Sexual Mixing Patterns and Partner Characteristics of Black MSM in Massachusetts at Increased Risk for HIV Infection and Transmission

Matthew J. Mimiaga, Sari L. Reisner, Kevin Cranston, Deborah Isenberg, Donna Bright, Gary Daffin, Sean Bland, Maura A. Driscoll, Rodney VanDerwarker, Benny Vega, and Kenneth H. Mayer

---

ABSTRACT *Black men who have sex with men (MSM) are at increased risk for HIV infection in the United States compared to other MSM. The aim of this study was to investigate Black MSM's sexual mixing patterns and partner characteristics in relation to sexual risk taking, as a possible explanation for this observed increase in HIV incidence. Between January and July 2008, 197 Black MSM were recruited via modified respondent-driven sampling and completed optional pretest and post-test HIV serological testing, counseling, and a demographic, behavioral, and psychosocial assessment battery. Bivariate and multivariable logistic regression procedures were used to examine predictors of risky sex across partner types. Overall, 18% of the sample was HIV-infected; 50% reported unprotected intercourse with men, 30% with women, and 5% with transgender partners. Fifty-three percent identified as bisexual or straight, although all reported oral or anal sex with another man in the prior 12 months. Significant predictors of engaging in at least one episode of: (1) serodiscordant unprotected anal sex (UAS) with a male partner in the past 12 months: individuals at risk for social isolation (AOR=4.23; $p=0.03$), those with unstable housing (AOR=4.19; $p=0.03$), and those who used poppers at least weekly during sex (AOR=5.90; $p=0.05$); (2) UAS and/or unprotected vaginal intercourse with a female partner in the past 12 months: those with unstable housing (AOR=4.85; $p=0.04$), those who used cocaine at least weekly during sex (AOR=16.78; $p=0.006$), being HIV-infected (AOR=0.07; $p=0.02$), and feeling social norms favor condom use (AOR=0.60; $p=0.05$); (3) UAS with the participants' most recent nonmain male sex partner: use of alcohol and drugs during last sex by participant (AOR=4.04; $p=0.01$), having sex with a Hispanic/Latino male (AOR=2.71; $p=0.04$) or a Black male (AOR=0.50; $p=0.05$) compared to a White male, and lower education (AOR=1.31; $p=0.02$). Findings suggest that sexual risk behaviors of Black MSM differ across partner type and by the characteristics of their sexual networks and that this subpopulation of MSM are at high risk for HIV acquisition and transmission. Effective prevention strategies need to address the distinct sexual and behavioral risk patterns presented by different sexual partnerships reported by Black MSM.*

KEYWORDS HIV/AIDS, STD, African American/Black, MSM, Prevention

---

Mimiaga, Reisner, Bland, VanDerwarker, Vega, and Mayer are with the The Fenway Institute, Fenway Community Health, Boston, MA, USA; Mimiaga is with the Harvard Medical School/Massachusetts General Hospital, Boston, MA, USA; Cranston, Isenberg, and Driscoll are with the Massachusetts Department of Public Health, Boston, MA, USA; Bright is with the Justice Resource Institute, Boston, MA, USA; Daffin is with the Multicultural AIDS Coalition, Boston, MA, USA; Mayer is with the Brown Medical School/Miriam Hospital, Providence, RI, USA.

Correspondence: Matthew J. Mimiaga, ScD, MPH, The Fenway Institute, Fenway Community Health, 1340 Boylston Street, Boston, MA 02215, USA. (E-mail: mmimiaga@fenwayhealth.org)

INTRODUCTION

Black men and women are more likely to be infected with HIV and sexually transmitted diseases (STDs) in the United States compared to other racial/ethnic groups, creating a major public health problem.¹ In 2006, Black men and women represented only 12.6% of the total U.S. population but accounted for 49% of all HIV/AIDS diagnoses.^{1,2} Among Black men living with HIV/AIDS in the U.S., the primary transmission category remains sexual contact with other men,¹ and Black men who have sex with men (MSM) continue to be the group at greatest risk of HIV and other STD incidence.^{1,3–6}

Numerous studies have sought to explore and explain the differential rates of HIV and STDs among Black MSM. Possible explanations for racial disparities in HIV and STD incidence have included socioeconomic position and cultural factors, structural barriers in accessing health care, and differences in sexual behavior.^{7–11} Although studies have consistently found higher HIV prevalence among Black MSM relative to MSM of other races/ethnicities, comparable or lower rates of sexual risk behavior (i.e., unprotected anal sex [UAS]) have been observed among Black MSM compared to White and/or Latino MSM,^{10,12–15} suggesting that behavioral risk factors for HIV infection alone do not sufficiently explain elevated rates of HIV among Black MSM.¹²

One potential explanation for higher HIV infection rates—that the sexual networks of Black MSM place them at greater risk for HIV and STDs than the sexual networks of other MSM—has not yet been sufficiently investigated.^{10,12,16,17} Prior research has shown that sexual mixing between members of different populations may facilitate the spread of HIV and STDs.^{18–22} Early research with MSM found sexual relationships between MSM of different age groups to be associated with higher risk for HIV infections.^{20,21} Studies have more recently begun to underscore the importance of focusing on and understanding racial dynamics in sexual networks.^{13,22–24} For example, Laumann and Youm demonstrated that the incidence and prevalence of HIV and STDs remained higher within Black populations because Black men and women were more likely than White and Latino men and women to have sex exclusively with partners of the same race who were more likely to be HIV- and/or STD-infected.²²

In more recent research focused on MSM, Bingham and colleagues found that racial differences in male partner types partially accounted for elevated rates of HIV infection by examining the role of partner characteristics among 400 MSM ages 23 to 29 in the Los Angeles Young Men's Survey.¹³ Approximately 27% of Black MSM reported having a Black male sex partner in the past 12 months compared to 12% of Hispanic/Latinos and 3% of Whites.¹³ Moreover, for Black MSM compared to White MSM, sexual partner choices (i.e., older age and having Black sexual partners) were better predictors of the higher rates of HIV seroprevalence in the sample than individual behavioral histories (i.e., HIV risk behavior).¹³ Similarly, Berry and colleagues, in an analysis of data from the 2004 National HIV Behavioral Surveillance Survey in San Francisco, confirmed a significant tendency among Black MSM to have more partners of the same race.²⁴ Accordingly, a combination of intraracial and intergenerational sexual mixing may explain the disproportionate rates of HIV and STDs among Black MSM.²⁵

The primary objective of this study was to investigate the sexual mixing patterns and partner characteristics among Massachusetts Black MSM as a possible explanation for observed racial disparities in HIV and STDs by examining patterns

of risky sexual behaviors across partner types. Given prior research suggesting that behavioral risk factors for HIV infection cannot alone explain elevated HIV rates,^{10,12–15} understanding the dynamics of sexual partnering among Black MSM may play an integral role in the development and implementation of culturally appropriate prevention programs.

METHODS

Design and Setting

Between January and July 2008, 197 participants were recruited via modified respondent-driven sampling (RDS)²⁵ and completed a quantitative assessment with a trained interviewer and were offered voluntary HIV counseling and testing. The study was a joint collaboration between Fenway Community Health, a freestanding health care and research facility specializing in HIV/AIDS care and serving the needs of the lesbian, gay, bisexual, and transgender community in the greater Boston area;²⁶ the Multicultural AIDS Coalition (MAC), a community-based HIV/AIDS service organization working within communities of color; the Justice Resource Institute (JRI), one of the largest human service providers in Massachusetts; and the Massachusetts Department of Public Health HIV/AIDS Bureau. The Institutional Review Boards at FCH and JRI approved the study and all study activities took place at two participating study sites in Boston, Massachusetts: MAC (N=154) and JRI (N=43).

Sample

Eligibility Criteria Individuals were eligible for the study if they (1) self-identified as African American or Black, (2) identified as male, (3) were age 18 years or older, (4) reported living in Massachusetts, and (5) reported oral or anal intercourse with a man in the preceding 12 months. Each study participant was screened for study eligibility prior to enrollment.

Recruitment The study utilized a modified RDS method,²⁵ used successfully in prior studies of MSM in Massachusetts,^{27,28} to recruit a diverse sample of men. Eight study participants were selected to function as recruiter “seeds,” four at each of the participating study sites (MAC and JRI). Because the initial four seeds at JRI had not produced enough referrals to reach the targeted sample size in the timeframe needed, an additional 13 seeds were added at JRI consistent with RDS methodology.^{25,29}

Seeds were each asked to recruit up to five individuals in their sexual or social network who in turn recruited a subsequent wave of no more than five respondent group members and so on until the a priori determined sample size had been reached. All subsequent participants had to be a member of the recruiter’s social or sexual network and meet the eligibility criteria for the study. To keep track of social networks, each participant was given five cards with study information to hand to potential recruits. Each card had a number code that connected participants back to the initial seeds. A dual incentive system was used to compensate participants: recruits were offered remuneration for completing the survey (\$25) and getting tested for HIV (\$25); in addition, they were offered \$10 for each eligible peer they recruited, for a total maximum of \$100. Altruistic motives for recruiting peers were emphasized; thus, respondents were provided with a means to not only earn

financial rewards, but also to feel engaged in their community by actively helping to advance HIV and STD prevention efforts.

Quantitative Assessment and Measures

After providing informed consent, participants completed a quantitative assessment administered by a trained interviewer that lasted approximately 1 h.

Demographics, Substance Use, STD History, and HIV Status Demographic, substance use, STD history, and HIV status questions were adapted from the Centers for Disease Control and Prevention's National HIV Behavioral Surveillance Survey, MSM Cycle.³⁰ Demographic information included age, ethnicity, education, health insurance, housing, religious affiliation, sexual identification, and disclosure of MSM status (i.e., "outness"). Questions assessed substance use during sex in the prior 12 months, including use and frequency of nonparenteral and injection drug use (IDU). Participants were asked about their STD history in the previous 12 months and ever; they were also asked to report their HIV status. As part of the study procedures, HIV testing and counseling were offered via rapid HIV antibody test (see procedures below) and HIV status was verified among participants who were HIV tested.

Sexual Behavior/Sexual Partner History Sexual behavior/sexual partner history questions were adapted from the Centers for Disease Control and Prevention's National HIV Behavioral Surveillance Survey, MSM Cycle.³⁰ Questions were asked about sexual partners (men, women, and transgender partners) including where participants met their sexual partners (i.e., sexual networks); demographic information about their most recent main male partner (i.e., spouse, boyfriend) and their most recent nonmain male partner (i.e., casual partner or "hook-up"), including race/ethnicity, HIV status, drug/alcohol use at last sex, and other characteristics; and specific sexual practices as well as the gender, HIV status, and type of partner.

Alcohol Use The CAGE questionnaire, a clinical screening instrument for alcoholism (Cronbach's $\alpha=0.69$), was used to assess alcohol use where a score of 2 or more indicated a possible problem with alcohol.^{31–33}

Depression Depressive symptoms were assessed with the Center for Epidemiologic Studies Depression Scale (CES-D), which has been validated in many populations to assess clinically significant depressive symptoms (Cronbach's $\alpha=0.89$).^{34, 35} The 20 items were scored on a four-point Likert scale from 0 to 3 with a score of 16 or greater indicative of depressive symptoms; we also used the scale score as a continuous variable.

Social Support Social support was assessed using an abbreviated version of the Lubben Social Network Scale (LSNS-6) adapted to evaluate friendship and sexual partnership ties (Cronbach's $\alpha=0.83$).³⁶ The six-item scale was scored on a five-point Likert scale from 0 to 5 where a score of <12 indicated a person at risk for social isolation. A clinical cut point score of <12 on this scale usually indicated that the respondent had fewer than two people to perform the social integration functions of friendship and sexual partners. Perceived social support was assessed using the Multidimensional Scale of Perceived Social Support (MSPSS), a 12-item validated scale scored on seven-point Likert scale from 1 to 7 (Cronbach's $\alpha=$

0.88).^{37,38} Scores were summed and high scores indicated greater perceived social support.

HIV Optimism/Skepticism The HIV optimism/skepticism scale was used to assess participant attitudes toward current HIV treatments with lower scores indicating greater optimism (Cronbach's $\alpha=0.79$).³⁹

Condom Norms To assess condom use norms, participants were asked two questions, taken from previous research on this topic:⁴⁰ (1) "Most of my friends think that condoms are just too much of a hassle to use" and (2) "Most of my friends think you should always use a condom when having sex with a new person." Responses were scored on a four-point Likert scale from "strongly agree" to "strongly disagree"; item 2 was reverse scored and scores were summed to produce a mean scale score.

HIV and STD Knowledge The 18-item HIV Knowledge Questionnaire (HIV-KQ-18), a brief self-report measure shown to have internal consistency across samples (Cronbach's α s=0.75–0.89), was used to assess participants' HIV-related knowledge.⁴¹ A 27-item STD Knowledge Questionnaire (STD-KQ), a comprehensive self-report measure of knowledge about STDs demonstrating good internal consistency (Cronbach's $\alpha=0.86$), was used to assess STD knowledge.⁴² For both HIV and STD scales, responses were "true," "false," or "don't know." In scoring, each correct answer was awarded one point; incorrect and "don't know" responses were scored zero. A single summary score was obtained for each scale by summing the number of items correctly answered ("don't know" responses were scored as incorrect). Higher scores indicated greater HIV or STD knowledge.

HIV Prevention Services Participants were asked about their exposure to HIV prevention services in the past 12 months, including whether or not they had (1) contact with an HIV prevention outreach worker, (2) participated in a one-on-one prevention intervention, and (3) participated in a group-level HIV prevention intervention. Participants were also asked if they had an interest in participating in an HIV prevention intervention in the future on a four-point Likert scale ranging from "very" to "not at all." If participants indicated they were "not very" or "not at all" interested in future participation in HIV prevention efforts, they were further queried as to reasons why they were not interested.

History of Incarceration Participants were asked to report whether they had ever spent time in jail or prison at any time in their life. The survey instrument was piloted with ten participants (five participants by MAC and five by JRI) who met eligibility requirements for the study. Data obtained from the pilot phase were used only to refine study instruments; these data were not combined and analyzed with findings reported in this study. Pilot participants were eligible to be subsequently recruited by a social or sexual network member into the main study; however, pilot participants could not be selected as a participant seed.

HIV Testing

After both the consent process and administration of the quantitative assessment, each participant had the option to have a voluntary confidential rapid HIV antibody test. Overall, 91% of the sample ($N=180$) opted to have a rapid HIV test during

their study visit. The Food and Drug Administration-approved OraQuick® ADVANCE™ HIV-1/2 Antibody Test was used for HIV testing [sensitivity=99.6% (98.5–99.9); specificity=100% (99.7–100)]. Like conventional HIV enzyme immunoassays, rapid HIV tests are screening tests that require confirmation if reactive (preliminary positive). Reactive rapid HIV test results were confirmed by confirmatory Western blot testing. Each participant who consented to HIV testing received standard-of-care, pretest, and post-test HIV counseling. Clients were referred to medical and psychosocial support services as appropriate. All HIV test counselors had completed the required training and Massachusetts' state certification process prior to meeting with participants.

Data Analysis

The SAS version 9.1 statistical software was used to perform each analysis in the present study where statistical significance was determined at the $p < 0.05$ level.⁴³ The distribution and range of each variable was assessed both by partner type (transgender, male, and female) and characteristics and by sexual risk (unprotected vs. protected). Chi-square global tests of independence and Fisher's exact tests were used to examine independent associations between variables.

Outcomes of Interest Three separate dichotomous outcomes were examined: (1) serodiscordant (a known different HIV status) UAS with a male sex partner(s) in the prior 12 months; (2) UAS and/or vaginal sex with a female sex partner(s) in the prior 12 months; and (3) UAS with most recent, nonmain male sex partner.

Bivariate and Multivariable Logistic Regression Models For all variables, bivariate logistic regression analyses were conducted to establish which variable resulted in statistically significant parameter estimates with our three outcomes of interest. A separate multivariable logistic regression model was constructed for each of our three outcomes. Variables with a p value of < 0.10 in the bivariate models were retained in the three final multivariable models.⁴⁴ All multivariable models controlled for age and education regardless of their significance in the bivariate procedures.

Because there were multiple, potentially correlated indicators of variables (e.g., substance and alcohol use) in this analysis, multicollinearity among these variables was assessed; intercorrelation among the independents above 0.80 were considered to be problematic. For significant bivariate predictors that were multicollinear with each other, the variable thought to be theoretically most important in the analysis was chosen and retained in the final multivariable model, whereas the others were dropped.⁴⁴

RESULTS

Overall Sample Characteristics

Demographics Participants had a mean age of 38.7 (SD=11.3), and 87% identified as African American, 23% as either Haitian, Cape Verdean, Caribbean, Jamaican, and African, and 8% as Hispanic/Latino. Seventy-eight percent had a high school degree, 10% had less than a high school degree, and 14% had a college degree or higher. The majority of the men had public health insurance (73%

Medicaid/MassHealth, 7% Medicare, and 3% Veteran's Administration) and 5% had no health insurance. Thirteen percent reported having had unstable housing within the past 12 months.

HIV and STD History Overall, 18% of the sample was HIV-infected. However, only one participant was newly diagnosed with HIV in the study. Twenty-nine percent reported ever being diagnosed with an STD (syphilis, gonorrhea, *Chlamydia*, and/or herpes), and 7% reported having been diagnosed with an STD in the previous 12 months.

Sexual Identity Participants identified as 44% homosexual, 44% bisexual, 9% heterosexual, and 3% unknown, although all participants reported oral or anal sex with another man in the previous 12 months. One fifth had not disclosed their MSM identity (i.e., were not "out") to friends, family, spouse, and health care providers.

Transactional Sex Ten percent of the sample reported having sex for money (either payer or payee) in the past 12 months, and 3% reported serodiscordant UAS during their last sex for money encounter.

Substance and Alcohol Use In the past 12 months, participants reported sex while using a variety of substances: 39% marijuana, 22% cocaine, 15% crack, 14% poppers, 7% crystal methamphetamine, 5% heroin, and 3% IDU. Thirty-eight percent indicated problem alcohol use by the CAGE criteria.

Depression and Social Support One third of the men had clinically significant depressive symptoms by CES-D criteria (33% CES-D score 16+) and 38% reported low levels of social support (LSNS-6 score <12), indicating increased risk for social isolation.

HIV Prevention Services In the prior 12 months, 71% of the sample reported exposure to some HIV prevention activities (67% contact with an HIV prevention outreach worker, 52% had participated in individual-level HIV prevention interventions, and 54% had participated in group-level HIV prevention interventions). When asked if they had an interest in participating in an HIV prevention intervention in the future, the overwhelming majority (93%) indicated that they were "very" or "somewhat" interested. The most common reasons for disinterest in 7% were: "I feel that I am educated enough on this topic," "I already know my HIV status," "I never really think about it," and "boring."

Unprotected Sex with Male, Female, and Transgender Partners in Previous 12 months

Table 1 outlines the demographic characteristics of the sample by partner type (male, female, transgender) and sexual risk (unprotected vs. protected sex) and Table 2 describes the frequency and predictors of serodiscordant UAS (receptive or insertive) with male sex partners in the prior 12 months.

Male Sex Partners Participants reported a mean of 6 (SD=10.26) oral and/or anal sex male sex partners in the prior 12 months; 83% reported engaging in anal sex with another male in the previous 12 months and 50% reported UAS with another male. Only 17% reported oral sex only with a male partner. Of men reporting anal sex with multiple male partners in the past 12 months, 61% reported UAS at least

TABLE 1 Demographic, behavioral, and psychosocial characteristics of Black MSM by partner gender (male, female, and transgender) and sexual risk behavior (unprotected vs. protected sex; N=197)

	Male partners			Female partners		Transgender partners		All
	UAS (N=99)	No UAS (N=64)	Oral sex only (N=34)	UVF/UAF (N=59)	No UVF/UAF (N=138)	UVT/UAT (N=9)	No UVT/UAT (N=188)	
Age in years, mean (SD)	38.3 (11.3)	37.5 (11.4)	41.8 (10.9)	39.9 (8.4)	38.1 (12.4)	46.0 (7.2)	38.3 (11.4)	38.7 (11.3)
Ethnicity ^a , % (N)								
African American	85 (84)	88 (56)	92 (31)	92 (54)	85 (117)	100 (9)	87 (162)	87 (171)
Other ethnicity (Haitian, Jamaican, Cape Verdean, African, Caribbean)	27 (27)	20 (13)	15 (5)	12 (7)	28 (38)	0 (0)	25 (45)	23 (45)
Hispanic/Latino	11 (11)	5 (3)	3 (1)	7 (4)	8 (11)	0 (0)	8 (15)	8 (15)
Education, % (N)								
Some high school	6 (6)	14 (9)	9 (3)	8 (5)	10 (13)	0 (0)	10 (18)	10 (18)
High school degree or GED	79 (78)	73 (47)	80 (27)	85 (50)	74 (102)	89 (8)	77 (144)	78 (152)
College or graduate degree	15 (15)	13 (8)	9 (3)	7 (4)	16 (22)	11 (1)	14 (25)	14 (26)
Housing, % (N)								
Unstable housing in past 12 mo	16 (15)	10 (6)	9 (3)	24 (14)	8 (10)	34 (3)	12 (21)	13 (24)
Health insurance ^a , % (N)								
No health insurance	7 (6)	4 (2)	3 (1)	7 (4)	4 (5)	0 (0)	5 (9)	5 (9)
Private health insurance/HMO	22 (21)	27 (17)	9 (3)	9 (5)	27 (36)	22 (2)	21 (39)	21 (41)
Medicaid/MassHealth	72 (71)	71 (45)	80 (27)	84 (49)	69 (94)	78 (7)	73 (136)	73 (143)
Medicare	8 (7)	4 (2)	12 (4)	6 (3)	8 (10)	0 (0)	7 (13)	7 (13)
Veteran's Administration	2 (1)	2 (1)	9 (3)	4 (2)	3 (3)	0 (0)	3 (5)	3 (5)
Other	2 (1)	2 (1)	0 (0)	0 (0)	2 (2)	0 (0)	2 (2)	2 (2)
Religious identity, % (N)								
Religious affiliation (Protestant, Roman Catholic, Christian Orthodox, Other)	67 (66)	63 (40)	50 (17)	51 (30)	67 (93)	67 (6)	62 (117)	62 (123)
History of incarceration, % (N)								
Past incarceration	56 (55)	45 (29)	50 (17)	66 (39)	45 (62)	89 (8)	50 (93)	51 (101)
Sexual identity, % (N)								
Heterosexual	6 (6)	11 (7)	12 (4)	15 (9)	6 (8)	11 (1)	9 (16)	9 (17)

Homosexual	52 (51)	42 (27)	26 (9)	8 (5)	60 (82)	0 (0)	46 (87)	44 (87)
Bisexual	38 (38)	44 (28)	59 (20)	70 (41)	33 (45)	89 (8)	41 (78)	44 (86)
Unknown	4 (4)	3 (2)	3 (1)	7 (4)	1 (3)	0 (0)	4 (7)	3 (7)
Disclosure of MSM experience, % (N)								
Not out	19 (18)	18 (11)	27 (9)	38 (22)	12 (16)	23 (2)	20 (36)	20 (38)
HIV/STDs, % (N)								
HIV-infected	21 (20)	15 (9)	18 (6)	6 (3)	24 (32)	12 (1)	19 (34)	18 (35)
History of STDs ever	31 (30)	25 (16)	33 (11)	28 (16)	30 (41)	45 (4)	29 (53)	29 (57)
STD in past 12 months	8 (7)	7 (4)	3 (1)	6 (3)	7 (9)	0 (0)	7 (12)	7 (12)
Substance use during sex in the prior 12 months, % (N)								
Crystal meth	11 (10)	0 (0)	9 (3)	6 (3)	8 (10)	0 (0)	7 (13)	7 (13)
Crack cocaine	16 (15)	10 (6)	21 (7)	23 (13)	11 (15)	34 (3)	14 (25)	15 (28)
Powder cocaine	24 (23)	19 (12)	21 (7)	39 (23)	14 (19)	67 (6)	20 (36)	22 (42)
Heroin	6 (5)	5 (3)	0 (0)	12 (7)	1 (1)	23 (2)	4 (6)	5 (8)
Marijuana	50 (49)	27 (17)	30 (10)	55 (32)	32 (44)	23 (2)	40 (74)	39 (76)
Poppers	23 (22)	4 (2)	6 (2)	12 (7)	14 (19)	12 (1)	14 (25)	14 (26)
IDU	4 (3)	4 (2)	0 (0)	9 (5)	0 (0)	23 (2)	2 (3)	3 (5)
Sexual risk in the prior 12 months, % (N)								
UAS NonMain Male	67 (66)	0 (0)	0 (0)	39 (23)	32 (43)	23 (2)	35 (64)	34 (66)
Serodiscordant UAS nonmain male	24 (23)	4 (2)	0 (0)	17 (10)	11 (15)	23 (2)	13 (23)	13 (25)
UAS main male	42 (41)	0 (0)	0 (0)	9 (5)	27 (36)	12 (1)	22 (40)	21 (41)
Serodiscordant UAS main male	10 (9)	2 (1)	0 (0)	2 (1)	7 (9)	12 (1)	5 (9)	6 (10)
UAF	13 (12)	13 (8)	15 (5)	43 (25)	0 (0)	56 (5)	11 (20)	13 (25)
UVF	30 (29)	25 (16)	33 (11)	95 (56)	0 (0)	56 (5)	28 (51)	29 (56)
UAT or UVT	4 (3)	7 (4)	6 (2)	11 (6)	3 (3)	100 (9)	0 (0)	5 (9)
Sex for money (payer or payee)	14 (13)	5 (3)	6 (2)	11 (6)	9 (12)	23 (2)	9 (16)	10 (18)
Serodiscordant UAS for money	5 (4)	0 (0)	0 (0)	2 (1)	3 (3)	0 (0)	3 (4)	3 (4)
Where met sex partners in the prior 12 months ^a , % (N)								
Internet	29 (28)	13 (8)	9 (3)	4 (2)	27 (37)	0 (0)	21 (39)	20 (39)
Bar/club	36 (35)	36 (23)	36 (12)	39 (23)	35 (47)	78 (7)	34 (63)	36 (70)
Public cruising area	28 (47)	32 (20)	59 (20)	58 (34)	39 (53)	78 (7)	43 (80)	45 (87)

TABLE 1 (continued)

	Male partners		Female partners		Transgender partners		All
	Oral sex only		No UVE/UAF		UVT/UAT		
	UAS (N=99)	No UAS (N=64)	UAF/UAF (N=59)	No UVE/UAF (N=138)	UVT/UAT (N=9)	No UVT/UAT (N=188)	
							Total sample (N=197)
Adult bookstore	5 (4)	2 (1)	0 (0)	4 (2)	3 (3)	12 (1)	3 (4)
Bathhouse or sex club	3 (2)	2 (1)	0 (0)	0 (0)	3 (3)	0 (0)	2 (3)
Private sex parties	10 (9)	2 (1)	9 (3)	7 (4)	7 (9)	0 (0)	7 (13)
Circuit party or rave	2 (1)	0 (0)	0 (0)	0 (0)	1 (1)	0 (0)	1 (1)
Through friends	64 (63)	50 (32)	68 (23)	65 (38)	58 (80)	78 (7)	60 (111)
Social gathering	39 (38)	30 (19)	50 (17)	46 (27)	35 (47)	34 (3)	38 (71)
Other	16 (15)	15 (9)	3 (1)	17 (10)	11 (15)	23 (2)	13 (23)
HIV prevention exposure in the prior 12 months, % (N)							
Exposure to an HIV prevention (outreach worker, one-on-one, or group-level)	66 (65)	77 (49)	76 (26)	66 (39)	73 (101)	67 (6)	71 (134)
Psychosocial, % (N)							
Alcohol dependence (CAGE score 2+)	39 (38)	35 (22)	39 (13)	53 (31)	31 (42)	67 (6)	38 (73)
Depression (CES-D score 16+)	38 (37)	32 (22)	18 (6)	39 (23)	31 (42)	45 (4)	33 (65)
Socially isolated (LSNS-6 score <12)	34 (33)	41 (26)	42 (14)	29 (17)	41 (56)	23 (2)	38 (73)
Social support (MSPSS) score, mean (SD)	57.1 (11.4)	56.4 (9.0)	55.1 (10.9)	54.1 (10.1)	57.5 (10.6)	57.8 (6.6)	56.5 (10.6)
Depression (CES-D) score, mean (SD)	14.5 (13.5)	12.7 (12.2)	10.4 (9.8)	16.3 (15.0)	11.9 (11.1)	22.3 (17.7)	13.2 (12.5)
HIV treatment optimism score, mean (SD)	34.1 (4.3)	34.2 (3.1)	34.1 (3.4)	33.1 (3.9)	34.6 (3.6)	33.2 (1.4)	34.2 (3.8)
Condom norms score, mean (SD)	5.1 (1.2)	5.8 (1.1)	5.0 (1.2)	5.1 (1.3)	5.4 (1.2)	5.6 (0.9)	5.3 (1.2)
HIV knowledge score, mean (SD)	15.4 (2.8)	15.7 (2.1)	15.6 (2.2)	14.9 (3.0)	15.8 (2.2)	16.0 (1.5)	15.5 (2.4)
STD knowledge score, mean (SD)	16.8 (4.9)	16.9 (4.1)	16.5 (3.1)	15.7 (4.4)	17.2 (4.3)	16.6 (4.7)	16.8 (4.3)

Positive HIV status was confirmed via rapid HIV antibody test. Percentages may exceed 100% due to rounding
UAS unprotected anal sex (either insertive or receptive) with male partner, UVT/UAF unprotected vaginal or anal sex with female partner, UVT/UAT unprotected vaginal or anal sex with transgender partner
^aParticipants were asked to “check all that apply”; therefore, percentages may exceed 100%

TABLE 2 Predictors of serodiscordant UAS (receptive or insertive) with male partners in the prior 12 months (N=197)

Predictors	Bivariate odds ratio (95%CI)	p value	Multivariable model odds ratio ^a (95%CI)	p value
Socially isolated (LSNS-6 score <12)				
No	—	—	—	—
Yes	3.42 (1.25, 9.37)	0.01	4.23 (1.13, 15.71)	0.03
Housing in the past 12 months				
Stable	—	—	—	—
Unstable	3.50 (1.33, 9.17)	0.01	4.19 (1.13, 15.57)	0.03
At least weekly use of poppers during sex				
No	—	—	—	—
Yes	6.53 (1.36, 31.45)	0.02	5.90 (1.01, 36.03)	0.05

^aFinal multivariable logistic regression model adjusted for participant's age, education, HIV status, and sexual orientation

once. Thirty men (15%) reported serodiscordant UAS with another male partner in the prior 12 months.

Bivariate Associations. Variables significantly associated with an increased odds of engaging in at least one episode of serodiscordant UAS with a male partner in the past 12 months included: reporting social isolation compared to those who did not report this (OR=3.42; $p=0.01$), being without stable housing in the past 12 months (OR=3.50; $p=0.01$), and using poppers at least weekly during sex with male partners (OR=6.53; $p=0.02$).

Multivariable Logistical Regression Model Predicting Serodiscordant UAS with Male Sex Partners in the Prior 12 Months. In a multivariable logistic regression model adjusting for participant age, education, sexual orientation, and HIV status, variables significantly associated with an increased odds of engaging in at least one episode of serodiscordant UAS with a male partner in the past 12 months included: reporting social isolation (AOR=4.23; $p=0.03$), being without stable housing in the past 12 months (AOR=4.19; $p=0.03$), and using poppers at least weekly during sex with male partners (AOR=5.90; $p=0.05$).

Female Sex Partners In the past 12 months, over a third (39%) of the total sample reported oral, anal, or vaginal sex with a female partner; 29% of the total sample reported unprotected vaginal sex with a mean number of 2.03 (SD=2.63) female partners, and 13% reported UAS with a mean number of 1.02 (SD=1.42) female partners. Of men reporting sex with a female partner in the past 12 months, 78% reported unprotected anal or vaginal sex at least once (Table 3).

Bivariate Associations. Variables significantly associated with increased odds of engaging in at least one episode of UAS and/or vaginal sex with a female partner in the past 12 months included: identifying as heterosexual (OR=18.45; $p=0.004$) or bisexual (OR=14.94; $p=0.001$); having clinically significant depressive symptoms,

TABLE 3 Predictors of unprotected anal or vaginal sex with female sex partners in the prior 12 months (N=197)

Predictors	Bivariate odds ratio (95%CI)	<i>p</i> value	Multivariable model odds ratio ^a (95%CI)	<i>p</i> value
HIV status				
Uninfected	—	—	—	—
Infected	0.15 (0.04, 0.51)	0.002	0.07 (0.01, 0.73)	0.02
Religious identity				
No	—	—	—	—
Yes	0.50 (0.27, 0.93)	0.02	0.40 (0.11, 1.42)	0.15
Sexual identity				
Homosexual	—	—	—	—
Heterosexual	18.45 (4.97, 68.52)	0.004	13.54 (0.99, 17.40)	0.15
Bisexual	14.94 (5.51, 40.49)	0.001	6.78 (0.99, 31.82)	0.40
Social support (MSPSS) scale score	0.97 (0.94, 0.99)	0.04	1.01 (0.95, 1.07)	0.81
HIV treatment optimism scale score	0.89 (0.81, 0.97)	0.01	1.01 (0.86, 1.17)	0.93
Depression (CES-D) scale score	1.03 (1.01, 1.05)	0.02	1.02 (0.98, 1.05)	0.40
Housing in the past 12 months				
Stable	—	—	—	—
Unstable	4.01 (1.66, 9.67)	0.002	4.85 (1.01, 23.33)	0.04
Disclosure of MSM status				
Yes out	—	—	—	—
Not out	4.53 (2.16, 9.51)	0.0001	2.11 (0.47, 9.59)	0.33
Alcohol dependency (CAGE)				
No	—	—	—	—
Yes	2.53 (1.35, 4.73)	0.003	2.25 (0.62, 8.18)	0.21
At least weekly use of cocaine during sex				
No	—	—	—	—
Yes	6.76 (1.75, 26.02)	0.005	16.78 (2.21, 27.30)	0.006
Condom norms scale score	0.79 (0.61, 1.02)	0.07	0.60 (0.36, 0.99)	0.05
HIV knowledge scale score	0.86 (0.76, 0.97)	0.02	1.02 (0.73, 1.43)	0.89
STD knowledge scale score	0.92 (0.87, 0.99)	0.03	0.94 (0.78, 1.15)	0.59
History of incarceration				
No	—	—	—	—
Yes	2.39 (1.27, 4.51)	0.007	2.81 (0.69, 11.55)	0.14

^aFinal multivariable logistic regression model adjusted for participant’s age and education and included the following variables: HIV status, religious identity, sexual identity, social support, HIV treatment optimism, depression, housing situation, disclosure of MSM identity, alcohol dependence, weekly cocaine use, condom norms, HIV and STD knowledge, and history of incarceration

such that each additional scale score is associated with an increase in sexual risk taking (OR=1.03; *p*=0.02); having had unstable housing in the past 12 months, (OR=4.01; *p*=0.002); not being “out” about one’s sexuality (OR=4.53; *p*=0.0001); having a probable problem with alcohol (OR=2.53; *p*=0.003); using cocaine at least weekly during sex (OR=6.76; *p*=0.005); and having been incarcerated in the past (OR=2.39; *p*=0.007).

Variables significantly associated with decreased odds of engaging in at least one episode of UAS and/or vaginal sex with a female partner in the past 12 months

included: being HIV-infected ($OR=0.45$; $p=0.002$); having a religious identity/affiliation ($OR=0.50$; $p=0.02$); having social support, such that each scale score increase is associated with a decrease in sexual risk taking ($OR=0.97$; $p=0.04$); being optimistic about HIV treatment, such that each scale score increase was associated with a decrease in sexual risk taking ($OR=0.89$; $p=0.01$); and being knowledgeable about HIV ($OR=0.86$; $p=0.02$) and STDs ($OR=0.92$; $p=0.03$), such that each scale score increase was associated with decreased sexual risk taking.

Multivariable Logistical Regression Model Predicting Anal or Vaginal Sex with Female Sex Partners in the Prior 12 Months. In a multivariable logistic regression model adjusting for participant age and education, variables significantly associated with an increased odds of engaging in at least one episode of UAS and/or vaginal sex with a female partner in the past 12 months included: having had unstable housing in the past 12 months ($AOR=4.85$; $p=0.04$) and using cocaine at least weekly during sex ($AOR=16.78$; $p=0.006$). Variables significantly associated with a decreased odds of engaging in at least one episode of UAS and/or vaginal sex with a female partner in the past 12 months included: being HIV-infected ($AOR=0.07$; $p=0.02$) and feeling that social norms favor condom use, such that each scale score increase was associated with decreased sexual risk ($AOR=0.60$; $p=0.05$).

Transgender Sex Partners Eight percent of participants reported oral, anal, or vaginal sex with a transgender partner in the prior 12 months; 5% reported UAS and/or vaginal sex with a mean number of 1.29 ($SD=0.95$) transgender sex partners. Of participants reporting sex with a transgender partner, 56% reported unprotected anal or vaginal sex.

Sexual Partner Characteristics among Participants Reporting UAS with their Most Recent Main and Nonmain Male Partner in Previous 12 Months

Table 4 outlines the characteristics of participants' last sexual encounter in the past 12 months by partner type (main vs. nonmain) with whom they had anal sex (unprotected vs. protected).

Main Male Partner Overall, 35% of participants reported having anal sex with a main male partner in the prior 12 months. Of those reporting anal intercourse with their most recent main male partner in the previous 12 months, 59% reported UAS, of which 18% was with a serodiscordant sexual partner. Men reporting UAS with their most recent main male partner also reported high rates of unprotected vaginal sex (13%) and UAS (3%) with at least one female partner, and 27% UAS with their most recent nonmain male partner in the prior 12 months.

Nonmain Male Partner Of the 197 MSM enrolled, 69% reported having anal sex with a nonmain male (casual/hook-up) partner in the previous 12 months. Of the men reporting anal intercourse with their most recent nonmain male partner in the previous 12 months, 49% reported UAS, of which 31% had a sexual partner of a different HIV serostatus. Among MSM reporting UAS, participants reported sex with Black (49%), Latino/Hispanic (40%), and White (13%) men during their most recent nonmain male sex partner (casual/hook-up). Men reporting UAS with their most recent nonmain male partner also reported high rates of unprotected vaginal

TABLE 4 Characteristics of last sexual encounter in past 12 months by participants reporting anal sex with nonmain (N=136) and main (N=69) partners

	Nonmain male partner (N=136)		Main male partner (N=69)	
	UAS (N=66)	No UAS (N=70)	UAS (N=41)	No UAS (N=28)
Mean age of last partner, mean (SD)	40.6 (9.7)	32.9 (12.5)	35.3 (12.7)	33.4 (12.5)
Sexual risk during past 12 months, % (N)				
UAS with nonmain male partner	100 (66)	0 (0)	27 (11)	0 (0)
UAS with main male partner ^a	17 (11)	30 (21)	100 (41)	0 (0)
UAF	16 (10)	9 (6)	3 (1)	0 (0)
UVF	35 (23)	18 (12)	13 (5)	11 (3)
UVT/UAT	4 (2)	5 (3)	3 (1)	0 (0)
Sexual risk during last sex, % (N)				
Serodiscordant UAS with nonmain male partner	31 (20)	5 (3)	18 (7)	4 (1)
Serodiscordant UAS with main male partner	5 (3)	5 (3)	22 (9)	4 (1)
Age categories of last partner, % (N)				
18–29	41 (27)	27 (19)	34 (14)	25 (76)
30–39	34 (22)	26 (18)	20 (8)	25 (7)
40+	26 (17)	19 (13)	22 (9)	15 (4)
Unknown	0 (0)	20		
Race/ethnicity of last partner, % (N)				
African American/Black	49 (32)	43 (30)	42 (17)	43 (12)
Latino/Hispanic	40 (26)	18 (12)	25 (10)	11 (3)
White	13 (8)	10 (7)	10 (4)	11 (3)
HIV status of last partner, % (N)				
HIV-uninfected	47 (31)	42 (29)	25 (10)	33 (9)
HIV-infected	13 (8)	5 (3)	10 (4)	0 (0)
Do not know	41 (27)	25 (17)	42 (17)	29 (8)
Did you know last partner's HIV status before having sex with them?, % (N)				
No	41 (27)	25 (17)	42 (17)	29 (8)
Yes	60 (39)	48 (33)	35 (14)	36 (10)
Participant high or buzzed during last sex, % (N)				
Alcohol ^a	19 (12)	19 (13)	3 (1)	29 (8)
Drugs	11 (7)	9 (6)	5 (2)	8 (2)
Both ^a	50 (33)	18 (12)	15 (6)	11 (3)
Neither ^a	22 (14)	26 (18)	37 (15)	43 (12)
Sex partner high or buzzed during last sex, % (N)				
Alcohol	19 (12)	13 (9)	20 (8)	11 (3)
Drugs	14 (9)	9 (6)	5 (2)	8 (2)

TABLE 4 (continued)

	Nonmain male partner (N=136)		Main male partner (N=69)	
	UAS (N=66)	No UAS (N=70)	UAS (N=41)	No UAS (N=28)
Both ^a	54 (35)	20 (14)	20 (8)	8 (2)
Neither ^a	14 (9)	28 (19)	30 (12)	36 (10)
Last partner ever IDU, % (N)				
No	72 (47)	55 (38)	40 (16)	43 (12)
Yes	13 (8)	5 (3)	8 (3)	0 (0)
Where met last partner, % (N)				
Internet	16 (10)	8 (5)	10 (4)	11 (3)
Bar/club	20 (13)	13 (9)	10 (4)	15 (4)
Public cruising	25 (16)	13 (9)	15 (6)	15 (4)
Through friends	19 (12)	22 (15)	22 (9)	11 (3)
Social gathering	8 (5)	9 (6)	8 (3)	15 (4)

Percentages may exceed 100% due to rounding

UAS unprotected anal sex (either insertive or receptive) with male partner, UVF/UAF unprotected vaginal or anal sex with female partner, UVT/UAT unprotected vaginal or anal sex with transgender partner, IDU injection drug use

^aChi-square or Fisher's exact statistical tests significant at $p < 0.05$ comparing nonmain UAS to main UAS

sex (35%) and UAS (15%) with at least one female partner, and UAS (17%) with their most recent main male partner in the prior 12 months.

Bivariate Associations. The following were significant predictors of UAS with most recent nonmain male sex partner: use of alcohol and drugs during last sex by participant (OR=3.54; $p=0.01$), use of alcohol and drugs during last sex by the most recent nonmain male sex partner (OR=5.28; $p=0.02$), and lower educational level of participant (i.e., high school/GED vs. college or graduate degree; OR=1.77; $p=0.04$). Participants were less likely to have engaged in UAS with a Black sex partner (OR=0.82; $p=0.04$) relative to a White sex partner (Table 5).

Multivariable Logistical Regression Model Predicting UAS with most Recent Nonmain Male Sex Partner. In a final multivariable logistic regression model adjusting for participant's age and HIV status, and partner's age and HIV status, significant variables associated with UAS with the participants' most recent nonmain male sex partner included: use of alcohol and drugs during last sex (AOR=4.04; $p=0.01$) and having sex with a Hispanic/Latino male (AOR=2.71; $p=0.04$) or a Black male (AOR=0.50; $p=0.05$). Participants with a high school diploma/GED were more likely to engage in UAS (AOR=1.31; $p=0.02$) than those with a college degree.

DISCUSSION

In examining the sexual mixing patterns and partner characteristics of Massachusetts Black MSM, the current study found a considerable proportion engaged in UAS with male partners (49% UAS during last sex with a nonmain male partner), including serodiscordant anal sex and unprotected vaginal and anal sex with female

partners and transgender partners. These findings suggest that sexually active Black MSM in Massachusetts are a group at high risk of HIV/STD acquisition and transmission whose sexual risk behaviors differ across partner types and by the characteristics of their sexual relationships, corroborating prior research.^{10,12,16,17}

Recent studies have underscored the importance of focusing on and understanding sexual networks by race and prior research has observed a significant tendency among Black MSM to have more partners of the same race.^{13,22,24} Consistent with previous studies,^{13,22,24} Black MSM in the current sample had more partners who were Black men (49%) and fewer Hispanic/Latino (40%) or White (13%) male partners. However, in contrast with prior research, relative to participants who had sex last with a White male, participants who had sex last with a Hispanic/Latino male were more likely to have engaged in UAS and those who had sex with a Black male were less likely to report engaging in UAS.¹³ Still, 19% of Black MSM reporting UAS in the past 12 months engaged in serodiscordant UAS during their last sexual encounter with a Black nonmain male partner. Whereas prior research has shown that elevated rates of sexual risk behavior alone may not account for elevated HIV seroprevalence rates among Black MSM,^{10,12–15} findings from the current study further suggest that elevated rates of sexual mixing with other Black MSM also may not adequately account for higher rates of HIV among Black men. Most likely, a combination of behavioral risk, sexual partner mixing, and additional contextual factors provide the best explanation of elevated HIV rates among Black MSM. For example, among participants reporting UAS with a Black sex partner during last sex, higher rates of substance use were observed (59% reported being both high and buzzed during last sex with a Black male partner and 59% reported their sex partner was both high and buzzed) than among those participants who reported UAS with a Latino male (42% reported being both high and buzzed and 50% reported their sex partner was both high and buzzed). Similarly, 17% of Black MSM reporting unprotected vaginal or anal sex with female partners in the past 12 months had engaged in serodiscordant UAS during last sex with a nonmain male sex partner, suggesting the potential of HIV and/or STD transmission risk to their female partners. Findings may be helpful in understanding the dynamics of sexual partnering and specific sexual risk behavior among Black MSM in order to design locally appropriate and culturally focused HIV prevention programs for this population.

Consistent with prior research documenting the role of alcohol/drug use and elevated sexual risk among MSM,^{45,46} substance use during sex was significantly associated with unprotected sex among Black MSM across different partner types. Participants who used poppers at least weekly during sex with a male partner were more likely to have engaged in serodiscordant sex in the prior year. Using cocaine at least weekly during sex was significantly associated with increased odds of having engaged in at least one episode of unprotected anal and/or vaginal sex with a female partner in the past 12 months. Similarly, concurrent use of alcohol and drugs by the participant during last sex with a nonmain male partner significantly predicted UAS during last sex. These results suggest that integrating alcohol/drug use information/prevention/treatment into HIV prevention interventions with Black MSM may help to reduce sexual risk by supporting them to use substances less frequently and/or increasing awareness of the role of substance use both as a trigger and facilitator to engaging in unsafe sexual behavior. However, the association of different drugs with different subpopulations of Black MSM (i.e., poppers with MSM sex and cocaine with female partners) suggests that disinhibiting drug patterns may vary within the

TABLE 5 Predictors of UAS (receptive or insertive) with most recent nonmain male sex partner (N = 197)

Predictors	Bivariate odds ratio (95%CI)	<i>p</i> value	Multivariable model odds ratio ^a (95%CI)	<i>p</i> value
Substance use during last sex (participant)				
None	—	—	—	—
Alcohol use during last sex	1.19 (0.42, 3.39)	0.41	1.09 (0.29, 4.19)	0.50
Substance use during last sex	1.50 (0.41, 5.47)	0.90	1.00 (0.18, 5.40)	0.51
Both alcohol and substance use during last sex	3.54 (1.35, 9.24)	0.01	4.04 (1.06, 15.38)	0.01
Substance use during last sex (nonmain male partner) ^b				
None	—	—	—	—
Alcohol use during last sex	2.82 (0.87, 9.09)	0.84	—	—
Substance use during last sex	3.17 (0.86, 11.64)	0.66	—	—
Both alcohol and substance use during last sex	5.28 (1.93, 14.44)	0.02	—	—
Race/ethnicity of last sexual partner				
White	—	—	—	—
Black	0.82 (0.21, 0.99)	0.04	0.50 (0.11, 0.99)	0.05
Latino/Hispanic	3.21 (0.67, 15.29)	0.14	2.71 (1.02, 13.93)	0.04
Education of participant				
College degree or higher	—	—	—	—
High school degree or GED	1.77 (1.01, 5.88)	0.04	1.31 (1.01, 4.95)	0.02
Less than a high school degree or GED	0.42 (0.08, 2.04)	0.08	0.14 (0.018, 1.01)	0.08

^aFinal multivariable logistic regression model includes participant's substance use during their last sexual encounter with a nonmain male sex partner, the race/ethnicity of the sexual partner, and participant's educational attainment; we also adjusted for participant's age and HIV status, and partner's age and HIV status

^bDue to significant multicollinearity among substance use during last sex for both the participant and the participant's sexual partner, substance use by the participant's sexual partner during last sex was not retained in the multivariable model

diverse subcultures of Black MSM, so that a variety of substance use interventions may need to be developed.

Prior studies have indicated that decreased social support and lack of peer condom use norms are associated with sexual risk among MSM.^{47–50} In the current study, the role of social support and condom use norms varied by partner type. Men at increased risk for social isolation were more likely to have engaged in serodiscordant UAS with a male partner in the past 12 months than those who reported more social support. Participants who reported that their social norms favored condom use were significantly less likely to engage in unprotected anal and/or vaginal sex with a female partner in the past 12 months. Consistent with previous research,^{48,51–56} strong community norms supporting the acceptability of condom use may assist or encourage safer sexual behavior among Black MSM. This seems particularly likely given that lower rates of UAS were observed in our sample among Black MSM reporting last sex with Black male nonmain (casual/hook-up) sex partners. Together, these findings suggest the important role that community

engagement may play in helping Black MSM to decrease sexual risk taking and suggest that safer sex interventions for this population may need to involve social networks, not just individuals.

Several socioeconomic and structural variables were associated with increased sexual risk among Black MSM. Unstable housing was significantly associated with unsafe sexual behavior such that unstably housed participants were at increased odds of engaging in unprotected sex with both male (serodiscordant) and female partners. These findings are consistent with prior research showing elevated rates of sexual risk behaviors among runaway and homeless youth and street populations with unstable housing.^{57–60} Participants with lower levels of education (high school diploma/GED or less vs. college/graduate degree) were more likely to have engaged in UAS during last sex with a nonmain partner. Other studies have also documented an association between UAS and being less educated and having a lower socioeconomic status.^{61–67} Given that 86% of the current sample of exclusively Black MSM and between 33% and 67% of other mixed race/ethnicity MSM samples in Massachusetts have less than or equal to a high school diploma/GED,^{27,28} findings suggest that socioeconomically disadvantaged Black MSM are a subgroup in need of structural interventions to support HIV prevention efforts.

Interestingly, being HIV-infected was significantly associated with decreased likelihood of engaging in unprotected anal and/or vaginal sex with a female partner in the past 12 months. However, in contrast to prior research documenting increased sexual risk taking among HIV-infected MSM,^{68–70} no associations were found between HIV serostatus and UAS with male partners. Indeed, this is an interesting finding. Explanations could be that HIV-infected men who have sex with both men and women (MSM/W), like other Black MSM/W are less likely than gay identified MSM to disclose their MSM behaviors. This challenge to keep the behaviors in confidence may be made more difficult for HIV-infected MSM, so using a condom becomes critical to avoid disclosure of MSM behaviors. Also, MSM/W may be married to or in committed relations with these women (we did not ask about female main partners) and/or the women may be the mother of their children. So there could be a protective nature there that does not exist among other MSM. In other words, internal motivations and social factors may explain this finding, in lieu of evidence-based prevention interventions targeting the MSM/W population.

The present study's limitations include possible bias from socially desirable answers as the survey was interviewer administered. In contrast to traditional RDS, this study did not weight the final sample according to the population being studied, so that inferences about the prevalence of specific conditions in the population could not be assessed. Resource limitations determined the sample size, which did not allow for recruitment chains to continue and hence interrupted the ability to establish equilibrium. As with other nonprobability sampling methods, modified RDS is subject to potential biases and reduced generalizability of the study findings to the wider Black MSM population. With regard to recruitment, the nonrandom selection of initial recruits meant that the origination of seeds could subsequently affect the characteristics of recruits.

The results of this largest study of Black MSM in New England suggest that effective prevention strategies need to address the distinct sexual and behavioral risk patterns presented by different sexual partnerships. Although a sizable proportion of participants had been exposed to some HIV prevention activity in the past 12 months, high rates of risky sexual behavior were observed among Black MSM

across partner types and traits in the current study. These findings suggest that innovative HIV prevention interventions that incorporate social support and substance use information/treatment, structural interventions, and which are informed by knowledge of sexual networks and partner characteristics, may represent useful strategies for future efforts.

ACKNOWLEDGEMENTS

We would like to thank the following individuals who contributed time and energy to this project: Tom Barker, William Graves, Pam McMorrow, Brandon Perkovich, and Ashley Tetu.

This work was funded by the HIV/AIDS Bureau, Massachusetts Department of Public Health. Some of the investigator time on this project was support by grant number R03DA023393 from the National Institute on Drug Abuse (PI: M. Mimiaga). The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

REFERENCES

- Centers for Disease Control and Prevention. *HIV/AIDS Surveillance Report*, 2006. vol. 18, Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention; 2008.
- U.S. Census Bureau. *State and county quickfacts*; 2006. Accessed on: October 1, 2008. Available at: <http://quickfacts.census.gov/qfd/states/00000.html>.
- Beatty LA, Wheeler D, Gaiter J. HIV prevention research for African Americans: current and future directions. *J Black Psychol*. 2004; 30: 40–58. doi:10.1177/0095798403259245.
- Fullilove RE. *African Americans, Health Disparities and HIV/AIDS: Recommendations for Confronting the Epidemic in Black America*. New York, NY: National Minority AIDS Council; 2006.
- Hall HI, Byers RH, Ling Q, Espinoza L. Racial/ethnic and age disparities in HIV prevalence and disease progression among men who have sex with men in the United States. *Am J Public Health*. 2007; 97(6): 1060–1066. doi:10.2105/AJPH.2006.087551.
- Mays VM, Cochran SD, Zamudio A. HIV prevention research: are we meeting the needs of African American men who have sex with men? *J Black Psychol*. 2004; 30(1): 78–105. doi:10.1177/0095798403260265.
- Heckman TG, Kelly JA, Bogart LM, Kalichman SC, Rompa DJ. HIV risk differences between African-American and white men who have sex with men. *J Natl Med Assoc*. 1999; 91: 92–100.
- Institute of Medicine. *Hidden Epidemic: Confronting Sexually Transmitted Diseases*. Washington, DC: National Academy Press; 1997.
- Malebranche DJ, Peterson JL, Fullilove RE, Stackhouse RW. Race and sexual identity: perceptions about medical culture and healthcare among black men who have sex with men. *J Natl Med Assoc*. 2004; 96(1): 97–107.
- 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: 1007–1019. doi:10.2105/AJPH.2005.066720.
- Peterson JL, Coates TJ, Catania JA, et al. High-risk sexual behavior and condom use among gay and bisexual African-American men. *Am J Public Health*. 1992; 82: 1490–1494. doi:10.2105/AJPH.82.11.1490.
- Millett GA, Flores SA, Peterson JL, Bakeman R. Explaining disparities in HIV infection among black and white men who have sex with men: a meta-analysis of HIV risk behaviors. *AIDS*. 2007; 21: 2083–2091. doi:10.1097/QAD.0b013e3282e9a64b.

13. Bingham TA, Harawa NT, Johnson DF, Secura GM, MacKellar DA, Valleroy LA. The effect of partner characteristics on HIV infection among African American men who have sex with men in the Young Men's Survey, Los Angeles, 1999–2000. *AIDS Educ Prev*. 2003; 15: 39–53. doi:[10.1521/aeap.15.1.5.39.23613](https://doi.org/10.1521/aeap.15.1.5.39.23613).
14. Harawa NT, Greenland S, Bingham TA, et al. Associations of race/ethnicity with HIV prevalence and HIV-related behaviors among young men who have sex with men in 7 urban centers in the United States. *J Acquir Immune Defic Syndr*. 2004; 35: 526–536. doi:[10.1097/00126334-200404150-00011](https://doi.org/10.1097/00126334-200404150-00011).
15. Koblin BA, Husnik MJ, Colfax G, et al. Risk factors for HIV infection among men who have sex with men. *AIDS*. 2006; 20: 731–939. doi:[10.1097/01.aids.0000216374.61442.55](https://doi.org/10.1097/01.aids.0000216374.61442.55).
16. Malebranche DJ. Black men who have sex with men and the HIV epidemic: next steps for public health. *Am J Public Health*. 2003; 93(6): 862–865. doi:[10.2105/AJPH.93.6.862](https://doi.org/10.2105/AJPH.93.6.862).
17. Sifakis F, Hylton JB, Flynn C, et al. Racial disparities in HIV incidence among young men who have sex with men: the Baltimore young men's survey. *J Acquir Immune Defic Syndr*. 2007; 46: 343–348. doi:[10.1097/QAI.0b013e31815724cc](https://doi.org/10.1097/QAI.0b013e31815724cc).
18. Ford K. Social differences in partners of American adults: association with condom use and sexually transmitted infections. *Can J Hum Sex*. 2003; 12(3/4): 129–135.
19. Havanon N, Bennett A, Knodel J. Sexual networking in provincial Thailand. *Stud Fam Plann*. 1993; 24: 1–17. doi:[10.2307/2939210](https://doi.org/10.2307/2939210).
20. Morris M, Zavisca J, Dean L. Social and sexual networks: their role in the spread of HIV/AIDS among young gay men. *AIDS Educ Prev*. 1995; 7: 24–35.
21. Service S, Blower SM. HIV transmission in sexual networks: an empirical analysis. *Proc R Soc Lond B Biol Sci*. 1995; 260: 237–244. doi:[10.1098/rspb.1995.0086](https://doi.org/10.1098/rspb.1995.0086).
22. Laumann EO, Youm Y. Racial/ethnic group differences in the prevalence of sexually transmitted diseases in the United States: a network explanation. *Sex Transm Dis*. 1999; 26(5): 250–261. doi:[10.1097/00007435-199905000-00003](https://doi.org/10.1097/00007435-199905000-00003).
23. Choi KH, Operanio D, Gregorich SE, Han L. Age and race mixing patterns of sexual partnerships among Asian men who have sex with men: implications for HIV transmission and prevention. *AIDS Educ Prev*. 2003; 15: 53–65. doi:[10.1521/aeap.15.1.5.33.23609](https://doi.org/10.1521/aeap.15.1.5.33.23609).
24. Berry M, Raymond HF, MacFarland W. Same race and older partner selection may explain higher HIV prevalence among black men who have sex with men. *AIDS*. 2007; 21(17): 2349–2350. doi:[10.1097/QAD.0b013e3282f12f41](https://doi.org/10.1097/QAD.0b013e3282f12f41).
25. Heckathorn DD. Respondent-driven sampling: a new approach to the study of hidden populations. *Soc Probl*. 1997; 44: 174–199. doi:[10.1525/sp.1997.44.2.03x0221m](https://doi.org/10.1525/sp.1997.44.2.03x0221m).
26. Mayer KH, Mimiaga MJ, VanDerwarker R, Goldhammer H, Bradford JB. Fenway Community Health's model of integrated community-based LGBT care, education, and research. In: Meyer IH, Northridge ME, eds. *The Health of Sexual Minorities*. New York, NY: Springer Science & Business Media, LLC; 2007: 693–715.
27. Mimiaga MJ, Goldhammer H, Belanoff C, Tetu AM, Mayer KH. Men who have sex with men: perceptions about sexual risk, HIV and sexually transmitted disease testing, and provider communication. *Sex Transm Dis*. 2007; 34: 113–119. doi:[10.1097/01.olq.0000225327.13214.bf](https://doi.org/10.1097/01.olq.0000225327.13214.bf).
28. Mimiaga MJ, Reisner SL, Tetu AM, et al. Psychosocial and behavioral predictors of partner notification after HIV and STI exposure and infection among MSM. *AIDS Behav*. In press.
29. Heckathorn DD. Respondent-driven sampling II: deriving valid population estimates from chain-referral samples of hidden populations. *Soc Probl*. 2002; 49: 11–34. doi:[10.1525/sp.2002.49.1.11](https://doi.org/10.1525/sp.2002.49.1.11).
30. Sanchez T, Finlayson T, Drake A, et al. Human Immunodeficiency Virus (HIV) risk, prevention, and testing behaviors—United States, National HIV Behavioral Surveillance System: men who have sex with men, November 2003–April 2005. *MMWR Surveill Summ*. 2006; 55: 1–16.
31. Ewing JA. Detecting alcoholism: the CAGE questionnaire. *JAMA*. 1984; 252: 1905–1907. doi:[10.1001/jama.252.14.1905](https://doi.org/10.1001/jama.252.14.1905).

32. Knowlton R, McCusker J, Stoddard A, et al. The use of the CAGE questionnaire in a cohort of homosexually active men. *J Stud Alcohol*. 1994; 55: 692–694.
33. Mayfield D, McLeod G, Hall P. The CAGE questionnaire: validation of a new alcoholism screening instrument. *Am J Psychiatry*. 1974; 131: 1121–1123.
34. Radloff LS. The CES-D scale: a self-report depression scale for research in the general population. *Appl Psychol Meas*. 1977; 1: 385–401. doi:[10.1177/014662167700100306](https://doi.org/10.1177/014662167700100306).
35. U.S. Department of Health and Human Services. *CES-D Scale*. Bethesda, MD: Department of Health and Human Services, National Institute of Health; 2004.
36. Lubben J, Blozik E, Gillmann G, et al. Performance of an abbreviated version of the Lubben social network scale among three European community-dwelling older adult populations. *Gerontologist*. 2006; 46: 503–513.
37. Zimet GD, Dahlem NW, Zimet SG, Farley GK. The multidimensional scale of perceived social support. *J Pers Assess*. 2008; 52: 30–41. doi:[10.1207/s15327752jpa5201_2](https://doi.org/10.1207/s15327752jpa5201_2).
38. Zimet GD, Powell SS, Farley GK, Werkman S, Berkoff KA. Psychometric characteristics of the multidimensional scale of perceived social support. *J Pers Assess*. 1990; 55: 610–617. doi:[10.1207/s15327752jpa5503&4_17](https://doi.org/10.1207/s15327752jpa5503&4_17).
39. Van de Ven P, Crawford J, Kippax S, et al. A scale of optimism–skepticism in the context of HIV treatments. *AIDS Care*. 2000;12:171–176. doi:[10.1080/09540120050001841](https://doi.org/10.1080/09540120050001841).
40. Catania JA, Coates TJ, Kegeles S. A test of the AIDS risk reduction model: psychosocial correlates of condom use in the AMEN Cohort Survey. *Health Psychol*. 1994; 13(6): 548–555. doi:[10.1037/0278-6133.13.6.548](https://doi.org/10.1037/0278-6133.13.6.548).
41. Carey MP, Schroder KE. Development and psychometric evaluation of the brief HIV knowledge questionnaire. *AIDS Educ Prev*. 2002; 14(2): 172–182. doi:[10.1521/aeap.14.2.172.23902](https://doi.org/10.1521/aeap.14.2.172.23902).
42. Jaworski BC, Carey MP. Development and psychometric evaluation of a self-administered questionnaire to measure knowledge of sexually transmitted diseases. *AIDS Behav*. 2007; 11(4): 557–574. doi:[10.1007/s10461-006-9168-5](https://doi.org/10.1007/s10461-006-9168-5).
43. SAS Institute Inc. *SAS® Version 9.1.3*. Cary, NC: SAS Institute Inc.; 2003.
44. Afifi AA, Clark V, May S. *Computer-Aided Multivariate Analysis*. 4th edn. New York: Chapman and Hall; 2004.
45. Stall R, Mills TC, Williamson J, et al. Association of co-occurring psychosocial health problems and increased vulnerability to HIV/AIDS among urban men who have sex with men. *Am J Public Health*. 2003; 93: 939–942. doi:[10.2105/AJPH.93.6.939](https://doi.org/10.2105/AJPH.93.6.939).
46. Stall R, Paul JP, Greenwood G, et al. Alcohol use, drug use, and alcohol-related problems among men who have sex with men: the Urban Men’s Health Study. *Addiction*. 2001; 96: 1589–1601. doi:[10.1046/j.1360-0443.2001.961115896.x](https://doi.org/10.1046/j.1360-0443.2001.961115896.x).
47. Darbes LA, Lewis MA. HIV-specific social support predicts less sexual risk behavior in gay male couples. *Health Psychol*. 2005; 24(6): 617–622. doi:[10.1037/0278-6133.24.6.617](https://doi.org/10.1037/0278-6133.24.6.617).
48. O’Donnell L, Agronick G, San Doval, et al. Ethnic and gay community attachments and sexual risk behaviors among urban Latino young men who have sex with men. *AIDS Educ Prev*. 2002; 14(6): 457–471. doi:[10.1521/aeap.14.8.457.24109](https://doi.org/10.1521/aeap.14.8.457.24109).
49. Peterson JL, Rothenberg R, Kraft JM, Beeker C, Trotter R. Perceived condom norms and HIV risks among social and sexual networks of young African American men who have sex with men. *Health Educ Res*. 2008; 24: 119–127.
50. Peterson JL, Folkman S, Bakeman R. Stress, coping, HIV status, psychosocial resources, and depressive mood in African American gay, bisexual, and heterosexual men. *Am J Community Psychol*. 1996; 24(4): 461–487. doi:[10.1007/BF02506793](https://doi.org/10.1007/BF02506793).
51. Crosby RA, DiClemente RJ, Wingwood GM, et al. HIV/STD-protective benefits of living with mothers in perceived supportive families: a study of high-risk African American female teens. *Prev Med*. 2001; 33(3): 175–178. doi:[10.1006/pmed.2001.0868](https://doi.org/10.1006/pmed.2001.0868).
52. Ennett ST, Bailey SL, Federman E. Social network characteristics associated with risky behaviors among runaway and homeless youth. *J Health Soc Behav*. 1999; 40: 63–78. doi:[10.2307/2676379](https://doi.org/10.2307/2676379).

53. Gore-Felton C, Koopman C, Turner-Cobb JM, Duran R, Israelski D, Spiegel D. The influence of social support, coping and mood on sexual risk behavior among HIV-positive men and women. *J Health Psychol.* 2002; 7(6): 713–722. doi:[10.1177/1359105302007006874](https://doi.org/10.1177/1359105302007006874).
54. Heckman TG, Kelly JA, Somlai AM. Predictors of continued high-risk sexual behavior in a community sample of persons living with HIV/AIDS. *AIDS Behav.* 1998; 2(2): 127–135. doi:[10.1023/A:1022194829791](https://doi.org/10.1023/A:1022194829791).
55. Henrich CC, Brookmeyer KA, Shrier LA, Shahar G. Supportive relationships and sexual risk behavior in adolescence: an ecological-transactional approach. *J Pediatr Psychol.* 2006; 31(3): 286–297. doi:[10.1093/jpepsy/jsj024](https://doi.org/10.1093/jpepsy/jsj024).
56. St. Lawrence JS, Brasfield TL, Jefferson KW, et al. Social support as a factor in African-American adolescents' sexual risk behavior. *J Adolesc Res.* 1994; 9(3): 292–310. doi:[10.1177/074355489493002](https://doi.org/10.1177/074355489493002).
57. Clements K, Gleghorn A, Garcia D, Katz M, Marx R. A risk profile of street youth in northern California: implications for gender-specific human immunodeficiency virus prevention. *J Adolesc Health.* 1997; 20: 343–353. doi:[10.1016/S1054-139X\(97\)00033-5](https://doi.org/10.1016/S1054-139X(97)00033-5).
58. Halcon LL, Lifson AR. Prevalence and predictors of sexual risks among homeless youth. *J Youth Adolesc.* 2004; 33: 71–80. doi:[10.1023/A:1027338514930](https://doi.org/10.1023/A:1027338514930).
59. Rotheram-Borus MJ, Koopman C, Haignere C, Davies M. Reducing HIV sexual risk behaviors among runaway adolescents. *JAMA.* 1991; 266: 1237–1241. doi:[10.1001/jama.266.9.1237](https://doi.org/10.1001/jama.266.9.1237).
60. Rotheram-Borus MJ, Song J, Gwadz M, Lee M, Van Rossem R, Koopman C. Reductions in HIV risk among runaway youth. *Prev Sci.* 2003; 4: 173–187. doi:[10.1023/A:1024697706033](https://doi.org/10.1023/A:1024697706033).
61. Diaz RM, Stall RD, Hoff C, Daigle D, Coates TJ. HIV risk among Latino gay men in the Southwestern United States. *AIDS Educ Prev.* 1996; 8: 415–429.
62. Hogg RS, Craib KJ, Willoughby B, Sestak B, Montaner JS, Schechter MT. Sociodemographic correlates for risk-taking behaviour among HIV seronegative homosexual men. *Can J Public Health.* 1993; 84: 423–426.
63. Hope VD, MacArthur C. Safer sex and social class: findings from a study of men using the 'gay scene' in the West Midlands Region of the United Kingdom. *AIDS Care.* 1998; 10: 81–88.
64. Janssen M, de Wit J, Stoebbe W, van Griensven F. Educational status and risk of HIV in young gay men. *J Health Psychol.* 2000; 5: 487–499.
65. Janssen M, de Wit J, Hospers HJ, van Griensven F. Educational status and young Dutch gay men's beliefs about using condoms. *AIDS Care.* 2001; 13: 41–56. doi:[10.1080/09540120020018170](https://doi.org/10.1080/09540120020018170).
66. Kippax S, Crawford J, Rodden P, Noble J. Predictors of unprotected male-to-male anal intercourse with casual partners in a national sample. *Aust J Public Health.* 1995; 19: 132–138.
67. Rawstorne P, Fogarty A, Crawford J, et al. Differences between HIV-positive gay men who 'frequently', 'sometimes' or 'never' engage in unprotected anal intercourse with seroconcordant casual partners: positive Health Cohort, Australia. *AIDS Care.* 2007; 19(4): 514–522. doi:[10.1080/09540120701214961](https://doi.org/10.1080/09540120701214961).
68. Grulich A, Prestage GP, Kippax SC, Crawford JM, Van de Ven PG. HIV serostatus of sexual partners of HIV-positive and HIV-negative homosexual men in Sydney. *AIDS.* 1998; 12: 2508. letter.
69. Hoff CC, Stall R, Paul J, et al. Differences in sexual behavior among HIV discordant and concordant gay men in primary relationships. *J Acquir Immune Defic Syndr Hum Retrovirol.* 1997; 14: 72–78.
70. Van de Ven P, Rawstorne P, Treloar C, Richters J. *HIV/AIDS, Hepatitis Sexually Transmissible Infections in Australia: Annual Report of Behaviour, 2004.* Sydney, Australia: National Centre in HIV Social Research, University of New South Wales; 2004.