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ORIGINAL PAPER

Clinically Significant Depressive Symptoms as a Risk Factor for HIV Infection Among Black MSM in Massachusetts

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Abstract High rates of depression have been observed among men who have sex with men (MSM) relative to the general adult male population; however, a dearth of research has explored depression among Black MSM. Black MSM ($n = 197$) recruited via modified respondent-driven sampling between January and July 2008 completed an interviewer-administered quantitative assessment and voluntary HIV counseling and testing. Bivariate and multivariable logistic regression procedures examined the associations of demographics, behavioral HIV risk factors, and psychosocial variables with depressive symptoms by severity, using the 20-item Center for Epidemiologic Studies Depression Scale (CES-D). Adjusting for demographic and behavioral variables, significant factors associated with (1) clinically significant depressive symptoms (33%; CES-D score $\geq$ 16): being publicly insured by Medicaid, having serodiscordant anal sex with a casual male partner, and being diagnosed with an STD in the prior 12 months; (2) moderate depressive symptoms (19%; CES-D score 16–26): having serodiscordant unprotected anal sex with a casual male partner and being diagnosed with an STD in the prior 12 months; (3) severe depressive symptoms (14%; CES-D score 27+): being publicly insured by Medicaid and reporting difficulty accessing healthcare in the past 12 months. Moderately depressed Black MSM may be more likely to engage in behaviors that place them at increased risk for HIV and other STDs. HIV prevention interventions for Black MSM may benefit from incorporating screening and/or treatment for depression, allowing MSM who are depressed to respond more effectively to behavioral change approaches.

Keywords MSM · Depression · African American · HIV · STD

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Introduction

Rates of depression among men who have sex with men (MSM) are consistently higher than those among the general adult male population, ranging from 15–26% (Cochran and Mays 2000; Meyer 2003; Meyer et al. 2008; Salomon et al. 2008) as compared to 5–12%, respectively, (American Psychiatric Association 2000; Kessler et al. 1994, 1996). Mental health and other psychosocial problems have been identified as a major contributor to sexual risk behavior and HIV infection across studies (Kelly et al. 1993; Koblin et al. 2006; Meade and Sikkema 2005; Parsons et al. 2003; Salomon et al. 2008; Semple et al. 2000;

Strathdee et al. 1998). Given the disproportionate HIV and sexually transmitted disease (STD) burden among MSM, who according to the Centers for Disease Control and Prevention (CDC) in 2006 constituted 53% of new HIV/AIDS infections in the US and 72% of all men living with HIV (CDC 2008), and among whom rates of STDs have steadily risen in recent years (CDC 2007; Massachusetts Department of Public Health 2007), the high rates of depression observed among MSM are concerning.

The relationship between clinically significant depressive symptoms and sexual risk behavior has been somewhat inconsistent in the scientific literature. While some studies report greater sexual risk behavior in states of depression (Koblin et al. 2006; Rogers et al. 2003; Stall et al. 2003), other studies have found no association (Bradley et al. 2008; Dilley et al. 1998; Dolezal et al. 2000; Robins et al. 1994; Rubb et al. 1993) or decreased sexual interest and activity (Kennedy et al. 1999; Mathew and Weinman 1982). In studies where associations were found, depression has been consistently associated with increased sexual risk behavior in both HIV-infected and uninfected MSM (Beck et al. 2003; Bradley et al. 2008; Kelly et al. 1993; Koblin et al. 2006; Parsons et al. 2003; Perdue et al. 2003; Rogers et al. 2003; Semple et al. 2000; Stall et al. 2003; Strathdee et al. 1998). A study by Rogers and colleagues (2003) suggests variation in the patterns of association between depressive disorders and sexual behavior among MSM, which may help to explain prior inconsistencies on the relationship between depression and sexual risk-taking. While major depression was related to less sexual activity, dysthymic disorder (a milder, persistent depressive disorder) was associated with an increased likelihood of unprotected sex (Rogers et al. 2003). Further research is warranted to investigate the association between depression and sexual risk among MSM, as well as how severity of depression impedes or facilitates risk for HIV and other STDs.

Prior research has examined clinically significant depressive symptoms among Black MSM (Cochran and Mays 1994; Peterson et al. 1996; Richardosn et al. 1997). Rates of depression among Black MSM have been shown to be as high as 33% (Cochran and Mays 1994; Peterson et al. 1996) and elevated compared to heterosexual Black men and other MSM (Richardosn et al. 1997). More recently, empirical studies have begun to explore the relationship between depression and sexual risk in Black MSM (Crawford et al. 2002; Myers et al. 2003). For example, Crawford et al. (2002) reported that among a sample of 174 gay and bisexual Black men, psychological distress, including depression, was associated with greater levels of sexual risk behavior. Likewise, Myers et al. (2003) found that among a sample of 502 mixed HIV serostatus Black men, half of whom identified as MSM or MSMW, psychological distress and depression were among the strongest predictors of sexual risk-taking. Given that Black individuals represent only 13% of the total population (US Census Bureau 2006), but account for 49% of all HIV/AIDS cases diagnosed annually in the United States (CDC 2008) and that sexual contact with other men is the primary HIV transmission category among all Black men (CDC 2008), studies of Black MSM need to address more adequately psychological factors contributing to HIV risk (Mays et al. 2004; Millett et al. 2007). In particular, the severity of clinically significant depressive symptoms may be an important risk factor to consider in designing effective HIV primary and secondary prevention interventions with Black MSM.

Using a modified respondent-driven sampling method to recruit exclusively Black MSM in Massachusetts, this study sought to: (1) examine the frequency of clinically significant depressive symptoms, including the severity of symptoms, and (2) investigate the association of demographic, behavioral HIV risk factors, and other psychosocial variables with clinically significant depressive symptoms. In accordance with prior research (Rogers et al. 2003), we hypothesized that severe depressive symptoms would not be significantly associated with sexual risk and that Black MSM with moderate depressive symptoms would be more likely to report sexual risk behavior (i.e., unprotected sex) than MSM without depressive symptoms.

Methods

Design and Setting

One hundred and ninety seven Black MSM were recruited via modified respondent-driven sampling between January and July 2008. Following an informed consent process with trained study staff, participants completed: (1) a quantitative assessment with a trained interviewer, and (2) optional voluntary pre- and post-test HIV counseling and testing. This study was a collaboration between Fenway Health (FH), a freestanding health care and research facility specializing in HIV/AIDS care and lesbian, gay, bisexual, and transgender health in the greater Boston area (Mayer et al. 2007); the Multicultural AIDS Coalition (MAC), a community-based organization working within communities of color to end the HIV/AIDS epidemic; Justice Resource Institute (JRI), one of the largest human service providers in Massachusetts; and the Massachusetts Department of Public Health (MDPH) HIV/AIDS Bureau. The study was approved by the FH and JRI Institutional Review Boards and all study activities took place at MAC and JRI, the two participating study sites in Boston, Massachusetts.

Sample

Eligibility Criteria

Prior to study enrollment, each potential participant was screened for study eligibility on the telephone or in-person by trained study staff. Eligible participants were individuals who: (1) were Black, (2) identified as male, (3) were 18 years of age or older, (4) self-reported living in Massachusetts, and (5) self-reported oral or anal sex with a man in the preceding 12 months.

Recruitment

A modified respondent-driven sampling (RDS) method (Heckathorn 1997), implemented successfully with prior studies of MSM in Massachusetts (Mimiaga et al. 2007, 2008), was used to recruit participants. RDS was modified to terminate recruitment when the a priori desired sample size had been met, prior to equilibrium. As such, we did not weight the final sample, as in traditional RDS. Another modification included adding many seeds from diverse backgrounds to expedite the recruitment process.

Initially eight study participants were selected to function as recruiter seeds, four at each of the participating study sites (MAC and JRI). Seeds were evaluated by study staff prior to enrollment for their commitment to the goals of the study and motivation to recruit eligible peers within their social network. Because the original four seeds at JRI did not produce enough referrals to reach the targeted sample size in the necessary timeframe, an additional 13 seeds were added, consistent with RDS methodology (Heckathorn 1997, 2002), resulting in 17 seeds at JRI and four at MAC. All seeds met the study eligibility criteria outlined above. Seeds also had to be motivated and able to recruit a maximum of five of their social/sexual network members into the study. At screening, study staff assessed individuals' ability to recruit their social/sexual network members by querying men on the total number of study eligible men they had in their personal social/sexual network.

Each seed was asked to recruit up to five individuals in their sexual/social network, who in turn recruited a wave of no more than five respondent group members, and so on until the target sample size was reached. Each participant was given cards with study information to hand to potential recruits. Tracking networks was accomplished using cards with a number code on each card that connected participants back to recruits and initial seeds. A dual incentive system was used, where participants were compensated $25 for the survey, $25 for the optional HIV testing, and $10 for each eligible peer they recruited (up to five peers). Hence, each study participant could earn up to $100 for their participation.

Quantitative Assessment and Measures

Participants completed an interviewer-administered quantitative assessment that lasted approximately 1 hour. The survey instrument was piloted with 10 participants who met seed eligibility requirements for the study, and revised based on pilot participant feedback. Pilot data were not analyzed for the current study.

Demographics, Sexual Behavior, Substance Use, STD History, and HIV Status

Demographic characteristics (i.e., age, education, housing status, health insurance), sexual behavior/sexual partner history (most recent sexual encounter and past 12 months), and questions about substance use during sex were adapted from the Centers for Disease Control and Prevention's National HIV Behavioral Surveillance Study, MSM cycle (Sanchez et al. 2006). Also adapted were questions about reasons for using the Internet to meet sexual partners in the past 12 months. Participants were asked to self-report STD history (syphilis, gonorrhea, Chlamydia, herpes) recent (past 12 months) and lifetime, 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.

Alcohol Use

The CAGE questionnaire, a 4-item validated clinical screening instrument for alcoholism (Cronbach's alpha = 0.69; Ewing 1984; Knowlton et al. 1994; Mayfield et al. 1974), was used to assess probable alcohol dependence. Although some research suggests performance-related differences by gender, race, or ethnicity on the CAGE instrument, the CAGE remains a validated brief screener for alcohol use disorders, particularly among primary care and emergency room populations (Cherpitel 1998, 2002; Cook et al. 2005; Ewing 1984; Knowlton et al. 1994; Mayfield et al. 1974; Steinbauer et al. 1998). The four items were: "Have you ever felt you should cut down on your drinking?", "Have people ever annoyed you by criticizing your drinking?", "Have you ever felt bad or guilty about your drinking?", and "Have you ever had a drink first thing in the morning (as an "eye opener") to steady your nerves?" A "yes" indicated a positive response and was scored as 1; a "no" was scored as 0. A score of two or more indicated a likely problem with alcohol (i.e., positive screen for probable alcohol dependence). In previous research, a score of three on the CAGE has been associated with an 72% probability of alcohol abuse or dependence (Buchsbaum et al. 1991).

Depression

Clinically significant depressive symptoms were assessed with the Center for Epidemiologic Studies Depression scale (CES-D), a 20-item validated screening measure of clinically significant distress as a marker for clinical depression (coefficient alpha = 0.90; Cronbach's alpha = 0.89; Radloff 1977; US DHHS 2004). The CES-D has been validated in Black populations (Naughton and Wiklund 1993), and no differences in internal consistency have been found between Black and White individuals (Roberts and Vernon 1983). Studies of Black MSM have also demonstrated high internal consistency reliability for the CES-D (Kalichman et al. 2005; Peterson et al. 1996). Representative items from the CES-D include: "I was bothered by things that usually don't bother me", "I did not feel like eating; my appetite was poor", "I felt that I could not shake off the blues even with help from my family and friends", and "I had trouble keeping my mind on what I was doing." Respondents indicated the frequency of occurrence of each symptom over the past week on a 4-point Likert scale, where 0 = *rarely or none of the time (less than 1 day)*, 1 = *some or a little of the time (1–2 days)*, 2 = *occasionally or a moderate amount of time (3–4 days)*, and 3 = *most or all of the time (5–7 days)*.

Healthcare Access

To assess healthcare accessibility, a question was adapted from a prior MSM study (Mimiaga et al. 2007). Participants were asked to self-report whether they had difficulty obtaining needed healthcare services in the past 12 months.

History of Incarceration and Drug and/or Alcohol Treatment

Participants were asked to self-report whether they had ever spent time in jail or prison and whether they had ever been in treatment for drug and/or alcohol use at any time in their life.

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 offered Western Blot confirmatory 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, at the discretion of the counselor. All HIV test counselors completed the appropriate trainings and were certified to conduct HIV testing in Massachusetts prior to meeting with participants. Only one participant was newly diagnosed with HIV in the study as a result of HIV testing procedures (categorized as HIV-infected in the bivariate/multivariate analyses). All other participants' self-reported HIV status was consistent with their HIV test results.

Data Analysis

SAS® version 9.1.3 (SAS Institute Inc 2003) statistical software was used to perform analyses, where statistical significance was determined at the $P < 0.05$ level.

Primary Outcomes

Three outcomes were dichotomously assessed at the time of study enrollment: (1) clinically significant depressive symptoms: CES-D score of 16 or higher; (2) moderate depression: CES-D score of 16–26; participants scoring 27 or higher ($N = 27$) were excluded from the analysis for this outcome; (3) severe depressive symptoms: CES-D score of 27 or higher; participants who scored 16–26 ($N = 38$) were excluded from the analysis for this outcome. These moderate and severe cutoffs have been used previously to detect clinically depressive symptoms across a wide range of studies (Blumenthal et al. 2003; Ensel 1986; Geisser et al. 1997; Schulberg 1985; Zich et al. 1990).

Independent Variables of Interest

Independent variables of interest included the following dichotomous indicators: demographics (Medicaid, private health insurance), sexual behavior (unprotected anal or vaginal sex with a female partner in the past 12 months, serodiscordant unprotected anal sex with a non-monogamous casual male during most recent sexual encounter), current alcohol use (positive screen for probable alcohol dependence CAGE score 2+; drug use during sex), HIV status (HIV-infected), recent STD diagnosis (history of any recent STD in the past 12 months: syphilis, gonorrhea, Chlamydia, herpes), psychosocial factors (history of incarceration, history of alcohol/drug treatment), Internet use (use Internet to meet sexual partners in the prior 12 months because they "felt lonely"), and access to healthcare (difficulty getting healthcare in past 12 months).

Bivariate and Multivariable Logistic Regression Models

For all variables, bivariate logistic regression analyses were conducted to establish statistically significant parameter

estimates with the three outcomes of interest. A separate multivariable logistic regression model was constructed for each of the three outcomes. We a priori determined to adjust for: age, education, sexual identity (heterosexual/homosexual/gay), HIV status, and recruitment site in all multivariable models. Variables with a $P < 0.10$ in bivariate regression analyses were retained in the multivariable logistic regression model.

For significant bivariate predictors that were multicollinear (intercorrelation among the independent variables above 0.80), 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 (Afifi et al. 2004). Due to multicollinearity, we chose to include current alcohol problem (CAGE) rather than history of drug/alcohol treatment in the final models.

Results

Demographics (Table 1)

Participants had a mean age of 38.65 (SD = 11.32). Most participants (87%) identified as African American; others (16%) identified as Haitian, Jamaican, Cape Verdean, African, or Caribbean, and Hispanic/Latino (8%). The majority of the sample had less than a college degree (87%), and had public health insurance (84%; i.e., Medicaid). Although all participants reported oral or anal sex with another male in the prior 12 months, less than half (45%) self-identified as gay and 20% reported having never disclosed their MSM sexual behavior to anyone (i.e., were not "out").

Overall, 33% of the sample (65/197) screened positive for clinically significant depressive symptoms (CES-D score $\geq$ 16), with a mean CES-D score of 27.6 (SD = 10.9). Nineteen percent (38/197) had moderate (CES-D score 16–26) and 14% (27/197) had severe (CES-D score 27 or higher) depressive symptoms. Demographic characteristics of the sample comparing MSM with clinically significant depressive symptoms to those without are presented in Table 1.

Outcome 1: Clinically Significant Depressive Symptoms (CES-D score $\geq$ 16) (Table 2)

Bivariate Associations of Demographic and Behavioral Risk Factors for Clinically Significant Depressive Symptoms (CES-D score $\geq$ 16)

Demographics. Men who reported being publicly insured via Medicaid compared to those without public insurance were more likely to have clinically significant depressive symptoms (OR = 2.37; $P = 0.02$). However, men who reported having private health insurance/HMO compared to those without private insurance were less likely to have clinically significant depressive symptoms (OR = 0.35; $P = 0.05$).

Sexual Risk. Unprotected anal sex with a female partner in the prior 12 months was significantly associated with an increased risk for clinically significant depressive symptoms (OR = 2.50; $P = 0.03$), as was reporting having used the Internet to meet sexual partners in the prior 12 months due to loneliness (OR = 2.64; $P = 0.01$).

Psychosocial Factors. Having a current problem with alcohol was significantly associated with increased odds of clinically significant depressive symptoms (OR = 2.37; $P = 0.006$). Furthermore, participants who reported a history of incarceration (OR = 2.26; $P = 0.009$) had a higher odds of having clinically significant depressive symptoms, as did those who reported a history of drug/alcohol treatment (OR = 3.20; $P = 0.01$).

Multivariable Logistic Regression Model of Risk Factors for Clinically Significant Depressive Symptoms (CES-D score $\geq$ 16)

In a multivariable model adjusting for participants' age, education, sexual orientation, HIV status, and recruitment site (Table 2), participants who were publicly insured via Medicaid (AOR = 7.31; $P = 0.007$), reported engaging in serodiscordant unprotected anal sex with a casual male partner during last sexual encounter (AOR = 2.90; $P = 0.002$), and were diagnosed with an STD in the prior 12 months (AOR = 8.33; $P = 0.02$) were at increased odds of having clinically significant depressive symptoms.

Outcome 2: Moderate Depressive Symptoms (CES-D score 16–26) (Table 3)

Bivariate Associations of Demographic and Behavioral Risk Factors for Moderate Depressive Symptoms (CES-D score 16–26)

Sexual Risk. Serodiscordant unprotected anal sex with a casual male sex partner was significantly associated with moderate depressive symptoms, such that those who had serodiscordant unprotected anal sex with a causal male partner during their most recent sexual encounter were more than eight times more likely to have moderate depressive symptoms than MSM who did not engage in this level of sexual risk taking (OR = 8.29; $P = 0.02$).

Psychosocial Factors. Compared to participants without a history of incarceration or drug/alcohol treatment, men who had been incarcerated were more likely to report moderate depressive symptoms (OR = 2.38; $P < 0.02$), as were men who had been in drug/alcohol treatment history (OR = 3.07; $P = 0.003$).

Table 1 Demographic characteristics by participants with depressive symptoms (CES-D score 16+; $n = 65$) and those without (CES-D score 0–15; $n = 132$)

	Depressive symptoms ($n = 65$)	No depressive symptoms ($N = 132$)	Total sample ($n = 197$)
Mean age (SD)	38.52 (11.22)	38.72 (11.42)	38.65 (11.32)
Mean CES-D score (SD)	27.6 (10.9)	6.1 (5.0)	13.2 (12.5)
Mean number male partners (SD)	5.38 (6.12)	6.24 (11.79)	5.95 (10.26)
Mean number female partners (SD)	4.48 (4.76)	4.28 (5.18)	4.36 (4.99)
	% (*N*)	% (*N*)	% (*N*)
Race/ethnicity[a]			
African American	88 (57)	87 (114)	87 (171)
Other race/ethnicity (Haitian, Jamaican, Cape Verdean, African, Caribbean)	13 (8)	17 (22)	16 (30)
Hispanic/Latino	7 (4)	9 (11)	8 (15)
Education			
Some high school	10 (6)	10 (12)	10 (18)
High school degree or GED	77 (50)	78 (102)	78 (152)
College or graduate degree	14 (9)	13 (17)	14 (26)
Housing			
Unstable housing in past 12 months	13 (8)	13 (16)	13 (24)
Health insurance[a]			
No health insurance	5 (3)	5 (6)	5 (9)
Private health insurance/HMO	11 (7)	26 (34)	21 (41)
Medicaid	84 (54)	68 (89)	73 (143)
Medicare	7 (4)	7 (9)	7 (13)
Veteran's administration	4 (2)	3 (3)	3 (5)
Other	4 (2)	0 (0)	2 (2)
Sexual Identity			
Heterosexual	10 (6)	9 (11)	9 (17)
Homosexual	37 (24)	48 (63)	45 (87)
Bisexual	53 (34)	40 (52)	44 (86)
Disclosure MSM status			
Not out	19 (12)	20 (26)	20 (38)
HIV/STDs			
HIV-infected	17 (11)	19 (24)	18 (35)
History of STDs ever	28 (18)	30 (39)	29 (57)
STD in past 12 months	10 (6)	5 (6)	7 (12)
Substance use during sex past 12 months[a]			
Crystal methamphetamine	8 (5)	7 (8)	7 (13)
Crack	19 (12)	13 (16)	15 (28)
Cocaine	31 (20)	17 (22)	22 (42)
Heroine	7 (4)	4 (4)	5 (8)
Marijuana	53 (34)	32 (42)	39 (76)
Poppers	11 (7)	15 (19)	14 (26)
Any drug during sex (crystal, crack, cocaine, heroine, marijuana)	71 (46)	47 (61)	55 (107)
Sexual risk past 12 months			
UAS non-main male	44 (28)	29 (38)	34 (66)
Serodiscordant UAS non-main male	19 (12)	10 (13)	13 (25)
UAF	20 (13)	10 (12)	13 (25)

Table 1 continued

	% (*N*)	% (*N*)	% (*N*)
UVF	33 (21)	27 (35)	29 (56)
Sex for money (either payer or payee)	14 (9)	7 (9)	10 (18)
Psychosocial			
Moderate depression (CES-D 16–26)	58 (38)	0 (0)	19 (38)
Severe depression (CES-D 27+)	42 (27)	0 (0)	14 (27)
Alcohol problem (CAGE)	51 (33)	31 (40)	38 (73)
History of drug or alcohol treatment	62 (40)	33 (44)	43 (84)
History of incarceration	80 (52)	45 (59)	51 (101)
Report using internet to meet sexual partners because they "feel lonely"	49 (32)	27 (36)	35 (68)

Note: Due to rounding, percentages may exceed 100%

[a] Participants were asked to "check all that apply"; thus percentages exceed 100%

UAS unprotected anal sex, *UAF* unprotected anal sex with a female partner, *UVF* unprotected vaginal sex with a female partner

Table 2 Risk factors associated with clinically significant depressive symptoms (CES-D score 16+; $N = 65$) among Black MSM ($N = 197$)

Predictors	Bivariate Odds Ratio (95% CI)	*P* Value	Multivariable Model Odds Ratio (adjusted) (95% CI)[a]	*P* value
Health insurance				
No medicaid	–	–	–	–
Medicaid	**2.37 (1.13–4.99)**	**0.02**	**7.31 (1.74–14.20)**	**0.007**
CAGE				
No current alcohol problem	–	–	–	–
Current alcohol problem	**2.37 (1.29–4.37)**	**0.006**	1.46 (0.58–3.71)	0.43
History of incarceration				
No	–	–	–	–
Yes	**2.26 (1.22–4.17)**	**0.009**	1.90 (0.70–4.12)	0.20
Sexual risk behavior in past 12 months				
No unprotected anal sex with female partner	–	–	–	–
Unprotected anal sex with female partner	**2.50 (1.07–5.85)**	**0.03**	2.21 (0.65–7.44)	0.20
No serodiscordant unprotected anal sex with non-main male partner	–		–	
Serodiscordant unprotected anal sex with non-main male partner	2.09 (0.89–4.92)	0.09	**2.90 (2.02–14.19)**	**0.002**
Recent STD in past 12 months				
No	–		–	
Yes	2.11 (0.65–6.93)	0.10	**8.33 (1.43–48.38)**	**0.02**

Bold values indicate the adjusted odds ratios were significants ($P < 0.05$)

[a] Final multivariable logistic regression model included: serodiscordant unprotected anal sex with casual male partner, unprotected anal sex with female partner(s), CAGE, recent STD history, history of incarceration, insurance status; we also adjusted for participant's age, education, sexual orientation, HIV status, drug use, and recruitment site

Multivariable Logistic Regression Model of Risk Factors for Moderate Depressive Symptoms (CES-D score 16–26)

In a multivariable model adjusting for participants' age, education, sexual orientation, HIV status, and recruitment site (Table 3), MSM who reported serodiscordant unprotected anal sex with a casual male partner during last sex (AOR = 9.86; $P = 0.02$) and those who reported being diagnosed with an STD in the prior 12 months (AOR = 6.40; $P = 0.04$) were significantly more likely to have moderate depressive symptoms compared to the referent groups.

Table 3 Predictors of moderate depressive symptoms (CES-D score 16–26; $N = 38$) among Black MSM ($N = 170$)

Predictors	Bivariate odds ratio (95% CI)	*P* Value	Multivariable model odds ratio (adjusted) (95% CI)[a]	*P* value
CAGE				
No current alcohol problem	–	–	–	–
Current alcohol problem	2.07 (0.99–4.33)	0.06	1.50 (0.55–4.09)	0.43
Serodiscordant unprotected anal sex with non-main male partner				
No	–		–	
Yes	**9.29 (1.44–47.53)**	**0.02**	**9.86 (1.51–64.61)**	**0.02**
HIV status				
Uninfected	–		–	
Infected	0.81 (0.30–2.17)	0.10	0.19 (0.03–1.10)	0.06
Recent STD				
No	–		–	
Yes	2.30 (0.60–8.73)	0.10	**6.40 (1.10–37.28)**	**0.04**

Participants with severe depressive symptoms ($N = 27$) were excluded from this analysis

Bold values indicate the adjusted odds ratios were significants ($P < 0.05$)

[a] Final multivariable logistic regression model includes disclosure of CAGE, serodiscordant unprotected anal sex with casual male partner, recent STD; we also adjusted for participant's age, education, HIV status, and recruitment site

Outcome 3: Severe Depressive Symptoms (CES-D score 27 or higher) (Table 4)

Bivariate Associations of Demographic and Behavioral Risk Factors for Severe Depressive Symptoms (CES-D score 27 or higher)

Demographics. Participants publicly insured with Medicaid were more likely to have severe depressive symptoms compared to men with private insurance (OR = 3.87; $P = 0.03$).

Sexual Risk. Unprotected anal sex with a female partner in the prior 12 months (OR = 4.21; $P = 0.006$) and using the Internet to meet sexual partners in the prior 12 months because they "felt lonely" (OR = 3.84; $P = 0.002$) were significantly associated with increased odds of having severe clinically significant depressive symptoms.

Psychosocial Factors. Men with a current problem with alcohol (OR = 2.88; $P = 0.01$) and those with a history of drug/alcohol treatment (OR = 3.40; $P = 0.005$) were significantly more likely to have severe depressive symptoms relative to men without a drinking problem and with no history of drug/alcohol treatment.

Multivariable Logistic Regression Model of Risk Factors for Severe Depressive Symptoms (CES-D score 27 or higher)

In a multivariable model adjusting for participants' age, education, sexual orientation, HIV status, and recruitment site (Table 4), participants insured via Medicaid compared to those with private health insurance (AOR = 4.46; $P = 0.05$) and those reporting difficulty accessing healthcare in the past 12 months (AOR = 5.19; $P = 0.04$), compared to those reporting no difficulty accessing care, were at higher odds for severe depressive symptoms.

Discussion

With one-third of Black MSM screening positive for clinically significant depressive symptoms in the present study, results suggest that depression represents a pervasive psychosocial issue among Black MSM, as it does among MSM in general (Cochran and Mays 1994, 2000; Hirshfield et al. 2008; Meyer et al. 2008; Salomon et al. 2008). More than half of depressed men in the sample (58% or 38/65) had moderate depressive symptoms and, consistent with our hypothesis and prior research (Rogers et al. 2003), increased sexual risk behavior was associated with moderate depressive symptoms. Specifically, men reporting serodiscordant unprotected anal sex with a casual male partner had a nine-fold greater risk and those diagnosed with an STD had a six-fold greater risk for having moderate depressive symptoms. Results suggest that moderately depressed Black MSM in particular may be at increased risk for HIV and other STDs. HIV prevention interventions for Black MSM may benefit from incorporating screening and/or treatment for depression, thus allowing MSM who are depressed to respond more effectively to behavioral change approaches to HIV prevention.

Whereas, increased sexual risk was associated with moderate depressive symptoms, socioeconomic disadvantage was associated with severe depressive symptoms in

Table 4 Predictors of severe depressive symptoms (CES-D score 27+; $N = 27$) among Black MSM ($N = 159$)

Predictors	Bivariate odds ratio (95% CI)	*P* Value	Multivariable model odds ratio (adjusted) (95% CI)[a]	*P* value
Health insurance				
No medicaid	–	–	–	–
Medicaid	**3.97 (1.10–13.55)**	**0.03**	**4.46 (1.01–20.42)**	**0.05**
CAGE				
No current alcohol problem	–	–	–	–
Current alcohol problem	**2.88 (1.24–6.69)**	**0.01**	1.81 (0.60–5.52)	0.29
Sexual risk behavior in past 12 months				
No unprotected anal sex with female partner	–	–	–	–
Unprotected anal sex with female partner	**4.21 (1.52–11.64)**	**0.006**	2.83 (0.88–9.17)	0.08
No serodiscordant unprotected receptive anal sex with non-main male partner	–		–	
Serodiscordant unprotected anal sex with non-main male partner	2.40 (0.82–7.06)	0.10	5.79 (0.62–54.41)	0.12
Difficulty getting needed healthcare in past 12 months				
No	–	–	–	–
Yes	**3.99 (1.16–13.72)**	**0.03**	**5.19 (1.07–25.21)**	**0.04**

Participants with moderate depressive symptoms ($N = 38$) were excluded from this analysis

Bold values indicate the adjusted odds ratios were significants ($P < 0.05$)

[a] Final multivariable logistic regression model includes disclosure of health insurance status, CAGE score, access to health care, health insurance status, serodiscordant unprotected anal sex with casual male partner, UAF; we also adjusted for participant's age, education, HIV status, recent STD history, and recruitment site

the current study (i.e., being publicly insured via Medicaid and having had difficulty accessing healthcare in the past 12 months), consistent with prior research on socioeconomic status and depression among Black men (Gilmer et al. 2005; Watkins et al. 2006). Prior research has suggested that Black individuals may have increased vulnerability to mental health disorders (Kessler et al. 1994; US Department of Health and Human Services 2001) because they are overrepresented in high-need populations due to homelessness, incarceration, and other psychosocial factors (Bureau of Justice Statistics 1998, 1999; Jencks 1994; US Department of Health and Human Services 2001). In the current study, participants with a history of incarceration and/or drug/alcohol treatment were more likely to have clinically significant depressive symptoms, which supports this explanation of the overrepresentation of Blacks in high-need populations. Furthermore, many Black men are disproportionately exposed to everyday psychological stressors (e.g., racism and discrimination, poverty, unemployment, violence) that may adversely affect mental health and place them at greater risk for depression (Kessler et al. 1994; Watkins et al. 2006; Williams 2003). Future research would benefit from examining the role of additional contributing factors to depression among Black MSM, such as psychosocial coping (Strathdee et al. 1998), racism/discrimination (Watkins et al. 2006), or internalized homophobia (Johnson et al. 2008).

In the current study, having used the Internet to meet sexual partners in the prior 12 months because of loneliness was associated with clinically significant depressive symptoms. It has been suggested that depression may play a role in fueling sexual risk in the online sex-seeking environment (Kalichman et al. 2005). In this study, Black MSM with depressive symptoms may be at risk of feeling isolated and use the Internet to find sexual partners with whom they may practice unsafe sex. This is not surprising given that feelings of loneliness themselves are commonly associated with depression. Incorporating coping skills into HIV prevention interventions may be an effective means of helping MSM to learn how to more effectively deal with their loneliness while protecting their sexual health. Findings support recent research suggesting that the Internet may represent a viable medium to reach and screen MSM at risk for depression (Hirshfield et al. 2008).

Consistent with our hypotheses, in bivariate analyses screening positive for an alcohol problem increased the odds of having clinically significant depressive symptoms. This is aligned with prior research suggesting high rates of alcohol abuse among Black men (Caetano and Clark 1998; Grant et al. 2004; SAMHSA 2007), as well as among MSM in general (Cochran et al. 2000; Drabble et al. 2005; Irwin and Morgenstern 2005; Stall et al. 2001), which may contribute to increased sexual risk taking. However, drug use was not significantly associated with clinically

significant depressive symptoms among the current sample. The association between history of incarceration and alcohol/drug treatment and depression further suggests that understanding the complex relationships between psychosocial factors and sexual risk (e.g., "intertwined syndemics"; Stall et al. 2003) may yield the most productive new insights for addressing and improving sexual health among Black MSM.

Limitations pertaining to recruitment methodology and data collection bear mention. First, we used a screener to assess depression and did not use a diagnostic tool (e.g., clinical interview). However, the CES-D is a widely accepted screening instrument with well-established reliability and validity (Radloff 1977; Schulberg 1985), and its scores have been shown to correlate highly with clinicians' ratings and with other self-report depression measures (Blumenthal et al. 2003; Ensel 1986). Similarly, the use of the CES-D with a single cutoff to measure depression and no measure of duration made it impossible to differentiate between types of depressive disorders (i.e., dysthymic disorder vs. major depression) which have been shown to be differentially associated with rates of risk taking among MSM (Rogers et al. 2003). Future research would benefit from utilizing a clinical diagnostic interview, especially among men with moderate CES-D scores (16–26), to differentiate types of depressive disorders and examine sexual risk behavior. A similar limitation applies to the use of the CAGE instrument for likely alcohol dependence, which is a screener and not a diagnostic tool. An additional related limitation is that most measures used in the study utilized a 12 months assessment timeframe (e.g., in the "12 months prior to study enrollment"), whereas, the CES-D assessed depressive symptoms across a 1 week timeframe (e.g., in the "past week, including today").

Second, as a cross-sectional study, data are subject to the limitations of a study design which descriptively measures exposure and disease status at the same point in time, not allowing for inferences in causality to be made. Third, since the survey was interviewer-administered, responses could have been biased towards social desirability, which would underestimate the results. Fourth, in contrast to traditional RDS, this study did not weight the final sample according to the population being studied. Modifications to the traditional RDS technique included adding many seeds to expedite the recruitment process and ending recruitment prior to the achievement of equilibrium. We did this to harness the in-group recruitment tendencies of seeds, making the study similar to a non-probability convenience sample. Hence, the non-random selection of initial recruits potentially informed the characteristics of subsequent recruits. Furthermore, the use and level of incentives may have contributed to a sample of more socially marginalized Black MSM, limiting generalizability of findings.

Limitations notwithstanding, this is the first study of which we are aware to document clinically significant depressive symptoms among an exclusively Black MSM sample in Massachusetts, and to examine differences by severity of depressive symptoms. Findings suggest that moderately depressed Black MSM are more likely to engage in behaviors that place them at increased risk for HIV and other STDs. HIV primary and secondary prevention interventions may benefit from incorporating screening and/or treatment for depression to more effectively address unsafe sexual behavior among Black MSM. Organizations and programs serving Black MSM, in Massachusetts in particular, should be aware of the high rates of depression among this population and proactively respond to address the psychosocial and HIV prevention needs of Black MSM. Further investigation of depression within the context of sexual risk taking among Black MSM is warranted, especially as related to the benefit of treatment or screening in future HIV prevention interventions.

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