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Neighborhood social cohesion, religious participation and sexual risk behaviors among cisgender Black sexual minority men in the southern United States

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Abstract

Background: Few studies have examined associations between neighborhood social cohesion and sexual risk behaviors among gay, bisexual and other sexual minority men (SMM) and none have among Black SMM in the southern U.S. The purpose of the current study is to examine associations between neighborhood social cohesion and sexual risk behaviors among Black SMM in the southern U.S., a population heavily impacted by HIV. We also examined whether these relationships are modified by religious participation for Black SMM in the southern U.S.

Methods: Data was obtained from the MARI Study, a sample of Black SMM ages 18-66 years, recruited from the Jackson, MS and Atlanta, GA metropolitan areas ($n=354$). Neighborhood social cohesion was assessed with a validated 5-item scale. We conducted multivariable regression analyses to examine the association between neighborhood social cohesion with each of the sexual risk behaviors (e.g., condomless sex and drug use before or during sex), controlling for key confounders. We then performed moderation analysis by religious participation (religious attendance and private religiosity).

Results: Compared to Black SMM with higher perceived neighborhood social cohesion, Black SMM with lower neighborhood social cohesion had increased odds of alcohol use before or during sex (aPR=1.56; 95% CI=1.16-2.11) and condomless anal sex with casual partners (aPR=1.55; 1.03-2.32). However, the magnitude of these associations varied by religious attendance and private religiosity. Black SMM with low religious service attendance had higher risk of alcohol

use in the context of sex when perceived neighborhood social cohesion was low; those with high private religiosity had elevated alcohol use in the context of sex when perceived neighborhood social cohesion was low.

Discussion: Interventions that target connectedness among neighborhood members through community education or mobilization efforts, including the involvement of religious organizations, should be considered for HIV prevention focused on alcohol and condomless sex among Black SMM.

Keywords

Neighborhoods; Social Cohesion; Religious Participation; HIV; Sexual Health; Black Sexual Minority Men; Southern United States

Introduction

HIV remains a public health priority among cisgender Black men, especially Black gay, bisexual and other sexual minority men (SMM), as it is estimated that 50% of Black SMM will acquire HIV in their lifetimes—a rate nearly five times that of White SMM (Centers for Disease Control and Prevention, 2016). Black SMM in the southern United States (U.S.) are at highest risk for HIV acquisition compared to Black SMM in other geographic regions (Centers for Disease Control and Prevention, 2016). Of the 25 U.S. cities with the highest diagnosed HIV prevalence rates, 21 were in the southern U.S. and 6 had diagnosed prevalence of 25% (Rosenberg et al., 2016). HIV infection among Black SMM in these cities is hyperendemic (sustained at prevalence levels of 15% or higher) (Rosenberg et al., 2016).

Studies have demonstrated that neighborhood characteristics can influence a wide range of HIV-related outcomes (Buot et al., 2014; Duncan et al., 2020b; Ransome et al., 2016; Ransome et al., 2017). However, social characteristics of neighborhoods such as social cohesion within neighborhoods remain understudied in the context of HIV prevention in the U.S., especially among SMM populations (Duncan et al., 2020b; Ransome et al., 2018). Neighborhood social cohesion is often characterized by the presence of a trusting network of relationships as well as shared values and norms among residents in a neighborhood (Kawachi & Berkman, 2000). Shared norms and values translate to protective behavior: one such mechanism is that residents of close-knit communities view the practice of protective behaviors as not just “protecting themselves” but also protecting “valued others in the community” (page 174). Neighborhood social cohesion and its effect on HIV risk behaviors needs further investigation because some studies suggest that potential benefits of cohesion does not accrue equally across all social groups. For instance, Henning-Smith and Gonzales found differences by sexual orientation in perceptions of neighborhood cohesion. They reported that lesbian, gay, and bisexual individuals are less likely to say they live in close-knit neighborhoods, are less likely to perceive they can count on their neighbors, trust their neighbors, or that people in their neighborhood help each other compared to their straight counterparts (Henning-Smith & Gonzales, 2018).

Research shows that neighborhood social cohesion is associated with higher pre-exposure prophylaxis (PrEP) adherence (Ransome et al., 2019; Zarwell et al., 2019) and HIV testing (Grover et al., 2016). Other studies have found that higher social cohesion is associated with lower engagement in sexual risk behaviors (Browning et al., 2008; Haley et al., 2018; Kerrigan et al., 2006; Lang et al., 2010), yet there are studies that find no association (Frye et al., 2017). We are aware of only one study that examined the association between neighborhood social cohesion and sexual risk behaviors among SMM (Frye et al., 2017) in New York City, and the authors did not find a significant association. To our knowledge, no studies have examined associations between neighborhood social cohesion and sexual risk behaviors among Black SMM in the southern U.S.

The postulated protected impact that neighborhood social cohesion should have on sexual health may potentially be influenced by intersecting individually-based cultural practices such as religiosity and spirituality (Hopkins, 2011; Maselko et al., 2011). Many studies (Garofalo et al., 2015; Quinn et al., 2016; Smallwood et al., 2017b; Watkins et al., 2016a, b) have documented that individual religiosity and spirituality may be either risk or protective factors for Black SMM, particularly in the southern U.S., which is often referred to as the ‘Bible Belt’ in the U.S. (Rosenburg, 2020). We expect that any association that neighborhood social cohesion may have on sexual and HIV risk outcomes among Black SMM in the southern U.S. will be moderated by their individual levels of religious beliefs or religious engagement. Specifically, one mechanism through which social capital and cohesion is expected to influence health behaviors, including sexual health behaviors, is through information sharing and social support (Ellison & Levin, 1998). The religious community has been, perhaps, the most pertinent establishment where Black people (including SMM) may receive relevant information on health practices (Taylor et al., 2003). Higher levels of religious service attendance could provide more opportunities to establish social relations and receive whatever goods produced through the social network, especially if goods come from one’s own neighborhood or across neighborhoods (Maselko et al., 2011). Reference Group Theory describes the degree to which an individual or group’s (e.g., SMM) behavior is influenced by groups through who they refer for guidance, which is influenced by degree of agreement between values and beliefs, clarity, sustained interaction with this group, and ascribed legitimacy to that group (Cochran et al., 1988). Thus, another mechanism is that religious norms that sanction or influence risk behaviors such as alcohol use or multiple sex partners could be reinforced among individuals who perceived their neighborhood networks to have high social cohesion. However, as others have noted (Gilbert & Dean, 2013; Villalonga-Olives & Kawachi, 2017), social cohesion may not always have a positive influence on some groups (plausibly Black SMM). This social detriment may include ostracism and stigma, because they do not conform to the values of the group. Given this possibility, one may expect that Black SMM attend services less frequently and/or feel ostracized compared to their non-SMM counterparts.

Religious service attendance, by far, is the most widely-studied indicator within the multidimensional construct of religiosity and is characterized by observable organizational aspects (Idler et al., 2003). Private religiosity or non-organizational aspects are activities practiced outside the purview of spectators and includes reading scriptures or other religious texts, praying in private and meditation (Koenig et al., 2012). While there is no consensus on

the topic, one might expect that private religious participation may also change the level of social engagement in one's neighborhood social cohesion activities (Maselko et al., 2011). For instance, while public religious events such as attending church that are not as affirming of same sex relationships, may dissuade men (including Black SMM) from taking part in social capital activities, one may feel empowered through religious content and have increased self-efficacy and be encouraged to participate in local events that generate or accumulate social cohesion (e.g., voter registration drives, health fairs). Beyond these pathways, there may be direct pathways from religiosity to HIV prevention in Black SMM (Drumhiller et al., 2018; Tamara et al., In press; White et al., 2019).

To date, there is no singular theory delineating how neighborhood social cohesion and religiosity influence sexual risk behaviors, including among Black SMM, who encounter unique barriers to neighborhood and religious involvement. Consequently, the main purpose of the current study is to examine associations between neighborhood social cohesion and sexual risk behaviors among Black SMM in two cities in the southern U.S. Based on the previous literature on the topic among general, i.e., non-sexual minority, samples (Browning et al., 2008; Haley et al., 2018; Kerrigan et al., 2006; Lang et al., 2010), we expect low neighborhood social cohesion will be associated with HIV risk behaviors, such as condomless anal sex and alcohol and drug use in the context of sex among Black SMM in the southern U.S. Also, we examine whether the association between neighborhood social cohesion and sexual risk behaviors among Black SMM in the southern U.S. is moderated by measures of individual religious participation. In addition to practical implications, these findings may allow us to contribute to developing theory of how community life and religious behaviors intersect to influence sexual risk.

Methods

The MARI Study

The MARI Study was established in two cities in the southern part of the U.S.: Jackson, MS and Atlanta, GA. Full details on the study design and recruitment methods have been reported previously (Hickson et al., 2015). The study aimed to describe and explore the environmental, behavioral, sociodemographic, and HIV risk behaviors among Black SMM, especially Black gay and bisexual men and included a limited number of Black transgender women (Hickson et al., 2015). Participants were given \$35 (which later was increased to \$50 to bolster participation). Recruitment activities involved efforts by local organizations, print advertisements distributed locally to colleges and universities, adult bookstores, bars and clubs, and digital advertisements posted on social media and through paid advertisements on geospatial sex and dating applications. Data used in the current study were collected from July 2013 in Jackson and December 2014 in Atlanta until the end of 2015. The MARI Study research protocols were approved by the Sterling Institutional Review Board and all participants provided written informed consent. The secondary analyses reported here were determined to be exempt by the Columbia University Mailman School of Public Health Institutional Review Board.

Participants

Eligible participants in MARI were cisgender men and transgender women who were 18 years or older and who reported sex with at least one man in the six months prior to enrollment. The total number of participants in this analysis was 386; 11 participants had no information on neighborhood cohesion and 21 were transgender women. For the current analysis, we restricted the sample to cisgender SMM, excluding transgender women given the documented socio-economic differences and differences in sexual risk behaviors (Ezell et al., 2018; Poteat et al., 2020; Siembida et al., 2016). See Table 1 for details about the sample characteristics.

Measures

Neighborhood Social Cohesion—We used a previously validated 5-item scale of neighborhood social cohesion that was econometrically validated in the Project on Human Development in Chicago Neighborhoods study (Sampson et al., 1997), which has been used in multiple other studies (Kawachi & Berkman, 2000; Mendes de Leon et al., 2009; Saito et al., 2017; Stafford et al., 2003). To assess neighborhood social cohesion, we first asked: “How often are these things a problem or are found in your neighborhood?” We then assessed the following 5 aspects of neighborhood social cohesion: 1) *This is a close knit neighborhood*; 2) *People around here are willing to help their neighbors*; 3) *People in this neighborhood generally don’t get along with each other*; 4) *People in this neighborhood can be trusted*; and 5) *People in this neighborhood do not share the same values*. Response options include: Strongly disagree; Disagree; Agree; and Strongly agree (scored from one to four). Question 3 and 5 were reverse coded. A total neighborhood social cohesion score was calculated by summing these 5 items and ranges between 5-20 with a mean of 13.29 ($SD = 2.84$). Higher scores indicate higher levels of social cohesion. The total sum of the scores were categorized into low (5-12), medium (13-14) and high (15-20), based on tertiles. The Cronbach’s α for the neighborhood social cohesion items was 0.659, indicating acceptable internal consistency.

Religious Participation—Religious participation was measured with 2 items, focusing on religious service attendance and private religiosity, respectively. For religious service attendance, participants were asked, “In general, how often do you attend the main worship service of your church or otherwise participate in organizational religion (such as watching services on TV, listening to services on the radio, participating in Bible study groups, etc.)?” Response options include: 1=Not at all; 2=Less than once a year; 3=A few times a year; 4=A few times a month; 5=At least once a week; 6=Nearly every day (scored from one to six). Religious service attendance was categorized into low (1-3) and high (4-6), based on the median. For private religiosity, respondents were asked, “Within your religious or spiritual tradition, how often do you pray privately or meditate in places other than at church, mosque, temple, or synagogue?” Response options include: 1=Never; 2=Less than once a month; 3=Once a month; 4=A few times a month; 5=Once a week; 6=A few times a week; 7=Once a day; and 8=More than once a day (scored one to eight). This was categorized into low (1-5) and high (6-8), based on the median. These two items were summed to obtain general religious participation score (range=2-14), and dichotomized into low (2-9) and high (10-14) religious participation, based on the median of the sum score to maximize power. The

Cronbach's α for the religious participations was 0.66, indicating acceptable internal consistency.

Sexual Risk Behaviors—Participants completed items on alcohol or drug use before or during sex, condomless anal sex with casual partners (consistent vs. inconsistent or no condom use), and the number of sexual partners (<6 male partners vs. 6 male partners) all in the 12 months prior to study participation. Participants were also asked if they had participated in group sex in the past 12 months and, at their most recent casual sexual encounter, if they had asked their partner about their HIV status. Risk practices associated with HIV were dichotomized (yes / no). Sexual risk behaviors were also dichotomized to be consistent with a prior paper from this dataset (Duncan et al., 2020a).

Covariates—Covariates were based on our past studies of risk factors for sexual risk behaviors in Black SMM in the southern U.S. and included age, Hispanic/Latino ethnicity, sexual orientation (gay/homosexual, bisexual, straight/heterosexual, questioning, or other), socioeconomic status, lifetime history of incarceration, HIV status and MARI study site (Duncan et al., 2020a; Duncan et al., 2020c; McNair et al., 2018). Education, annual income, and current employment status were used to characterize socioeconomic status. The reason for dichotomizing these confounding variables was largely due to the distribution of the data and to be consistent with past published manuscripts these data (Duncan et al., 2020a).

Statistical Analyses

Our sample was restricted to cisgender men who completed all neighborhood social cohesion questions ($n = 354$; 91.7%). Descriptive statistics for sociodemographic variables, religious participation items and sexual risk behaviors are presented as frequencies, proportions, and means (SDs). We conducted Poisson regression models with robust standard errors to examine the association between neighborhood social cohesion with each of the sexual risk behaviors, controlling for the same covariates listed earlier, computing prevalence ratio (PR) and the respective 95% confidence intervals (95% CI). We also examined the p -value for the trend using logistic regression. To determine whether religious participation modifies the association between neighborhood social cohesion and sexual risk behaviors, a stratified analysis was conducted within high and low religious participation to illustrate how the effect differed by level of religious participation. Statistical significance was assessed as $p < 0.05$. Stata Version 16.0 was used for all analyses.

Results

Distribution of Socio-Demographic Variables

Table 1 shows socio-demographic characteristics of the sample ($n = 354$). The mean age of the sample is 30.4 years ($SD = 11.3$). Only 2.3% reported Hispanic/Latino ethnicity. Most identified as gay (67.8%) or bisexual (26.8%). Fewer than half of the participants were employed (45.2%). Just over one-third were previously incarcerated (36.7%). The sample was low-income with almost 67% reporting an annual income of less than \$16,000. Almost 80% had completed some college education or more. Over one-third (37.3%) were HIV-positive. More participants were recruited from Jackson (60%). Participants generally

reported high-risk sexual behaviors, with almost 50% reporting alcohol use in the context of sex. More than a third (37.3%) reported drug use in the context of sex, and 16.4% reported having had any group sex during the past 12 months. Just over half (51.4%) reported that they have asked HIV status of most recent casual partner.

About 25% reported that they disagree with 2 items: “This is a close knit neighborhood” and “People around here are willing to help their neighbors”. More than 40% reported that they agree that “People in this neighborhood do not share the same values.” Approximately 33% indicated that they attend the main worship service of church or organization at least once a week or nearly every day. The mean religious service attendance score was 3.56 ($SD = 1.57$; range 1 to 6). Almost 30% reported that they pray privately or mediate in places other than at church, mosque, temple, or synagogue more than once a day. The mean private religiosity score on the 8-point scale defined in the Measures subsection was 5.71 ($SD = 2.38$).

Associations Between Neighborhood Social Cohesion, Religious Participation and Sexual Risk Behaviors

Table 2 shows the association between neighborhood social cohesion and sexual risk behaviors, after covariate adjustment (mentioned above). Low compared to highest neighborhood social cohesion was associated with increased risk of alcohol use in the context of sex (aPR=1.56; 95% CI=1.16-2.11) and condomless anal sex with casual partners (aPR=1.55; 1.03-2.32); significant trends were observed (p-trend=0.001, p-trend=0.02, respectively). The effect of neighborhood social cohesion on alcohol in the context of sex, condomless anal sex with casual partners, and six or more casual partners was modified by individual religious participation, although not consistently across both measures. No overall association was found between neighborhood social cohesion, drug use in the context of sex, having six or more casual sex partners, group sex or asking the partners HIV status.

When stratifying the analyses according to religious participation, we found that the low neighborhood social cohesion was associated with increased risk of alcohol use in the context of sex in the low religious participation group (aPR=1.66; 95% CI=1.05-2.62), but not in high religious participation group (aPR=1.52; 95% CI=0.99-2.31). A similar pattern of association was found for low (compared to high) neighborhood social cohesion was associated with increased risk of alcohol use in the context of sex among those with low religious service attendance (aPR=1.53; 95% CI=1.01-2.30), but not in the high religious service attendance group (aPR=1.48; 95% CI=0.95-2.30). In analyses stratified by private religiosity, however, the significant association was only found in high private religiosity (aPR=1.54; 95% CI=1.05-2.27).

Although living in a perceived low neighborhood social cohesion was not associated with having six or more casual sex partners (aPR=1.01; 95% CI=0.56-1.84), a significant interaction was found between religious service attendance and perceived neighborhood social cohesion (p=0.0310). Among those who attended religious service less frequently, medium compared to perceived high neighborhood social cohesion was associated with increased risk of having six or more casual sex partners (aPR=3.81; 95% CI=1.29-11.26). This association was not present in the high religious service attendance group. A similar pattern was observed for private religiosity. In contrast, perceived medium and low

neighborhood social cohesion was associated with increased risk of condomless anal sex with casual partners among those who had high levels of private religiosity (aPR=1.77; 95% CI=1.03, 3.05, aPR=1.98; 95% CI=1.15, 3.38, respectively). This association was not observed among those had low levels of private religiosity.

Discussion

To our knowledge, this is the first study to examine the association between neighborhood social cohesion and sexual risk behaviors among Black SMM in the southern U.S. and one of few to examine this association among SMM, in general, providing a meaningful contribution to the literature. In this study, low neighborhood social cohesion was associated with increased odds of condomless anal sex with casual partners and alcohol use in the context of sex. We also examined whether those relationships are modified by religiosity, as religious participation may be particularly prevalent and culturally meaningful in the southern U.S. and for Black SMM. Our findings suggest that high religiosity can have protective associations with alcohol use in the context of sex among Black SMM in the southern U.S. However, the directions of associations with public and private religious participation activities, are different. We recognize that religiosity can have mixed effects on health outcomes and health behaviors, including providing social support and a sense of social connectedness—which can buffer health risks—as well as promoting positive social norms related to sexual health such as monogamy and using condoms during sex. On the other hand, religiosity—via stigmatized experiences from the broader congregation and society—can also induce stressful experiences that sometimes result in maladaptive coping strategies or impaired decision making such as use of alcohol during sex (Duncan et al., 2020a; George, 2019).

These novel findings of the relations between neighborhood social cohesion and sexual health risk behaviors demonstrated within the present study could be explained through general and identity-specific mechanisms. For example, accumulating research suggests pro-social community relations may reduce barriers to health (e.g., social isolation, exposure to violence, stress) and facilitate health-supporting factors (e.g., open communication, exposure to positive social norms) (Kawachi & Berkman, 2000). Neighborhood social cohesion might also impact Black SMM individuals' sexual health, specifically, through unique, identity-related pathways. Minority stress theory (Meyer, 1995, 2003) suggests that SMM are at risk for experiencing stigma-related stress due to their marginalized social status, which over time, can erode co-occurring aspects of mental and sexual health. For example, multiple minority stress variables (e.g., expectations of rejection, identity concealment, internalized homophobia) have been shown to be negatively associated with sexual health among Black SMM (Arnold et al., 2014; Ayala et al., 2012; Smallwood et al., 2017b) and SMM more generally (Kuyper & Vanwesenbeeck, 2011; Pachankis et al., 2015; Rendina et al., 2017). Although little research has explored whether and how these stress pathways might be activated by neighborhood-level factors (Duncan et al., 2017), one can easily imagine how beliefs that are characteristic of low neighborhood social cohesion (e.g., my neighbors cannot be trusted, my neighbors do not share my values) might cause Black SMM to anticipate stigma from their neighbors, hide their sexual orientation with greater vigilance, and feel negatively about their sexual orientation in their own neighborhoods (Smallwood et

al., 2017a). In a socially conservative context, such as in many parts of the southern U.S. (Smallwood et al., 2017b; Ward, 2005), these pathways may be especially relevant to understanding the differential sexual health risks observed among Black SMM.

Our results differ from a previous study examining the association between neighborhood social cohesion and sexual risk behaviors among SMM in New York City (NYC) (Frye et al., 2017), which did not find any significant associations, perhaps because associations were not stratified by religiosity. In addition, we believe it is because the cities in the southern U.S. has much higher degrees of dependency on their specific communities as compared to NYC. Similarly, we found no association between neighborhood social cohesion and drug use in the context of sex, having six or more casual sex partners, or group sex. These findings inform and strengthen the aforementioned Reference Group Theory (Cochran et al., 1988) by illustrating how similar populations in disparate cultural contexts may have significantly different group behavior, which can be observed as a mechanism for health outcomes. Further research is needed on why associations between neighborhood social cohesion for alcohol and number of sexual partners were observed in Jackson, MS and Atlanta, GA but not in New York City. Studies in the literature, though, have found neighborhood social cohesion to be associated with multiple various health behaviors, including alcohol drinking in a large multi-ethnic, multi-city sample of participants (Echeverria et al., 2008) and other HIV risk in global settings (Pronyk et al., 2008).

The present pattern of results suggests that neighborhood social cohesion may differentially predict aspects of sexual health behaviors among Black SMM, thereby cautioning researchers against viewing neighborhood social cohesion as a blanket determinant of all HIV risk factors (Ransome et al., 2018). Increasingly nuanced research is needed to understand why neighborhood social cohesion was associated with some, but not all sexual risk behaviors measured within this study. By clarifying for which outcomes neighborhood social cohesion might be a suitable intervention target, such findings may help guide public health interventions aiming to improve sexual health among Black SMM in the southern U.S.

Future Research

Researchers should continue to assess associations between neighborhood social cohesion and sexual risk behaviors while taking into account religious participation among Black SMM in the southern U.S. and other marginalized populations. This research could be strengthened by using prospective study designs that allow us to address temporality. To provide but one example, experience-sampling methods—which allow researchers to collect ongoing information about experiences and behaviors as they occur within the context of individuals' everyday lives (Hektner et al., 2007; Shiffman et al., 2008)—could aid in furthering the ecological validity of the emerging associations between neighborhood social cohesion and sexual risk among Black SMM in the southern U.S. Also, because experience-sampling methodologies (e.g., ecological momentary assessment) can facilitate the examination of “microprocesses” between various social and behavioral phenomena among SMM (Duncan et al., 2019; Jackson et al., 2020; Livingston, 2017), such research could demonstrate how fluctuations in Black SMM individual's sense of social cohesion relate to

changes in sexual risk behaviors over time (i.e., at the within-person level). Such research could also test temporal hypotheses about the potential antecedents (e.g., exposure to stigma) or consequences (e.g., heightened expectations of rejection) of low neighborhood social cohesion among Black SMM in the southern U.S (Jackson et al., in press)(Jackson et al., in press).

In addition, future research on neighborhood characteristics and sexual health outcomes among Black SMM could further embrace an intersectional stigma perspective (Bowleg, 2013; Crenshaw, 1989). Future research might assess what unique factors predict neighborhood social cohesion and sexual health risk among Black SMM, such as perceived racism or homophobia (McConnell et al., 2018). One might also adopt an intersectional framework to study whether Black SMM in the southern U.S. have fewer opportunities to experience a sense of neighborhood social cohesion compared to heterosexual Black men and sexual minority White men in their same neighborhoods, due to the additional barriers to community connectedness that Black SMM may face (Frost et al., 2016; Herek, 2002; Meyer et al., 2008). For example, some opportunities for meaningful neighborhood engagement among Black men may occur in community spaces that reject or ridicule Black SMM, either directly (e.g., anti-gay doctrine promoted by many Black churches; (Baunach & Burgess, 2013; Pitt, 2010; Ward, 2005) or indirectly (e.g., subtle dynamics of homophobia and hypermasculinity within Black barber shops; (Malebranche et al., 2009). Thirdly, researchers might consider adopting an intersectional lens to examine the sense of social cohesion among more specific, intersectional neighborhood networks (e.g., community cohesion among Black SMM) as predictors or health risk. Indeed, a similar study by Grover and colleagues (2016) found a higher Cronbach's alpha in their social cohesion measure than our study (0.7025), perhaps due to tailoring the questions for sexual minority men – i.e., the question wording reflect membership among people in their sexual group and not as generic as “neighbors”, which is an area for future research (Grover et al., 2016). The present research may also inspire future research on neighborhood social cohesion and sexual health risk among other high-risk intersectional populations, such as Black transgender women (Goedel et al., 2017). The research on religion and spirituality among SMM also needs further development. Specifically, while generic measures such as church attendance and subjective spirituality are often in surveys—because of space limitations and familiarity—we need to go beyond those constructs and actively engage SMM to identify other aspects of these constructs (e.g., faith) (Ransome, 2020) and under which contexts are religion and spirituality helpful (e.g., to deal with stigma, stress, rejection, racism, etc.) (Lassiter, 2014; Lassiter & Parsons, 2016; Lassiter & Poteat, 2020).

Finally, global positioning systems (GPS) research could provide context as to how neighborhood social cohesion can influence sexual behaviors among Black SMM in the southern U.S., across different neighborhood contexts. Indeed, it would be useful to generate more knowledge about the assumptions behind this analysis – i.e. do SMM engage in sex *within* their neighborhoods? We assume that many of them travel out of their neighborhoods to meet sex partners, given the stigma associated with being gay in the Black community. Future work can examine whether social cohesion in one's residential neighborhood may facilitate Black SMM to seek support in other places or places where they can be their authentic selves (not having to be hypervigilant in hiding their same sex behaviors). GPS

studies can locate where men are engaging in high risk behaviors and verify whether it is in the neighborhood where they live, work, socialize or other neighborhood types. Such research may help determine where and how to strategically implement public health interventions aiming to promote sexual health among Black SMM in the southern U.S.

Limitations

This study is subject to limitations. First, social cohesion is a multidimensional construct, and we focused on the cognitive dimension. There is a structural dimension that measures access to physical resources like places for interaction. There are also other social cohesion scales and measures that focus on more community participation (Fone et al., 2006). Our selection of dimension and scale could have influenced our findings, which has been found in previous HIV research (Pronyk et al., 2008; Ransome et al., 2017). Additionally, we did not assess residential duration or current PrEP use, which is implicated in residential confounding. Another limitation is that these relationships might be shaped by experiences of stigma and discrimination, which were not accounted for. In addition, same source bias may be a concern (Diez Roux, 2007) given that self-reported measures of the exposure and outcome were assessed. We used a cross-sectional study design. As such, reverse causation and interdependence are possible as are omitted variable biases that accompany observational studies. Other, unmeasured variables (e.g., discrimination, low peer support) (Frye et al., 2015; Jeffries et al., 2013; Maulsby et al., 2014; Scott et al., 2014) could plausibly influence both low neighborhood social cohesion and as such the significance of associations with the sexual risk variables. Further we used self-reported but not objective metrics (e.g., such as geocoded place of residence) to assess where participants lived. The focus of this study was on the residential neighborhood, whereas some research has demonstrated that other neighborhoods (e.g., social neighborhoods, sexual neighborhoods) matter for SMM (Duncan et al., 2014; Koblin et al., 2017; Koblin et al., 2013), including Black SMM in the southern U.S. (Millett et al., 2007; Oster et al., 2013). While we used two widely accepted measures of religion and spirituality, these associations could be further confounded by religious denomination (which was not collected in the MARI study) or methodological limitations of these measures—e.g., relying on self-report. In addition, based on our likely conservative post-hoc power calculations, it does not seem that the study was very highly powered to test many of the studied associations, especially in the stratified analyses. Finally, generalizability may be of concern, given that this is a non-population based sample that includes Black SMM specifically in two geographic regions of the southern U.S.: Jackson, MS and Atlanta, GA. Despite these limitations, the present study results add to the current understanding of how neighborhood social cohesion relates to sexual health behaviors among Black SMM, a critically understudied research area.

Conclusion

Low neighborhood social cohesion was associated with increased odds of condomless anal sex with casual partners and alcohol use in the context of sex among Black SMM in the southern U.S., especially those with low religious participation. These results underscore the relevance of neighborhood-level factors in understanding sexual health behaviors among high-risk subpopulations. Study findings also suggest that interventions aiming to increase

neighborhood social cohesion may help prevent HIV transmission among Black SMM in the southern U.S. Low neighborhood social cohesion was associated with increased odds of alcohol use in the context of sex and condomless anal sex with casual partners among Black SMM in the southern U.S. However, the impact of neighborhood social cohesion on sexual risk among Black SMM in the south appears to be influenced by religious involvement. Interventions that target connectedness among neighborhood members through community education or mobilization efforts, including the involvement of religious organizations, should be considered for HIV prevention focused on alcohol and condomless sex among Black SMM.

Further research is needed to investigate mechanisms linking neighborhood social cohesion and religiosity with HIV prevention in this population. Further studies with additional measures of religiosity also may be important to elucidate this unique finding in our sample.

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Table 1.Characteristics of sample, The MARI Study 2013-2015 (*N*= 354)

	Mean±SD, N(%)
Mean Age (standard deviation)	30.36±11.34
Latino	8 (2.3)
Sexual Orientation	
Gay/Homosexual	240 (67.8)
Bisexual	95 (26.8)
Other	19 (5.4)
Employed	160 (45.2)
Any previous incarceration	130 (36.7)
Income	
<\$5,000	136 (38.4)
\$5,000-\$15,999	101 (28.5)
\$16,000 or more	109 (30.8)
No response	8 (2.3)
Highest level of education	
Some high school or completed high school	146 (41.2)
Some college	137 (38.7)
Bachelor's degree or higher degrees	71 (20.1)
HIV-positive	132 (37.3)
City of recruitment	
Jackson	212 (59.9)
Atlanta	142 (40.1)
In the year before survey:	
Alcohol in the context of sex	176 (49.7)
Drug use in the context of sex	132 (37.3)
Condomless anal sex with casual partners	132 (37.3)
Six or more casual partners past six months	67 (18.9)
Any group sex	58 (16.4)
Asked HIV status of most recent casual partner	182 (51.4)
Neighborhood cohesion scores	
Low cohesion (tertile 1; range=5-12, Mean±SD=10.64±1.62)	135 (38.1)
Medium cohesion (tertile 2; range=13-14, Mean±SD=13.55±0.50)	126 (35.6)
High cohesion (tertile 3; range=15-20, Mean±SD=16.76±2.07)	93 (26.3)
Religious participation	
Low (range=2-9, Mean±SD=5.87±2.68)	143 (40.4)
High (range=10-14, Mean±SD=11.67±1.29)	203 (57.3)
Religious service attendance	
Low (range=1-3, Mean±SD=2.05±0.93)	153 (43.2)

	Mean±SD, N(%)
High (range=4-6, Mean±SD=4.75±0.72)	195 (55.1)
Private religiosity	
Low (range=1-5, Mean±SD=2.61±1.51)	110 (31.1)
High (range=6-8, Mean±SD=7.15±0.84)	237 (67.0)

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Table 2. Association between neighborhood social cohesion and sexual risk behaviors by religious participation (*N* = 354)

Outcomes									
In the previous 12 months									
Alcohol in the context of sex	Drugs in the context of sex	Condomless anal sex with casual partners	Six or more casual sex partners	Group sex	Asked partner's HIV status				
aPR (95% CI)	aPR (95% CI)	aPR (95% CI)	aPR (95% CI)	aPR (95% CI)	aPR (95% CI)				
Neighborhood Cohesion, tertiles									
High (Q3)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Medium (Q2)	1.22 (0.89, 1.67)	1.06 (0.74, 1.53)	1.41 (0.94, 2.10)	1.35 (0.77, 2.36)	1.10 (0.62, 1.96)	1.05 (0.85, 1.29)			
Low (Q1)	1.56 (1.16, 2.11)**	1.34 (0.95, 1.89)	1.55 (1.03, 2.32)*	1.01 (0.56, 1.84)	0.99 (0.54, 1.80)	0.91 (0.73, 1.15)			
Stratified by religious participation									
<i>High</i> (<i>n</i> =203)									
Neighborhood Cohesion									
High (Q3)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Medium (Q2)	1.16 (0.76, 1.77)	1.06 (0.66, 1.71)	1.31 (0.75, 2.30)	0.95 (0.45, 2.00)	0.76 (0.35, 1.64)	1.02 (0.79, 1.33)			
Low (Q1)	1.52 (0.99, 2.31)	1.46 (0.89, 2.40)	1.63 (0.95, 2.80)	0.94 (0.41, 2.15)	1.05 (0.47, 2.33)	0.93 (0.70, 1.25)			
<i>Low</i> (<i>n</i> =143)									
Neighborhood Cohesion									
High (Q3)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Medium (Q2)	1.25 (0.76, 2.06)	0.86 (0.48, 1.55)	1.40 (0.77, 2.53)	2.76 (1.10, 6.93)*	1.64 (0.65, 4.10)	1.24 (0.87, 1.75)			
Low (Q1)	1.66 (1.05, 2.62)*	1.07 (0.62, 1.84)	1.29 (0.70, 2.36)	1.31 (0.46, 3.72)	0.98 (0.38, 2.56)	1.02 (0.69, 1.51)			
Stratified by religious service attendance									
<i>High</i> (<i>n</i> =195)									
Neighborhood Cohesion									
High (Q3)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Medium (Q2)	1.13 (0.72, 1.78)	0.99 (0.60, 1.64)	1.18 (0.69, 2.02)	0.59 (0.25, 1.38)	0.79 (0.35, 1.80)	1.00 (0.77, 1.29)			
Low (Q1)	1.48 (0.95, 2.30)	1.55 (0.95, 2.53)	1.49 (0.89, 2.49)	0.71 (0.31, 1.62)	0.62 (0.27, 1.42)	1.04 (0.80, 1.34)			
<i>Low</i> (<i>n</i> =153)									
Neighborhood Cohesion									

Outcomes									
In the previous 12 months									
	Alcohol in the context of sex	Drugs in the context of sex	Condomless anal sex with casual partners	Six or more casual sex partners	Group sex	Asked partner's HIV status			
	aPR (95% CI)	aPR (95% CI)	aPR (95% CI)	aPR (95% CI)	aPR (95% CI)	aPR (95% CI)			
High (Q3)	1.00	1.00	1.00	1.00	1.00	1.00			
Medium (Q2)	1.26 (0.81, 1.98)	0.93 (0.56, 1.54)	1.43 (0.80, 2.57)	3.81 (1.29, 11.26)*	0.88 (0.31, 2.44)	1.17 (0.80, 1.71)			
Low (Q1)	1.53 (1.01, 2.30)*	1.05 (0.65, 1.71)	1.46 (0.83, 2.58)	1.69 (0.56, 5.14)	1.06 (0.38, 2.91)	0.85 (0.56, 1.29)			
Stratified by Private religiosity									
<i>High (n=237)</i>									
Neighborhood Cohesion									
High (Q3)	1.00	1.00	1.00	1.00	1.00	1.00			
Medium (Q2)	1.13 (0.77, 1.68)	0.93 (0.61, 1.40)	1.77 (1.03, 3.05)*	1.19 (0.60, 2.36)	0.94 (0.46, 1.91)	1.00 (0.81, 1.25)			
Low (Q1)	1.54 (1.05, 2.27)*	1.31 (0.87, 1.99)	1.98 (1.15, 3.38)*	1.03 (0.49, 2.16)	1.03 (0.50, 2.13)	0.79 (0.60, 1.03)			
<i>Low (n=110)</i>									
Neighborhood Cohesion									
High (Q3)	1.00	1.00	1.00	1.00	1.00	1.00			
Medium (Q2)	1.24 (0.71, 2.16)	1.19 (0.57, 2.50)	0.98 (0.54, 1.78)	2.38 (1.00, 5.64)*	1.29 (0.41, 4.06)	1.29 (0.77, 2.15)			
Low (Q1)	1.47 (0.89, 2.45)	1.25 (0.62, 2.51)	1.05 (0.58, 1.89)	1.12 (0.41, 3.09)	0.87 (0.25, 2.96)	1.25 (0.71, 2.20)			

^a Adjusted for age, Hispanic/Latino ethnicity, sexual orientation, education, annual income, employment status, incarceration, recruitment city, and HIV results