

# The Associations of Resilience and HIV Risk Behaviors Among Black Gay, Bisexual, Other Men Who Have Sex with Men (MSM) in the Deep South: The MARI Study

Obie S. McNair<sup>1</sup> · June A. Gipson<sup>2</sup> · Damian Denson<sup>3</sup> · Darwin V. Thompson<sup>4</sup> · Madeline Y. Sutton<sup>3</sup> · DeMarc A. Hickson<sup>1</sup>

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**Abstract** Resilience is an understudied intrapersonal factor that may reduce HIV risk among men who have sex with men (MSM). Multivariable Poisson regression models were used to estimate the prevalence ratio (PR) of sexual risk behaviors, HIV prevalence, and history of sexually transmitted infections (STIs) with resilience scores in a population-based study among 364 black MSM in the Deep South. Participants with higher resilience scores had a lower prevalence of condomless anal sex with casual sexual partners in past 12 months ( $PR = 0.80$ ,  $p$  value =  $0.001$ ) and during their last sexual encounter ( $PR = 0.81$ ;  $p$  value =  $0.009$ ). Resilience was inversely associated with a lower prevalence of condomless anal sex with main sexual partners, participating in a sex party/orgy and having a STI in the past 12 months. Resilience may have a protective effect on HIV among black MSM, especially in the Deep South, and should be further explored in studies with prospective designs.

**Resumen** La resistencia es un factor intrapersonal que ha sido poco estudiado que puede reducir el riesgo de VIH entre los hombres que tienen sexo con hombres (HSH).

Modelos de regresión multivariable de Posesión han sido utilizado para estimar el ratio de prevalencia (RP) de los comportamientos sexuales, la prevalencia de VIH, y la historia de infección de transmisión sexual (ITS) en comparación con los resultados de resistencia en un estudio basado en la población entre 364 HSH negros en los estados del sureste de los EEUU. Los participantes con mayor resistencia tuvieron una prevalencia menor de tener sexo anal sin un condón con una pareja sexual casual en los últimos 12 meses ( $PR = 0.80$ ;  $p = 0.001$ ) y en su último encuentro sexual ( $PR = 0.81$ ;  $p = 0.009$ ). La resistencia fue inversamente asociado con una prevalencia baja de sexo anal sin condón con una pareja sexual principal, participando en una orgía y si tiene un ITS en los últimos 12 meses. La resistencia puede que tenga un efecto protector de VIH con la población HSH negros, especialmente en los estados del sureste de los EEUU, y debe estar mejor investigado con investigaciones prospectivas.

**Keywords** Resilience · HIV risk · Protective factors · Black men who have sex with men (MSM) · Deep South

**Palabras Claves** resistencia · riesgo de VIH · factores protectores · hombres que tienen sexo con otros hombres (HSH) negros · los estados del sureste de los EEUU

✉ Obie S. McNair  
omcnair@mbk-inc.org

<sup>1</sup> Center for Research, Evaluation, and Environmental Policy Change, My Brother's Keeper Inc., 510 George Street - Suite 100, Jackson, MS 39202, USA

<sup>2</sup> Center for Community-Based Programs, My Brother's Keeper Inc., Ridgeland, MS, USA

<sup>3</sup> Division of HIV/AIDS Prevention Centers for Disease Control and Prevention, Atlanta, GA, USA

<sup>4</sup> National AIDS Education and Services for Minorities, Inc., Atlanta, GA, USA

## Introduction

In the United States (U.S.), gay, bisexual and other men who have sex with men (often referred to collectively as MSM) account for 70% of all adults and adolescents diagnosed with HIV infection as of 2015 [1]. Yet, MSM represent only 2–4% of the U.S. population [2]. Recent data from the Centers for Disease Control and Prevention

(CDC) estimate that one in two black/African American (hereafter referred to as black) MSM, compared to one in 11 white MSM, will acquire HIV in their lifetime if current HIV prevention, care and treatment efforts remain unchanged [3]. Responding appropriately to this public health crisis requires a contextualized, thoughtful, and multi-level (i.e., intrapersonal, interpersonal, and neighborhood factors) research and prevention agenda for black MSM that is also informed by a social justice framework [4]. As a first step in setting this agenda, there is a need to fully understand the multi-level contexts that shape the HIV environmental “riskscape” (i.e., the set of multi-level risk and protective factors associated with HIV risk) [5] of black MSM [6, 7], especially black MSM in the Deep South. Intrapersonal traits, which include resilience, are salient factors that may mitigate HIV among black MSM [8, 9], but have been understudied to date.

Fergus and Zimmerman [10] conceptualize resilience as a multi-dimensional intrapersonal characteristic that positively influences HIV knowledge, attitude, and beliefs, drug use self-efficacy, and protective sexual behaviors (e.g., later onset of sexual debut). Resilience behaviors, such as hardiness, self-efficacy, and adaptive coping, are generally formulated during early childhood through adolescence and are influenced by family and peer supports [11, 12]. In a qualitative study among substance-using black MSM, participants characterize resilience as co-occurring socio-cultural factors that include one’s attitude, altruism, and lived experiences [13]. Accordingly, Herrick and colleagues [14] postulate that resilience across multiple levels may promote a reduction in sexual risk behaviors or buffer the effects of minority and social stressors (e.g., experiences of discrimination) on HIV risk among MSM populations. Therefore, resilience may contribute to better health and decreased HIV risk through behavioral, psychological and physiological mechanisms [10, 15].

There is a growing body of literature that documents cross-sectional associations among greater levels of resilience, protective sexual behaviors (e.g., consistent condom use), and a lower HIV prevalence among MSM populations [16–19]. However, few studies have examined these relationships among black MSM specifically [11, 20–24], and the majority of existing studies have been conducted among black MSM in urban and non-Southern areas such as Chicago, IL, Philadelphia, PA, and New York, NY. One study documented social support, a resilience-related psychosocial factor, to be directly and positively associated with frequent HIV testing and higher rates of consistent condom use during anal sex among black MSM in Dallas and Houston, TX [23]. A second study among young black MSM in Philadelphia, PA, demonstrated a buffering effect of resilience (defined as education and optimism) on the relationship between syndemics (i.e., depression, childhood

sexual abuse, alcohol and drug use, intimate partner violence) and prevalent HIV infection [24]. Specifically, at the highest levels of both optimism and education, the relationship between the number of syndemic factors and HIV prevalence was either flat or trended downwards whereas syndemic factors were positively associated with HIV prevalence at the lowest levels of resilience [24]. To our knowledge, there have been no published studies that have assessed the direct relationships between resilience and HIV risk among black MSM in the Deep South, a five state region (Alabama, Georgia, Louisiana, South Carolina, and Mississippi) with the highest prevalence of HIV in the U.S. [25].

Given the high number of new HIV infections among black MSM in the Deep South, [1, 25–27] along with the need to fully understand the protective role of resilience on HIV in this highly marginalized population [7, 15, 28, 29], we selected Jackson, MS, and Atlanta, GA to study similarities and differences in the correlates of HIV risk among Black MSM in these two Deep South cities. Therefore, the purpose of the current study is to investigate the associations among resilience, multiple sexual behaviors, and sexually transmitted infections (STIs), including HIV, among black MSM in Jackson, MS and Atlanta, GA. We hypothesize that greater levels of resilience would be inversely associated with sexual risk behaviors, HIV prevalence, and a history of STIs. We also tested whether the magnitude and direction of resilience, multiple sexual behaviors, and STIs varied by HIV serostatus and study site.

## Methods

The Ecological Study of Sexual Behaviors and HIV/STI among black/African American MSM in the Southeastern U.S. (The MARI Study) was a two-city, population-based study designed to typify the HIV environmental “riskscape” and to identify risk and protective factors of sexual behaviors and STIs, including HIV, among black MSM in Jackson, MS, (Copiah, Hinds, Madison, Rankin, and Simpson counties) and Atlanta, GA (Clayton, Cobb, DeKalb, Fulton, and Gwinnett counties) [5]. Participants were recruited through (1) the distribution and posting of printed advertisements at local colleges and universities, adult bookstores, bars and clubs, as well as community-based organizations (CBOs) that provide healthcare and social services to black MSM; (2) face-to-face recruitment from local bars and clubs frequented by black MSM, as well as from HIV prevention interventions, community events, and other activities conducted by local CBOs; (3) social networking websites/applications (‘apps’) such as Facebook; (4) geospatial sexual networking ‘apps’ such as

Jack'd; and (5) word-of-mouth referrals from participants and from CBO staff not affiliated with the study. Eligibility criteria included a self-report of African American or black race, male biological sex at birth (cis males and transgender women), being 18 years or older, residence in the Jackson, MS, or Atlanta, GA, metropolitan statistical areas (MSA), and oral or anal sex with another man in the six months prior to study enrollment. The study protocol was approved by the Sterling Institutional Review Board and all participants provided signed informed consent.

### Resilience

The Connor-Davidson Resilience Scale (CD-RISC) is a 25-item scale that measures one's ability to cope with adversity, or resilience [30], and may promote better health outcomes and serve as a protective factor against HIV. Items 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 were asked to rate their agreement with each statement on a 5-point scale: "Not True at All;" "Rarely True;" "Sometimes True;" "Often True;" "True All the Time," which were coded 0–4 and summed. Total CD-RISC scores ranged from 0 to 100, with higher scores reflecting greater resilience. Research has shown the CD-RISC to have excellent psychometric properties in general [30, 31] and black populations [32, 33], including young black MSM in New York City [11], although there have been a few exceptions [34, 35]. The Cronbach's alpha for the CD-RISC in the current sample was 0.97, suggesting exceptionally high internal reliability.

### Sexual Behaviors, HIV Infection, STI History

Fifteen self-reported sexual behaviors included alcohol or drug use before or during sex (yes or no), in separate questions; any condomless anal sex (inconsistent condom use: most of the time, about half the time, rarely or occasionally, or never) with main or casual sexual partners in the 12 months prior to enrollment in the study as well as during the last sexual encounter; number of lifetime oral or anal male sexual partners (categories dichotomized as  $\leq 5$  and  $\geq 6$  or more partners based on the distribution of responses); number of main and casual male sexual partners in the past 12 months (dichotomized as 0–1 and  $\geq 2$  for main partners and 0–2 and  $\geq 3$  for casual partners, based on the distribution of reported partners); asked last main and casual sexual partner's HIV serostatus (yes or no); and, in the past 12 months, engaged in vaginal sex with a female (yes or no), exchanged sex for money (yes or no); or participated in a sex party/orgy (yes or no).

Participants who reported being HIV uninfected or unaware of their HIV serostatus at study enrollment underwent rapid HIV testing, after risk-reduction counseling, by research staff. Those with a reactive test result were linked to a local HIV care clinic in either Jackson or Atlanta for confirmatory testing at the end of the study visit. If the confirmatory test result was positive, participants were classified as newly diagnosed HIV-infected. Participants aware of their HIV infection prior to enrollment in the study (previously diagnosed HIV infected) signed a release of health information authorization form to allow the research staff to confirm their infection. In sum, participants were categorized as HIV infected (previously and newly diagnosed) or HIV uninfected.

Participants self-reported a 12-month history of physician or healthcare professional-diagnosed STIs. Syphilis, gonorrhea, and Chlamydia were included due to the high prevalence of these STIs in the respective MSAs, and dichotomized as any or no STI in the 12 months prior to study enrollment.

### Covariates

Selected covariates included age, Hispanic/Latino ethnicity, sexual orientation (gay/homosexual, bisexual, straight/heterosexual, questioning, or other), position during anal sex (top, bottom, versatile, or other), gender of current sexual partners (male, female, transgender), educational attainment, annual household income, current employment status, history of incarceration, and study site.

### Statistical Analysis

In descriptive analyses, we summarized the socio-demographic characteristics of the overall analytic sample and investigated the distribution of selected participant characteristics across quartiles of resilience scores to explore possible threshold effects. Linear trends were tested by including resilience as an ordinal variable (i.e., quartiles were coded 1–4 respectively) in corresponding unadjusted linear and logistic regression models. Next, we fit fully adjusted multivariable Poisson regression models [36] with robust standard errors to estimate the prevalence ratio (PR) of sexual risk behaviors, prevalent HIV infection and history of STIs (in separate models) associated with resilience. In secondary analyses, we determined whether the associations among resilience, multiple sexual behaviors, and STIs varied by HIV serostatus and study site. Hypothesis testing was two-sided with a nominal type I error rate of 0.05; all statistical analyses were performed in SAS Version 9.3 (SAS Institute, Cary, NC).

## Results

The current analyses are based on data collected from 465 black MSM who enrolled in the study between July 2013 and December 2014. One hundred and one participants with missing audio computer-assisted self-interview survey data ( $n = 86$ ) or incomplete CD-RISC scores ( $n = 15$ ) were excluded from the analysis. Transgender women ( $n = 18$ ) were also excluded because transgender women are faced with a complex interplay of multi-level psychosocial stressors that may differentially impact HIV compared to MSM [37, 38]. Of the remaining 346 (74.4%) participants [mean age of 30.1 (standard deviation = 11.4) years], 33.6% of participants were previously diagnosed HIV infected and 3.5% had a reactive rapid HIV test result (and subsequently confirmed to be newly diagnosed HIV infected). Similar to the mean resilience scores reported in other samples of Black MSM [11], the mean resilience score was 80.3 (18.1) [median = 84.0; inter-quartile range = 69.0, 97.0]. The majority of participants self-identified as homosexual or gay (68.5%), and reported being versatile (42.9%) or a bottom (24.5%) during anal sex (Table 1). Nearly fifty-four percent (53.5%) reported being unemployed and roughly four in ten (36.1%) reported a history of incarceration. Higher levels of resilience were associated with younger age (Chi square = 16.87,  $df = 3$ ,  $p$  value < 0.001), current employment (Chi square = 13.29,  $df = 3$ ,  $p$  value = 0.004) and residence in the Jackson, MS MSA (Chi square = 20.00,  $df = 3$ ,  $p$  value < 0.001).

Table 2 illustrates the associations of resilience with reported sexual behaviors, confirmed HIV status, and self-reported history of STIs after adjustment of age, ethnicity, sexual orientation, position during anal sex, gender of current sexual partners, education, income, current employment status, history of incarceration, HIV serostatus (except in models with HIV serostatus as the outcome), and study site. Lower levels of resilience were associated with a greater prevalence of condomless anal sex with main and casual partners in the past 12 months as well as during the last sexual encounter (casual partners only) in fully adjusted models. For each standard deviation (SD) unit increase of resilience (SD = 18.06), the probability of condomless anal sex with main sexual partners in the past 12 months decreased by 14% (PR = 0.86,  $p$  value = 0.002). In addition, in fully adjusted models, for each SD increase in resilience, the probability of condomless anal sex with casual sexual partners in past 12 months decreased by 0.20% (PR = 0.80,  $p$  value = 0.001) and the probability of condomless anal sex during the last occurrence by 19% (PR = 0.81,  $p$  value = 0.009). Similarly, for each SD unit increase in resilience, the

probability of having two or more main male partners in the past 12 months decreased by 12%, however, this association did not reach statistical significance (PR = 0.88,  $p$  value = 0.054). Compared to participants in the highest quartile of resilience, participants in the lowest quartile of resilience, had a 2.2 times higher prevalence of participating in a sex party/orgy (PR = 2.15,  $p$  value = 0.042) and a 2.5 times higher prevalence of having a STI (PR = 2.49,  $p$  value = 0.013) in the past 12 months. No consistent associations were observed between resilience and any alcohol or drug use before or during sex; having five or more lifetime oral or anal male sexual partners; having three or more casual male sexual partners in the past 12 months; whether the participant asked their last main partner their HIV status; having had vaginal sex with a female partner or exchanged sex for money in the past 12 months; or HIV prevalence. The observed associations did not markedly differ by HIV status or study site (data not shown).

## Discussion

We are one of the first to investigate the associations of resilience with a set of 15 sexual behaviors, prevalent HIV infection, and reported history of STIs in a sample of young and middle-aged black MSM in the Deep South. First, higher resilience scores were associated with a lower probability of any reported condomless anal sex with main and casual male sexual partners in the past 12 months and during the last sexual encounter (casual sexual partners only). Second, lower resilience scores were associated with a higher prevalence of participating in sex parties/orgies in the past 12 months. Finally, resilience was inversely associated with a history of an STI in the past 12 months. No consistent associations were observed with alcohol or drug use before or during sex; number of lifetime oral or anal sex male partners, number of main or casual sexual partners in the past 12 months; whether participants asked their last main or casual partner their HIV status; having vaginal sex with female partners and exchanging sex for money in the past 12 months; and participant HIV serostatus.

A 2012 cross-sectional study among MSM used a resilience framework to link romantic motivations to consistent condom use during anal sex with main and casual partners [39], which is consistent with the current study. Findings in the current study expand the empirical evidence by demonstrating higher levels of resilience are associated with fewer reported main male sexual partners in the past year [40]. This is important as simulation studies suggest that 32–68% of HIV transmissions among MSM

**Table 1** Selected demographic and socio-economic characteristics by quartiles of resilience among black men who have sex with men (MSM), the MARI Study, 2013–2014

Variables	Total [21–100] ( <i>n</i> = 346)	Quartile 1 [21–69] ( <i>n</i> = 87)	Quartile 2 [70–83] ( <i>n</i> = 83)	Quartile 3 [84–96] ( <i>n</i> = 88)	Quartile 4 [97–100] ( <i>n</i> = 88)	P for trend
Resilience, mean	80.3 (18.1)	54.5 (10.9)	76.4 (3.6)	90.4 (3.9)	99.3 (1.1)	<0.001
Age, years	30.1 (11.4)	33.2 (12.1)	32.0 (12.0)	28.2 (10.2)	27.3 (10.2)	0.001
Latino/Hispanic ethnicity, %	2.3	3.5	1.2	3.5	1.1	0.558
Sexual orientation, %						
Homosexual/gay	68.5	67.8	59.0	68.2	78.4	0.113
Bisexual	26.0	24.1	31.3	28.4	20.5	0.380
Straight/heterosexual; questioning; “do not identify”	5.5	8.1	9.6	3.4	1.1	0.033
Position during sex, %						
Top	31.2	34.9	34.2	22.7	33.3	0.245
Bottom	24.5	20.9	24.4	28.4	24.1	0.724
Versatile	42.9	40.7	41.5	46.6	42.5	0.866
Other*	1.5	3.5	0.0	2.3	0.0	0.069
Current sexual partners, %						
Males only	80.9	79.3	78.3	85.2	80.7	0.653
Males and females	12.7	18.4	13.3	8.0	11.4	0.215
Other**	6.4	2.3	8.4	6.8	8.0	0.254
Education, %						
≤High school diploma	39.9	54.0	33.7	36.4	35.2	0.022
Some college	40.2	34.5	36.2	39.8	50.0	0.102
Bachelor and above	19.9	11.5	30.1	23.9	14.8	0.009
Annual household income, %						
Less than \$5000	37.8	48.2	36.6	35.6	31.0	0.341
\$5000–\$15,999	34.8	32.5	30.5	32.2	43.7	0.254
\$16,000 and above	27.4	19.3	32.9	32.2	25.3	0.149
Currently unemployed, %	53.5	70.1	48.2	48.9	46.6	0.004
History of incarceration, %	36.1	42.5	41.0	34.1	27.3	0.173
Jackson, MS study site	60.4	41.4	61.5	67.1	71.6	<0.001

\* Other. Open-ended category that allowed participants to specify their sexual position

\*\* Other included the response categories of females only, transgendered women, and not currently sexually active

Missing data. Latino/Hispanic ethnicity: *n* = 1; Position during sex: *n* = 3; Annual household income: *n* = 7

occur in the context of main sexual partnerships [41, 42]. In another study among black MSM in New York City, resilience has been shown to be associated with better psychological functioning factors (i.e., attachment, internalized homophobia, familism) that contribute to lower HIV risk among MSM [11]. Taking these results together, resilience may be a protective intrapersonal trait that reduces risky sexual behaviors and promotes HIV prevention and care outcomes among black MSM. Future studies with prospective designs are needed to establish the temporal ordering between resilience and HIV risk.

Previous research has shown that one in five MSM [43] and one in six black MSM [44] have participated in sex parties/orgies; this is consistent with the prevalence

observed among black MSM in the current study (15.4%). Sex parties/orgies are private and/or organized social environments to meet anonymous sexual partners [44–46] and men who attend these events report engaging in more frequent acts of condomless anal sex and report more STIs, including HIV, than others [44, 45]. In addition, sex parties/orgies are different, by definition, from commercial sex environments (i.e., bathhouses and sex clubs) or public sex environments (e.g., rest stops and cruising parks) [45], and research has shown that MSM who participate in sex parties engage in more condomless anal sex and report more casual partners than MSM who engage in commercial sex work or sex in public environments [47]. Although we did not ask about sexual behaviors during these events, our

**Table 2** Multivariable regression analyses of the associations of resilience with multiple sexual behaviors, HIV prevalence, and history of sexually transmitted infections among Black men who have sex with men in The MARI Study, 2013–2014

	Prevalence (%)	Quartiles of resilience <sup>a</sup> [PR (CI 95%)]			P for trend	SD units	
		Quartile 1 [21–69]	Quartile 2 [70–83]	Quartile 3 [84–96]			
Any alcohol or drug use before or during sex							
Alcohol use before or during sex	49.1	1.14 (0.82, 1.58)	1.23 (0.89, 1.70)	1.13 (0.81, 1.57)	0.369	1.00 (0.90, 1.11)	
Drug use before or during sex	36.6	0.92 (0.61, 1.39)	1.05 (0.70, 1.56)	1.10 (0.75, 1.60)	0.654	1.03 (0.90, 1.19)	
Any condomless anal sex with main partners							
Past 12 months	55.3	<b>1.53 (1.14, 2.04)**</b>	1.26 (0.94, 1.70)	0.99 (0.71, 1.38)	<b>0.001</b>	<b>0.86 (0.78, 0.94)**</b>	
Last sexual encounter	41.0	1.36 (0.94, 1.98)	1.11 (0.75, 1.64)	0.91 (0.60, 1.38)	<b>0.062</b>	0.91 (0.80, 1.03)	
Any condomless anal sex with casual partners							
Past 12 months	35.8	<b>2.56 (1.59, 4.12)***</b>	<b>1.58 (0.93, 2.68)<sup>†</sup></b>	1.55 (0.92, 2.61)	<b>&lt;0.001</b>	<b>0.80 (0.70, 0.91)**</b>	
Last sexual encounter	28.2	<b>2.20 (1.28, 3.76)**</b>	1.50 (0.83, 2.72)	1.29 (0.70, 2.38)	<b>0.002</b>	<b>0.81 (0.70, 0.95)**</b>	
>5 oral sex male partners, lifetime	72.0	1.05 (0.87, 1.26)	1.04 (0.87, 1.25)	0.92 (0.76, 1.11)	0.360	0.97 (0.91, 1.04)	
>5 anal sex male partners, lifetime	64.7	1.02 (0.83, 1.25)	0.87 (0.69, 1.08)	0.92 (0.75, 1.12)	0.968	0.99 (0.92, 1.07)	
≥2 main male partners, past 12 months	38.7	<b>1.45 (0.99, 2.13)<sup>†</sup></b>	1.20 (0.80, 1.79)	1.06 (0.70, 1.60)	<b>0.048</b>	<b>0.88 (0.78, 1.00)<sup>†</sup></b>	
≥3 casual male partners, past 12 months	43.1	0.84 (0.57, 1.25)	1.23 (0.89, 1.70)	1.02 (0.73, 1.42)	0.671	1.08 (0.95, 1.23)	
Asked last main partner's HIV status	74.9	0.90 (0.75, 1.09)	<b>0.83 (0.68, 1.02)<sup>†</sup></b>	0.97 (0.81, 1.16)	0.132	<b>1.07 (0.99, 0.15)<sup>†</sup></b>	
Asked last casual partner's HIV status	63.0	<b>0.74 (0.55, 0.99)*</b>	0.97 (0.78, 1.20)	0.87 (0.69, 1.10)	<b>0.084</b>	<b>1.13 (1.01, 1.25)*</b>	
Vaginal sex with female partner, past 12 months	20.1	1.10 (0.67, 1.81)	1.18 (0.69, 2.02)	0.89 (0.48, 1.67)	0.525	0.92 (0.77, 1.10)	
Exchange sex, past 12 months	17.4	0.85 (0.44, 1.65)	0.91 (0.47, 1.75)	0.96 (0.51, 1.79)	0.604	1.05 (0.84, 1.32)	
Sex party/orgy, past 12 months	16.2	<b>2.15 (1.03, 4.50)*</b>	1.00 (0.43, 2.36)	1.76 (0.82, 3.78)	0.109	<b>0.83 (0.67, 1.02)<sup>†</sup></b>	
HIV-infected (previously and newly diagnosed)	34.9	0.80 (0.55, 1.17)	0.71 (0.47, 1.08)	1.00 (0.71, 1.41)	0.107	1.13 (0.97, 1.30)	
History of STI, past 12 months	19.2	<b>2.49 (1.21, 5.13)*</b>	<b>2.22 (1.05, 4.71)*</b>	<b>2.42 (1.20, 4.90)*</b>	<b>0.022</b>	0.86 (0.70, 1.05)	

Bold values indicate statistical significance ( $p < 0.10$  or less)

Adjusted for age, Hispanic/Latino ethnicity, sexual orientation (gay/homosexual, bisexual, straight/heterosexual, questioning, or other), position during anal sex (top, bottom, versatile, or other), gender of current sexual partners (male, female, transgender), educational attainment, annual household income, current employment status, history of incarceration, HIV status (except in model considering HIV serostatus as outcome), and study site

HIV human immunodeficiency virus, STI sexually transmitted infections, SD standard deviation, CI confidence interval 95%, PR prevalence ratio

<sup>†</sup>  $p < 0.10$ , \*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$

<sup>a</sup> Quartile 4 [97–100] served as the referent group

study is the first to document an inverse association between resilience and participation in a sex party/orgy (in the past 12 months) among black MSM. Additional research is needed to better understand the risk behaviors that occur during sex parties/orgies in order to reduce the transmission and acquisition of STIs in these contexts.

Our findings have implications for the development or adaptation of culturally appropriate trauma treatments (i.e., cognitive-behavioral therapies that desensitize and reprocess the effects of traumas) and behavioral interventions

for black MSM. Existing behavioral interventions developed for black MSM (e.g., Many Men Many Voices, *d-up: Defend Yourself!*) have focused on improving intrapersonal traits such as self-esteem, positive attitudes and beliefs, changing social norms and addressing internalized HIV stigma and discrimination, and have been shown to be efficacious in reducing sexual risk behaviors over time [48, 49]. Young black MSM in the current study, compared with older black MSM, reported higher levels of resilience. Research shows that black adolescents with higher levels

of resilience reported higher levels of condom use and HIV self-efficacy and engaged in lower rates of risky sexual behaviors (e.g., condomless sex) than their respective counterparts [50–52]. This suggests that behavioral interventions, especially those targeting young black MSM, should consider resilience as a strengths-based personality trait in the context of behavioral theories, such as social cognitive theory, during the development of culturally relevant interventions to have potential long-term effects on the reduction of sexual risk behaviors and HIV risk. Specifically for MSM, interventions for resilience should consider opportunities during the full lifespan, including school-based efforts for youth to decrease bullying and increase peer support, and efforts for adults should strengthen social activism and community creativity to counter homophobia and possibly decrease HIV risk [53].

In addition, public health practitioners should address the high level of disenfranchisement (low socioeconomic, experiences with the criminal justice system, history of homelessness) experienced by the majority of black MSM in the core elements or theoretical framework of behavioral interventions. Poverty, incarceration and healthcare access are well-established determinants of health and are modifiable targets for HIV prevention among black MSM [28, 29, 54–59]. In a prospective study among a bi-racial sample of MSM, health insurance status explained 20% of the variation in new HIV infections between black and white MSM [60]. Therefore, future prevention efforts should address building resilience, self-efficacy traits, and educational opportunities to address post-traumatic stress related disorders associated with incarceration and homelessness.

Key strengths of our study are the inclusion of multiple sexual behaviors, current HIV status and history of STIs; the geographic location of the study sample in the Deep South—two high HIV prevalence metropolitan areas that have high rates of poverty, discrimination, and unmet healthcare and social service needs [25–27]; and adjustment for a large number of covariates in multivariable regression analyses, which limited the potential of residual confounding.

We had several limitations. First, the cross-sectional study design limited our ability to draw any causal inferences. Second, the 12-month recall period for many of the sexual behaviors and history of diagnosed STIs may have introduced measurement error, or misclassification. Third, the sample was drawn entirely from two MSAs in the Deep South, namely Jackson, MS, and Atlanta, GA, and the results may not be generalizable to other MSM or transgender women populations in other regions of the U.S. Lastly, the psychometric properties of the CD-RISC had not previously been validated with black MSM in the Deep South. The Cronbach's  $\alpha$  in the current study was 0.97,

suggesting exceptionally high internal reliability. Future research should continue to investigate the psychometrics of the CD-RISC to ensure this scale adequately captures resiliency in southern black MSM.

In conclusion, our findings suggest that resilience may be a protective factor against the acquisition and transmission of HIV among black MSM and underscore the importance of developing HIV prevention interventions that build resilience skills to overcome adversity, social and minority stressors, and other traumas experienced by black MSM, especially those in the Deep South.

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#### Compliance with Ethical Standards

**Conflict of interest** All authors declare that he/she has no conflict of interest. Damian Denson and Madeline Sutton are employees of the Centers for Disease Control and Prevention. The views expressed are their own and do not represent the views of the Centers for Disease Control and Prevention or the United States Government.

**Ethical Approval** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

**Informed Consent** Informed consent was obtained from all individual participants included in the study.

#### References

- Centers for Disease Control and Prevention. HIV Surveillance Report, 2015; vol. 27. Available at: <https://www.cdc.gov/hiv/pdf/library/reports/surveillance/cdc-hiv-surveillance-report-2015-vol-27.pdf>.
- Lieb S, Prejean J, Thompson DR, Fallon SJ, Cooper H, Gates GJ, et al. HIV prevalence rates among men who have sex with men in the southern United States: population-based estimates by race/ethnicity. *AIDS Behav*. 2011;15(3):596–606.
- National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention. Half of black gay men and a quarter of Latino gay men projected to be diagnosed within their lifetime. 2016. Retrieved from <http://www.cdc.gov/nchstp/newsroom/2016/croi-press-release-risk.html>.
- Matthews DD, Smith JC, Brown AL, Malebranche DJ. Reconciling epidemiology and social justice in the public health discourse around the sexual networks of black men who have sex with men. *Am J Public Health*. 2016;106(5):808–14.

5. Hickson DA, Truong NL, Smith-Bankhead N, Sturdevant N, Duncan DT, Schnorr J, et al. Rationale, design and methods of the ecological study of sexual behaviors and HIV/STI among African American men who have sex with men in the Southeastern United States (the MARI study). *PLoS ONE*. 2015;10(12):e0143823.
6. Baral S, Logie CH, Grosso A, Wirtz AL, Beyrer C. Modified social ecological model: a tool to guide the assessment of the risks and risk contexts of HIV epidemics. *BMC Public Health*. 2013;13:482.
7. Mayer KH, Wheeler DP, Bekker LG, Grinsztejn B, Remien RH, Sandfort TG, et al. Overcoming biological, behavioral, and structural vulnerabilities: new directions in research to decrease HIV transmission in men who have sex with men. *J Acquir Immune Defic Syndr*. 2013;63(Suppl 2):S161–7.
8. Fullilove R. African Americans, health disparities and HIV/AIDS: Recommendations for confronting the epidemic in Black America. 2006. Available at: [http://img.thebody.com/nmac/blacks\\_aids.pdf](http://img.thebody.com/nmac/blacks_aids.pdf).
9. McCree DH, Jones KT, O'Leary A, editors. African Americans and HIV/AIDS: understanding and addressing the epidemic. New York: Springer; 2010.
10. Fergus S, Zimmerman MA. Adolescent resilience: a framework for understanding healthy development in the face of risk. *Annu Rev Public Health*. 2005;26:399–419.
11. Wilson PA, Meyer IH, Antebi-Gruszka N, Boone MR, Cook SH, Cherenack EM. Profiles of resilience and psychosocial outcomes among young black gay and bisexual men. *Am J Community Psychol*. 2016;57(1–2):144–57.
12. Masten AS. Ordinary magic: resilience processes in development. *Am Psychol*. 2001;56(3):227–38.
13. Buttram ME. The social environmental elements of resilience among vulnerable African American/black men who have sex with men. *J Hum Behav Soc Environ*. 2015;25(8):923–33.
14. Herrick AL, Stall R, Goldhammer H, Egan JE, Mayer KH. Resilience as a research framework and as a cornerstone of prevention research for gay and bisexual men: theory and evidence. *AIDS Behav*. 2014;18(1):1–9.
15. Mustanski BS, Newcomb ME, Du Bois SN, Garcia SC, Grov C. HIV in young men who have sex with men: a review of epidemiology, risk and protective factors, and interventions. *J Sex Res*. 2011;48(2–3):218–53.
16. Herrick AL, Stall R, Chmiel JS, Guadamuz TE, Penniman T, Shoptaw S, et al. It gets better: resolution of internalized homophobia over time and associations with positive health outcomes among MSM. *AIDS Behav*. 2013;17(4):1423–30.
17. Gwadz MV, Clatts MC, Yi H, Leonard NR, Goldsamt L, Lankenau S. Resilience among young men who have sex with men in New York City. *Sex Res Soc Policy*. 2006;3(1):13–21.
18. Kurtz SP, Buttram ME, Surratt HL, Stall RD. Resilience, syndemic factors, and serosorting behaviors among HIV-positive and HIV-negative substance-using MSM. *AIDS Educ Prev*. 2012;24(3):193–205.
19. Mustanski B, Garofalo R, Herrick A, Donenberg G. Psychosocial health problems increase risk for HIV among urban young men who have sex with men: preliminary evidence of a syndemic in need of attention. *Ann Behav Med*. 2007;34(1):37–45.
20. Quinn K, Dickson-Gomez J, DiFrancesco W, Kelly JA, Lawrence JS. Correlates of internalized homonegativity among black men who have sex with men. *AIDS Educ Prev*. 2015;27(3):212–26.
21. Boone MR. Internalized homophobia, psychological distress, and resilience as correlates of substance use during sexual encounters in young adult black men who have sex with men. Columbia: Academic Commons. Available at: <https://academiccommons.columbia.edu/catalog/ac:178201>.
22. Peterson JL, Bakeman R, Sullivan P, Millett GA, Rosenberg E, Salazar L, et al. Social discrimination and resiliency are not associated with differences in prevalent HIV infection in black and white men who have sex with men. *J Acquir Immune Defic Syndr*. 2014;66(5):538–43.
23. Scott HM, Pollack L, Rebchook GM, Huebner DM, Peterson J, Kegeles SM. Peer social support is associated with recent HIV testing among young black men who have sex with men. *AIDS Behav*. 2014;18(5):913–20.
24. O'Leary A, Jemmott JB III, Stevens R, Rutledge SE, Icard LD. Optimism and education buffer the effects of syndemic conditions on HIV status among African American men who have sex with men. *AIDS Behav*. 2014;18(11):2080–8.
25. Reif S, Geonnotti KL, Whetten K. HIV infection and AIDS in the Deep South. *Am J Public Health*. 2006;96(6):970–3.
26. Reif S, Pence BW, Hall I, Hu X, Whetten K, Wilson E. HIV diagnoses, prevalence and outcomes in nine southern states. *J Community Health*. 2015;40(4):642–51.
27. Reif SS, Whetten K, Wilson ER, McAllister C, Pence BW, Legrand S, et al. HIV/AIDS in the Southern USA: a disproportionate epidemic. *AIDS Care*. 2014;26(3):351–9.
28. Millett GA, Peterson JL, Wolitski RJ, Stall R. Greater risk for HIV infection of black men who have sex with men: a critical literature review. *Am J Public Health*. 2006;96(6):1007–19.
29. Maulsby C, Millett G, Lindsey K, Kelley R, Johnson K, Montoya D, et al. HIV among black men who have sex with men (MSM) in the United States: a review of the literature. *AIDS Behav*. 2014;18(1):10–25.
30. Connor KM, Davidson JR. Development of a new resilience scale: the Connor-Davidson resilience scale (CD-RISC). *Depress Anxiety*. 2003;18:76–82.
31. Campbell-Sills L, Cohan SL, Stein MB. Relationship of resilience to personality, coping, and psychiatric symptoms in young adults. *Behav Res Ther*. 2006;44(4):585–99.
32. Brown DL. African American resiliency: examining racial socialization and social support as protective factors. *J Black Psychol*. 2008;34:32–48.
33. Coates EE, Phares V, Dedrick RF. Psychometric properties of the Connor-Davidson Resilience Scale 10 among low-income, African American men. *Psychol Assess*. 2013;25(4):1349–54.
34. Campbell-Sills L, Stein MB. Psychometric analysis and refinement of the Connor-davidson Resilience Scale (CD-RISC): validation of a 10-item measure of resilience. *J Trauma Stress*. 2007;20(6):1019–28.
35. Resnick BA, Inguito PL. The Resilience Scale: psychometric properties and clinical applicability in older adults. *Arch Psychiatr Nurs*. 2011;25(1):11–20.
36. Spiegelman D, Hertzmark E. Easy SAS calculations for risk or prevalence ratios and differences. *Am J Epidemiol*. 2005;162(3):199–200.
37. Poteat T, German D, Flynn C. The conflation of gender and sex: gaps and opportunities in HIV data among transgender women and MSM. *Glob Public Health*. 2016;11(7–8):835–48.
38. Sanchez T, Finlayson T, Murrill C, Guilin V, Dean L. Risk behaviors and psychosocial stressors in the New York City house ball community: a comparison of men and transgender women who have sex with men. *AIDS Behav*. 2010;14(2):351–8.
39. Bauermeister JA, Ventuneac A, Pingel E, Parsons JT. Spectrums of love: examining the relationship between romantic motivations and sexual risk among young gay and bisexual men. *AIDS Behav*. 2012;16(6):1549–59.
40. MacDonald TK, Martineau AM. Self-esteem, mood, and intentions to use condoms: when does low self-esteem lead to risky health behaviors? *J Exp Soc Psychol*. 2002;38(3):299–306.



41. Sullivan PS, Salazar L, Buchbinder S, Sanchez TH. Estimating the proportion of HIV transmissions from main sex partners among men who have sex with men in five US cities. *AIDS*. 2009;23(9):1153–62.
42. Goodreau SM, Carnegie NB, Vittinghoff E, Lama JR, Sanchez J, Grinsztejn B, et al. What drives the US and Peruvian HIV epidemics in men who have sex with men (MSM)? *PLoS ONE*. 2012;7(11):e50522.
43. Mimiaga MJ, Reisner SL, Bland SE, Driscoll MA, Cranston K, Isenberg D, et al. Sex parties among urban MSM: an emerging culture and HIV risk environment. *AIDS Behav*. 2011;15(2):305–18.
44. Solomon TM, Halkitis PN, Moeller RM, Siconolfi DE, Kiang MV, Barton SC. Sex parties among young gay, bisexual, and other men who have sex with men in New York City: attendance and behavior. *J Urban Health*. 2011;88(6):1063–75.
45. Binson D, Woods WJ, Pollack L, Paul J, Stall R, Catania JA. Differential HIV risk in bathhouses and public cruising areas. *Am J of Public Health*. 2001;91(9):1482–6.
46. Grov C, Parsons JT, Bimbi DS. Sexual risk behavior and venues for meeting sex partners: an intercept survey of gay and bisexual men in LA and NYC. *AIDS Behav*. 2007;11(6):915–26.
47. Pollock JA, Halkitis PN. Environmental factors in relation to unprotected sexual behavior among gay, bisexual, and other MSM. *AIDS Educ Prev*. 2009;21(4):340–55.
48. Jones KT, Gray P, Whiteside YO, Wang T, Bost D, Dunbar E, et al. Evaluation of an HIV prevention intervention adapted for black men who have sex with men. *Am J Public Health*. 2008;98(6):1043–50.
49. Wilton L, Herbst JH, Coultry-Doniger P, Painter TM, English G, Alvarez ME, et al. Efficacy of an HIV/STI prevention intervention for black men who have sex with men: findings from the many men, many voices (3MV) project. *AIDS Behav*. 2009;13(3):532–44.
50. Saewyc EM. Research on adolescent sexual orientation: Development, health disparities, stigma, and resilience. *J Res Adoles*. 2011;21(1):256–72.
51. Longmore MA, Manning WD, Giordano PC, Rudolph JL. Self-esteem, depressive symptoms, and adolescents' sexual onset. *Soc Psychol Q*. 2004;67(3):279–95.
52. Lohman BJ, Billings A. Protective and risk factors associated with adolescent boys' early sexual debut and risky sexual behaviors. *J Youth Adoles*. 2008;37(6):723–35.
53. Herrick AL, Lim SH, Wei C, Smith H, Guadamuz T, Friedman MS, Stall R. Resilience as an untapped resource in behavioral intervention design for gay men. *AIDS Behav*. 2011;15(Suppl 1):S25–9.
54. Jones KT, Johnson WD, Wheeler DP, Gray P, Foust E, Gaiter J. Nonsupportive peer norms and incarceration as HIV risk correlates for young black men who have sex with men. *AIDS Behav*. 2008;12(1):41–50.
55. Brewer RA, Magnus M, Kuo I, Wang L, Liu TY, Mayer KH. The high prevalence of incarceration history among black men who have sex with men in the United States: associations and implications. *Am J Public Health*. 2014;104(3):448–54.
56. Taussig J, Shouse RL, LaMarre M, et al. HIV transmission among male inmates in a state prison system—Georgia, 1992–2005. *J Am Med Assoc*. 2006;296(2):162–4.
57. Millett GA, Peterson JL. The known hidden epidemic: HIV/AIDS among black men who have sex with men in the United States. *Am J Prev Med*. 2007;32(4 suppl):31–3.
58. Millett GA, Peterson JL, Flores SA, Hart TA, Jeffries WL, Wilson PA, et al. Comparisons of disparities and risks of HIV infection in black and other men who have sex with men in Canada, UK, and USA: a meta-analysis. *Lancet*. 2012;380(9839):341–8.
59. Oster AM, Wiegand RE, Sionean C, Miles IJ, Thomas PE, Melendez-Morales L, et al. Understanding disparities in HIV infection between black and white MSM in the United States. *AIDS*. 2011;25(8):1103–12.
60. Sullivan PS, Rosenberg ES, Sanchez TH, Kelley CF, Luisi N, Cooper HL, et al. Explaining racial disparities in HIV incidence in black and white men who have sex with men in Atlanta, GA: a prospective observational cohort study. *Ann Epidemiol*. 2015;25(6):445–54.