

HIV status disclosure, depressive symptoms, and sexual risk behavior among HIV-positive young men who have sex with men

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Abstract The rate of HIV infection among young men who have sex with men (YMSM) is increasing in the United States, and targeted research is needed to inform interventions aimed at reducing HIV transmission in this population. This study aims to understand the association between HIV status disclosure and sexual risk behavior among HIV-positive YMSM. A particular focus is given to depressive symptoms and their potential role in explaining the association between HIV disclosure and sexual risk behavior. In a sample of 991 YMSM receiving care at 20 clinics across the United States, Univariate and multivariate analyses were conducted to explore these associations. Approximately one-half (52.4 %) of participants reported disclosing to their current sexual/romantic partner. Disclosure to family members was negatively associated with sexual risk behavior. Also, depressive symptoms were positively associated with sexual risk behavior. We discuss the implications of our findings for future research and intervention.

Keywords Disclosure · Depression · HIV/AIDS · Sexual risk behavior · Young men who have sex with men

Introduction

HIV incidence among youth in the United States is on the rise; recent estimates show a 21 % increase in new infections between 2006 and 2009 among 13- to 29-year-olds (Prejean et al., 2011). According to the CDC (2012), 72 % of youth who were newly infected in 2010 were infected through male-to-male sexual contact. Given the rising rate of HIV infection among young men who have sex with men (YMSM), it is important to explore the factors that influence HIV transmission in this group. In this study, we aim to understand the association between HIV disclosure and sexual risk behavior among HIV-positive YMSM. We also aim to understand the association of depressive symptoms to sexual risk behavior and their potential role in linking disclosure and sexual risk behavior.

Investigating the sharing of HIV status or the disclosure of HIV status among HIV-positive YMSM is of critical importance (Koenig et al., 2010) because developmental issues and contextual factors may make disclosure particularly difficult for HIV-positive YMSM. Emerging adulthood is a key developmental period for youth ages 18–29. During this transition from adolescence to adulthood, youth experience significant social, cognitive, and biological changes (Arnett, 2000). HIV-positive YMSM may find this time period particularly challenging since they often encounter issues regarding sexual identity development and other physical (e.g., feeling sick more often from HIV disease or antiretroviral therapy) and psychosocial barriers (e.g., feeling anxious about people

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findings out about their HIV status) to positive health (Mustanski et al., 2011; Ryan et al., 2009; Savin-Williams, 1994; Spencer & Patrick, 2009).

HIV disclosure and sexual risk behavior

Researchers have found that HIV disclosure is an important factor for reducing HIV transmission (Crepaz & Marks, 2002, 2003), receiving social support (Smith et al., 2008), and improving mental health (Lam et al., 2007; Lee & Rotheram-Borus, 2002). Furthermore, HIV disclosure has been associated with partner-level conversations regarding condom use and other safe-sex behaviors (Crepaz & Marks, 2003). Despite this, research examining the association between HIV disclosure and sexual risk behavior has produced mixed findings; some researchers have suggested that non-disclosure is associated with increased sexual risk behavior (Kalichman, 1999; Nicolai et al., 1999; Parsons et al., 2005), while other researchers have found that there is no association between HIV disclosure and sexual risk behaviors (Kalichman et al., 2002; Marks & Crepaz, 2001; Simoni & Pantalone, 2004). HIV disclosure and its sequelae may differ based on the type (e.g., sexual partner, family member, friend) of person to whom someone has disclosed (Antelman et al., 2001; Crepaz & Marks, 2003; Duru et al., 2006; Wolitski et al., 1998) and other social and contextual factors. These inconsistent findings, paired with evidence that HIV disclosure may differ by social and contextual factors, point to the need for additional research related to examining patterns of HIV disclosure (e.g., who is being disclosed to) and their effects on sexual risk behavior.

Researchers have found that high rates of non-disclosure among men who have sex with men (MSM), a group especially at risk for contracting and transmitting HIV. For example, using a national probability study, Ciccarone et al., 2003 reported that only 58 % of HIV-positive gay and bisexual men in the United States disclosed their HIV status to their casual sexual partners, while 86 % of women disclosed their status to casual sex partners. Likewise, HIV disclosure rates have been shown to vary by age, with younger individuals being less likely to disclose their HIV status to sexual partners than older individuals (O'Brien et al., 2003; Simoni & Pantalone, 2004).

Depression and YMSM

In addition to experiencing high rates of HIV, YMSM are disproportionately affected by mental health problems. Reports indicate high rates of depression and suicidal ideation among lesbian, gay, bisexual, and transgender (LGBT) youth as compared to heterosexual youth (Garofalo et al., 1999; Gibson, 1989; Noell & Ochs, 2001;

Remafedi, 1999; Safren & Heimberg, 1999). Additional research has shown that YMSM in particular have high rates of depression (Botnick et al., 2002; Kipke et al., 2007; Perdue et al., 2003; Salomon et al., 2009). For example, Salmon et al. (2009) found in a population of 4,295 MSM that YMSM aged 15–25 were 1.55 times more likely to experience depressive symptoms compared to older MSM. Reserachers have found that among HIV-positive youth, mental health is associated with psychosocial adjustment, HIV-medication adherence, and HIV disclosure (Brown et al., 2000; Hosek et al., 2000; Naar-King et al., 2006). Reserachers have also found that people living with HIV/AIDS (PLWH) experience high rates of mental health problems including depression, anxiety, and suicidal ideation (Cook et al., 2006; Donenberg, 2005; Lam et al., 2007; Plattner & Meiring, 2006). Taken together, these findings suggest that in order to inform secondary HIV prevention efforts it is important to understand how depression may be associated with HIV disclosure and sexual risk behavior among HIV-positive YMSM.

Depression, HIV status disclosure, and sexual risk behavior

Although it has been established that PLWH experience more mental health problems than persons living without HIV/AIDS (Rabkin, 2008), the research on the association between HIV disclosure and mental health has produced mixed results (Chaudoir et al., 2011). Some studies have found that HIV disclosure is associated with greater well-being (Zea et al., 2005), while other studies have found that HIV disclosure increases poor mental health (Armistead et al., 1999; Comer et al., 2001), or that there is no association between HIV disclosure and mental health (Kalichman et al., 2003; Simoni et al., 1997). However, these seminal studies examining the association between HIV disclosure and mental health have not included YMSM (Lam et al., 2007). Thus, more research is needed to identify the type of person to which HIV-positive YMSM disclose and whether this has an impact on their mental health and how this, in turn, may affect sexual risk behaviors. Researchers examining the relation between HIV disclosure and sexual risk behavior may encounter mixed findings because this association is influenced by other factors such as mental health (Serovich & Mosack, 2003).

Previous research concerning the association between depression and sexual risk behavior among HIV-positive and HIV-negative MSM have yielded mixed findings (Koblin et al., 2006; Safren et al., 2010; Stall et al., 2003). For instance, Alvy et al. (2011) found that the association between depression and sexual risk behavior was mediated

by cognitive escape and self-efficacy. In addition, Strathdee et al. (1998) found that MSM who participated in more sexual risk behavior experienced higher rates of depression; however, when factors such as social support and education were added to the model the effect was not significant. These studies demonstrate a potential association between depression and sexual risk behavior among MSM. However, these studies have largely neglected to include HIV-positive YMSM.

The current study

For the present study, we examined the interrelations among HIV disclosure to different groups of individuals, depressive symptoms, and sexual risk behavior among HIV-positive YMSM. We were particularly interested in understanding the role of depressive symptoms in explaining sexual risk behavior and potentially mediating the relation between HIV disclosure and sexual risk behavior. Specifically, we were interested in three key questions:

1. Is HIV disclosure to a current sex partner/romantic partner, family member, or friend associated with lower levels of depressive symptoms and sexual risk behavior among YMSM?
2. Are depressive symptoms positively associated with sexual risk behavior among YMSM?
3. Is the association between HIV disclosure and sexual risk behavior mediated by YMSM's level of depressive symptoms?

Methods

Study description and sample

The data used for the present analysis was collected as part of a larger study conducted by the Adolescent Trials Network for HIV/AIDS Interventions (ATN), a collaborative consortium of clinical sites across the US that have ongoing research and data collection activities focused on HIV-infected youth aged 12–24. The goal of the larger study was to better understand adherence to HIV medications, mental health, sexual risk behavior, and substance use among HIV infected adolescents and young adults.

Study participants were recruited during their scheduled clinic appointments by research coordinators at 20 ATN sites. Clinics were located across the United States including 6 clinics in the Northeast, 8 clinics in the South, 3 clinics in the Midwest, 2 clinics in the West, and 1 clinic in Puerto Rico. This collaborative study specifically recruited participants from multiple social and demographic backgrounds who had laboratory documentation

of HIV-1 infection during the time of study enrollment. Participants underwent an informed consent process and completed an audio computer assisted self-interview survey. The current analysis used a subsample of 991 participants who reported their birth sex as male and who indicated having sex with another male in the last 3 months.

Measures

The measures for key variables included previously used assessments of disclosure of HIV-positive serostatus, depressive symptoms, and sexual risk behavior in the past 3 months. These measures also assessed variables used in the covariate analyses, including relationship status, disclosure support, and demographic characteristics.

Sexual risk behavior

Participants were asked if they had sex with another man in the past 3 months. Those participants who answered yes to this question (i.e., all the participants in the current study) were then asked to report how many sexual encounters were unprotected (i.e., occurred without a condom) with an HIV-positive partner and with an HIV-negative or unknown HIV status partner. Responses from these items were added together to create a dichotomous measure of unprotected anal intercourse (UAI) and UAI with HIV negative or unknown serostatus partners (i.e., serodiscordant UAI, or SD-UAI), respectively.

Depressive symptoms

Depressive symptoms were assessed using the Brief Symptom Inventory (BSI), a self-report measure (Derogatis, 1993). The BSI consists of 53 items and nine subscales measuring the symptoms associated with somatization, obsession-compulsion, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism. Each item on the BSI describes a psychopathological symptom. Respondents rate how frequently they have experienced symptoms in the last 30 days on a five-point scale ranging from “not at all” (0) to “extremely” (4). The depression subscale includes 6-items ($\alpha = 0.87$) such as “feeling hopeless about the future.” Higher scores on the depression subscale are related to more depressive symptoms.

Disclosure of HIV-positive serostatus

Participants were asked if they had disclosed that they were HIV-positive to a variety of individuals including the following: a current sex/romantic partner (who was not a boy-

friend), a current boyfriend or girlfriend (someone they knew for a while with whom they have an ongoing relationship), family member (mother, father, or other relative), friend, priest/clergy, or other person. These items were used to create three dichotomous variables that assessed if participants disclosed to a current sex partner or romantic partner (i.e., boyfriend or girlfriend), a family member, or a friend (which included clergy and other persons). We referred to these different disclosure variables as disclosure types.

Covariates

Covariates included disclosure support, relationship status, and demographic factors. Disclosure support was assessed using one item. Participants were asked how much they agree that there were people in their life who were supportive about disclosing their HIV-positive status to a partner. Responses were on a Likert scale and ranged from “strongly disagree” (1) to “strongly agree” (5). Participants were asked to report their relationship status. Possible answer options were *single, living with a steady partner, married, separated, divorced, widowed* or *other*. Response options were collapsed into two categories: “single” or “in a relationship” (i.e., living with a partner, being married, or being in some other type of romantic relationship). Lastly, participants reported their race, age, and highest level of education completed. Race was recoded into “Black/African-American” and “Other race/ethnicity,” while education was recoded into “high school/GED” and “at least some college.”

Statistical analysis

Descriptive statistics were computed for all study variables. Means and standard deviations were examined for continuous measures and frequencies and proportions were examined for categorical variables. Bivariate correlations, independent *t* tests, and chi-squared tests were conducted to examine associations between disclosure types, depressive symptoms, and sexual risk behavior (i.e., UAI and SD-UAI).

We conducted linear and logistic regression analyses to examine associations between HIV disclosure types and sexual risk behavior, HIV disclosure types and depressive symptoms, and depressive symptoms and sexual risk behavior. In order to test for mediation, we used the classic Baron and Kenny (1986) four-step approach. In steps 1–3 of the approach we examined the following three associations for statistical significance ($p \leq 0.05$): HIV disclosure and sexual risk behavior, HIV disclosure and depressive symptoms, and depressive symptoms and sexual risk behavior. If statistically significant associations are observed in each of the first three steps, a final step involves exploring a potential

suppression effect of depressive symptoms on the association of HIV disclosure to depressive symptoms. We fit a model with the first variable identified in the first column (e.g., HIV disclosure to sex partner) along with age, education, race, and relationship status. HIV disclosure to family member, for example, would then be substituted for HIV disclosure to sex/romantic partner for the second model and so forth. These models are referred to as the univariate models. The multi-variable models differ from the univariate models in having fit all of the measures in the first column simultaneously. We used SPSS version 21 for all data analyses.

Results

The sample characteristics, including means and frequencies, can be found in Table 1. Participants ranged in age from 15 to 26, with an average age of 21.3 years ($SD = 2.0$). The vast majority (97.3 %) of the sample was behaviorally infected. The majority of participants

Table 1 Sample characteristics ($N = 991$)

Variable	M (SD)/N (%)
Age	21.3 (2.0)
Gender	
Male	936 (94.5)
Transgender	54 (5.4)
Sexual orientation	
Gay	746 (75.3)
Bisexual	159 (16.0)
Heterosexual	45 (4.5)
Other	39 (3.9)
Race/ethnicity	
Black/African American	628 (63.6)
Hispanic/Latino	219 (22.2)
White	140 (14.2)
Mixed race	130 (13.2)
Other	89 (9.0)
Some college education or more	410 (52.4)
Relationship status	
Single	801 (80.9)
In a relationship	189 (19.1)
Disclosure support	4.10 (1.11)
Disclosure	
Sex partner/romantic partner	464 (52.4)
Family member	661 (74.6)
Friend/other person	707 (79.8)
Depression	7.04 (6.11)
Any UAI	458 (46.2)
Any SD-UAI	310 (31.9)

identified as male (n = 936) and 5 % of individuals in the sample identified as transgender (n = 54). Seventy-five percent of the participants identified as gay (n = 746), 16 % identified as bisexual (n = 159), 4.5 % identified as heterosexual (n = 45), and 3.9 % (n = 39) identified as other. Almost two-thirds (63.6 %) of participants identified as Black, while 22 % identified as Hispanic/Latino, 14.2 % as White, 13.2 % as mixed race, and 9.0 % as other. Over half of participants (52.4 %) completed some college education or more. Lastly, the majority of the sample (80.9 %) reported being single.

Out of all the participants who reported disclosing their HIV status to at least one person (n = 886), over half (52.4 %) reported disclosing to their current sexual/romantic partner, while 74.6 % reported disclosing to family member and 79.8 % reported disclosing to a friend or other person. The mean level of depression was 7.04 (SD = 6.11; range 0–24). Less than half (46 %) of participants reported having at least one episode of UAI in the prior 3 months, while 31.9 % reported SD-UAI in the past 3 months.

Associations between HIV disclosure and depressive symptoms, and HIV disclosure and sexual risk behavior

Bivariate correlations among key study variables are presented in Table 2. Correlations among disclosure types, depressive symptoms, and sexual risk behavior (i.e., UAI and SD-UAI) were relatively small and ranged from –0.10 to 0.14. Results from *t* tests showed no significant association between the different persons in which a participant disclosed to and depressive symptoms. Mean levels of depressive symptoms were not significantly different for YMSM who disclosed their HIV status to sexual/romantic partners [*t*(884) = 0.72, *p* = .470], those who disclosed to family members [*t*(884) = 0.41, *p* = .68], or those who disclosed to friends/other persons [*t*(884) = –0.78, *p* = .44]. Results from linear regressions (which adjusted for age, college education, identifying as Black/African American, relationship status, and HIV disclosure support) also showed no

significant associations between HIV disclosure types and depressive symptoms (*p* > .05).

Chi-squared tests were conducted to examine bivariate associations between HIV disclosure types and sexual risk behavior. Findings showed that a significantly greater proportion of YMSM who reported disclosing their HIV status to sexual/romantic partners engaged in UAI compared to those who did not disclose to sexual/romantic partners [$\chi^2(1, N = 799) = 8.20, p < .001$]. However, there were no significant differences in the proportions reporting SD-UAI [$\chi^2(1, N = 870) = 1.63, p = .20$]. In contrast, a significantly lower proportion of YMSM who reported disclosing their HIV status to family members indicated engaging in UAI [$\chi^2(1, N = 799) = 4.64, p = .03$] and SD-UAI [$\chi^2(1, N = 870) = 5.15, p = .02$] compared to the proportion who did not disclose to family members. Lastly, there were no significant differences observed in UAI [$\chi^2(1, N = 799) = 0.28, p = .59$] or SD-UAI [$\chi^2(1, N = 870) = 0.00, p = .97$] between YMSM who disclosed to friends/others and those who did not.

Tables 3 and 4 present findings from logistic regression analyses in which HIV disclosure types were examined in relation to UAI and SD-UAI in adjusted univariate and multivariate models. Disclosing to a family member emerged as a significant predictor in univariate and multivariate models. The odds ratio for the univariate model predicting UAI was 0.57 (95 % CI 0.39–0.83) and for the multivariate model predicting UAI (which included depressive symptoms as an additional independent variable) was 0.57 (95 % CI 0.39–0.83), indicating that HIV disclosure to family members decreased the probability of having UAI. Similar findings were observed for the models predicting SD-UAI. The odds ratio for the univariate model was 0.59 (95 % CI 0.41–0.85) and for the multivariate model it was 0.54 (95 % CI 0.40–0.84), suggesting a protective association between HIV disclosure to family members and SD-UAI. The estimates that were obtained for HIV disclosure to sexual/romantic partners and HIV disclosure to friends/others did not reach statistical significance (*p* > .05).

Table 2 Bivariate correlations among HIV disclosure types, depressive symptoms, and UAI

	1	2	3	4	5	6
1. Disclosure to sex/romantic partner	1					
2. Disclosure to family member	0.020	1				
3. Disclosure to friend/other person	0.049	0.075*	1			
4. Depressive Symptoms	–0.039	–0.026	0.039	1		
5. Any UAI episodes	0.133**	–0.103**	0.030	0.139**	1	
6. Any SD-UAI episodes	0.043	–0.077*	–0.001	0.119**	–	1

Note Spearman rho correlation coefficients reported

** *p* < .01; * *p* < .05

Table 3 Univariate logistic regressions examining associations between HIV disclosure, depressive symptoms, and sexual risk behavior in the last 3 months

Variables	Sexual risk behavior					
	UAI models			SD-UAI models		
	b (SE)	OR	95 % CI	b (SE)	OR	95 % CI
Disclosure to sex partner	0.20 (0.17)	1.23	(0.87–1.73)	0.15 (0.18)	1.16	(0.81–1.65)
Age	0.13 (0.05)**	1.14	(1.04–1.26)	–0.01 (0.05)	0.99	(0.90–1.09)
Education						
HS/GED	<i>Ref.</i>			<i>Ref.</i>		
Some college	–0.26 (0.17)	0.77	(0.55–1.08)	–0.02 (0.18)	0.98	(0.69–1.38)
Race						
Other race/ethnicity	<i>Ref.</i>			<i>Ref.</i>		
Black	–0.54 (0.17)**	0.59	(0.42–0.82)	–0.62 (0.17)**	0.54	(0.39–0.75)
Relationship status						
In a relationship	<i>Ref.</i>			<i>Ref.</i>		
Single	0.21 (0.22)	1.23	(0.80–1.89)	–0.21 (0.23)	0.81	(0.52–1.28)
Disclosure support	–0.73 (0.08)	0.93	(0.80–1.08)	–0.07 (0.08)	0.93	(0.80–1.09)
Disclosure to family member	–0.56 (0.19)**	0.57	(0.39–0.83)	–0.52 (0.19)**	0.59	(0.41–0.85)
Age	0.14 (0.05)**	1.15	(1.04–1.26)	–0.01 (0.05)	0.99	(0.90–1.09)
Education						
HS/GED	<i>Ref.</i>			<i>Ref.</i>		
Some college	–0.24 (0.17)	0.79	(0.56–1.10)	0.002 (0.18)	1.00	(0.71–1.42)
Race						
Other race/ethnicity	<i>Ref.</i>			<i>Ref.</i>		
Black	–0.51 (0.17)**	0.60	(0.43–0.84)	–0.60 (0.17)**	0.55	(0.39–0.77)
Relationship status						
In a relationship	<i>Ref.</i>			<i>Ref.</i>		
Single	0.24 (0.21)	1.27	(0.84–1.92)	–0.19 (0.22)	0.83	(0.53–1.28)
Disclosure support	–0.05 (0.08)	0.96	(0.82–1.11)	–0.05 (0.08)	0.95	(0.82–1.11)
Disclosure to friend/other	0.03 (0.21)	1.03	(0.69–1.55)	–0.05 (0.22)	0.95	(0.63–1.45)
Age	0.14 (0.05)**	1.15	(1.05–1.26)	–0.002 (0.05)	1.00	(0.91–1.10)
Education						
HS/GED	<i>Ref.</i>			<i>Ref.</i>		
Some college	–0.26 (0.17)	0.77	(0.55–1.08)	–0.10 (0.18)	0.99	(0.70–1.40)
Race						
Other race/ethnicity						
Black	–0.53 (0.17)**	0.59	(0.42–0.82)	–0.62 (0.17)**	0.54	(0.38–0.75)
Relationship status						
In a relationship	<i>Ref.</i>			<i>Ref.</i>		
Single	0.29 (0.21)	1.33	(0.88–2.01)	–0.15 (0.22)	0.86	(0.56–1.33)
Disclosure support	–0.06 (0.08)	0.95	(0.81–1.10)	–0.05 (0.08)	0.95	(0.81–1.10)
Depressive symptoms	0.31 (0.01)*	1.03	(1.01–1.06)	0.03 (0.01) [†]	1.03	(1.01–1.06)
Age	0.12 (0.05)**	1.13	(1.04–1.24)	0.004 (0.05)	1.00	(0.92–1.10)
Education						
HS/GED	<i>Ref.</i>			<i>Ref.</i>		
Some college	–0.16 (0.17)	0.85	(0.62–1.18)	0.10 (0.17)	1.10	(0.79–1.53)
Race						
Other race/ethnicity	<i>Ref.</i>			<i>Ref.</i>		
Black	–0.52 (0.17)**	0.59	(0.43–0.82)	–0.55 (0.17)**	0.58	(0.42–0.80)

Table 3 continued

Variables	Sexual risk behavior					
	UAI models			SD-UAI models		
	b (SE)	OR	95 % CI	b (SE)	OR	95 % CI
Relationship status	<i>Ref.</i>			<i>Ref.</i>		
In a relationship	<i>Ref.</i>			<i>Ref.</i>		
Single	0.33 (0.20) [†]	1.39	(0.93–2.07)	−0.10 (0.21)	0.90	(0.60–1.37)
Disclosure support	−0.60 (0.07)	0.94	(0.82–1.09)	−0.04 (0.07)	0.96	(0.83–1.11)

** $p < .01$; * $p < .05$; [†] $p < .10$

Relations between depressive symptoms and sexual risk behavior

Tables 3 and 4 show results from logistic regression analyses in which depressive symptoms were examined in relation to UAI and SD-UAI in adjusted univariate and multivariate models. In the univariate model predicting UAI, depressive symptoms emerged as a significant predictor (OR 1.03; 95 % CI 1.01–1.06). The odds ratio suggests that with increasing levels of depressive symptoms, the odds of engaging in UAI increases among HIV-positive YMSM. In the multivariate model depressive symptoms were marginally associated with UAI (OR 1.03; 95 % CI 1.00–1.06). In the models examining SD-UAI as

the outcome variable, depressive symptoms emerged as a significant predictor. In the univariate model, the odds ratio for depressive symptoms was 1.04 (91 % CI 1.01–1.06); while in the multivariate model the odds ratio was 1.03 (95 % CI 1.00–1.06). These results suggest an independent association of depressive symptoms to sexual risk behavior.

Given that none of the disclosure variables were significantly related to depressive symptoms (i.e., based on results from the bivariate correlations, *t* tests and multivariate linear regression analyses), mediation analyses were not carried out. Thus, in the current sample depressive symptoms were deemed to not be a viable mediator of the association between HIV disclosure and UAI or SD-UAI.

Table 4 Multivariate logistic regressions examining associations between HIV disclosure, depressive symptoms, and sexual risk behavior in the last 3 months

Variables	Sexual risk behavior					
	UAI models			SD-UAI models		
	b (SE)	OR	95 % CI	b (SE)	OR	95 % CI
Disclosure to sex partner	0.22 (0.18)	1.25	(0.88–1.78)	0.18 (0.18)	1.19	(0.83–1.71)
Disclosure to family member	−0.57 (0.19)**	0.57	(0.39–0.83)	−0.54 (0.19)**	0.58	(0.40–0.84)
Disclosure to friend/other	0.08 (0.21)	1.08	(0.71–1.64)	−0.01 (0.22)	0.99	(0.65–1.52)
Depressive symptoms	0.03 (0.01) [†]	1.03	(1.00–1.06)	0.03 (0.01)*	1.03	(1.00–1.06)
Age	0.13 (0.05) [†]	1.13	(1.03–1.25)	−0.02 (0.05)	0.98	(0.89–1.08)
Education	<i>Ref.</i>			<i>Ref.</i>		
HS/GED	<i>Ref.</i>			<i>Ref.</i>		
Some college	−0.23 (0.18)	0.79	(0.56–1.12)	0.02 (0.18)	1.02	(0.72–1.45)
Race	<i>Ref.</i>			<i>Ref.</i>		
Other race/ethnicity	<i>Ref.</i>			<i>Ref.</i>		
Black	−0.48 (0.17)**	0.62	(0.44–0.87)	−0.57 (0.18)**	0.57	(0.40–0.80)
Relationship status	<i>Ref.</i>			<i>Ref.</i>		
In a relationship	<i>Ref.</i>			<i>Ref.</i>		
Single	−0.17 (0.22)	1.19	(0.76–1.83)	−0.25 (0.24)	0.78	(0.49–1.24)
Disclosure support	−0.05 (0.08)	0.95	(0.81–1.11)	−0.04 (0.08)	0.96	(0.82–1.12)

HS high school, GED graduate educational development

** $p < .01$; * $p < .05$; [†] $p < .10$

Discussion

The crisis of HIV among YMSM in the United States requires researchers to obtain a deeper understanding of the factors related to transmission and to the psychosocial health of YMSM living with HIV. The current study explored disclosure and its association to depression and sexual risk behavior among HIV-positive YMSM by focusing on HIV disclosure as it occurs in three different groups: sexual/romantic partners, family members, and friends. HIV disclosure was related to sexual risk behavior, highlighting the importance of HIV status disclosure and the necessary communication skills to disclose as potential HIV intervention strategies. While we did not observe an association between HIV disclosure and depressive symptoms, and hence could not confirm a potential mediating role of depressive symptoms in the association of HIV disclosure to sexual risk behavior, there was a strong direct association observed between depressive symptoms and sexual risk behavior. Thus, in addition to prevention interventions for HIV disclosure, mental health is also an important target for health promotion interventions targeting HIV-positive YMSM.

Our findings highlight the importance of understanding HIV disclosure as it occurs for different groups of people that are important to HIV-positive YMSM. Notably, we observed opposite effects on sexual risk behavior when examining HIV disclosure to sexual or romantic partners and HIV disclosure to family members. Further, in the univariate analyses we observed that HIV-positive YMSM in our sample were more likely to indicate having had UAI when they reported disclosing to a sexual or romantic partner. This may be due to the preponderance of evidence suggesting that serosorting is a frequently used HIV risk reduction strategy for YMSM (Marks et al., 2010). Indeed, the YMSM in our sample may have disclosed in an effort to permit condomless sex with partners thought to also be HIV-positive. This is further supported by the lack of significant findings regarding disclosure to sexual or romantic partners and SD-UAI.

A key finding from this study is the potentially protective effect that disclosure to family members may have on reducing the likelihood of sexual risk behavior among HIV-positive YMSM. Our results suggested that YMSM who share their HIV status with family members are less likely to engage in UAI or SD-UAI compared to YMSM who do not disclose to family members. It is important to note that disclosure support cannot explain this association, as this factor was included as a covariate in all models. Thus, HIV disclosure to a family member does not just serve as an indicator that an HIV-positive YMSM has support from his family, but may also speak to a broader concept of families protecting HIV-positive YMSM and fostering the importance of healthy sexual behavior.

Families play a critical role in shaping the health outcomes of HIV-positive YMSM (Hosek et al., 2008), and the findings obtained in this study lend support to the value of family HIV interventions in reducing additional sexual risk behavior and improving health outcomes among YMSM. However, outside of social support, the putative mechanisms through which HIV disclosure to family members impacts sexual risk-taking behaviors among HIV-positive YMSM are largely unknown. Thus, future qualitative and quantitative research is needed to better understand the association and possible mediators.

In addition to HIV disclosure to sexual or romantic partners and family members, YMSM's depressive symptoms were also observed to be associated with UAI and SD-UAI. The association between depressive symptoms and sexual risk behavior held even after accounting for significant HIV disclosure variables and important covariates. This suggests an independent association of depressive symptoms to sexual risk behavior and highlights the importance of mental health programming for HIV prevention. Numerous studies have examined depressive symptoms and sexual risk behavior among HIV-positive populations, with most finding no significant association between the two factors (Crepaz & Marks, 2002). However, studies specifically examining HIV-positive MSM have observed connections between depressive symptoms and sexual risk taking (Alvy et al., 2011; Mustanski, 2007). Additionally, researchers have found strong evidence that improving mental health functioning among HIV-positive MSM leads to a reduction in sexual risk behavior (Sikkema et al., 2008, 2010). This finding suggests a potentially strong connection between these two factors in populations of MSM. Our data indicate that clinical and behavioral interventions to treat depression and psychological distress are warranted, as these interventions have the potential to both improve mental health functioning and reduce sexual risk behavior in HIV-positive YMSM.

There are several limitations to this study that should be noted. First, the results from the study may not be generalizable to non-clinic-based samples of HIV-positive YMSM. YMSM who are out of care or cannot access care may not have the same underlying risk and protective factors identified in this research. A second limitation is that the disclosure types were broad and potentially overlapping. For example, we examined both disclosure to romantic and sexual partners in the same category and assessed disclosure to all family members as opposed to specific ones (e.g., mother, father, sibling, etc.). In our sample we observed limited variation within specific categories of possible individuals to which to disclose. Therefore, future research should focus on specific individuals and groups to whom YMSM may disclose their HIV-positive status. Finally, we were limited in examining

depressive symptoms as the sole potential mediator of the association between HIV disclosure and sexual risk behavior. Other factors such coping, self-efficacy, and self-esteem should also be considered as possible mediators of the association.

In spite of these limitations, there are several strengths of this study. It is among the first to examine HIV disclosure in a racially diverse population of HIV-positive YMSM. An additional strength of the study is the special attention paid to exploring different types of HIV disclosure and the exploration of the effects of HIV disclosure on sexual risk behavior beyond what social support can explain. Finally, our findings provide direction for future research that could extend our understanding of the links between HIV disclosure and sexual risk behavior. More specifically, our findings support a need to focus on potential areas (i.e., families, mental health) for HIV interventions that seek to improve the health and well-being of HIV-positive YMSM.

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Conflict of interest Stephanie H. Cook, Pamela Valera and Patrick A. Wilson declared that they have no conflict of interest.

Human and animal rights and Informed Consent All procedures followed were in accordance with ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from all patients for being included in the study.

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