including access to education, employment, housing, or healthcare. [108-110] These policies also contribute to social disorganization of neighborhoods, as lack of access to these resources can result in high rates of crime and poverty, as well as exposure to illicit drugs and drug abuse. [108-110] These factors further result in the clustering of areas with high concentrations of HIV prevalence. [111] In addition to experiences of discrimination due to structural racism, Black MSM are also exposed to discrimination due to their sexual orientation. [13, 112] Homophobia is also embedded in the social environment due to the commonly-held belief that homosexuality is religiously and morally wrong. [13, 103, 112, 113] These beliefs have shaped homophobic policies and laws, as well as homophobic community norms (e.g., religious freedom laws used to deny services for same-sex couples on religious grounds; lack of constitutional protections for workplace discrimination). [13, 103, 112-114] For Black MSM, the intersection of having multiple social identities, including being gay, being Black, and meeting expectations of gender norms pertaining to masculinity (e.g., hypermasculinity in the forms of physical dominance, anti-femininity, and aggression), can result in concomitant experiences of stigma and discrimination based on race/ethnicity, sexual orientation, and

gender. [102, 112, 115, 116] Exposure to these stigmatizing and discriminatory experiences affect the mental health of Black MSM, resulting in low self-esteem, anxiety, increased stress, depression, internalized homophobia, and social isolation. [13, 55, 112] To cope, Black MSM may engage in maladaptive behaviors, such as drug use or condomless anal sex in order to counteract feelings of loneliness and isolation, and heighten feelings of intimacy between male sex partners. [13, 25, 103, 117, 118] It can also affect partner selection within the networks of Black MSM. Due to the stigmatizing attitudes of others outside of their social network, Black MSM are more likely to form sexual partnerships and engage in high sexual risk behaviors in restricted sexual networks with other Black MSM, often who are clustered within high HIV prevalence areas. [21-24, 26-28, 30]

Exposure to individual stressors, including incarceration or intimate partner violence, may be an intervening mechanism in the pathway between neighborhood physical characteristics and sexual risk behaviors among MSM. Such exposures can result in adverse mental health outcomes, such as depression, which can in turn lead to maladaptive coping behaviors, such as condomless sex. [119-121] Research suggests that depression is high among Black MSM due to experiences of discrimination due to race/ethnicity, sexual orientation, and gender expression. [2, 13, 55, 57] To cope with depression, Black MSM may use or abuse illicit drugs and alcohol, as well as engage in risky sexual behaviors (e.g., serodiscordant condomless anal sex with causal partner), often while on drugs, which can further inhibit use of condoms and increase risk of HIV and other STIS. [13, 122, 123], [55, 124] However, only one study has examined neighborhood-level factors on depression among MSM, and found that depression was lower among MSM residing in neighborhoods with higher gay community attachment, but higher in neighborhoods with greater economic deprivation. [125] As depression has been cited as a factor in HIV risk among Black MSM, additional research is needed to explore how neighborhood factors influence depression among these populations.

Religiosity and spirituality may also explain the relationship between neighborhood context and sexual risk behaviors. Religion refers to the ritualistic practices that collectively connect humans to a higher power. [126, 127] Spirituality refers to internalized aspects of faith and belief systems. [126, 127] Religion and spirituality are important to the Black/African-American community. [80, 128] Black/African-Americans are more likely to engage in religious practices (e.g., attending church), and the Black/African-American church have traditionally provided support regarding the political and social issues affecting the community (e.g., civil rights), and is considered a place of refuge from racism and discrimination. [80, 128] This is especially true for Black MSM, as participation in religious rituals and activities enforce strong cultural bonds within the Black/African-American church and overall Black/African-American community. [80, 126, 129] Black/African-Americans residing in the South, including Black MSM residing in this region, are known to have strong religious and spiritual beliefs, primarily due to residing in a region commonly known as "the Bible Belt" due to the socially conservative and evangelical Protestantism within the region [74, 79] However, many Black/African-American churches espouse anti-gay sentiments, including the belief that homosexuality and gender variance is a sin. [75, 76, 80] Some Black/African-American churches have also verbally ridiculed Black MSM because of their sexual orientation, or may operate in silence by accepting Black MSM in their religious activities as long as no outward expressions of their sexuality are displayed. [77, 80] These negative experiences have detrimental effects on the mental health of Black MSM. However, religious and spiritual practices may also be a protective factor on mental health, and subsequently, HIV risk behavior. For example, prayer, mediation, or expressions of faith in God may be used among Black MSM to cope with anti-gay sentiments or abuse. Additionally increased religious practices was observed as a coping mechanism among individuals residing in dilapidated neighborhoods. [130, 131] Additional research is needed to determine if and how religiosity and spirituality influences the relationship between neighborhood context and sexual risk among Black MSM in the South.

Resilience, defined as the ability to cope with various stressors, is another factor that may be salient in understanding neighborhood context and HIV sexual risk behaviors. [132] Neighborhoods with high levels of resilience, for example, could potentially prevent HIV transmission by facilitating material and emotional support to at-risk populations. [52] The social environment of the neighborhood can also affect individual-level resilience, as Black MSM residing in neighborhoods with hostile social climates may have lowered resilience due to homophobia and harassment from their neighbors. [82, 133-135]Yet, resilience may be a protective factor in HIV, as it has been associated with being less likely for engaging in HIV sexual risk behaviors (e.g., condomless anal sex), indicating potential mediation between neighborhood context and sexual risk behaviors among Black MSM. [68, 83]

Theoretical Framework: Modified Social Ecological Model

This dissertation project used the modified social ecological model to examine the role of neighborhood context on sexual risk behaviors among Black MSM in the South. [20, 41, 42] The modified social ecological model originates from the social ecological model of human development, developed by Urie Bronfenbrenner. [85] Brofenbrenner argued that human development can be understood within the context of multiple systems, including the microsystem, which encompasses relationships closest to the individual (e.g., family, peers); the mesosystem, which encompasses relationships within structures of the microsystem (e.g., work, school, and neighborhood); the exosystem, which include structural-level factors, such as local policies, neighborhoods, and socials services; and the macrosystem, which encompasses societal, cultural, and religious attitudes, customs, and values. [85]

The social ecological model has been used to understand how these systems affect health and health behaviors. [20, 136, 137] Baral and colleagues modified the social ecological model to conceptualize HIV risk in vulnerable populations, including people who inject drugs and men who have sex with men. [20] To understand sexual HIV transmission of MSM, the model is composed of five layers of risk—

individual, network, community, policy, and the HIV stage of the epidemic. [20] Individual level of acquisition risk include individual risk behaviors that have the highest probability of exposure, such as condomless anal sex, and high numbers of male sex partners. [20]At the network level, the density and size of social and sexual networks shape HIV risk. [20] At the community level, stigmatizing norms and values, as well as lack of access to preventative services and HIV treatment, influence HIV risk. [20]Policies that influence HIV risk include the criminalization of homosexuality and laws and policies that affect condom availability. [20] The stage of the HIV epidemic can be understood by looking at the HIV incidence or HIV prevalence, which determines the risk of disease acquisition at the individual level. [20] Thus, there is a high chance of acquiring HIV among MSM due to the high HIV incidence and prevalence among this population. [1, 4, 124] Due to the porous nature of the levels of risks, factors can interact within each level; as such, community norms can influence engagement of high risk behaviors within sexual networks, thereby increasing HIV risk. [20]

Several studies have used the modified social ecological model to examine the relationship between perceived neighborhood context and sexual risk behaviors among MSM. [34, 52, 138] Thus, the modified social ecological model was applied to assess whether and how perceived neighborhood context is associated with sexual risk behaviors among Black MSM in the South. The dissertation proposed that an association exists between perceived neighborhood context (e.g. social cohesion, physical disorder) and individual-level behaviors attributable to HIV acquisition (e.g., sexual risk behaviors) among Black MSM. This relationship may be explained through additional social and psychosocial factors (e.g. discrimination, depression, resilience, religiosity/spirituality).

Chapter 3: Methods

Data Source

The study used data from The Ecological Study of Sexual Behavior and HIV/STI among African American men who have sex with men in the Southeastern US (known as the MARI study). The MARI study was a population-based study designed to typify the HIV environmental 'riskscape', and identify and evaluate HIV/STI risk and protective factors among Black MSM in Jackson, MS and Atlanta, GA. [138] Eligibility criteria included self-report of African American or Black race; male biological sex at birth; being 18 years or older; engaging in oral or anal sex with another man in the 6 months prior to study enrollment; and residence in the metropolitan statistical areas (MSA) of Jackson, MS (Copiah, Hinds, Madison, Rankin, and Simpson counties) or Atlanta, GA (Clayton, Cobb, Dekalb, Fulton, and Gwinnett counties). Participants were recruited through 1) the distribution of printed advertisements at local colleges and universities, adult bookstores, bars and clubs, as well as community-based organizations (CBOs) servicing Black MSM; 2) face-to-face recruitment from local bars and clubs frequented by Black MSM, and HIV prevention interventions, community events and other activities conducted by local CBOs; 3) social networking websites/applications ('apps'), such as Facebook and Twitter; 4) geospatial sexual networking 'apps', such as Jack'd and Grinder; and 5) word-of-mouth referrals.

The MARI study was conducted at the Open Arms Healthcare Center (Jackson, MS) or AID Atlanta Health Services Clinic (Atlanta, GA), and included a single study visit that lasted approximately 1.5 hours. Study procedures were conducted by trained research staff. After providing written informed consent, participants received several health screenings, including blood pressure and anthropometry (i.e., standing height, standing weight, body mass index, percent body fat, muscle mass, and circumferences of the chest, biceps, waist, and hip screenings); and rapid HIV testing after risk reduction counseling for participants who reported being HIV uninfected or were unaware of their HIV status.

Participants also provided whole blood for syphilis testing, using a vacutainer blood collection (venipuncture) tube, and pharyngeal and rectal swabs, and a urine specimen for gonorrhea and chlamydia testing. After the health screenings, participants completed a study questionnaire via audio computer-assisted self-interview (ACASI) technology. The questionnaire consisted of items focused on intrapersonal factors (e.g., socio-demographics, body image, personality traits, religiosity and spirituality), interpersonal factors (e.g., early life environment, social and minority stressors, social support), and community factors (e.g., residential history and neighborhood environment). At the end of the study visit, participants received their anthropometric and blood pressure measurements, and HIV test results. Participants with a reactive HIV test received confirmatory testing at a local HIV care clinic at the end of the study visit to ensure linkage to appropriate care services. STI test results were mailed to the address provided by the study participant. Participants were compensated $35 to $50. The study protocol was approved by the Sterling Institutional Review Board.

Relevant Study Measures

Predictors:

Perceived neighborhood context: Five different scales that included a total of 21 items were used to assess perceived neighborhood context. Table 1 displays the item descriptions and scales for each item.

Social cohesion was measured using 5 items, and used a 4-point Likert scale ranging from 1=strongly agree to 4= strongly disagree. As Item 3 and Item 5 are negatively termed, these items were reverse-coded so that the items have the same order of scale, and the highest response value of '4' indicates a low level of social cohesion. Neighborhood safety was assessed using 1 item (Item 6), using the same 4-point Likert scale.

Neighborhood violence was assessed using 3 items (Items 7-9) that measured the frequency with which acts of violence occurred in the last 6 months, using a 4-point Likert scale ranging from 1=often

to 4=never. Neighborhood problems were assessed with 6 items (Items 10-15). Participants assessed each neighborhood problem on a 4-point Likert scale ranging from 1= very serious to 4= not really a problem. Items 7-15 were reverse-coded so that the highest response value indicates a high level of neighborhood violence and neighborhood problems, respectively.

LGBT-friendliness was measured using 6 items (Items 16-21). There were multiple scales used for these items. One item (Item 16) measured the rank of participant's responses on whether the neighborhood was gay friendly (1=not at all gay friendly, 2=somewhat gay friendly, 3=very gay friendly). This item was reverse-coded so that this item has the same order of scale, and the highest response value indicates a low level of LGBT-friendliness. Four items (Items 17-19, and Item 21) used 3-point scale (1=yes, 2=no, 3=somewhat) to measure whether the neighborhood had a gay community and was accepting of a gay community. These items were recoded so that the same order of scale was used, in which "somewhat" was scored as a '2' instead of a '3'. One item (Item 20) asked participants to rate their agreement on "if there is a LGBT community in one's area", using a 5-point scale ranging from 1 = strongly agree to 5= strongly disagree.

Table 1: Item Descriptions and Scales for Perceived Neighborhood Context

Item Number	Survey Item	Scale	Recoded Scale
Neighborhood social cohesion (5 items)			
1	This is a close knit neighborhood	1=Strongly agree 2=Agree 3=Disagree 4=Strongly disagree	
2	People are willing to help neighbors	1=Strongly agree 2=Agree 3=Disagree 4=Strongly disagree	
3	People in this neighborhood generally don't get along with each other	1=Strongly agree 2=Agree 3=Disagree	1=Strongly disagree 2=Disagree 3=Agree 4=Strongly agree

		4=Strongly disagree	
4	People in this neighborhood can be trusted	1=Strongly agree 2=Agree 3=Disagree 4=Strongly disagree	
5	People in this neighborhood do not share the same values	1=Strongly agree 2=Agree 3=Disagree 4=Strongly disagree	1=Strongly disagree 2=Disagree 3=Agree 4=Strongly agree
Neighborhood safety (1 item)			
6	This neighborhood is safe from crime	1=Strongly agree 2=Agree 3=Disagree 4=Strongly disagree	
Neighborhood violence (3 items)			
7	Frequency of fights in this neighborhood with a weapon	1=Often 2=Sometimes 3=Rarely 4=Never	1=Never 2=Rarely 3=Sometimes 4=Often
8	Frequency violent argument between neighbors	1=Often 2=Sometimes 3=Rarely 4=Never	1=Never 2=Rarely 3=Sometimes 4=Often
9	Frequency of gang fights	1=Often 2=Sometimes 3=Rarely 4=Never	1=Never 2=Rarely 3=Sometimes 4=Often
Neighborhood problems (6 items)			
10	Excessive noise	1=Very serious problem 2=Somewhat serious problem 3=Minor problem 4=Not really a problem	1= Not really a problem 2= Minor problem 3= Somewhat serious problem 4=Very serious problem
11	Heavy traffic or speeding cars	1=Very serious problem 2=Somewhat serious problem 3=Minor problem 4=Not really a problem	1= Not really a problem 2= Minor problem 3= Somewhat serious problem 4=Very serious problem

12	Lack of access to adequate food and/or shopping	1=Very serious problem 2=Somewhat serious problem 3=Minor problem 4=Not really a problem	1= Not really a problem 2= Minor problem 3= Somewhat serious problem 4=Very serious problem
13	Lack of parks or playgrounds	1=Very serious problem 2=Somewhat serious problem 3=Minor problem 4=Not really a problem	1= Not really a problem 2= Minor problem 3= Somewhat serious problem 4=Very serious problem
14	Trash and litter	1=Very serious problem 2=Somewhat serious problem 3=Minor problem 4=Not really a problem	1= Not really a problem 2= Minor problem 3= Somewhat serious problem 4=Very serious problem
15	No/poorly maintained sidewalks	1=Very serious problem 2=Somewhat serious problem 3=Minor problem 4=Not really a problem	1= Not really a problem 2= Minor problem 3= Somewhat serious problem 4=Very serious problem
LGBT-friendliness (6 items)			
16	Neighborhood is gay friendly	1=Not at all gay friendly 2=Somewhat gay friendly 3=Very gay friendly	1=Very gay friendly 2=Somewhat gay friendly 3=Not at all gay friendly
17	There is a ‘gay community’ in area	1=Yes 2=No 3=Somewhat	1=Yes 2=Somewhat 3=No
18	People in neighborhood open and accepting to ‘gay community’	1=Yes 2=No 3=Somewhat	1=Yes 2=Somewhat 3=No
19	CITY OF CURRENT RESIDENCE is supportive community for LGBT	1=Yes 2=No 3=Somewhat	1=Yes 2=Somewhat 3=No

20	Someone said "there's a LGBT community"	1=Strongly agree 2-Agree 3=Neutral 4=Disagree 5=Strongly disagree	
21	Gay community serves individual needs	1=Yes 2=No 3=Somewhat	1=Yes 2=Somewhat 3=No

Potential mediators:

Resilience: The 25-item Connor-Davidson Resilience Scale (CD-RISC) was used to assess the participant's ability to cope with adversity, or resilience. [132] Items in the resilience scale included "I am able to adapt to change"; "coping with stress strengthens me"; "when things look hopeless, I don't give up"; and "I have a strong sense of purpose." Participants used a 5-point scale to rate their agreement with each resilience item ranging from 0=not true at all to 4=true all the time. Each statement was coded 0-4, and summed. Total CD-RISC scores ranged from 0 to 100, with higher scores indicating greater resilience. The CD-RISC has been shown in studies to have high internal consistency, with a Cronbach's alpha of 0.97.

Depression: Depression was assessed using The Center for Epidemiologic Studies Depression Scale (CES-D), a 20-item scale that measures the frequency of depressive symptoms. [139] Participants were asked to rank the frequency of occurrence of each item (e.g., I felt depressed, I felt hopeful about the future, my sleep was restless). Items were scored on a 4-point scale ranging from 0= rarely or none of the time to 3 = most or all of the item, with total scores ranging from 0 to 60. Higher scores indicate more depressive symptoms. The CES-D has been shown to have high internal consistency, with a Cronbach's alpha of 0.92. The scale has also been reported to be a reliable measure for assessing number, types, and duration of depressive symptoms across racial, gender, and age categories. [140]

Religiosity and spirituality: Participant's assessment of religion included items regarding organized religious activity, private prayer, and daily spiritual experiences. The Daily Spiritual Experiences Scale,

which assesses daily spiritual experiences in six domains, including feeling God's presence, feeling's God's love, and being spiritually touched by the creation, and had a Cronbach's alpha of 0.95, indicating high internal reliability. [141] Higher scores indicate increased involvement in religious activity and spiritual experiences.

Discrimination: Discrimination was assessed using 9-items that were adapted from the Multiple Discrimination Scale (Cronbach's $\alpha = 0.84$) [142]. The 9 items assessed different discrimination events in the past year due to race/ethnicity, sexual orientation, and HIV status. Items included "In the past year, were you ignored, excluded, or avoided by people close to you because you are Black or African American? (yes or no)" and " In the past year, were you ignored, excluded, or avoided by people close to you because someone knew or suspected that you are HIV positive? (yes or no)." Scores ranged from 0-9, with higher scores representing more discrimination in the past year.

Covariates: Consistent with previous research [83, 93], covariates include age, any drug use within the past 12 months (yes or no)), study site (e.g., Jackson, MS, or Atlanta, GA) any STIs within the past 12 months (yes or no), sexual orientation (gay/homosexual, bisexual, or straight/heterosexual/questioning/other), HIV status (HIV-negative, HIV-positive), and socioeconomic status. Socioeconomic status information included annual personal income (classified as < $5000, $5000 to $15,999, and $16,000 or higher); educational attainment (less than high school or high school diploma or higher); employment status (full-time/part-time, or unemployed), history of incarceration (yes or no), and transportation status (owning a vehicle, using public transit).

Outcomes:

Sexual behaviors: Fourteen self-reported sexual behaviors were assessed, including consistent condom use with main or casual sexual partners at last sex (dichotomized as 1 for using condoms the entire time

during sex, and 0 for some of the time or not at all); consistent condom use during anal sex with main or casual sexual partners in the past 12 months prior to study enrollment (dichotomized as 1 for always, and 0 for most of the time to never); number of lifetime anal male sexual partners (dichotomized as ≤5 and ≥6 or more partners based on the median distribution of responses); number of main and casual male sex partners in the past 12 months (dichotomized as 0–1 and ≥2 for main partners and 0–2 and ≥3 for casual partners, based on the mean distribution of reported partners); asked last main and casual sexual partner's HIV status prior to sex (yes or no); and, in the past 12 months, engaged in consistent condom use during vaginal sex (yes or no); exchanged sex for money (yes or no); participated in a sex party/orgy (yes or no), or used drugs or alcohol before or during sex (yes or no).

Statistical Analysis

All data were analyzed using SAS 9.4. Descriptive statistics, including frequencies and percentages for categorical variables, and means, standard deviations, medians and interquartile ranges for continuous variables, were generated for all predictors, outcomes, and covariates. Statistical significance was defined as $\alpha=0.05$. The MARI dataset contained 580 observations, but all analyses were conducted for the 412 MARI participants who identified as male and reported only males as their current sex partner. There were three primary analyses conducted to determine whether and how perceived neighborhood context was associated with sexual risk behaviors among Black MSM in the South (e.g., Jackson, MS and Atlanta, GA).

In the first analysis, exploratory factor analysis was conducted for all 21 items measuring perceived neighborhood context to assess whether the three observed variables, physical disorder (e.g., safety, violence, problems), social cohesion, and LGBT-friendliness, measured the latent construct, perceived neighborhood context. Principal axis factoring was used as the extraction method, as principal axis factoring explores the common variance among items and delineates the latent factors in the data.[143]

The number of factors were determined using Kaiser's criteria evaluating eigenvalues above 1, a Scree test, and a parallel analysis. A Promax oblique rotation was used, as this rotational technique produces factors that are correlated, and produces more accurate results for research involving human behaviors.[144] Items loading at least 0.40 were kept for the analysis. Items that cross-loaded on two or more factors were removed, and analyses were repeated until all items strongly loaded on a single factor. The factor-based scores for the domains assessing perceived neighborhood context were utilized in the subsequent regression and mediation analyses as the predictor variables.

The second set of analyses used regression models to determine if a relationship exists between perceived neighborhood context and sexual risk behaviors among Black MSM in the South. The hypothesis tested was that the domains of perceived neighborhood context will be associated with high-risk sexual behaviors among Black MSM, controlling for age, drug use, STIs, HIV status, study site, sexual orientation, and socioeconomic status. Separate bivariate logistic regressions were conducted to individually test the association between each domain assessing perceived neighborhood context as the independent variables, and each of the sexual risk behaviors as outcomes. Multivariable logistic regression was used to test the association between perceived neighborhood context and sexual risk behaviors, controlling for age, drug use, STIs, HIV status, study site, sexual orientation, and socioeconomic status. Each domain assessing perceived neighborhood context was assessed as a continuous predictor. All variables identified as a covariates (e.g., age, HIV status) were regressed on each sexual risk behavior in bivariate logistic regressions to determine if associations were statistically significant, and to ensure that variables should be controlled for in the regression analyses between perceived neighborhood context and sexual risk behaviors. Because the domains of perceived neighborhood context were scales with a wide numeric range, odds ratio were expressed as the ratio associated with a difference of 5 units on each scale rather than a 1-unit difference. Model fit was assessed using the Hosmer-Lemeshow Goodness of Fit Test.

The third set of analyses assessed whether the relationship between perceived neighborhood context and sexual risk behaviors among Black MSM in the South was mediated by discrimination, depression, religiosity/spirituality, and resilience. It was hypothesized that the domains of perceived neighborhood context will be associated with high-risk sexual behaviors among Black MSM through four mediators—discrimination, depression, religiosity/spirituality, and resilience—controlling for age, drug use, STIs, HIV status, study site, sexual orientation, and socioeconomic status. The third set of analyses builds on the results from the regression models developed in the second set of analyses exploring the relationship between perceived neighborhood context and sexual risk behaviors among Black MSM in the South. To better understand the influence of the overall latent construct of perceived neighborhood context on sexual risk behaviors, the mediation analyses focused only on the domains on perceived neighborhood context that were significantly associated with the same sexual risk behaviors identified in both the bivariate and multivariable regression models. Simple mediation models, and parallel multiple mediation models were conducted to test the relationships. Simple mediation models were used to determine how each mediator independently influences the effect of perceived neighborhood context on sexual risk behaviors. Parallel multiple mediation models were used to determine how each mediator influenced the effect of perceived neighborhood context on sexual risk behaviors, adjusting for the other mediators. The conceptual diagrams in Figure 1 and Figure 2 depict the conceptual diagrams for the simple mediation model and the parallel multiple mediation model, respectively. In these diagrams, the domains of perceived neighborhood context (X) was modeled as affecting sexual risk behaviors (Y) through one direct effect pathway ($X \rightarrow Y$), and through four indirect pathways for each mediator (M_1, M_2, M_3, and M_4).

The SAS PROCESS Macro was utilized to test the simple mediation and parallel multiple mediation models.[145] Bootstrap confidence intervals for indirect effects using 5000 samples were generated, as bootstrapping overcomes the assumption of normality and yields the most accurate

results.[146, 147] To prevent the bootstrap confidence interval from changing each time for each analysis of the mediation pathway, the same number was used as a seed ("210") for the random number generator for bootstrapping. All regression models for the mediation analysis were converted from the log odds metric to odds ratios, adjusted for age, drug use, STIs, HIV status, study site, sexual orientation, and socioeconomic status. As with the odds ratios in the bivariate and logistic regressions, the adjusted odds ratios for the mediation analyses were expressed as the ratio associated with a difference of 5 units on each scale rather than a 1-unit difference.

Figure 1: Conceptual Diagrams of Simple Mediation Models

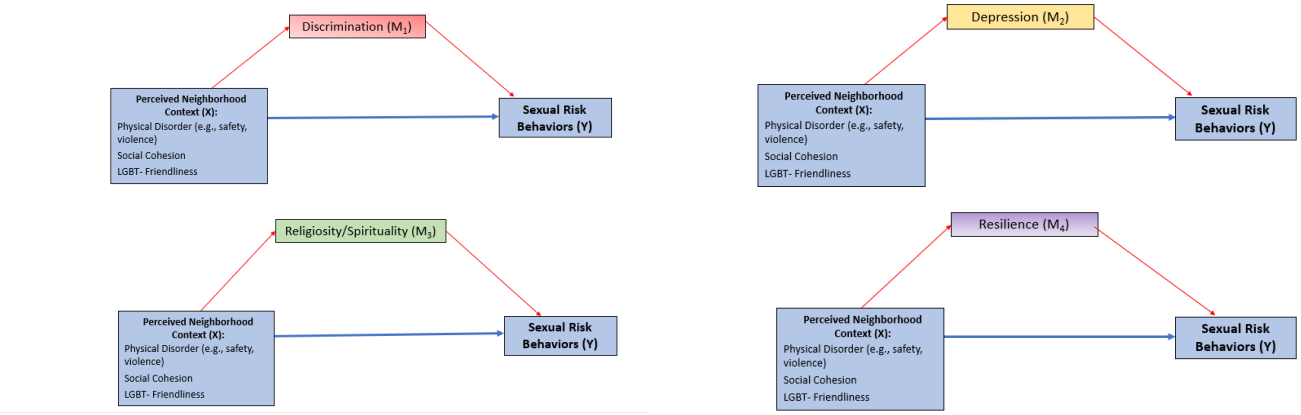
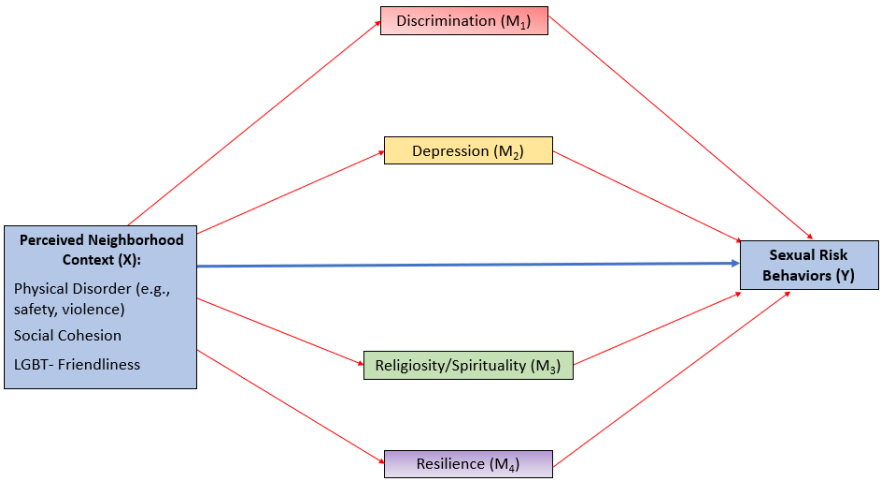


Figure 2: Conceptual Diagram of Parallel Multiple Mediation Model



Chapter 4: Results

Study Participants

From July 2013 to December 2014, 412 Black MSM were enrolled in the study. Table 2 displays demographic characteristics and sexual behaviors of the 412 participants. The mean age of study participants was 29.2 (SD=10.27), and more than half of study participants resided in Jackson, MS (n=252, 61.17%). Majority of study participants identified as gay/homosexual (n=339, 82.28%). Most participants attended some college (n=165, 40.05%), were employed (n=209, 50.73%), and used a personal vehicle for transportation (n=200, 48.54%). More than half of study participants reported testing HIV negative at last test (n=235, 57.04%). Marijuana use was the drug most commonly reported among study participants (n=209, 46.55%). Most reported consistent condom use with a casual partner at last sex (n=286, 69.42%), and during anal sex in the past 12 months (n=248, 60.19%). Of the 159 participants who engaged in vaginal sex in the past 12 months, 15.5% (n=64) reported consistent condom use when having vaginal sex. Most participants asked their last main partner's HIV status before sex (n=246, 59.71%) or asked their casual partner's HIV status before sex (n=222, 53.88%) Additionally, most participants reported alcohol use before or during sex (n=209, 46.55%). The mean scores for the psychosocial factors were as follows: discrimination—1.27 (SD=1.93); depression was 17.93 (SD=12.69); religiosity/spirituality—62.8 (SD=18.54); and resilience—80.5 (SD=19.05).

Table 2: Selected Demographic and Socioeconomic Characteristics, and Sexual Behaviors among Black MSM, 2013-2014 (n=412)*

Age, mean (SD)	29.15 (10.27)
Site, n (%)	
Jackson, MS	252 (61.17%)
Atlanta, GA	160 (38.83%)
Sexual orientation, n (%)	
Gay/homosexual	339 (82.28%)
Bisexual	64 (15.53%)
Questioning/Non-identifying	7 (1.70%)
Straight/heterosexual	2 (0.49%)

Income, n (%)*	
<$5,000	147 (35.68%)
$5,000 to $15,999	120 (29.13%)
$16,000 or higher	141 (34.22%)
Education, n (%)	
Less than high school	27 (6.55%)
High school diploma	131 (31.80%)
Some college	165 (40.05%)
Bachelor's Degree and higher	89 (21.60%)
Employment Status, n (%)	
Full-time/part-time	209 (50.73%)
Unemployed	203 (49.27%)
Transportation Status, n (%)*	
Personal vehicle	200 (48.54%)
Public transit	124 (30.10%)
Friends/family	86 (20.87%)
Ever incarcerated, n (%)*	
No	277 (67.23%)
Yes	134 (32.52%)
HIV status, n (%)*	
HIV positive	168 (40.78%)
HIV negative	235 (57.04%)
STIs diagnosed in past 12 months, n (%)*	
Syphilis	42 (10.19%)
Gonorrhea	35 (8.50%)
Chlamydia	32 (7.77%)
Genital Warts/Human papillomavirus (HPV)	7 (1.70%)
Herpes	6 (1.46%)
Hepatitis B	4 (0.97%)
Hepatitis A	3 (0.73%)
Trichomonas	1 (0.24%)
Substance use within past 12 months, n (%) *	
Marijuana	194 (47.09%)
Powdered cocaine	30 (7.28%)
Crack cocaine	20 (4.85%)
Painkillers (e.g., morphine, codeine, oxycodone)	8 (1.94%)
Viagra	7 (1.70%)
Crystal meth	6 (1.46%)
Inhalants	4 (0.97%)
Downers (e.g., Valium, Ativan)	3 (0.73%)
Sexual behaviors, n (%)	
Consistent condom use at last sex, main partner	222 (53.88%)

Consistent condom use at last sex, casual partner	286 (69.42%)
Consistent condom use during anal sex in past 12 months, main partner	173 (41.99%)
Consistent condom use during anal sex in past 12 months, casual partner	248 (60.19%)
≥ 6 lifetime anal male sex partners	281 (68.20%)
≥ 2 main male sex partners in past 12 months	161 (39.08%)
≥ 3 casual male sex partners in past 12 months	182 (44.17%)
Asked last main partner's HIV status before sex	246 (59.71%)
Asked last casual partner's HIV status before sex	222 (53.88%)
Engaged in vaginal sex in the past 12 months	159 (38.59%)
Consistent condom use during vaginal sex in past 12 months	64 (15.53)%
Exchanged sex for money in past 12 months	63 (15.29%)
Sex party or orgy in past 12 months	62 (15.05%)
Any drugs before or during sex	139 (33.74%)
Any alcohol before or during sex	195 (47.33%)
Psychosocial factors, mean (SD)	
Discrimination	1.27 (1.93)
Depression	17.93 (12.69)
Religiosity/Spirituality	62.80 (18.54)
Resilience	80.50 (19.05)

missing data observations by variable: income (n=4), transportation status (n=2), ever incarcerated (n=1), HIV status (n=9), STIs diagnosed in past year (n=6), substance use within past year (n=6).

Exploratory Factor Analysis Results

The first research question assessed whether the observed variables, physical disorder (e.g., safety, violence, problems), social cohesion, and LGBT-friendliness, held together as measures of the latent construct, perceived neighborhood context.

Among the 412 study participants, 16 observations were excluded due to missing data. However, the analytic sample size of 396 participants was still sufficient for the analyses, and with the 21-item survey, met the recommended 15:1 participants per item ratio.[144] The correlation matrix in Table 3 showed a correlation of items between 0.001 and 0.810. Each item correlated at 0.3 with at least one other item, indicating that most of the items were correlated with one another. The Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy was 0.86, above the recommended value of 0.6, indicating that a factor analysis was suitable for all 21 items.

Table 3: Item Correlations

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1	1.000																				
2	0.734**	1.000																			
3	-0.222**	-0.239**	1.000																		
4	0.512**	0.664**	-0.256**	1.000																	
5	-0.142*	-0.134*	0.503**	-0.127*	1.000																
6	0.404**	0.476**	-0.102*	0.523**	-0.117*	1.000															
7	0.025	0.053	0.266**	0.086	0.195**	0.257**	1.000														
8	0.080	0.110*	0.247**	0.160*	0.226**	0.314**	0.810**	1.000													
9	0.003	0.016	0.290**	0.042	0.165*	0.130*	0.753**	0.725**	1.000												
10	0.148*	0.188*	0.207**	0.173*	0.169*	0.267**	0.534**	0.575**	0.524**	1.000											
11	0.122*	0.187*	0.226**	0.156*	0.149*	0.253**	0.532**	0.570**	0.484**	0.718**	1.000										
12	0.055	0.121*	0.271**	0.086	0.220**	0.119*	0.452**	0.479**	0.490**	0.607**	0.595**	1.000									
13	0.168*	0.201**	0.180*	0.156*	0.150*	0.163*	0.435**	0.495**	0.494**	0.585**	0.548**	0.726**	1.000								
14	0.143*	0.243**	0.244**	0.187*	0.171*	0.248**	0.515**	0.563**	0.531**	0.638**	0.598**	0.661**	0.703**	1.000							
15	0.162*	0.188*	0.149*	0.177*	0.096	0.242**	0.464**	0.456**	0.453**	0.528**	0.556**	0.619**	0.678**	0.710**	1.000						
16	0.213**	0.230**	0.077	0.177*	0.090	0.184*	0.230**	0.195**	0.159*	0.237**	0.127*	0.196**	0.272**	0.244**	0.251**	1.000					
17	0.163*	0.153*	-0.048	0.130*	0.041	-0.010	-0.039	-0.072	0.002	-0.011	-0.055	-0.002	0.110*	-0.015	0.091	0.186*	1.000				
18	0.267*	0.276**	-0.029	0.220**	0.073	0.171*	0.093	0.090	0.070	0.090	0.015	0.059	0.178**	0.124*	0.092	0.379**	0.442**	1.000			
19	0.152*	0.142*	-0.037	0.146*	0.012	0.021	0.017	0.001	0.028	0.086	-0.002	0.030	0.122*	0.062	0.171*	0.098	0.312**	0.412**	1.000		
20	0.228**	0.270**	0.006	0.120*	0.042	0.085	-0.032	-0.049	0.011	0.002	-0.049	0.038	0.078	0.023	0.053	0.150*	0.370**	0.344**	0.289**	1.000	
21	0.152*	0.186*	0.057	0.112*	-0.006	0.066	0.119*	0.095	0.116*	0.171*	0.087	0.164*	0.220**	0.192*	0.152*	0.207**	0.211**	0.288**	0.285**	0.398**	1.000

**p<0.05*
***p<0.001*

Principal axis factoring was used to determine the factor structure, as principal axis factoring explores the common variance among items and delineates the latent factors in the data.[143] Several criteria were used to determine the number of factors. Kaiser's criteria identified 3 factors with eigenvalues above 1 (see Table 4). The proportion of variance criterion recommended a 4-factor solution, as there were 4 factors that accounted for at least 5% of the common variance, and the cumulative percentage of the common variance of the 4 factors was 101.18% (see Table 4). The Scree test, shown in Figure 3, suggested a 5-factor solution, as there was a relatively large break between factors 1 and 2, a large break between factors 2 and 3, and relatively small breaks between factors 3 and 4, and factors 4 and 5. Factors 6 through 21 had relatively no breaks, possibly due to small eigenvalues. However, a parallel analysis provides the most accurate results, and the graph in Figure 4 indicates a presence of 4 underlying dimensions.[148] Thus, a 4-factor solution was utilized in the final model.

Table 4: Eigenvalues of Reduced Correlation Matrix for 4 Factors

	Eigenvalue	**Difference**	**Proportion (%)**	**Cumulative (%)**
1	5.868	3.114	54.79%	54.79%
2	2.754	1.336	25.71%	80.50%
3	1.418	0.621	13.24%	93.74%
4	0.797	0.325	7.44%	101.18%

Figure 3: Scree Test for Factor Retention

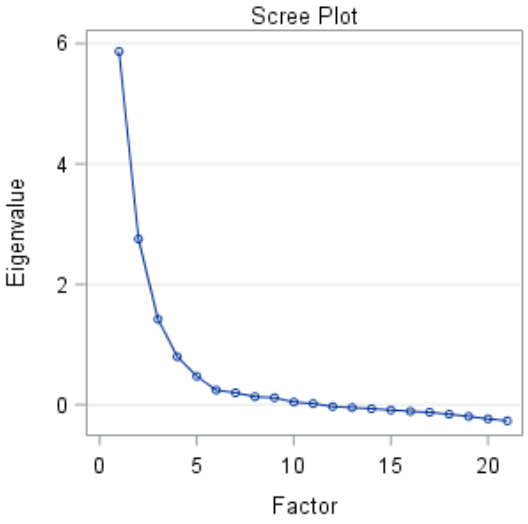
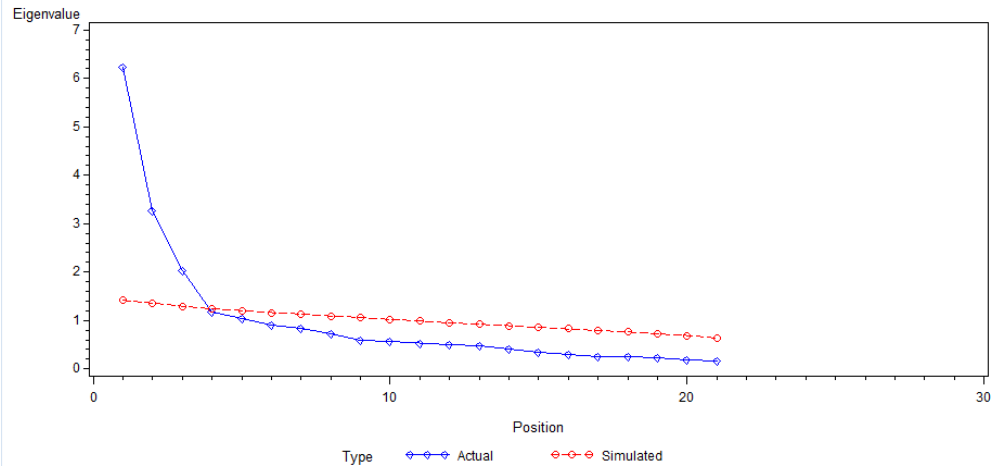


Figure 4: Parallel Analysis for Factor Retention



A Promax oblique rotation was used, as this rotational technique is appropriate when factors are correlated and not independent.[144] In the oblique rotated factor pattern, an item was said to have a meaningful loading on a given factor if the factor loading was 0.40 or greater for that factor, and less than 0.40 for other factors.[148] Table 5 provides the factor loadings and communalities on each factor in the 4-factor solution. In the 4-factor solution, each factor has at least 3 items with meaningful loadings. There were six items that loaded on Factor 1, which was subsequently grouped as neighborhood problems (e.g., lack of parks or playgrounds; trash and litter). Four items loaded on Factor 2, including

the single item measuring neighborhood safety (Item 6). As a result, Factor 2 was grouped as social cohesion and safety. Three items loaded on Factor 3, which was grouped as neighborhood violence (e.g., fights in neighborhood, violent arguments, gang fights). Five items loaded on Factor 4, which was grouped as neighborhood LGBT-friendliness. The item communalities ranged from 0.212 to 0.787, suggesting that the 4-factor solution accounted for approximately 21% to 79% of the variance for each item.

Although Item 3 and Item 5 were reverse coded because they are negatively termed, these items did not have meaningful loadings on any of the factors. When reviewing the correlations for these items with the other items loading on social cohesion (Items 1, 2, and 4; see Table 3) the inter-item correlations among Items 1, 2, and 4 are high (Items 1 and 2: r=0.734; Items 1 and 4: r=0.512, Items 2 and 4: r=0.664) but when these items correlate with 3 and 5, the correlations are lower and in the opposite direction (Items 1 and 3: r=-0.222; Items 1 and 5: r=-0.142; Items 2 and 5: r= -0.134; Items 4 and 5: r=-0.127). Additionally, the estimated internal consistency of the items within neighborhood social cohesion (Items 1--5) indicate poor reliability, as the Cronbach's alpha was 0.428 and less than the acceptable Cronbach's alpha for reliability (i.e.., $\alpha \geq 0.70$). The results for Items 3 and 5 may be due to response bias, as participant's may not have realized that the items were negatively termed, and responded to these items as if they were in the same order as Items 1, 2, and 4. As a result, Items 3 and 5 were not included in any of the domains assessing perceived neighborhood context.

Item 16 also did not have a meaningful loading on any of the 4 factors, and was not included in any of the domains assessing perceived neighborhood context. It is important to note that item 16 has a different measurement scale (i.e., 1=not at all gay friendly to 3=very gay friendly) than the other items in the survey that measure feelings regarding the gay community (e.g., for item 17—Feel that there is a gay community is measured as 1=Yes, 2=Somewhat, 3=No), and this difference in measurement scale may attribute to the lack of meaningful loadings.

Table 5: Factor Loadings and Component Communalities for Items Assessing Perceived Neighborhood Context

	Factor Loadings				Communalities	
	Factor 1: Neighborhood Problems	**Factor 2: Social Cohesion and Safety**	**Factor 3: Neighborhood Violence**	**Factor 4: LGBT-Friendliness**	**Initial**	**Extraction**
12: Lack of access to adequate food/shopping	**0.854**	-0.115	-0.031	-0.009	0.634	0.670
13: Lack of parks or playgrounds	**0.854**	-0.032	-0.064	0.108	0.673	0.702
15: No/poorly maintained sidewalks	**0.796**	0.036	-0.043	0.036	0.631	0.620
14: Trash and litter	**0.789**	0.038	0.074	-0.013	0.687	0.709
11: Heavy traffic or speeding cars	**0.637**	0.084	0.195	-0.164	0.616	0.601
10: Excessive noise	**0.620**	0.066	0.220	-0.040	0.632	0.612
2: People are willing to help neighbors	0.098	**0.784**	-0.069	0.127	0.688	0.722
4: People in neighborhood can be trusted	0.009	**0.721**	0.046	0.037	0.522	0.549
1: Close knit neighborhood	0.041	**0.686**	-0.059	0.146	0.561	0.559
6: Neighborhood is safe from crime	-0.012	**0.608**	0.248	-0.068	0.417	0.431
5: People in this neighborhood do not share the same values	0.097	-0.388	0.239	0.193	0.313	0.218
3: People in this neighborhood generally don't get along with each other	0.170	-0.482	0.280	0.122	0.379	0.331
7: Fight in neighborhood with weapon	0.066	-0.008	**0.839**	0.004	0.734	0.774
8: Frequency of violent arguments	0.130	0.070	**0.795**	-0.057	0.738	0.787
9: Frequency of gang fights	0.198	-0.102	**0.672**	0.032	0.654	0.647
18: People in neighborhood open and acceptive to LGBT community	-0.103	0.076	0.125	**0.671**	0.421	0.478
17: Feel there is a "gay community"	-0.042	-0.040	-0.059	**0.597**	0.303	0.339
20: Someone said "there's a LGBT" community	-0.047	0.021	-0.041	**0.589**	0.319	0.347
19: City is supportive community for LGBT	0.030	-0.021	-0.048	**0.525**	0.280	0.274
21: Gay community serves individual needs	0.121	-0.022	0.004	**0.470**	0.253	0.252
16: Neighborhood is gay friendly	0.101	0.088	0.148	0.334	0.254	0.212

Note: Factor loadings in boldface indicate the final significant loading of each item on the four factors.

Table 6 reports the descriptive statistics (including the mean, standard deviations, and range), the factor-based correlations, and the estimated internal consistency of the responses to each factor-based scale. Items with meaningful loadings (i.e., excluding items 3, 5, and 16) were summed for each of the 4 domains for perceived neighborhood context. Scores for neighborhood problems ranged from 6 to 24, with higher scores indicating more neighborhood problems. Total scores for social cohesion and safety ranged from 4 to 16, with higher scores indicating less cohesiveness and safety within the neighborhood. Total scores for neighborhood violence ranged from 3 to 12, with higher scores indicating more neighborhood violence. Total scores for LGBT-friendliness ranged from 5 to 17, with higher scores indicating less LGBT-friendliness within the neighborhood. Based on the average scores for neighborhood problems (mean=11.46, SD=5.25) and LGBT-friendliness (mean=9.40, SD=3.04), most participants perceived their neighborhoods to have minor problems, but lack LGBT-friendliness.

The estimates of internal consistency as measured by Cronbach's alpha are reported along the diagonal of Table 6. The coefficients range from 0.714 to 0.91, and indicate acceptable reliability. Similar results were identified in the correlations between the factor-based scales. For example, in Table 6, there was a statistically significant, and moderately strong positive correlation between neighborhood problems and neighborhood violence (r =0.657). There were statistically significant, and weak positive correlations between social cohesion and safety, and neighborhood problems (r =0.257), and between social cohesion and safety, and neighborhood violence (r =0.146), suggesting that participants who consider their neighborhood to lack social cohesion and safety also consider their neighborhoods to have high problems and violence. There was also a statistically significant, moderately weak positive correlation between social cohesion and safety, and LGBT-friendliness (r =0.272), which may suggest that neighborhoods that are not closely-knit may lack a LGBT-friendly community. However, participants may consider LGBT-friendly communities to be associated with high neighborhood

problems and violence based on the positive but weak correlations between these domains (r =0.121, and r =0.035).

Table 6: Descriptive Statistics, Intercorrelations, and Cronbach's Alpha for Factor-Based Scales

Domain	Mean (SD)	Range	Neighborhood Problems	Social Cohesion and Safety	Neighborhood Violence	LGBT-Friendliness
Neighborhood problems	11.46 (5.25)	6—24	**[0.910]**			
Social cohesion and safety	9.12 (2.95)	4—16	0.257**	**[0.832]**		
Neighborhood violence	5.69 (2.76)	3—12	0.657**	0.146*	**[0.908]**	
LGBT-friendliness	9.40 (3.04)	5—17	0.121*	0.272**	0.035	**[0.714]**

*$p<0.05$
**$p<0.001$

Bivariate and Multivariable Regression Analysis

Table 7 shows the results of the bivariate and multivariable logistic regressions assessing the association between the domains of perceived neighborhood context and sexual risk behaviors among Black MSM in the South.

Neighborhood problems: Based on the scoring of neighborhood problems, higher scores indicate more neighborhood problems. For each 5 unit increase in neighborhood problems, the odds of Black MSM reporting consistent condom use with a casual partner at last sex decreased by 20% (OR=0.80, 95%CI=0.65, 0.97). The results were similar for those reporting consistent condom use during anal sex in the past 12 months with a casual partner (OR=0.80, 95%CI=0.66, 0.97). Black MSM reporting more neighborhood problems also had higher odds of reporting drug use before or during sex, as the odds significantly increased by 29% for each 5 unit increase in neighborhood problems (OR=1.29, 95%CI=1.06, 1.57). There were no statistically significant associations between neighborhood problems and sexual risk behaviors when adjusting for the covariates (i.e., age, drug use within the past 12 months, STIs within the past 12 months, sexual orientation, socioeconomic status, HIV status, and study site).

Social cohesion and safety: Based on the scoring of social cohesion and safety, higher scores indicate less social cohesion and safety. For each 5 unit increase in social cohesion and safety, the odds of Black MSM reporting consistent condom use during anal sex in the past 12 months with a main partner decreased by 38% (OR=0.62, 95%CI=0.44, 0.87), and by 42% for those reporting consistent condom use during anal sex in the past 12 months with a casual partner (OR=0.58, 95%CI=0.41, 0.83). These results remained statistically significant after adjusting for the covariates (consistent condom use during anal sex in past 12 months with main partner [AOR=0.64, 95%CI=0.44, 0.92]; consistent condom use during anal sex in past 12 months with casual partner [AOR=0.59, 95%CI=0.40, 0.86]). The odds of reporting consistent condom use during vaginal sex in the past 12 months significantly decreased by 47% for each 5 unit increase in social cohesion and safety (OR=0.53, 95%CI=0.31, 0.880), and the results remained statistically significant after adjusting for the covariates (AOR=0.36, 95%CI=0.18, 0.70). Additionally, Black MSM reporting low social cohesion and safety had greater odds of reporting alcohol use or drug use before or during sex (alcohol use before/during sex [OR=1.59, 95%CI=1.13, 2.25]; drug use before/during sex [OR=1.63, 95%CI=1.13, 2.35]) These results were similar in the adjusted models (alcohol use before/during sex [AOR=1.70, 95%CI=1.15, 2.49]; drug use before/during sex [AOR=2.50, 95%CI=1.45, 4.32]).

Neighborhood violence: Based on the scoring of neighborhood violence, higher scores indicate more neighborhood violence. For each 5 unit increase in neighborhood violence, the odds of Black MSM reporting consistent condom use with a casual partner at last sex decreased by 38% (OR=0.62, 95%CI=0.43, 0.91), and by 35% for those reporting consistent condom use during anal sex with a casual partner in the past 12 months (OR=0.65, 95%CI=0.45, 0.93). Additionally, Black MSM reporting more neighborhood violence had higher odds of exchanging sex for money in the past 12 months (OR=2.05, 95%CI=1.29, 3.24), as well as higher odds of engaging in a sex party or orgy in the past 12 months (OR=2.08, 95%CI=1.31, 3.30). There was also an 83% increase in the odds of reporting drug use before

or during sex for each 5 unit increase in neighborhood violence (OR=1.83, 95%CI=1.26, 2.67). In the adjusted models, only exchanging sex for money in the past 12 months remained statistically significant. That is, for each 5 unit increase in neighborhood violence, the odds of exchanging sex for money in the past 12 months increased by 70% (AOR=1.70, 95%CI=1.01, 2.87). Neighborhood violence was not significantly associated with any of the other sexual risk behaviors assessed in the multivariable models.

LGBT-Friendliness: Based on the scoring of LGBT-friendliness, higher scores indicate less LGBT-friendliness within the neighborhood. For each 5 unit increase in LGBT-friendliness, the odds of Black MSM reporting consistent condom use at last sex with a main partner decreased by 29% (OR=0.71, 95%CI=0.51, 0.99); however, this association was not statistically significant in the multivariate model. For each 5 unit increase in LGBT-friendliness, the odds of Black MSM reporting consistent condom use during anal sex with a casual partner in the past 12 months decreased by 36% (OR=0.64, 95%CI=0.46, 0.90). Additionally, there was a 37% decrease in the odds of Black MSM asking their last causal sex partner's HIV status before sex for each 5 unit increase in LGBT-friendliness (OR=0.63, 95%CI=0.43, 0.93). Results were similar in the adjusted models (consistent condom use with anal sex in the past 12 months with a casual partner [AOR=0.58, 95%CI=0.41, 0.84]; asked last casual sex partner's HIV status [AOR=0.57, 95%CI=0.37, 0.86]).

Table 7: Bivariate and Multivariable Logistic Regression Analysis of the Associations between Domains Assessing Perceived Neighborhood Context and Sexual Risk Behaviors among Black MSM in the South (n=412)

	Neighborhood Problems		Social Cohesion and Safety		Neighborhood Violence		LGBT-Friendliness	
	Unadjusted OR (95% CI)	**Adjusted OR (95% CI)**	**Unadjusted OR (95% CI)**	**Adjusted OR (95% CI)**	**Unadjusted OR (95% CI)**	**Adjusted OR (95% CI)**	**Unadjusted OR (95% CI)**	**Adjusted OR (95% CI)**
Consistent condom use at last sex								
--with main partner	0.87 (0.72, 1.05)	0.92 (0.75, 1.13)	0.78 (0.56, 1.09)	0.82 (0.57, 1.18)	0.72 (0.51, 1.03)	0.76 (0.52, 1.13)	0.71 (0.51, 0.99)*	0.74 (0.52, 1.05)
--with casual partner	0.80 (0.65, 0.97)*	0.85 (0.68, 1.06)	0.71 (0.49, 1.03)	0.71 (0.47, 1.05)	0.62 (0.43, 0.91)*	0.66 (0.43, 1.0)	0.77 (0.54, 1.09)	0.74 (0.50, 1.08)
Consistent condom use during anal sex in past 12 months								
--with main partner	0.86 (0.71, 1.04)	0.94 (0.76, 1.15)	0.62 (0.44, 0.87)*	0.64 (0.44, 0.92)*	0.83 (0.58, 1.19)	0.93 (0.62, 1.38)	0.76 (0.55, 1.06)	0.78 (0.54, 1.11)
--with casual partner	0.80 (0.66, 0.97)*	0.92 (0.75, 1.14)	0.58 (0.41, 0.83)*	0.59 (0.40, 0.86)*	0.65 (0.45, 0.93)*	0.78 (0.52, 1.16)	0.64 (0.46, 0.90)*	0.58 (0.41, 0.84)*
≥ 6 lifetime anal male sex partners	1.12 (0.91, 1.37)	1.03 (0.81, 1.32)	1.30 (0.90, 1.88)	1.07 (0.71, 1.61)	1.13 (0.76, 1.67)	1.03 (0.65, 1.63)	0.92 (0.65, 1.30)	1.10 (0.73, 1.65)
≥ 2 main male sex partners in past 12 months	1.10 (0.91, 1.33)	1.01 (0.82, 1.24)	1.09 (0.77, 1.53)	1.06 (0.73, 1.53)	1.18 (0.83, 1.70)	0.99 (0.66, 1.48)	0.85 (0.61, 1.19)	0.77 (0.54, 1.11)
≥ 3 casual male sex partners in past 12 months	1.04 (0.86, 1.26)	0.92 (0.75, 1.13)	1.06 (0.76, 1.48)	1.02 (0.71, 1.46)	1.17 (0.82, 1.68)	0.92 (0.62, 1.36)	1.18 (0.85, 1.63)	1.27 (0.90, 1.80)
Asked last main sex partner's HIV status	1.02 (0.80, 1.30)	1.06 (0.81, 1.39)	0.99 (0.64, 1.54)	1.07 (0.66, 1.73)	0.75 (0.48, 1.17)	0.78 (0.47, 1.28)	0.76 (0.50, 1.15)	0.70 (0.45, 1.11)
Asked last casual sex partner's HIV status	0.98 (0.79, 1.23)	0.98 (0.77, 1.25)	0.69 (0.46, 1.05)	0.65 (0.42, 1.02)	0.69 (0.45, 1.04)	0.72 (0.45, 1.14)	0.63 (0.43, 0.93)*	0.57 (0.37, 0.86)*
Consistent condom use during vaginal sex in past 12 months	1.04 (0.79, 1.36)	1.15 (0.81, 1.62)	0.53 (0.31, 0.88)*	0.36 (0.18, 0.70)*	1.18 (0.70, 1.99)	1.45 (0.73, 2.88)	1.18 (0.73, 1.94)	1.06 (0.59, 1.90)
Exchanged sex for money in past 12 months	1.27 (0.99, 1.62)	1.22 (0.93, 1.60)	0.82 (0.51, 1.30)	0.86 (0.52, 1.42)	2.05 (1.29, 3.24)*	1.70 (1.01, 2.87)*	0.84 (0.53, 1.32)	1.00 (0.61, 1.62)
Sex party or orgy in past 12 months	1.23 (0.96, 1.58)	1.06 (0.81, 1.39)	0.91 (0.57, 1.45)	0.87 (0.53, 1.44)	2.08 (1.31, 3.30)*	1.55 (0.93, 2.58)	0.93 (0.59, 1.47)	1.18 (0.73, 1.91)
Any alcohol before or during sex	1.04 (0.87, 1.26)	0.95 (0.77, 1.18)	1.59 (1.13, 2.25)*	1.70 (1.15, 2.49)*	1.21 (0.85, 1.72)	0.99 (0.65, 1.50)	1.03 (0.75, 1.43)	1.13 (0.79, 1.64)
Any drugs before or during sex	1.29 (1.06, 1.57)*	0.98 (0.74, 1.31)	1.63 (1.13, 2.35)*	2.50 (1.45, 4.32)*	1.83 (1.26, 2.67)*	0.94 (0.55, 1.62)	0.74 (0.52, 1.05)	1.03 (0.64, 1.66)

*OR—odds ratio, CI—confidence interval ; *p<0.05;*

Simple Mediation Analyses and Parallel Multiple Mediation Analyses

As aforementioned in the Methods, mediation analyses focused only on the domains on perceived neighborhood context that were significantly associated with the same sexual risk behaviors identified in both the bivariate and multivariable regression models. Based on the bivariate and multivariable regression models, social cohesion and safety, and LGBT-friendliness were significantly associated with consistent condom use during anal sex in the past 12 months (social cohesion and safety: AOR=0.59, 95%CI=0.40, 0.86; LGBT-friendliness: AOR=0.58, 95%CI=0.41, 0.84). The mediation analyses were conducted to explore whether and how the four mediators—discrimination, depression, religiosity/spirituality, and resilience—influenced these relationships.

Figure 5 and Figure 6 display the statistical diagrams for the simple mediation models and the parallel multiple mediation model of the relationship between social cohesion and safety, and consistent condom use during anal sex in the past 12 months, adjusted for the covariates. Table 8 shows the results of the mediated effects depicted in Figure 5 and Figure 6. In the simple mediation models, there were statistically significant indirect effects of social cohesion and safety on consistent condom use during anal sex in the past 12 months with a casual partner through depression and resilience. That is, for each 5 unit increase in social cohesion and safety, the odds of consistent condom use during anal sex in the past 12 months with a casual partner decreased by 13% through depression (AOR=0.87, Boot 95%CI=0.76, 0.96), and by 8% through resilience (AOR=0.92, Boot 95%CI=0.81, 0.99). In the parallel multiple mediation model, the direct effect of social cohesion and safety on consistent condom use during anal sex in the past 12 months with a casual partner remained statistically significant, adjusting for the other indirect effects (AOR=0.65, Boot 95%CI=0.44, 0.97). Additionally, depression significantly mediated

this relationship when adjusting for the other mediators, based on results from the parallel mediation model (AOR=0.89, Boot 95% CI=0.77, 0.98).

Similar results were observed in the mediation models exploring the relationship between LGBT-friendliness and consistent condom use during anal sex in the past 12 months with a casual partner. Table 9 displays the results of the mediated effects, and Figure 7 and Figure 8 display the statistical diagrams for the simple mediation models and parallel mediation model of this relationship, respectively. In the simple mediation models, there were statistically significant indirect effects of LGBT-friendliness on consistent condom use during anal sex in the past 12 months with a casual partner through depression and resilience. That is, for each 5 unit increase in LGBT-friendliness, the odds of consistent condom use during anal sex in the past 12 months with a casual partner decreased by 13% through depression (AOR=0.87, Boot 95% CI=0.76, 0.95), and by 9% through resilience (AOR=0.91, Boot 95% CI=0.80, 0.98). In the parallel multiple mediation model, the odds of consistent condom use during anal sex in the past 12 months with a casual partner decreased by 32% for each 5 unit increase in LGBT-friendliness, adjusting for other indirect effects (AOR=0.68, Boot 95%CI=0.46, 1.02); however, this was not statistically significant. Yet, depression significantly mediated this relationship when adjusting for the other mediators, based on results from the parallel mediation model (AOR=0.90, Boot 95% CI=0.78, 0.98).

Table 8: Simple Mediation Effects and Parallel Multiple Mediation Effects of Psychosocial Mediators on the Relationship between Social Cohesion & Safety and Consistent Condom Use during Anal Sex in Past 12 Months with Casual Partner

Simple Mediation Models: Model Pathways	**Coefficients/Effect (SE)^**	**AOR (Boot 95% CI)**
Social cohesion & safety →Discrimination	0.023 (0.034)	
Discrimination→Condom use	-0.056 (0.056)	
Indirect Effect: Social cohesion & safety →Discrimination→Condom use	-0.001 (0.004)	0.99 (0.95, 1.02)
Direct Effect: Social cohesion & safety →Condom use	-0.103 (0.038)*	0.60 (0.41, 0.87)*
Social cohesion & safety →Depression	0.915 (0.217)*	
Depression→Condom use	-0.031 (0.009)*	
Indirect Effect: Social cohesion & safety →Depression→Condom use	-0.028 (0.012)*	0.87 (0.76, 0.96)*
Direct Effect: Social cohesion & safety →Condom use	-0.086 (0.040)*	0.65 (0.44, 0.96)*
Social cohesion & safety →Religiosity/Spirituality	-0.650 (0.330)*	
Religiosity/Spirituality→Condom use	0.005 (0.006)	
Indirect Effect: Social cohesion & safety →Religiosity/Spirituality→Condom use	-0.003 (0.005)	0.98 (0.92, 1.03)
Direct Effect: Social cohesion & safety →Condom use	-0.104 (0.039)*	0.59 (0.40, 0.87)*
Social cohesion & safety →Resilience	-1.010 (0.311)*	
Resilience→Condom use	0.017 (0.006)*	
indirect Effect: Social cohesion & safety →Resilience→Condom use	-0.017 (0.011)*	0.92 (0.81, 0.99)*
Direct Effect: Social cohesion & safety →Condom use	-0.089 (0.039)*	0.64 (0.44, 0.94)*
Parallel Multiple Mediation Model: Model Pathways	**Coefficients/Effect (SE)^**	**AOR (Boot 95% CI)**
Social cohesion & safety →Discrimination	0.033 (0.035)	
Social cohesion & safety →Depression	0.913 (0.221)*	
Social cohesion & safety →Religiosity/Spirituality	-0.689 (0.326)*	
Social cohesion & safety →Resilience	-0.890 (0.311)*	
Discrimination→Condom use	0.010 (0.061)	
Depression→Condom use	-0.025 (0.010)*	
Religiosity/Spirituality→Condom use	-0.0003 (0.007)	
Resilience→Condom use	0.010 (0.007)	
Indirect Effect: Social cohesion & safety →Discrimination→Condom use	0.0003 (0.004)	1.00 (0.96, 1.04)
Indirect Effect: Social cohesion & safety →Depression→Condom use	-0.023 (0.013)*	0.89 (0.77, 0.98)*
Indirect Effect: Social cohesion & safety →Religiosity/Spirituality→Condom use	0.0003 (0.006)	1.00 (0.94, 1.08)
Indirect Effect: Social cohesion & safety →Resilience→Condom use	-0.009 (0.009)	0.95 (0.85. 1.02)
Direct Effect: Social cohesion & safety →Condom use	-0.085 (0.041)*	0.65 (0.44, 0.97)*

SE—Standard Error; AOR—adjusted odds ratio at 5 units change; CI—confidence interval ;Boot 95% CI—based on 5000 bootstrapped samples,
**Boot 95% CI does not include 1.00, indicating statistical significance;*
^for indirect effects, SE are based on 5000 bootstrapped samples

Figure 5: Statistical Diagrams of Simple Mediation Effects of Psychosocial Mediators on the Relationship between Social Cohesion & Safety and Consistent Condom Use during Anal Sex in Past 12 Months with Casual Partner

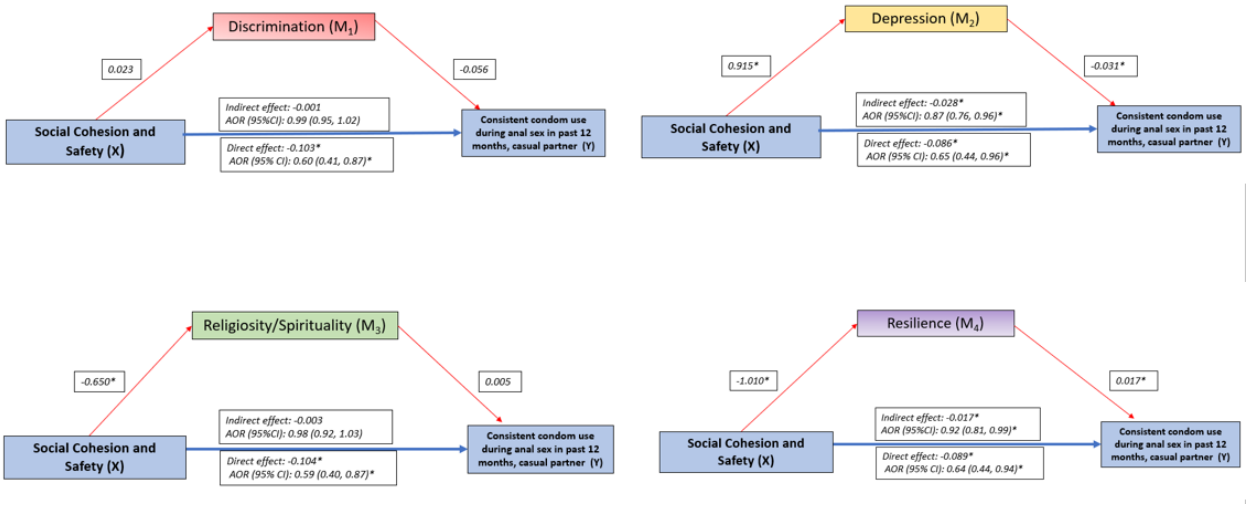


Figure 6: Statistical Diagram of Parallel Multiple Mediation Effects of Psychosocial Mediators on the Relationship between Social Cohesion & Safety and Consistent Condom Use during Anal Sex in Past 12 Months with Casual Partner

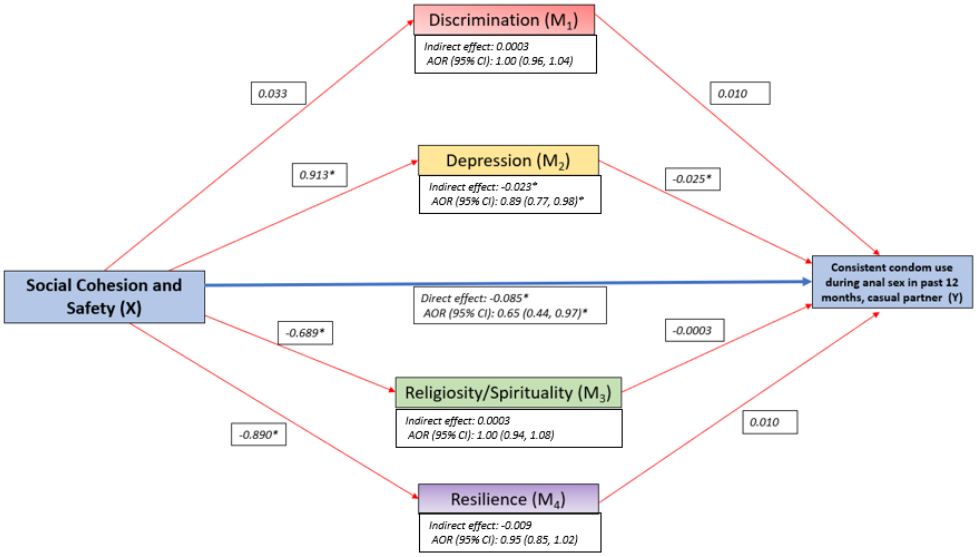


Table 9: Simple Mediation Effects and Parallel Multiple Mediation Effects of Psychosocial Mediators on the Relationship between LGBT-Friendliness and Consistent Condom Use during Anal Sex in Past 12 Months with Casual Partner

Simple Mediation Models: Model Pathways	**Coefficients/Effect (SE)^**	**AOR (Boot 95% CI)**
LGBT-friendliness→Discrimination	0.070 (0.033)*	
Discrimination→Condom use	-0.047 (0.057)	
Indirect Effect: LGBT-friendliness→Discrimination→Condom use	-0.003 (0.005)	0.98 (0.92, 1.02)
Direct Effect: LGBT-friendliness →Condom use	-0.105 (0.037)*	0.59 (0.41, 0.85)*
LGBT-friendliness →Depression	0.875 (0.210)*	
Depression→Condom use	-0.031 (0.009)*	
Indirect Effect: LGBT-friendliness →Depression→Condom use	-0.027 (0.011)*	0.87 (0.76, 0.95)*
Direct Effect: LGBT-friendliness →Condom use	-0.075 (0.038)*	0.69 (0.47, 1.00)
LGBT-friendliness →Religiosity/Spirituality	-1.770 (0.313)*	
Religiosity/Spirituality→Condom use	0.002 (0.006)	
Indirect Effect: LGBT-friendliness →Religiosity/Spirituality→Condom use	-0.003 (0.012)	0.99 (0.87, 1.11)
Direct Effect: LGBT-friendliness →Condom use	-0.096 (0.039)*	0.62 (0.42, 0.91)*
LGBT-friendliness →Resilience	-1.083 (0.302)*	
Resilience→Condom use	0.018 (0.006)*	
Indirect Effect: LGBT-friendliness →Resilience→Condom use	-0.019 (0.011)*	0.91 (0.80, 0.98)*
Direct Effect (LGBT-friendliness →Condom use)	-0.088 (0.038)*	0.64 (0.44, 0.93)*
Parallel Multiple Mediation Model: Model Pathways	**Coefficients/Effect (SE)^**	**AOR (Boot 95% CI)**
LGBT-friendliness→Discrimination	0.075 (0.034)*	
LGBT-friendliness →Depression	0.831 (0.217)*	
LGBT-friendliness →Religiosity/Spirituality	-1.636 (0.312)*	
LGBT-friendliness →Resilience	-0.959 (0.304)*	
Discrimination→Condom use	0.015 (0.061)	
Depression→Condom use	-0.026 (0.010)*	
Religiosity/Spirituality→Condom use	-0.003 (0.007)	
Resilience→Condom use	0.011 (0.007)	
Indirect Effect: LGBT-friendliness→Discrimination→Condom use	0.001 (0.006)	1.01 (0.95, 1.07)
Indirect Effect: LGBT-friendliness →Depression→Condom use	-0.021 (0.011)*	0.90 (0.78, 0.98)*
Indirect Effect: LGBT-friendliness →Religiosity/Spirituality→Condom use	0.005 (0.013)	1.02 (0.90, 1.17)
Indirect Effect: LGBT-friendliness →Resilience→Condom use	-0.011 (0.010)	0.95 (0.85, 1.02)
Direct Effect: LGBT-friendliness →Condom use	-0.076 (0.040)	0.68 (0.46, 1.02)

SE—Standard Error; AOR—adjusted odds ratio at 5 units change; CI—confidence interval ;Boot 95% CI—based on 5000 bootstrapped samples,
**Boot 95% CI does not include 1.00, indicating statistical significance;*
^for indirect effects, SE are based on 5000 bootstrapped samples

Figure 7: Statistical Diagrams of Simple Mediation Effects of Psychosocial Mediators on the Relationship between LGBT-Friendliness and Consistent Condom Use during Anal Sex in Past 12 Months with Casual Partner

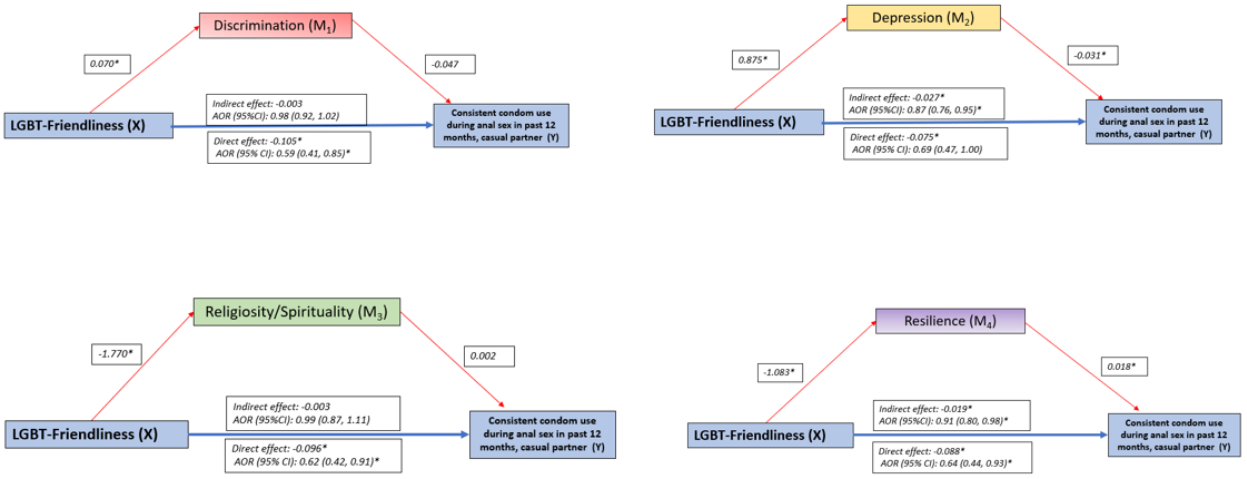
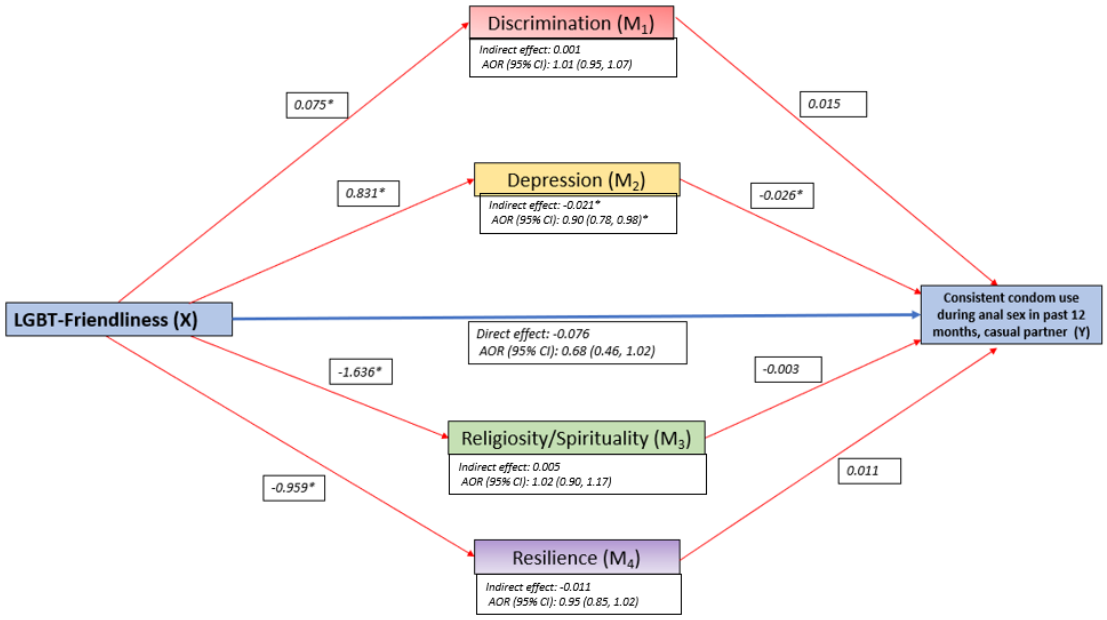


Figure 8: Statistical Diagram of Parallel Multiple Mediation Effects of Psychosocial Mediators on the Relationship between LGBT-Friendliness and Consistent Condom Use during Anal Sex in Past 12 Months with Casual Partner



Chapter 5: Discussion

The purpose of this dissertation was to examine the relationship between perceived neighborhood context and sexual risk behaviors among Black MSM in the South. The dissertation used data from the MARI study (full name: The Ecological Study of Sexual Behavior and HIV/STI among African American men who have sex with men in the Southeastern US) and was based on the modified social ecological model. The dissertation addressed three research questions to examine this relationship. The first research question assessed whether the observed variables, physical disorder (e.g., safety, violence, problems), social cohesion, and LGBT-friendliness, held together as measures of the latent construct, perceived neighborhood context. The second research question explored whether a relationship existed between perceived neighborhood context and sexual risk behaviors among Black MSM in the South. Lastly, the third research question assessed whether the relationship between perceived neighborhood context and sexual risk behaviors was best explained through discrimination, depression, religiosity/spirituality, and resilience.

Findings from First Research Question

Findings for the first research question were partially supported. It was hypothesized that physical disorder, social cohesion, and LGBT-friendliness were measures of the latent construct, perceived neighborhood context. A 4-factor structure for 18 out of the 21 items was evident, based on a principal axis exploratory factor analysis with a promax oblique rotation. The 4-factor structure translated to 4 distinct domains of the latent construct, perceived neighborhood context. Two of the four domains included the hypothesized variables, social cohesion and LGBT-friendliness. However, instead of identifying 1 domain indicating physical disorder, the

remaining 2 domains were neighborhood violence and neighborhood problems. Although these 2 distinct domains were not hypothesized, these variables were in alignment with the existing literature, as both problems (e.g., trash/litter, excessive noise) and violence (e.g., crime) have been used when describing neighborhood physical disorder as related to HIV risk.[41] [94] An additional finding from the exploratory factor analysis was that item assessing neighborhood safety had a meaningful loading onto the factor for social cohesion, creating the domain described as social cohesion and safety. This was consistent with existing literature on social cohesion, as neighborhood safety has been most associated with social cohesion than other neighborhood characteristics, and residents of highly social cohesive neighborhoods have been cited to have greater feelings of perceived safety.[40] [97] However, it is possible that the item for neighborhood safety may have loaded with items measuring social cohesion due to similarity in the item scales. Additional research is needed to examine whether and how neighborhood safety is associated with neighborhood social cohesion.

Although each of the 4 identified factors had at least 3 items with meaningful loadings of 0.40, there were 3 items that did not load on any factors. Two of the 3 items may not have loaded on any factors due to response bias, as they were negatively termed (e.g., "People in this neighborhood generally don't get along with each other"). Study participants may have responded to these items as if they were in the same direction as the other items. The third item assessed the presence of the gay community in their neighborhood; however, it may not have had meaningful loadings on any of the 4 factors due to its scale, which differed from the other items that loaded on the factor for LGBT-friendliness. Rewriting the negatively termed items to be positively termed, or revising the scale of all 3 items may ensure that these items meaningfully load on all factors measuring perceived neighborhood context.

Findings from Second Research Question

For the second research question, it was hypothesized that the domains of perceived neighborhood context were associated with high-risk sexual behaviors among Black MSM in the South, controlling for age, drug use, STIs, HIV status, study site, sexual orientation, and socioeconomic status. The hypothesis was partially supported in the multivariable logistic regression analyses. That is, social cohesion and safety, neighborhood violence, and LGBT-friendliness were the only domains of perceived neighborhood context to be significantly associated with sexual risk behaviors among Black MSM in the South. Although a directional hypothesis was not presented, the findings from the multivariable logistic regression analyses suggest that the presence of negative neighborhood characteristics and lack of positive social neighborhood characteristics may facilitate engagement in risky sexual behaviors. When adjusted for the covariates, low social cohesion and safety was significantly associated with lower odds of consistent condom use during anal sex in the past 12 months with both a main and casual partner, lower odds of consistent condom use during vaginal sex in the past 12 months, and greater odds of using alcohol or drugs before or during sex. Low LGBT-friendliness was also significantly associated with lower odds of consistent condom use during anal sex in the past 12 months with a casual partner, as well as lower odds of asking the last casual sex partner's HIV status prior to sex. More neighborhood violence was significantly associated with greater odds of exchanging sex for money. This was the only statistically significant association for neighborhood violence in the adjusted models. There were no statistically significant associations between neighborhood problems and any of the sexual risk behavior outcomes in the multivariable analyses. There were also no statistically significant associations in the

multivariable analyses between any of the perceived neighborhood context domains and consistent condom use at last sex with a main or casual partner, number of lifetime anal male sexual partners, number of main and casual male sex partners in the past 12 months, asking last main sex partner's HIV status before sex, or participating in a sex party or orgy in the past 12 months.

The findings are consistent with the growing literature on the effect of neighborhood context and HIV prevention and risk behaviors among Black MSM. For example, neighborhoods with increased crime and violence, and low social cohesion were associated with increase maladaptive behaviors (e.g., engaging in substance use) and decreased protective behaviors (e.g., consistent condom use) as a way of coping with the negative neighborhood environment.[41] [42] [43] [44] Additionally, as neighborhoods with a gay community can foster support, belonging, and acceptance among Black MSM, the lack thereof can facilitate engagement in risky sex or drug behaviors as a coping mechanism to the lack of am LGBT-friendly environment. [102] [103]

However, there were certain surprising findings regarding the association between neighborhood physical characteristics and certain sexual risk behavior outcomes. For example, in the multivariable analyses, neighborhood violence was significantly associated only with outcome of exchanging sex for money in the past 12 months. As aforementioned, neighborhood problems was not significantly associated with any sexual risk behaviors in the multivariable analyses. As previous evidence suggests that neighborhood or the built environment has significant associations with risky sexual behavior, such as condomless anal sex, among Black MSM, additional research is needed to explore the associations between neighborhood problems and neighborhood violence on sexual risk behaviors among Black MSM in the South.

An additional surprising finding were the associations between social cohesion and safety on consistent condom use during anal or vaginal sex in the past 12 months. As evidence suggests an association between low social cohesion and safety, and condomless anal sex among Black MSM, these findings suggests that low social cohesion and safety in the neighborhood may be associated with lowered controls to engage in consistent condom use, regardless of the type of sex.[44] Although Black MSM who engage in penile-vaginal sex may engage in fewer sexual risk behaviors than those who only engage in anal sex, low social cohesion and safety within the neighborhood may be an additional risk factor for Black MSM in the South who engage in both anal and vaginal sex.[149] Additional research is needed to investigate and address the association between social cohesion and safety, and condomless anal and vaginal sex among Black MSM in the South.

Findings from Third Research Question

For the third research question, it was hypothesized that the domains of perceived neighborhood context were associated with high-risk sexual behaviors among Black MSM in the South through four mediators—discrimination, depression, religiosity/spirituality, and resilience—controlling for age, drug use, STIs, HIV status, study site, sexual orientation, and socioeconomic status. To better understand the influence of the overall latent construct of perceived neighborhood context on sexual risk behaviors, only the domains of perceived neighborhood context that were significantly associated with the same sexual risk behaviors in the multivariable logistic regression analyses were included in the simple mediation and parallel multiple mediation analyses. Based on the results of the multivariable logistic regression analyses, the simple mediation and parallel multiple mediation analyses assessed the effects of

both social cohesion and safety, and LGBT-friendliness, on consistent condom use during anal sex in the past 12 months with a casual partner. In the simple mediation analyses, depression and resilience significantly mediated both relationships. In the parallel multiple mediation analysis for social cohesion and safety and the consistent condom use outcome, the indirect effect through depression remained significant, adjusting for other mediators. There was also a statistically significant direct effect between social cohesion and safety, and the consistent condom use outcome. In the parallel multiple mediation analyses for LGBT-friendliness and the consistent condom use outcome, the indirect effect through depression also remained significant, adjusting for other mediators; however, the direct effect was not statistically significant. Neither discrimination nor religiosity/spirituality were found to significantly mediate either of the relationships.

The findings from the mediation analyses suggest depression as a significant proximal factor in influencing the effect of perceived neighborhood context on sexual risk behaviors among Black MSM in the South. These findings are supported by existing evidence on depression among Black MSM and HIV risk. Specifically, as depression is high among Black MSM due to the experiences related to the intersection of racism, sexual orientation, and gender expression, Black MSM may engage in risky sexual behavior to cope with depression symptoms and to heighten increased feelings of connectedness. [2] [13] [123] [122] Additionally, the findings add to the literature regarding the influence of depression on residing in neighborhoods with low cohesiveness and safety, but support the evidence related to residing in neighborhoods with low gay presence, which was associated with greater odds of depression among MSM. [102, 103, 125] The findings may also support the evidence on resilience, which is considered a protective factor in engaging in risky sexual behaviors among Black MSM, and resilience has been cited as being

greater among those living in hostile environments. [82 83 133 134] However, depression may have a greater mediating effect than resilience on the relationship between social cohesion and safety, and LGBT-friendliness, and consistent condom use during anal sex in the past 12 months with a causal partner, as only depression remained significant in the parallel multiple mediation analyses when adjusting for the other mediators. Yet, the parallel multiple mediation models did not test these relationships with only depression and resilience as mediators. Additional research to determine whether and how depression and resilience influence the relationship between neighborhood context and sexual risk behaviors among Black MSM in the South.

Limitations

There are several limitations to consider regarding these findings. Firstly, due to the cross-sectional study design, causal relationships or directionality between the variables cannot be determined. Secondly, as the study sample was obtained from Jackson, MI and Atlanta, GA, the results may not be generalizable to all Black MSM in the South. Thirdly, the exploratory factor analyses were only conducted with the current study sample. Although the study sample met the recommended 15:1 participants per survey item ratio for the neighborhood context survey, results from the exploratory factor analyses may need to be validated with a larger sample size. [7] Additionally, self-reported measures of neighborhood context were used instead of objective neighborhood-level data, such as crime statistics, census information on housing vacancies, or geos-spatial assessment of LGBT resources within the community. The use of self-reported measures for neighborhood context can lead to implicit bias, as participant's experiences of their neighborhood may also be shaped by their own personal characteristics or levels of socialization within the neighborhood. [52] However, several studies have identified self-

reported measures of neighborhood context as being associated with several health outcomes, as the use of individual-level perceptions of neighborhood context allows participants to define and characterize their overall neighborhood experiences. [52] [49] Yet, sexual risk behaviors were also collected via self-report, introducing concern of social desirability bias. In addition, the recall period of the past 12 months for sexual risk behaviors may have introduced misclassification due to recall bias. However, the use of ACASI to administer the survey may have ensured accuracy in entering responses for each question, as well as minimized any concerns regarding privacy or providing sensitive information. [150, 151]

Further, the mediation analyses were conducted using the SAS PROCESS Macro for simple mediation and parallel multiple mediation analyses. Other approaches used for mediation, including serial multiple mediation analyses or inverse odds-ratio weighted estimation, may have provided additional explanation between the domains of perceived neighborhood context, sexual risk behaviors, and social and psychosocial mediators. Additionally, the mediation analyses only included the associations between the domains of perceived neighborhood context that were statistically significant with the same sexual risk behavior outcome in the multivariable logistic regressions analyses. This was done to provide a better understanding of the effect of the overall latent construct of perceived neighborhood context on sexual risk behavior among Black MSM in the South; however, there may mediating effects on the other domains of perceived neighborhood context and other sexual risk behaviors, such as neighborhood violence on exchanging sex for money. Also, by only including statistically significant multivariable logistic regression associations in the mediation analyses, I may have missed any significant mediating effects on the non-statistically significant associations between neighborhood context and sexual risk behaviors. Moreover, as depression, discrimination, religiosity/spirituality, and resilience

were included in the mediation analyses due to their associations with neighborhood context or HIV risk among MSM, there may be additional factors (e.g., social support) that could better explain the relationship between perceived neighborhood context sexual risk behavior among Black MSM in the South.

Implications and Conclusions

The study adds to the growing literature on neighborhood context and HIV risk behaviors among Black MSM. To my knowledge, this study is the first to explore social and structural factors that can be attributed the neighborhood context and HIV risk relationship among Black MSM, and especially among Black MSM in the South. As the existing literature has multiple operationalizations of neighborhood context as a driver of HIV risk among MSM, this study identifies the salient variables—that is, neighborhood problems, social cohesion and safety, neighborhood violence, and LGBT-friendliness—that are consistent measures of the latent construct of perceived neighborhood context. Yet, confirmatory factor analysis should be conducted to validate the perceived neighborhood context scale and confirm the 4-factor solution identified in the exploratory factor analysis. Although most of the variables measuring perceived neighborhood context had significant associations with sexual risk behaviors, additional analyses may be needed to further explain and understand neighborhood perceptions among Black MSM in the South. Qualitative research, including a photovoice project or focus groups, could be used to gather rich insight on the lived experiences of Southern Black MSM in their neighborhoods. These qualitative explorations could also explore the mental health and sexual behaviors of Southern Black MSM to better ascertain the relationship between perceived neighborhood context on sexual risk behaviors through depression. Also, analyses that include objective

measures of neighborhood context, such as poverty and crime statistics, with individual-level data on neighborhood context may provide a multi-level understanding of the relationship of neighborhood context on sexual risk behaviors among Black MSM in the South.

Nevertheless, the findings from the dissertation can be used to inform and develop HIV prevention interventions that address the social and structural factors that influence individual HIV risk behaviors to reduce HIV risk among Black MSM in the South. Specifically, the findings highlight the need for structural interventions to improve neighborhood infrastructure in order to increase social cohesion and safety, reduce neighborhood violence, and provide an LGBT-friendly environment. Additionally, the inclusion of mental health resources targeting depression may be instrumental in eliminating HIV among Black MSM in the South.

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