HIV Sexual Risk Behavior among Black Men Who Meet Other Men on the Internet for Sex

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ABSTRACT *Using the Internet to meet sexual partners is associated with increased HIV risk behavior, including substance use, sex with multiple or anonymous partners, and unprotected anal sex (UAS), among diverse samples of MSM, yet little is known about Internet use and HIV risk among Black MSM specifically. In 2008, a sample of 197 Black MSM completed an interviewer-administered assessment and voluntary HIV counseling and testing. One fifth of the sample (20 %) reported meeting a sexual partner via the Internet in the past 12 months. Men who met sexual partners over the Internet had significantly more male sex partners ($M=13.44$, $SD=20.01$) than men who did not meet partners in this manner ($M=4.11$, $SD=4.14$, $p<0.001$) and reported significantly higher rates of UAS ($p<0.05$). Adjusting for sociodemographic and other HIV-related covariates, factors significantly associated with the increased odds of engaging in at least one episode of UAS with a male partner in the past 12 months included: meeting sexual partners on the Internet, identifying as gay, and lower knowledge about HIV transmission. These findings highlight the unique HIV risk behaviors among Black MSM meeting sexual partners via the Internet and warrant tailoring of prevention activities to address the specific behaviors and social influences that may contribute to increased HIV spread among this population.*

KEYWORDS MSM, Internet, African American/Black, HIV, Sexual risk

INTRODUCTION

More than 30 years after the first AIDS cases were reported among gay men in the USA, men who have sex with men (MSM) continue to be disproportionately impacted by the HIV epidemic.¹ Representing approximately 2 % of the US male population,¹ MSM comprised more than half (56 %) of all new HIV infections diagnosed among adults and adolescents in 2009,² and 49 % of all people living with HIV.³ Moreover, rates of new HIV infections among MSM continue to rise and the estimated number of new diagnoses among adult and adolescent males exposed

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through male-to-male sexual contact increased 17 % from 2005 to 2008.⁴ Among Black men living in the USA, incident HIV infections are nearly eight times as high as White men, with the primary mode of transmission remaining sexual contact with other men.⁵ Black MSM (BMSM) constituted the majority (68 %) of new HIV infections among all Black men,⁵ and 42 % of incident infections among all MSM in 2009.²

Among MSM, the Internet has emerged as a popular sexual partner seeking venue. A 2006 meta-analysis of studies conducted among mixed samples of MSM found that, on average, 40 % (weighted mean) of MSM recruited offline used the Internet to seek out sex partners and 30 % reported having sex with partners met online.⁶ Moreover, a growing number of studies demonstrate HIV-related risk behaviors associated with online sex-seeking, including multiple sex partners, unprotected anal sex, and substance use during sex.⁷⁻¹¹ In a cross-sectional study conducted at a resort among a mixed-race sample of MSM from 14 states, meeting sex partners on the Internet was significantly associated with the increased odds of engaging in fisting, group sex, and popper or ecstasy use during sex.¹² Similarly, among a sample of men at a gay pride event in Atlanta, Benotsch, Kalichman, and Cage (2002) found that men who reported meeting sex partners online also reported higher rates of methamphetamine use, more male partners in the previous 6 months, and higher rates of unprotected receptive and insertive anal intercourse, compared with men that did not meet their partners on the Internet.⁷ Likewise, Rosser and colleagues, in an online survey of 2,716 MSM who used the Internet to seek sex with male partners, found that the risk of unprotected anal sex with male partners substantially increased with partners met online.¹¹ Moreover, Black MSM in this sample reported increased sexual risk with both online and offline partners, compared to men of other races/ethnicities.

Epidemiologic studies have confirmed the moderating relationship between Internet use and disease outcomes as cases of HIV transmission and syphilis outbreaks have been traced to specific chat rooms and male sex partners who were met online.^{13,14} Given that Black MSM are at greater risk for HIV than MSM of other races/ethnicities,⁴ and meeting partners online is associated with HIV risk behaviors among diverse samples of MSM,⁷⁻¹¹ our understanding of the risk dynamics of Black MSM may benefit from exploring the relationship between Internet use and sexual risk-taking behaviors.

The current study had three overarching aims. First, we sought to assess the prevalence of Internet use to meet sexual partners among an exclusively Black sample of MSM in Massachusetts. Secondly, we aimed to understand the demographic, behavioral, psychosocial, and socio-sexual network correlates of meeting sexual partners on the Internet. The final aim was to investigate the association between online sexual partnering and other demographic and psychosocial factors with sexual risk behaviors among Black MSM. Based on a review of existing research,^{4,11,15} we hypothesized that (1) Black MSM who reported meeting sexual partners online would have an increased odds of engaging in high-risk sexual behaviors compared to men who did not meet their sex partners online; and (2) the association between meeting sexual partners online and sexual risk behavior would remain significant even after accounting for the influence of other significant correlates of high-risk sexual behavior.

METHODS

Design and Setting

One hundred and ninety-seven Boston area Black MSM were recruited via respondent-driven sampling between January and July 2008. Following an informed

consent process with trained study staff, participants completed a quantitative assessment with a trained interviewer, and were offered voluntary pre- and post-test HIV counseling and testing. The study was a joint collaboration between Fenway Health (FH), 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;¹⁶ 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 FH 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).

HIV Testing

Each participant had the option to take a voluntary anonymous rapid HIV antibody test (fingerstick). The FDA 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)]. Rapid reactive HIV test study participants (preliminary positive) were confirmed by Western Blot testing by blood draw. Each participant received standard-of-care, pre- and post-test HIV counseling. Clients were referred to appropriate medical and psychosocial support services, including referrals for depression.

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. Respondent-driven sampling (RDS),¹⁷ used with previous studies of MSM in Massachusetts,^{18,19} was utilized to recruit participants. 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.^{17,20}

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 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 sexually transmitted infection (STI) 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, Internet Use, Sexual Identity, and Sexual Behavior Disclosure. Demographic characteristics (age, education, and housing status), and questions regarding sexual identity and disclosure of same-sex behavior were adapted from the Centers for Disease Control and Prevention's National HIV Behavioral Surveillance Study, MSM cycle.²¹ Participants were also asked to self-report on recent (past 12 months) and lifetime (ever) STI history (syphilis, gonorrhea, chlamydia, and herpes), as well as current HIV status. HIV status was confirmed via rapid HIV antibody testing at study enrollment for those who agreed to be tested.

Internet Use. The majority of the Internet use questions were adapted from the Centers for Disease Control and Prevention's National HIV Behavioral Surveillance Study, MSM cycle.²¹ Participants were also asked whether they had met their sex partners on the Internet (most recent male partner or any sexual partner in the last 12 months).

Condom Norms. To assess condom use norms, participants were asked two questions, taken from previous research on this topic:²² (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. Higher scores indicated more positive attitudes towards using condoms.

HIV Knowledge. The 18-item HIV Knowledge Questionnaire (HIV-KQ-18), a brief self-report measure shown to have internal consistency across samples (Cronbach's alphas=0.75–0.89),²³ was used to assess participants' HIV-related knowledge (Cronbach's alpha for our sample=0.75). 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 by summing the number of items correctly answered ("don't know" responses were scored as incorrect). Higher scores indicated greater HIV knowledge.

Race of Social and Sexual Networks. Participants were asked to report on the race/ethnicity (Black, White, Latino, Asian, Native American, and Pacific Islander) of their most recent male sex partner(s). The race of participants' most recent male sex partner was dichotomized into a single variable—Black or non-Black race. Additionally, participants were asked to approximate the percentage of their friends that were of a certain race/ethnicity. Percents were scored continuously from 0 to 100.

Substance and Alcohol Use. Questions about substance use in the last 12 months (in general and during sex) were adapted from the Centers for Disease Control

and Prevention's National HIV Behavioral Surveillance Study, MSM cycle.²¹ The CAGE questionnaire, a four-item validated clinical screening instrument for problematic alcohol use (Cronbach's alpha for our sample=0.88)²⁴⁻²⁶ was used to assess likely alcohol dependence. A score of 2 or more indicated likely alcohol dependence.²⁷

Sexual Practices and Risk. Sexual risk behavior questions were adapted from the Centers for Disease Control and Prevention's National HIV Behavioral Surveillance Survey, MSM cycle.²¹ Questions were asked about male and female sexual partners, including where participants met their sexual partners, demographic information about their most recent male partners, and specific sexual practices. Sexual practices included unprotected anal sex (UAS) with one or more male sex partner (main and non-main) and unprotected anal or vaginal sex (UAVS) with one or more female partner—all within the past 12 months.

Data Analysis

SAS® version 9.2 statistical software²⁸ was used to perform analyses, where statistical significance was determined at the $p < 0.05$ level.

Primary Outcome. The primary outcome of interest was a dichotomous variable of unprotected anal sex with one or more male partners in the past 12 months (yes/no). Small sample size precluded us from having enough power to fit a multivariable model with unprotected vaginal sex as an outcome.

Primary Independent Variable of Interest. Having met sexual partners on the Internet in the past 12 months was dichotomously assessed (yes/no).

Covariates. Demographics, sexual identity, and sexual behavior disclosure; substance use and alcohol use; HIV knowledge; condom norms; race of social and sexual networks; and sexual risk were examined in relation to the primary outcome of interest.

Descriptive and Bivariate Analyses. Frequencies and descriptive statistics were generated for all variables, including the tests of normality for all continuous scale scores. Men who had met male sexual partners on the Internet in the last year were compared to those that had not on all covariates using t tests, chi-square analyses, and logistic regression analyses. For highly skewed continuous variables, such as number of male partners and HIV knowledge, non-parametric tests were used (Mann-Whitney/Wilcoxon rank-sum tests).

Multivariable Logistic Regression Models. Bivariate analyses were used to estimate which variables resulted in statistically significant parameter estimates with the primary outcome of interest. Next, a series of sequential logistic regression models were fit to determine the independent influence of meeting sexual partners via the Internet on sexual risk behavior after controlling for factors found to be associated with high-risk sex with male partners. The models were as follows: (1) model 1: Sociodemographic factors were entered in the first step as control variables, including age (continuous), higher education (high school diploma/GED or less vs. some college or more) and sexual

identity (gay vs. bisexual or heterosexual); (2) model 2: Health protective factors were added on the second step, including HIV knowledge and condom use norms (both continuous). Previous research has shown HIV knowledge and condom use norms to be associated with Internet use and with sexual risk behaviors;^{8,29–31} thus, health protective factors were included as potential confounders. (3) Model 3: HIV-related risk behaviors were entered on the third step, including substance use during sex in the past 12 months (yes/no) and having exchanged goods or services for sex during one's lifetime (yes/no). (4) Model 4: The primary independent predictor of interest, meeting sexual partners on the Internet in the past 12 months (yes/no), was entered on the final step, adjusting for all sociodemographics, health protective factors, and HIV-related risk behaviors.

Goodness of fit statistics were calculated for each fitted model and appear in Table 4. A likelihood ratio test was used to compare the fit of the nested models, testing the goodness of fit of the *null model* as a special case of the other, the *alternative model*. The test is based on the likelihood ratio, which expresses how many times more likely the estimated data are to be in their predicted configuration than observed data under one model than the other.^{32,33}

RESULTS

Overall Sample Characteristics

Demographic, behavioral, and psychosocial characteristics of the sample, comparing MSM who had and had not met sex partners on the Internet in the past 12 months, are presented in Table 1.

Demographics and Internet Use. Participants had a mean age of 38.7 (SD=11.3) and 20 % of the sample reported using the Internet to meet sexual partners in the last 12 months. The odds of having met one's most recent male sexual partner online significantly decreased with older age (OR=0.96; 95 % CI=0.92, 0.99; $p=0.02$). Men with an associate, bachelor's, or graduate degree (higher education) had a significantly greater odds of having met their most recent sexual partner online (OR=3.99; 95 % CI=1.59, 10.01; $p=0.003$), compared to men with lower educational attainment (high school graduate or lower). Eighty-six percent reported having stable housing within the past 12 months, with significantly more of the participants who met sexual partners on the Internet in the last year (97 %) reporting stable housing than those who did not meet sexual partners online (84 %) [χ^2 (1, $N=197$)=4.33, $p=0.04$]. However, only 3 % of the sample were homeowners, with no major differences found between those that did and did not meet sexual partners online (Table 1).

HIV and STI History. Overall, 18 % of the sample were HIV-infected, 29 % reported having ever been diagnosed with an STI (syphilis, gonorrhea, chlamydia, and/or herpes), and 6 % reported having been diagnosed with an STI in the previous 12 months. No significant differences were observed in HIV serostatus or STI history between men who had and had not met a sexual partner online in the last 12 months. Only one participant was newly diagnosed with HIV in the study as a result of HIV testing procedures (categorized as HIV-infected in all analyses). All other participants' self-reported HIV status was consistent with their HIV test results.

TABLE 1 Demographic characteristics of Black MSM who have (N=39) and have not (N=158) met sex partner(s) on the Internet in the prior 12 months

	TOTAL (N=197)	MET SEXUAL PARTNER(S) ON INTERNET (N=39)	DID NOT MEET SEXUAL PARTNER(S) ON INTERNET (N=158)	
	Mean (SD)			<i>t</i> or <i>Z</i> ^a
Age in years (<i>t</i>)	38.7 (11.3)	35.9 (12.3)	39.3 (11.0)	1.72
Number of male sex partners ^b (<i>Z</i> ^a)	5.96 (10.26)	13.44 (20.01)	4.11 (4.14)	3.56***
Number of female sex partners ^b (<i>t</i>)	9.68 (10.28)	6.71 (10.45)	9.9 (10.29)	-2.00
HIV knowledge (<i>Z</i> ^a)	15.51 (2.45)	16.03 (2.18)	15.39 (2.50)	1.73
Condom norms (<i>t</i>)	5.33 (1.23)	5.23 (1.27)	5.35 (1.22)	-0.42
	% (N)			<i>X</i> ²
Education				
College or graduate degree	13 (26)	21 (8)	11 (18)	2.43
Some College	33 (65)	33 (13)	33 (52)	
High school or GED	44 (87)	38 (15)	46 (72)	
Some high school	10 (18)	8 (3)	9 (15)	
HIV/STIs				
HIV-infected	18 (35)	18 (7)	18 (28)	0.24
History of STIs - lifetime	29 (57)	23 (9)	30 (48)	1.49
STI - past 12 mos.	7 (12)	3 (1)	7 (11)	1.23
Housing				
Stable housing - past 12 mos.	86 (170)	97 (38)	84 (132)	4.33*
Homeowner	3 (6)	5 (2)	3 (4)	0.7
Sexual Identity				
Homosexual (gay)	44 (87)	64 (25)	39 (62)	7.86*
Bisexual	44 (86)	26 (10)	48 (76)	
Heterosexual	9 (17)	10(4)	8 (13)	
Unknown	3 (7)	0 (0)	4 (7)	
Disclosure of MSM Experience				
Out	81 (159)	95 (37)	77 (122)	6.26**
Probable Alcohol Dependence				
CAGE score 2+	38 (73)	26 (10)	40 (63)	2.72
Substance Use - Past 12 Mos.				
Crystal methamphetamine	6 (12)	8 (3)	6 (9)	0.50
Crack Cocaine	17 (33)	10 (4)	18 (29)	0.74
Powder cocaine	24 (47)	8 (3)	28 (44)	6.53**
Heroin	5 (9)	3 (1)	5 (8)	0.28
Marijuana	47 (93)	38 (15)	49 (78)	0.66
Poppers (amyl nitrite)	14 (28)	15 (6)	14 (22)	0.34
Viagra (sildenafil)	9 (17)	10 (4)	8 (13)	0.16
Substance use during sex ^c	55 (109)	46 (18)	56 (89)	0.31
Sexual Risk				
Exchanged sex w/man for goods lifetime ^{b, d}	11 (22)	10 (4)	11 (18)	0.05
UAS w/ male partners - past 12 mos. ^e	50 (99)	72 (28)	45 (71)	5.63*
UAVS w/female partners - past 12 mos. ^e	30 (59)	5 (2)	36 (57)	14.28***

HIV status confirmed via rapid HIV antibody test

UAS unprotected insertive or receptive anal sex with a male partner, UAVS unprotected anal or vaginal sex with a female partner

* $p<0.05$; ** $p<0.01$; *** $p<0.001$

^aMann–Whitney non-parametric tests

^bSex includes oral/anal with male partners; or oral/anal/vaginal with female partners

^cSubstance use during sex includes crystal, crack cocaine, powdered cocaine, heroin, and marijuana

^dGoods included money, drugs, food, housing etc.

Sexual Identity and Sexual Behavior Disclosure. Although all participants reported oral or anal sex with another man in the past 12 months, 19 % reported having never disclosed their same-sex behavior (i.e., were “not out”) and only 44 % self-identified as gay. In an unadjusted bivariate analysis comparing self-identified gay to bisexually or heterosexually identified men, self-identifying as gay was significantly associated with having met one or more sexual partners online in the past year (OR=2.56; 95 % CI=

TABLE 2 Race of social and sexual network of Black MSM who have (N=39) and have not (N=158) met sex partner(s) on the Internet in the prior 12 months

	Met sexual partner(s) on Internet (N=39)	Did not meet sexual partner(s) on Internet (N=158)	
	Mean (SD)	Mean (SD)	t or Z ^a
Race of friends (mean percentage)			
Black (t)	43.85 (22.31)	44.69 (24.69)	0.22
White (t)	19.95 (16.30)	19.86 (15.55)	-0.03
Asian (Z ^a)	4.90 (9.87)	4.35 (7.54)	0.08
Native American (Z ^a)	0.59 (2.23)	2.28 (4.83)	-2.78**
Pacific Islander (Z ^a)	0.64 (1.95)	1.74 (6.77)	-0.69
	% (N)	% (N)	X ²
Race of most recent male partner			
Non-Black	54 (21)	37 (59)	5.11*

Participants were asked to approximate the percentage of their friends that were of a certain race/ethnicity
*p<0.05; **p<0.01
^aMann-Whitney non-parametric tests

1.24, 5.32; $p=0.01$). Additionally, having disclosed same sex behavior (i.e., being “out” about one’s sexual behavior with others) was significantly associated with meeting sexual partners on the Internet in the past 12 months (OR=5.46; 95 % CI= 1.25, 23.76; $p=0.02$).

HIV Knowledge and Condom Norms. Overall, participants had a mean HIV knowledge score of 16 (SD=2.45) out of a possible 18 points, with higher scores indicating greater HIV knowledge. The mean condom norm score was 5 (SD=1.23) out of a possible 8 points, with higher scores indicating more positive attitudes towards using condoms. No significant differences were found on either variable between those who did and did not meet sexual partners on the Internet in the past 12 months.

Race of Social and Sexual Network. Overall, 41 % of the sample reported their most recent male sex partner was of a non-Black race/ethnicity. Having a most recent non-Black male sex partner was significantly associated with the increased odds of having met this partner online (OR=2.43; 95 % CI=1.11, 5.33; $p=0.03$). Men who met sexual partners online reported comparable percentages of Black friends (M=43.85; SD=22.31) as men who did not meet sexual partners online (M=44.69; SD=24.69) [$t <1.0$, ns]. However, both groups reported significantly more Black friends (M=44.52; SD=21.76) than White friends (M=19.88; SD=15.66) [$t=12.83$, $p<0.001$] (Table 2).

Substance and Alcohol Use, Past 12 Months. In the past 12 months, participants reported using a variety of substances: 47 % marijuana, 24 % powdered cocaine; 17 % crack cocaine; 14 % poppers; 6 % crystal methamphetamine, and 5 % heroin. Using powdered cocaine in the past 12 months was significantly associated with increased odds of having met sexual partners online in the past year (OR=0.21; 95 % CI=0.06, 0.76; $p=0.02$). With regard to substance use during sex in the past 12 months, the majority of participants (55 %) reported using one or more

substances during sex (i.e., crystal, crack cocaine, powdered cocaine, heroin, or marijuana), with no statistically significant differences seen between those who did (46 %) and did not (56 %) meet at least one sexual partner online in the last year. Additionally, 38 % of the sample indicated a likely problem with alcohol based on the CAGE criteria. Of those that did not meet a sex partner online in the past year, 40 % were found to have a probable alcohol problem, compared to 26 % of those who met at least one sex partner online in the past 12 months [NS, $p=0.10$].

Sexual Practices and Risk with Male Partners. In the past 12 months, participants reported a mean of 6 (SD=10.26) oral and/or anal sex male sex partners, with men who met sexual partners online in the last year reporting significantly more male partners ($M=13.44$; SD=20.01) than men who did not meet sexual partners online ($M=4.11$; SD=4.14) [$Z=3.56$ (Mann–Whitney test), $p<0.001$]. Half (50 %) of the sample reported UAS with at least one male sexual partner. Among men who used the Internet to meet one or more sex partners in the last 12 months, nearly three quarters (72 %) reported UAS with another male at least once, compared to only 45 % of men who reported not meeting sex partners on the Internet [χ^2 (1, $N=163$)=5.63, $p=0.02$]. Additionally, 11 % of the sample reported having ever exchanged goods (e.g., money, drugs, food, clothes, etc.) for sex with male partners, but no significant differences were found comparing the proportion of men who did and did not report lifetime transactional sex by Internet use in the past 12 months.

Sexual Practices and Risk with Female Partners. Overall, 36 % of the sample reported engaging in anal or vaginal sex with one or more female sex partners in the past 12 months. The mean number of female sex partners (oral, anal, and/or vaginal) in the past 12 months was 10 (SD=10.28), with men who met sexual partners online reporting fewer female partners ($M=6.71$; SD=10.45) than men who had not met sexual partners online in the last year ($M=9.90$; SD=10.29), although this difference was not statistically significant. Nearly one third (30 %) of the total sample reported unprotected anal or vaginal sex with a female partner and 36 % of men who did not meet their sex partners through the Internet in the last year reported UAVS with a female in the past 12 months, compared to only 5 % of those who met their sex partner(s) online [χ^2 (1, $N=197$)=14.28, $p<0.001$].

Multivariable Sequentially Fitted Logistic Regression Model

Primary Outcome: Unprotected Anal Sex with Male Partner(s), Past 12 Months. To test the hypothesis that associations between meeting sexual partners online and sexual risk would remain significant after accounting for the influence of other predictors of high-risk sexual behavior, a series of sequential logistic regression models were fit to determine the independent influence of meeting sexual partners on the Internet (Table 3).

1. Model 1: Age, education, and gay identity were entered in the first step as sociodemographic control variables; none of the variables reached statistical significance at the alpha 0.05 level, but were retained due to their conceptual importance as potential confounders.

TABLE 3 Sequential logistic regression model predicting unprotected anal sex with one or more male partner in the past 12 months among a sample of Black MSM (n=197)

Unprotected anal sex with one or more male partner—past 12 months (n=99)									
Model 1			Model 2			Model 3			Model 4
OR	95 % CI	p value	aOR	95 % CI	p value	aOR	95 % CI	p value	aOR
Step 1									
Age (continuous)	1.01	0.98–1.04	0.52	0.96–1.02	0.54	0.97	0.93–1.02	0.24	0.98
Higher education ^a									
No	1.00	–	–	–	–	1.00	–	–	1.00
Yes	1.24	0.63–2.44	0.53	0.73–3.03	0.28	1.95	0.65–5.82	0.23	1.94
Gay identity									
No	1.00	–	–	–	–	1.00	–	–	1.00
Yes	1.45	0.74–2.85	0.27	0.78–3.20	0.21	5.31	1.71–16.50	0.004	4.86
Step 2									
HIV knowledge (continuous)	–	–	0.95	0.82–1.09	0.44	0.74	0.57–0.95	0.02	0.68
Condom norms (continuous)	–	–	0.60	0.44–0.82	0.001	0.72	0.47–1.09	0.12	0.81
Step 3									
Substance use during sex ^{b,c}									
No	–	–	–	–	–	1.00	–	–	1.00
Yes	–	–	–	–	–	3.57	0.94–13.57	0.06	3.60
Ever exchanged sex with a man for goods ^d									
No	–	–	–	–	–	1.00	–	–	1.00
Yes	–	–	–	–	–	2.72	0.48–15.57	0.26	2.87
Step 4									
Met sexual partner on Internet ^a									
No	–	–	–	–	–	–	–	–	1.00
Yes	–	–	–	–	–	–	–	–	7.07

OR odds ratio, aOR adjusted odds ratio
^aHigher education=some college or more
^bEngaged in behavior in the past 12 months
^cSubstance use during sex includes crystal, crack cocaine, powdered cocaine, heroin, and/or marijuana
^dSex includes oral/anal with a male partner; goods includes money, drugs, food, housing etc.

2. Model 2: HIV knowledge and condom norms were then entered in the second step and significantly added to the prediction of UAS with one or more male partner in the past 12 months (χ^2 (6, $N=197$)=13.59, $p=0.001$; see Table 4 for goodness of fit statistics). Having greater HIV knowledge was protective against sexual risk with male partners. Men with greater HIV knowledge had a decreased odds of engaging in UAS with one or more male sexual partners in the last year (aOR=0.60; CI=0.44, 0.82; $p=0.001$). However, for higher levels of HIV knowledge, meeting sexual partners on the Internet appeared to have a differential effect (Figure 1). For example, for men with HIV knowledge score of 16, those who meet sexual partners through the Internet had a fitted probability of UAS that was 0.9409 whereas for those who did not use the Internet to meet sexual partners, their fitted probability of UAS was 0.6914. Similarly, at a score of 5 for HIV knowledge (participant scores ranged from 5 to 18), the log(odds) of engaging in UAS for a man reporting sexual partnering on the Internet was 6.95, whereas the log(odds) for a man who did not meet a partner through the Internet was 5.00 (Figure 2).
3. Model 3: Substance use during sex in the past 12 months (i.e., any of the following: crystal, crack cocaine, powdered cocaine, heroin, and marijuana) and having ever exchanged sex for goods with a male partner (e.g., food, clothing, money, drugs etc.) were added in the third step and significantly added to the prediction of sexual risk behavior with male partners [χ^2 (11, $N=197$)=98.57, $p<0.0001$]. Substance use during sex approached significance as a risk factor for sexual risk behavior with male partners (aOR=3.60; CI=0.84, 15.42; $p=0.08$).
4. Model 4: Meeting sexual partners over the Internet in the past 12 months was added on the final step and significantly added to the prediction of high-risk sexual behavior with male partners [χ^2 (12, $N=197$)=6.93, $p=0.01$]. As shown in

TABLE 4 Goodness of fit statistics for four sequential logistic regression models predicting unprotected anal sex with one or more male partner in the past 12 months among a sample of Black MSM ($n=197$)

	χ^2	<i>df</i>	<i>p</i> value	−2LL	No. of predictors	Δ-2LL	<i>df</i>	<i>p</i> value
Model 1	2.37	3	0.5	208.29	3	—	—	—
Age								
Higher education								
Gay identity								
Model 2	14.95	5	0.01	194.70	5	13.59	2	0.001
HIV knowledge								
Condom norms								
Model 3	27.69	7	<0.001	96.13	7	98.57	2	<0.0001
Substance use during sex ^a								
Exchanged sex with a man for goods—lifetime ^b								
Model 4	34.62	8	<0.0001	89.20	8	6.93	1	0.01
Met sexual partner on Internet ^a								

Model 1 age, higher education, and gay identity, Model 2 model 1, plus HIV knowledge and condom norms, Model 3 models 1 and 2, plus substance use during sex and ever exchanged sex with a man for goods, Model 4 models 1–3, plus met sexual partner on Internet

^aEngaged in behavior in the past 12 months

^bSex includes oral/anal with a male partner; goods includes money, drugs, food, housing etc.

Internet use = met sexual partners through the Internet
No Internet use = did not use the Internet to meet sexual partners
Note. Plotted for a prototypical participant of sample mean age, with high education, gay self-identified, mean condom use score, and who did not report using substances or having exchange/transactional sex.

FIGURE 1. Graphical display of final fitted multivariable logistic regression model. The fitted probability of engaging in UAS for men who reported using the Internet to meet sexual partners in the past 12 months (*solid line*) and those who did not (*dashed line*) by HIV knowledge.

Table 3, meeting sexual partners over the Internet in the last 12 months was a significant predictor of UAS with male partner(s) in the last 12 months (aOR=7.07;

Internet Use = met sexual partners through the Internet
No Internet Use = did not use the Internet to meet sexual partners
Note. Plotted for a prototypical participant of sample mean age, with high education, gay self-identified, mean condom use score, and who did not report using substances or having exchange/transactional sex.

FIGURE 2. Graphical display of final fitted multivariable logistic regression model. Log(odds) of engaging in unprotected anal sex for men who reported using the Internet to meet sexual partners in the past 12 months (*solid line*) and those who did not (*dashed line*).

CI=1.33, 37.48; $p=0.02$), after controlling for demographic and other factors that were statistically associated with high-risk sex with male partners.

DISCUSSION

The results from the present study indicate that Black MSM who used the Internet to meet sexual partners were at greater risk for engaging in male-to-male HIV sexual risk behavior, consistent with prior studies with community-based samples of MSM.^{7-12,14,15,34-36} Men who reported using the Internet to meet male sexual partners reported a significantly higher number of male partners in the past 12 months, and a higher proportion of men who engaged in HIV transmission risk behavior (unprotected sex) reported using the Internet to meet sexual partners. The fitted odds (adjusted) of engaging in unprotected anal sex with men who reported meeting sexual partners online were more than seven times the odds for men who did not meet male sexual partners on the Internet. The association between meeting sexual partners online and sexual risk behavior remained significant even after adjusting for sociodemographic covariates and other HIV-related risk factors. A similar relationship was not seen in this study between Internet use and unprotected sex with female sexual partners. In fact, in bivariate analyses, men who reported meeting sexual partners on the Internet in the past year were at decreased risk for engaging in unprotected anal or vaginal sex with female partners, suggesting that Internet use to meet male sex partners may not facilitate HIV risk between Black MSM and their female partners.

In this sample of Black MSM recruited via networks in Massachusetts, men meeting male sexual partners through the Internet had greater odds of engaging in sexual risk behavior, despite lower rates of cocaine use and other substances in the past year, lower rates of substance use during sex, and lower rates of problematic alcohol abuse than men who did not meet their male sexual partners online. Additionally, while HIV knowledge was protective against HIV risk behavior for the overall sample, among the men with high levels of HIV knowledge, those that met their male sexual partners online had a higher odds of engaging in UAS than those with similarly high levels of HIV knowledge who did not meet their male sexual partners online. These findings are contrary to previous research conducted among non-Black and mixed-race samples,^{7,9,15,37} and suggest the Black MSM may experience specific social, cultural, and contextual issues that potentially moderate the relationship between Internet sex seeking and HIV risk among this group. Future research would benefit from understanding the online experience of Black MSM who seek sex on the Internet in order to develop effective interventions for this population.

One in five (20 %) Black MSM in the sample reported having met a sexual partner using the Internet in the previous 12 months. The prevalence of online sexual partnering appeared to be lower in the current study of exclusively Black MSM compared to other community-based, mixed-race/ethnicity samples of MSM which have reported the prevalence of engaging in sex with partners met online to be as high as 48 %.^{7,8,10,38,39} The lower proportion of Internet sexual partnering in this sample, relative to other studies, may be related to other factors which were found to statistically and theoretically pattern alongside Internet use. Correlates of having used the Internet to meet sexual partners in the past 12 months in the current sample, in addition to having engaged in unprotected anal sex with a male sexual

partner and having a greater number of male sexual partners, were gay-self identification and being “out” about one’s sexual behavior with men. Culturally specific norms surrounding gay self-identification and being “out” may influence online partner seeking behaviors differentially for Black MSM who self-identify as gay compared to those who do not as prior research suggests that Black MSM are less likely than men of other races/ethnicities to identify as gay or disclose their sexual behavior with other men.^{30,40–42} To this end, the majority (66 %) of Black MSM in this study did not identify as gay (i.e., identified as heterosexual or bisexual) and 20 % had never come out to anyone. Previously cited research documenting Internet use among mixed race/ethnicity samples, indicates a much higher proportion of gay-identified men (62–95 % of participants).^{7,8} Moreover, qualitative research suggests that, within the Black community, masculine social role expectations, homophobia, HIV-related stigma, and other socio-contextual factors may discourage Black MSM from adopting gay identities.^{43,44} It is possible that Black MSM in our sample may resist publicly identifying as gay, in turn influencing their use of the Internet to seek male sexual partners, as well as their patterns of engaging in sex with other men.

Racialized sexual preferences may also be important to consider in explaining not only the low prevalence of online sexual partnering, but also the sexual risk behaviors of Black MSM meeting sexual partners online. In a cross-sectional study of MSM in San Francisco, Black MSM significantly preferred other Black men, while Asian, Latino, and White MSM scored Blacks lowest in terms of their preference for sexual partners.⁴⁵ For Black men who prefer sexual partners of particular racial/ethnic backgrounds (Black or other races/ethnicities), there may be a smaller pool of potential male sexual partners to choose from. Moreover, qualitative research among MSM of color has found that race-based preferences can lead to feelings of rejection and a perceived “hierarchy of value” based on race,⁴⁶ experiences that are often internalized and have been found in previous research to be associated with HIV risk-taking behaviors among racial minority MSM.^{47–49} In the current study, participants not only reported a higher proportion of Black friends (mean percent, 44 %) than White friends (mean percent, 20 %), but also a higher proportion of men who met a sexual partner online reported that their most recent sexual partner was non-Black (54 %) than those who did not meet a sexual partner online (37 %). Findings lend support to race-based social and sexual networks, which play out in online settings. Future research should explore the impact of racialized sexual preferences on partner access and sexual risk behaviors among Black MSM who use the Internet to seek sexual partners.

Access issues also necessitate consideration in relation to explaining the prevalence of Internet use to meet sexual partners, especially given that the current study represented a more marginalized group of Black men (87 % had less than a college degree; 94 % were not homeowners; 13 % had unstable housing) than the sociodemographic profile of Black residents in the greater Boston area (79 % of Black men have less than a college degree; 31 % of homeowners are Black).⁵⁰ Previous studies among MSM have shown that meeting sexual partners on the Internet is associated with being White, younger in age (between 18 and 40 years of age), and having more education (more than a high school degree).^{7,8,11,15,35,51} To this end, the US Bureau of Labor Statistics’ Consumer Purchasing Index found that among individuals living in the Boston metropolitan area in 2001, the proportion of households with a computer increased with educational attainment and fewer Black households had access to a computer (<50 %) than White (>70 %) or Asian

households (>80 %).⁵² Thus, the prevalence of online sexual partnering may be affected by racial and socioeconomic issues, such that within the Black MSM community, men of higher education and income may be more likely to use the Internet to seek male sexual partners than the larger number of men of lower education and economic position. While this study lacked a non-Black comparison group, findings from bivariate analyses support previous research—on average, the odds of having met one's most recent male sex partner on the Internet increased with higher education (some college or more) and among those with a most recent male sex partner of a non-Black race.

Some limitations should be considered when interpreting findings from the current study. First, the cross-sectional study design did not allow for the longitudinal following of sexual risk outcomes and thus it is not possible for causal inferences to be made. In addition, the survey was interviewer-administered which may have led to socially desirable responses and, ultimately, to the underreporting of specific sexual and drug use behaviors. In contrast to traditional RDS methods, this study did not weight the final sample according to the population being studied; thus, the sample represents a cross-sectional, non-probability-based sample of Black MSM in an urban area. In addition, the use and level of incentives may have contributed to a sample of more socially marginalized Black MSM than in the greater Boston area, limiting the generalizability of findings. Additionally, the sample lacked a non-Black comparison group and thus differences in the rates of online sexual partnering and associated HIV risk behavior in the present study could not be determined based on race/ethnicity.⁵³ Lastly, Black MSM in the sample were not specifically asked about their sexual behavior with male partners met through the Internet. Future research should explore whether the high rate of HIV sexual risk activities observed among Black MSM who reported using the Internet to seek sexual partners is merely a function of the higher number of partners met online or in fact a unique risk factor for high-risk sexual behaviors among this population.

Although previous studies have demonstrated the HIV risk associated with online sexual partnering among diverse samples of MSM, our data are among the first to consider the role of the Internet in the HIV risk behaviors of an exclusively Black sample. Future research should explore the factors that mediate and moderate the relationship between Internet-based sexual partnering and HIV risk behavior among Black MSM specifically, including consideration of the social and contextual factors influencing sexual risk. Developing culturally competent online messaging or novel interventions may prove useful at reducing sexual risk taking among Black MSM who meet sex partners on the Internet. Such interventions should address the individual and contextual factors promoting risky online sexual partnering among Black MSM. Finally, it should be noted, that while the risk of engaging in unprotected anal sex decreased among men who did not meet sexual partners online, this group still engaged in some level of sexual risk. Given that Black MSM are at increased risk for HIV transmission,² our findings highlight the need for a diverse set of interventions that reflect the heterogeneity of this highly vulnerable population.

ACKNOWLEDGEMENTS

This work was funded by the HIV/AIDS Bureau, Massachusetts Department of Public Health.

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