

Self-Disclosure of HIV Status, Social Support, and Mental Health Among HIV-Positive  
Young Black Men Who Have Sex With Men (YBMSM) in the USA

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Thesis submitted in partial fulfillment of  
the requirements for the degree of  
Master of Science in the Global Health Program  
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2017

ABSTRACT

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## Abstract

Background: Young black men who have sex with men (YBMSM) are a particularly vulnerable group for HIV infection. HIV-positive YBMSM often suffer from mental health challenges as a result of discrimination based on their HIV status, race, and sexual preferences. Potential associations among HIV self-disclosure, social support, and mental health have been reported in several studies. The aim of this study is to explore the associations among self-disclosure, social support and mental health, including depression and anxiety. Methods: Cross-sectional secondary data, with a sample size of 199 HIV-positive YBMSM, was retrieved from the baseline data of an on-going study. Qualitative interviews were conducted at three sites in North Carolina. Linear regression and content analysis were used in the quantitative and qualitative analysis respectively to explore the associations among self-disclosure, social support, and mental health. Results: In linear regression models for depression and anxiety, social support was significantly associated with depression ( $p < 0.01$ ) and anxiety ( $p < 0.05$ ). Self-disclosure was not significantly associated with depression or anxiety in regression analyses. Qualitative analysis showed connections between social support and mental health as well as self-disclosure and mental health. Conclusions: Both self-disclosure and social support could affect mental health in YBMSM. Further research is needed to better understand the mechanisms linking self-disclosure, social support, and

mental health to develop effective and tailored mental health interventions for this marginalized population.

## **Dedication**

This thesis is dedicated to the courageous HIV-positive young black men in North Carolina in appreciation of their participation in this study, and to people who work selflessly to improve the health of this marginalized population.

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## List of Abbreviation

AIDS	Acquired Immunodeficiency Syndrome
ART	Antiretroviral Therapy
HIV	Human Immunodeficiency Virus
HMP	HealthMpowerment
STD	Sexually Transmitted Disease
UNC	University of North Carolina
YBMSM	Young Black Men who have Sex with Men

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# **1. Introduction**

## ***1.1 The HIV Epidemic among YBMSM in North Carolina***

The global rate of HIV infection is increasing rapidly in adolescents and young adults. In 2015, 670,000 out of 2,100,000 new HIV infections were among individuals aged 15 to 24 years old (UNICEF, 2016). This trend has resulted in an increase in AIDS-related deaths in young people while the death rate has declined in other age groups (UNICEF, 2016). Adolescents and young adults have become a particularly vulnerable group. For example, in the United States (U.S) in 2015, 14,594 young adults aged 20-29 were newly diagnosed with HIV, accounting for 37 percent of all newly diagnosed cases (CDC, 2016c).

At all ages men who have sex with men (MSM) have also been identified as a vulnerable group for HIV infection. According to the U.S. Centers for Disease Control and Prevention (CDC), more than 60% of newly HIV infected individuals were MSM in the U.S. (CDC, 2016a). The number of newly infected young MSM, aged 13-24, increased by 22 percent from 2008 to 2010 (CDC, 2016b). The heaviest burden of new infections continues to be among young black MSM (YBMSM), who account for 55 percent of new cases in young MSM. YBMSM now have more new infections when comparing with other subgroups by race, age and sex, based on the data from the U.S. CDC (CDC, 2016b).

Furthermore, the retention rate in HIV care in YBMSM is low compared with other vulnerable populations. Millett et al. (2012) reviewed studies from 1981 to 2011 and found that YBMSM have a lower rate of being aware of their HIV status, being retained in HIV care and receiving antiretroviral therapy (ART) than other HIV-positive MSM (Millett et al., 2012). Another study also found that after being diagnosed with HIV, only a limited number of YBMSM had engaged in medical care, were retained in care, and achieved viral suppression (Zanoni & Mayer, 2014).

## ***1.2 Mental Health in HIV positive YBMSM***

Mental stress and psychiatric disorders have been reported to be associated with HIV infection (Lam, Naar-King, & Wright, 2007a; Swindells, Mohr, Justic, Berman, & others, 1999). In terms of adults, many studies have consistently shown a higher prevalence of psychiatric disorders among individuals who were living with HIV compared to those who were not (Ciesla & Roberts, 2001; Dew et al., 1997; Prachakul, Grant, & Keltner, 2007). The symptoms of mental stress and psychiatric disorders among HIV positive adults may include mood disturbance, depression, and anxiety (Fell et al., 1993; Lam et al., 2007a).

Adolescents and young adults are in a critical developmental stage of transition from adolescence to adulthood, experiencing significant biological, social, and cognitive changes (Arnett, 2000). This developmental stage transition of adolescents and young adults is even more challenging for HIV infected individuals due to the stressors caused



by HIV infection, such as alienation, social isolation, and stigma (D'Angelo et al., 2001; Rao, Pryor, Gaddist, & Mayer, 2007). A recent study of 20 sites across the U.S. found a high prevalence (18%) of psychological symptoms among adolescents and young adults who were HIV positive, particularly for those who are not taking antiretroviral therapy (ART) (Brown, Whiteley, Harper, Nichols, & Nieves, 2015).

Regardless of age, black MSM usually experience dual discrimination based on their race and sexual orientation. Their depressive distress scores seem to be higher than white men independent of their HIV status when measured by the Center for Epidemiologic Studies Depression Scale (CES-D Scale) (Cochran & Mays, 1994). Previous studies have also consistently shown that youth or black MSM experience alienation, depression, and anxiety caused by discrimination or stigma that is often associated with sexual preferences and/or race (Crawford, Allison, Zamboni, & Soto, 2002; Hosek, Harper, Lemos, & Martinez, 2008; Lam et al., 2007a; Raymond & McFarland, 2009).

However, few studies have focused on the mental health of HIV positive YBMSM, who might have more complex mental health issues because of their unique developmental stage, race, sexual orientation and HIV status.

### ***1.3 Self-disclosure and Mental Health***

Research related to self-disclosure, the confiding of positive HIV status to others, has examined self-disclosure practices and the impact on mental health. Whether to

disclose HIV status and how to choose disclosure targets are common challenges faced by the individuals who are living with HIV. Most studies found that the overall disclosure rate of sexual orientation and HIV positive status among YBMSM was low compared to other subgroups of MSM. Studies showed that black MSM were less likely to disclose their sexual orientation and HIV status, or be involved in peer organization and social networks compared to white MSM (Bird, Fingerhut, & McKirnan, 2011; Kennamer, Honnold, Bradford, & Hendricks, 2000). However, a recent study conducted in North Carolina showed that the disclosure rate was high (97%) among HIV-positive racial/ethnic minority young MSM, ages 13 to 24. Particularly, the disclosure rate was higher in disclosing to female relatives than males (Hightow-Weidman et al., 2013).

The self-disclosure of HIV status can have both positive and negative impacts on mental and psychological health. On the one hand, self-disclosure can act as a coping strategy to manage HIV-related stress (Hult, Wrubel, Bränström, Acree, & Moskowitz, 2012; S. E. Stutterheim et al., 2011). In a study of disclosure and psychological well-being in Latino gay and bisexual men, excluding differences depending on disclosure targets, disclosure was generally related to greater self-esteem and lower levels of depression (Zea, Reisen, Poppen, Bianchi, & Echeverry, 2005). On the other hand, YBMSM can experience health inequities and stigma as a marginalized group within their social network (Geter et al., 2016). Self-disclosure, especially within their social network, may have a detrimental effect on mental health and social relationships, caused by rejection,

discrimination and stigma (Heckman et al., 2004; Holt et al., 1998; Lam et al., 2007a; Pence, Miller, Whetten, Eron, & Gaynes, 2006; S. Stutterheim et al., 2009).

#### ***1.4 Social Support and Mental Health***

In the past two decades, studies have consistently shown that social support serves as a buffer against the negative effects of stress on anxiety and depression in adults (Abler et al., 2015; Berkman, 1995; Cohen, 2004; Cohen & Wills, 1985). For adolescents and young adults, establishing a social network for peer support is one of the main tasks of this normal developmental stage. However, YBMSM may face more challenges in establishing social networks and gaining social support due to their sexual orientation and HIV status (Battles & Wiener, 2002). A study of HIV positive youth found that gay/lesbian/bisexual individuals were more likely than heterosexual individuals to have low social support, which was correlated with more mental health symptoms (Lam et al., 2007a).

In addition, studies suggest that perceived social support may be more important than the actual social support provided in improving mental health among HIV positive individuals (Haber, Cohen, Lucas, & Baltes, 2007; McDowell & Serovich, 2007). For example, in some studies, young MSM are more likely to disclose their HIV status to mothers than fathers in the family because they perceived greater acceptance among mothers (Estrada, Rigali-Oiler, Arciniega, & Tracey, 2011; Meyer & Champion, 2010). Moreover, compared with other family members, adult MSM are more likely to disclose

their HIV status to friends than family (Klitzman et al., 2007). This may also be because they believe peers can offer more acceptance and support than family members.

### ***1.5 Self-disclosure and Social Support***

Researchers have been interested in the association between HIV self-disclosure and social support in the past decades. For HIV-positive individuals, self-disclosure of HIV status could be a crucial step before receiving social support (Hays et al., 1993; Huber, 1996; Kalichman, DiMarco, Austin, Luke, & DiFonzo, 2003; Kimberly & Serovich, 1996). Researchers have reported that HIV self-disclosure is positively related to increased social support from peers (Battles & Wiener, 2002). For individuals who are living with HIV, self-disclosure can offer a chance to express themselves, increase self-esteem, and build intimacy within personal relationships (Chaudoir & Fisher, 2010). Self-disclosure also has other potential benefits for individual and public health, particularly in hospital and clinical settings, including increased access to health care and retention in antiretroviral treatment, as well as increased condom use (Chaudoir & Fisher, 2010).

However, disclosing HIV status does not always benefit HIV-positive individuals since they might face consequences such as rejection and discrimination from the recipient, as well as privacy loss (Levy et al., 1999; Mansergh, Marks, & Simoni, 1995). One study found a significant association between lower perceived social support and nondisclosure (Perry et al., 1994). Another study found that adolescents were less

likely to disclose their HIV status to their main partner, immediate families, or friends compared to adults, which may be associated with a lack of social support and corresponding isolation (O'Brien et al., 2003).

### ***1.6 Why this study is needed***

The physical and mental health of YBMSM is one of the priority concerns given the rapid growth of new HIV infections. To improve the health status of YBMSM, more studies are needed to understand the connections among self-disclosure, social support, and mental health in order to develop better designed health interventions. Few studies have focused on these associations in YBMSM, therefore, the relationships among these dimensions are not clear.

### ***1.7 Study Aim and Hypothesis***

The aim of this study is to explore the associations among HIV self-disclosure, social support, and mental health outcomes, including depression and anxiety in YBMSM. This study has two hypotheses. *Hypothesis 1*: Self-disclosure of HIV-positive status is positively associated with improved mental health (reduced depression and anxiety) among YBMSM. *Hypothesis 2*: Social support is positively associated with better mental health (reduced depression and anxiety) among YBMSM.

## 2. Methods

### 2.1 Study Setting

Our study had two components in terms of data collection: secondary data (quantitative data, baseline survey data from *HealthMpowerment.org* [HMP] study) and primary data (qualitative data, in-depth interviews). Quantitative data were collected from across North Carolina, while qualitative interviews were conducted in three different sites: Chapel Hill, Durham, and Charlotte in NC, the United States.

Chapel Hill site: The University of North Carolina (UNC) Behavior and Technology Lab (BATLab) is a part of the Division of Infectious Disease in the UNC-Chapel Hill School of Medicine. Their mission is to design, implement, and test technology-based interventions to facilitate health behavior change related to HIV and other sexually transmitted infections acquisition and transmission. Four faculty members, one fellow, and several research assistants are conducting different research projects related to HIV care and MSM behavior changes. Secondary data retrieved from the HMP study, an ongoing study started in 2008, were used in this study. Some semi-structured in-depth interviews were completed with the assistance of BATLab.

Durham site: The mission of the Duke Global Health Institute, Center for Health Policy & Inequalities Research (CHPIR) is to improve the health of individuals and communities by addressing health inequities. They conduct interdisciplinary, policy-relevant evaluative and intervention-based research. Most of the in-depth interviews for

this study were conducted in Durham.

Charlotte site: Several interviews were also conducted in Charlotte with the support provided by the Regional AIDS Interfaith Network (RAIN). RAIN is one of the largest HIV nonprofits in the Carolinas. Established in 1992, they offer various personalized care not only for people who live with HIV but also for their families. RAIN's aim is to reduce the stigma on people who live with HIV in the community and lower the HIV rates in the region.

## ***2.2 Study Population***

The study population includes HIV positive young black men who have sex with men (YBMSM). In North Carolina, more than 400 YBMSM have participated in an ongoing research study, HMP, which is being conducted by UNC's BATLab. The HMP study targets health promotion for YBMSM and transgender women. See Section 2.3 for more details.

In our study, the inclusion criteria for both secondary data and in-depth interviews were the same and based on self-report. The inclusion criteria included: 1) age 18-30 years old; 2) biologically male at birth; 3) self-identity as black or African American and non-heterosexual; 4) history of having sex with men; 5) HIV-positive diagnosis; 6) current residence in North Carolina; and 7) ability to communicate fluently in English. Exclusion criteria included history of extreme mental illness and unwillingness or inability to sign informed consent about participation in the study.

## ***2.3 Secondary Data Collection (Quantitative data)***

### **2.3.1 Secondary quantitative data source**

HMP is an internet and mobile phone-based intervention designed to reduce sexual risk behavior, promote health and wellness, and support community-building for YBMSM and transgender women (TW) (Baltierra et al., 2016; Hightow-Weidman et al., 2012; Muessig et al., 2013; Muessig, Baltierra, Pike, LeGrand, & Hightow-Weidman, 2014). HMP was developed through continuous rounds of evaluation by YBMSM/TW. It is a user-driven and mobile-phone-optimized intervention.

Participants were recruited from the local community in North Carolina through online ads on Facebook and Craigslist, listservs, flyers, and through sexually transmitted infection (STI) and HIV health providers in clinics. The eligibility criteria for HMP participants were the same as [Section 2.2](#).

### **2.3.2 Data Collection Instruments (Measurements)**

The quantitative data were collected by a comprehensive survey questionnaire developed by BATLab for HMP study. The questionnaire was administered at baseline, 3 months, 6 months, and 12 months using the computer assisted self-interviewing (CASI) software, (Qualtrics, Provo, UT). The components from the baseline survey used in this study include sociodemographic characteristics, HIV status, clinically relevant depressive symptoms, anxiety, HIV self-disclosure, perceived social support, HIV-related stigma, self-esteem, and experienced sexual minority stigma.



### **2.3.2.1 Sociodemographic Information**

Sociodemographic information included age, education, race identification in addition to black, living conditions (living with others, homeless in the past six months), income, health insurance, spirituality, religiosity, relationship status, arrests, and time spent in jail.

### **2.3.2.2 Dependent Variables**

Dependent variables were depressive symptomatology and anxiety. Depressive symptoms were measured by the Center for Epidemiologic Studies Depression Scale (CES-D) (Radloff, 1977). The CES-D is a 20-item validated scale to identify groups at high risk of clinical depression ( $\alpha=0.90$ ). A 4-point Likert scale was used for participants to report the frequency of depressive symptoms in the past week. The total CES-D score ranges from 0-60. A cutoff point of  $\geq 16$  was used to create a dichotomous depression variable indicating clinically relevant depressive symptomatology. Henceforth, clinically relevant depressive symptoms will be referred to as depression for simplicity.

Anxiety was measured using the 7-item version of the General Anxiety Disorder scale (GAD-7) ( $\alpha=0.92$ ) (Spitzer, Kroenke, Williams, & Löwe, 2006). Participants indicated the frequency of each anxiety symptom they experienced in the past two weeks. The frequency was categorized by not at all, several days, more than half the days and nearly every day with a range of score from 0 to 3. The total GAD-7 score ranges 0-21. The cutoff points for mild, moderate, and severe anxiety are 5, 10, and 15,

respectively. In this study, anxiety was dichotomized as no/mild anxiety or moderate/severe anxiety using 10 as cutoff points.

### **2.3.2.3 Independent Variables**

Independent variables included HIV self-disclosure, perceived social support, self-esteem, HIV-related stigma, and experienced sexual minority stigma. General HIV self-disclosure was collected by asking, “have you disclosed your HIV status to anyone”. If participant answered “yes”, then questions about disclosure targets were asked, including, “who have you told about your HIV status” and “how many of your friends/family members/sexual partners have you disclosed your HIV status to”. The response categories for the last question were none, a few, most, and all.

Perceived social support was measured by the Medical Outcomes Study Social Support Survey (MOS-SSS) (Sherbourne & Stewart, 1991). The MOS-SSS consists of four subtypes support scales -emotional (alpha=0.97), tangible (alpha=0.92), affectionate (alpha=0.94), and positive social interaction (alpha=0.96), as well as an overall functional social support index (alpha=0.98). The original scale scores for overall social support and for each subtype range from 0 to 5. In our study, the original scale scores were transformed to a 0-100 scale to compare to published literature. Higher scores indicate greater levels of perceived social support.

Self-esteem was measured by the Rosenberg Self-Esteem Scale (Robins, Hendin, & Trzesniewski, 2001). It is a 10-item scale measuring global self-esteem (alpha=0.88-

0.90). The response categories range from 0 (i.e., strongly disagree) to 3 (i.e., strongly agree). The total score ranges from 0-30. The cutoff points for low, normal, and high self-esteem are 15, and 25, respectively.

HIV-related stigma was measured using Steward et al.'s HIV stigma model (2008). HIV-related stigma includes four dimensions: experienced discrimination (enacted stigma), perceived discrimination (vicarious stigma,  $\alpha=0.88$ ), perceived stigma (felt-normative stigma,  $\alpha=0.94$ ) and internalized stigma ( $\alpha=0.83$ ) (Steward et al., 2008). For internalized stigma, perceived stigma and perceived discrimination items, responses were categorized on a 4-point Likert scale (range 0-30); for experienced discrimination, responses were yes or no (range 0-10). Higher scores indicate greater levels of stigma for each dimension.

'Experienced sexual minority discrimination' was measured by the Multiple Discrimination Scale (MDS)-Gay subscale (Bogart, Landrine, Galvan, Wagner, & Klein, 2013). The MDS-Gay subscale is a 10-item scale assessing experiences with institutional and violent forms of discrimination events due to sexual orientation in the last year ( $\alpha=0.88$ ). The total score ranges from 0 to 10. A higher score indicates more experiences of sexual minority discrimination.

### **2.3.3 Quantitative data retrieval and analysis**

The quantitative data were retrieved from the HealthMpowerment.org (HMP) study. Based on the eligibility criteria for our study, baseline data for HIV positive YBMSM were retrieved from the HMP database.

In data analyses, Fisher's exact tests and Wilcoxon rank sum tests were used to compare the sociodemographic characteristics, self-disclosure and social support differences between various mental health outcomes, including depression and anxiety. Linear regression models were used to explore the potential predictor variables for depression and anxiety, including social support, self-disclosure, psychological and sociodemographic prediction variables. Additionally, for the anxiety model, the Tobit model was used to take into account the potential bounded nature of the GAD-7 anxiety score. All the quantitative data were analyzed using Stata/SE 14.0 (StataCorp, Texas, USA)

## ***2.4 Primary Data Collection (Qualitative data)***

### **2.4.1 Qualitative data subject recruitment**

Participants for the semi-structured in-depth interviews were identified from, but not limited to, the HMP study to satisfy the criteria of age, sex, and HIV status. Considering that YBMSM are a hard-to-reach population, convenience sampling was selected as the most appropriate sampling method. All of the participants in HMP received an email with a brief introduction to the in-depth interview and a contact

number for those interested in participating. People who were interested in participating in the study were encouraged to call the contact number. In addition, after each interview, we asked the participant to spread the study recruitment information to other potential participants. The sample size of in-depth interviews was determined to be fifteen based on the need for variation in demographic characteristics and the constraints of budget and time in this study.

#### **2.4.2 Qualitative data collection protocol**

Each potential participant who called on the phone was screened by answering a few screening questions (See Appendix A). If accepted into the study after screening, the researcher scheduled an interview with each participant. Before the interviews began, possible risks and benefits were explained by the interviewer and an informed consent form was signed by each participant (See Appendix B). These interviews were conducted in a private room in Chapel Hill, Durham, or Charlotte, depending on the residence of the participant. After completing the interview, each participant was compensated with a gift card.

#### **2.4.3 Data collection instruments**

In this study, a semi-structured in-depth interview guide was used, which ensured consistency among participants but gave the interviewer the flexibility to probe for more detailed information. The interview questions in the guide were adapted from the MSM study literature and the MOS Social Support Scale (See Appendix C). The

interviews provided greater insight into concerns of self-disclosure and the self-disclosure experience of YBMSM; where and what types of social support they received; their mental health status changes over time; and how the self-disclosure and social support influenced their mental health.

#### **2.4.4 Qualitative data analysis**

The interviews were transcribed by the primary investigator, by an online transcribing service called *Verbal Ink*, and by an independent assistant after the interviews were completed. The quality of each transcription was checked by the primary investigator for consistency and accuracy. No translation was needed because all of the interviews were conducted in English. The transcriptions were then coded for recurring themes and subthemes using Nvivo 11.0. The list of themes and subthemes was generated to explore the connection among the three main categories: self-disclosure, social support, and mental health.

### ***2.5 Ethical Considerations***

Prior to data collection, approval was obtained from the Institutional Review Board (IRB) of Duke University in Durham, North Carolina.

## **3. Results**

### ***3.1 Quantitative Results***

#### **3.1.1 Overall Sociodemographic Description of the Sample**

The main sociodemographic characteristics of the HIV-positive YBMSM participants can be found in Table 1. The sample consisted of 199 HIV-positive YBMSM. The average age of the participants was 24.9 years (SD=3.1). Most of the participants (71.9%) had finished high school or attended some college; and 17.1% had a college degree or more than a college degree. All participants self-identified as black, and some also identified themselves as Native American (24.6%) and white (10.6%).

In terms of living conditions, 10% of the participants were currently homeless and 33% of them had been homeless in the last six months. Around 40% of these YBMSM currently did not have a job and more than half of them (54.3%) earned less than US\$ 11,000 per year. The majority of the participants (80.4%) had some form of health insurance. Most of the participants were very (47.7%) or somewhat (40.2%) spiritual. More than half of them (63.8%) were very or somewhat religious. More than half of them (60.8%) were not in a relationship while around one-third of them were in a committed relationship with a man. Only three participants reported that they were in a committed relationship with a woman. In the last 3 months, 7% of the participants had been arrested and 6% had been in jail.

**Table 1. Sociodemographic characteristics and depression of YBMSM (n=199)**

<b>Characteristics</b>	<b>Overall (n=199) N (%) / Mean [SD]</b>	<b>Not depressed (n=83) N (%) / Mean [SD]</b>	<b>Depressed (n=114) N (%) / Mean [SD]</b>	<b>P value</b>
<b>Age*</b>	24.90 [3.11]	25.29 [3.16]	24.74 [3.05]	0.22
<b>Education</b>				0.10
Less than high school	22 (11.06)	6 (7.23)	16 (14.04)	
High school to some college	143 (71.86)	58 (69.88)	83 (72.81)	
College degree or more	34 (17.09)	19 (22.89)	15 (13.16)	
<b>Race (Besides Black)</b>				
White	21 (10.55)	7 (8.97)	14 (13.08)	0.49
Latino/Hispanic	18 (9.05)	5 (6.49)	13 (12.26)	0.22
Asian/Pacific Islander	4 (2.01)	1 (1.30)	3 (2.83)	0.64
Middle Eastern	5 (2.51)	2 (2.60)	2 (1.87)	1.00
Native American	49 (24.62)	20 (25.00)	29 (27.10)	0.87
Don't know	16 (8.04)	4 (5.19)	12 (11.32)	0.19
None	113 (56.78)	54 (67.50)	58 (51.79)	0.04
<b>Live with</b>				
Alone	36 (18.09)	20 (25.00)	16 (14.95)	0.09
Significant others	32 (16.08)	14 (17.72)	18 (16.82)	1.00
Child/Children	3 (1.51)	3 (3.85)	0	0.07
Parents/Guardians	47 (23.62)	17 (22.08)	29 (26.61)	0.50
Brothers/Sisters	26 (13.07)	9 (11.54)	17 (15.60)	0.52
Other relatives	13 (6.53)	4 (5.19)	9 (8.26)	0.56
Roommates/Nonrelatives	59 (29.65)	27 (34.62)	31 (28.97)	0.43
Currently homeless	20 (10.05)	1 (1.30)	19 (17.92)	<0.01
<b>Homeless (last 6 months)</b>	66 (33.17)	16 (19.28)	50 (43.86)	<0.01
<b>Currently have job</b>	119 (59.80)	56 (67.47)	61 (53.51)	0.06
<b>Income (annual, \$) (n=197)</b>				0.02
<10,999	107 (54.31)	34 (41.98)	72 (63.16)	
11,000-20,999	41 (20.81)	19 (23.46)	21 (18.42)	
21,000-30,999	26 (13.20)	14 (17.28)	12 (10.53)	
>31,000	23 (11.68)	14 (17.27)	9 (7.89)	
<b>Have health insurance</b>	160 (80.40)	73 (87.95)	86 (75.44)	0.03
<b>Spirituality</b>				0.44
Very spiritual	95 (47.74)	40 (48.19)	54 (47.37)	
Somewhat spiritual	80 (40.20)	37 (44.58)	43 (37.72)	
A little spiritual	16 (8.04)	4 (4.82)	11 (9.65)	



Not at all spiritual	8 (4.02)	2 (2.41)	6 (5.26)	
<b>Religiosity</b>				0.84
Very religious	45 (22.61)	19 (22.89)	25 (21.93)	
Somewhat religious	82 (41.21)	36 (43.37)	45 (39.47)	
A little religious	38 (19.10)	16 (19.28)	22 (19.30)	
Not at all religious	34 (17.09)	12 (14.46)	23 (19.30)	
<b>Current relationship status</b>				0.52
Not in a relationship	121 (60.80)	49 (59.04)	72 (63.16)	
Committed with a man	67 (33.67)	27 (32.53)	38 (33.33)	
Committed with a woman	3 (1.51)	2 (2.41)	1 (0.88)	
Other	8 (4.02)	5 (6.02)	3 (2.63)	
<b>Arrested (last 3 months)</b>	14 (7.04)	3 (3.61)	11 (9.65)	0.16
<b>In jail (last 3 months)</b>	12 (6.03)	2 (2.41)	10 (8.77)	0.08

\*T test was used.

Note: Fisher's exact tests were used for other characteristics.

**Table 2. Sociodemographic characteristics and anxiety of YBMSM (n=195)**

<b>Characteristics</b>	<b>Overall (n=199) N (%) / Mean [SD]</b>	<b>Not/mild Anxiety (n=135) N (%) / Mean [SD]</b>	<b>Moderate/ Severe Anxiety (n=60) N (%) / Mean [SD]</b>	<b>P value</b>
<b>Age*</b>	24.90 [3.11]	25.33 [3.11]	24.25 [2.97]	0.02
<b>Education</b>				0.18
Less than high school	22 (11.06)	11 (8.15)	9 (15.00)	
High school to some college	143 (71.86)	97 (71.85)	44 (73.33)	
College degree or more	34 (17.09)	27 (20.00)	7 (11.67)	
<b>Race (Besides Black)</b>				
White	21 (10.55)	11 (8.73)	10 (17.54)	0.13
Latino/Hispanic	18 (9.05)	6 (4.80)	10 (17.86)	<0.01
Asian/Pacific Islander	4 (2.01)	2 (1.60)	2 (3.57)	0.59
Middle Eastern	5 (2.51)	3 (2.40)	1 (1.75)	1.00
Native American	49 (24.62)	35 (27.34)	14 (24.56)	0.72
Don't know	16 (8.04)	13 (10.40)	3 (5.36)	0.40
None	113 (56.78)	79 (59.85)	33 (56.90)	0.75
<b>Live with</b>				
Alone	36 (18.09)	27 (20.93)	9 (16.07)	0.55
Significant others	32 (16.08)	23 (17.97)	9 (16.07)	0.84
Child/Children	3 (1.51)	3 (2.38)	0	0.55
Parents/Guardians	47 (23.62)	29 (23.02)	17 (29.31)	0.37
Brothers/Sisters	26 (13.07)	14 (11.02)	12 (20.69)	0.11
Other relatives	13 (6.53)	7 (5.56)	6 (10.34)	0.35
Roommates/Nonrelatives	59 (29.65)	47 (37.01)	10 (17.86)	0.01
Currently homeless	20 (10.05)	8 (6.40)	11 (19.64)	0.02
<b>Homeless (last 6 months)</b>	66 (33.17)	35 (25.93)	30 (50.00)	<0.01
<b>Currently have job</b>	119 (59.80)	82 (60.74)	33 (55.00)	0.53
<b>Income (annual, \$) (n=197)</b>		n=135	n=60	0.02
<10,999	107 (54.31)	68 (51.13)	36 (60.00)	
11,000-20,999	41 (20.81)	25 (18.80)	15 (25.00)	
21,000-30,999	26 (13.20)	22 (16.54)	4 (6.67)	
>31,000	23 (11.68)	18 (13.53)	5 (8.33)	
<b>Have health insurance</b>	160 (80.40)	114 (84.44)	44 (73.33)	0.08
<b>Spirituality</b>				0.72
Very spiritual	95 (47.74)	62 (45.93)	31 (51.67)	
Somewhat spiritual	80 (40.20)	58 (42.96)	22 (36.67)	

A little spiritual	16 (8.04)	11 (8.15)	4 (6.67)	
Not at all spiritual	8 (4.02)	4 (2.96)	3 (5.00)	
<b>Religiosity</b>				0.58
Very religious	45 (22.61)	28 (20.74)	16 (26.67)	
Somewhat religious	82 (41.21)	55 (40.74)	26 (43.33)	
A little religious	38 (19.10)	28 (20.74)	8 (13.33)	
Not at all religious	34 (17.09)	24 (17.78)	10 (16.67)	
<b>Current relationship status</b>				0.51
Not in a relationship	121 (60.80)	78 (57.78)	41 (68.33)	
Committed with a man	67 (33.67)	48 (35.56)	17 (28.33)	
Committed with a woman	3 (1.51)	3 (2.22)	0	
Other	8 (4.02)	6 (4.44)	2 (3.33)	
<b>Arrested (last 3 months)</b>	14 (7.04)	9 (6.67)	5 (8.33)	0.77
<b>In jail (last 3 months)</b>	12 (6.03)	7 (5.19)	4 (6.67)	0.74

\*T test was used.

Note: Fisher's exact tests were used for other characteristics.

### **3.1.2 Associations Between Sociodemographic Characteristics and Mental Health**

We measured the mental health status of YBMSM on depression and anxiety using the CES-D and GAD-7, respectively.

The overall mean CES-D depression score was 19.0 (SD=11.5). Using 16 as the cutoff point (Radloff, 1977), we found that 42.1% of the participants were not depressed while 57.9% were depressed. For anxiety, the overall mean GAD-7 score was 7.1 (SD=6.2). At a cut-off point of 10 or greater (Spitzer et al., 2006), more than two-thirds of the participants had no or mild anxiety (69.2%) and less than one-third had moderate or severe anxiety (30.8%).

The main sociodemographic characteristics of the HIV-positive YBMSM sample are displayed in both Table 1 and Table 2, mental health status using depression and anxiety, respectively. As can be seen, the prevalence of homelessness in the last six months was much higher in people who were depressed (43.9%) than in those not depressed (19.3%). Compared with people who were not depressed, depressed participants included a higher proportion of those living on low incomes (less than \$11,000 annually). Moreover, the prevalence of having been arrested and the prevalence of having been in jail in the previous three months were also higher in people who were depressed (9.7% and 8.8%) compared with those who were not depressed (3.6% and 2.4%). In terms of anxiety status, the prevalence of living with roommates/nonrelatives was higher in people who reported having no/mild anxiety (37.0%) than in those who

reported having moderate/severe anxiety (17.9%). The homelessness rate in the last six months was lower in the participants with no or mild anxiety (25.9%) than in those with moderate or severe anxiety (50.0%).

### **3.1.3 Associations Between HIV Self-Disclosure and Mental Health**

The overall disclosure rate was high (93.5%). The prevalence of self-disclosure of HIV status to different targets was above seventy percent among the 173 YBMSM (Table 3 and Table 4). More than ninety percent of the participants had disclosed their HIV status to at least one of their sex partners. The rate of disclosure to friends (85.0%) and family (77.5%) was lower than the rate for sex partners (93.5%). From the results of Fisher's exact test, depressed individuals had a significantly higher rate of self-disclosure to family members (84.2%) compared with those who were not depressed (68.1%) ( $P < 0.05$ ). The rate of self-disclosure to friends and sex partners showed no significant difference between not depressed individuals and depressed individuals. Comparing the no/mild anxiety individuals and moderate/severe anxiety individuals, the rate of self-disclosure to friends, family, and sex partners did not differ significantly.

**Table 3. HIV Self-Disclosure and depression**

<b>Characteristics</b>	<b>Not depressed N (%)</b>	<b>Depressed N (%)</b>	<b>P value<sup>#</sup></b>	<b>Overall N (%)</b>
<b>To friends</b>			0.67	
No	12 (16.67)	14 (13.86)		26 (15.03)
Yes*	60 (83.33)	87 (86.14)		147 (84.97)
<b>To family</b>			0.02	
No	23 (31.94)	16 (15.84)		39 (22.54)
Yes*	49 (68.05)	85 (84.16)		134 (77.46)
<b>To sex partners</b>			0.05	
No	10 (13.89)	5 (4.95)		15 (8.67)
Yes*	62 (86.11)	96 (95.05)		158 (91.33)

\*Yes=A few/Most/All

<sup>#</sup>Fisher's exact tests

**Table 4. HIV Self-Disclosure and anxiety**

<b>Characteristics</b>	<b>No/mild Anxiety N (%)</b>	<b>Moderate/ Severe Anxiety N (%)</b>	<b>P value<sup>#</sup></b>	<b>Overall N (%)</b>
<b>To friends</b>			0.65	
No	19 (16.10)	7 (12.73)		26 (15.03)
Yes*	99 (83.90)	48 (87.27)		147 (84.97)
<b>To family</b>			0.05	
No	32 (27.12)	7 (12.73)		39 (22.54)
Yes*	86 (72.88)	48 (82.23)		134 (77.46)
<b>To sex partners</b>			0.78	
No	11 (9.32)	4 (7.27)		15 (8.67)
Yes*	107 (90.68)	51 (92.73)		158 (91.33)

\*Yes=A few/Most/All

<sup>#</sup>Fisher's exact tests

### **3.1.4 Associations Between Social Support and Mental Health**

Measured by the MOS-SSS, a higher score indicates greater perceived social support. Table 5 and Table 6 present perceived social support and mental health, including depression and anxiety. The average score of overall social support was 68.7 (SD=27.5). Emotional support had the highest score (69.7, SD=29.4) among the four types of scores. The lowest score was tangible support with the mean score of 64.9 (SD=31.1). The average scores of affectionate support and positive social interaction were both around 68.

Wilcoxon rank-sum tests were performed to compare the various social support scores within the different depression statuses. The scores of overall social support and the four subtypes of social support were all significantly lower in depressed participants than in those not depressed ( $p < 0.01$ ). Among the individuals who were not depressed, the average score of emotional support was the highest (81.9, SD=25.6) while the affectionate support was the lowest (77.2, SD=30.5). Among individuals who were depressed, the average score of positive social interaction was the highest (62.3, SD=31.4) while the tangible support was the lowest (56.1, SD=31.7).

Comparing the social support scores by anxiety status using Wilcoxon rank-sum tests, the score of overall social support and the four different subtypes of social support were all significantly lower in moderate or severe anxiety participants than in those with no/mild anxiety ( $p < 0.05$ ). Among the individuals who had moderate or severe anxiety,

the highest score was positive social interaction (61.7, SD=32.6). Among the individuals with no or mild anxiety, the highest score was the emotional support (75.4, SD=26.1). In both moderate/severe anxiety and no/mild anxiety groups, the lowest score was the tangible support (54.4, SD=33.0; 69.9, SD=29.1, respectively).



**Table 5. Self-Disclosure and depression**

<b>Characteristics</b>	<b>Not Depressed Mean [SD]</b>	<b>Depressed Mean [SD]</b>	<b>P value<sup>#</sup></b>	<b>Overall Mean [SD]</b>
Overall	79.7 [23.7]	60.5 [26.3]	<0.001	68.7 [27.5]
Social Support	81.9 [25.6]	61.0 [28.8]	<0.001	69.7 [29.4]
Emotional Support	76.9 [25.8]	56.1 [31.7]	<0.001	64.9 [31.1]
Affectionate Support	77.2 [30.5]	61.8 [33.3]	<0.001	68.4 [32.9]
Positive Social Interaction	77.0 [27.4]	62.3 [31.4]	<0.001	68.5 [30.6]

<sup>#</sup>Wilcoxon rank sum tests

**Table 6. Self-Disclosure and anxiety**

<b>Characteristics</b>	<b>No/mild Anxiety Mean [SD]</b>	<b>Moderate/ Severe Anxiety Mean [SD]</b>	<b>P value<sup>#</sup></b>	<b>Overall Mean [SD]</b>
Overall	73.7 [24.7]	58.3 [29.9]	<0.001	68.7 [27.5]
Social Support	75.4 [26.1]	58.3 [32.4]	<0.001	69.7 [29.4]
Emotional Support	69.9 [29.1]	54.4 [33.0]	0.006	64.9 [31.1]
Tangible Support	73.0 [31.2]	59.7 [34.5]	0.025	68.4 [32.9]
Affectionate Support	71.8 [29.1]	61.7 [32.6]	<0.001	68.5 [30.6]

<sup>#</sup>Wilcoxon rank sum tests

### 3.1.5 Associations Among Self-Disclosure, Social Support, and Mental Health

Multiple linear regression models for depression and anxiety were developed (Table 7). Besides self-disclosure and social support, models also included psychological predictor variables (self-esteem, experienced HIV discrimination, perceived HIV discrimination, and experienced sexual minority discrimination) and sociodemographic predictor variables. All the models were statistically significant ( $p < 0.01$ ) and R-squared was 0.45 and 0.40 for depression and anxiety, respectively.

In the depression model, when self-disclosure, psychological and sociodemographic predictor variables were statistically controlled, the score of overall social support was negatively correlated with the CES-D depression score ( $b = -0.10$ ,  $SE = 0.03$ ,  $p < 0.01$ ). However, self-disclosure was not significant at the 0.05 level in the model ( $b = -4.52$ ,  $SE = 3.62$ ,  $p = 0.22$ ). For the psychological factors, only perceived HIV discrimination ( $b = 0.24$ ,  $SE = 0.11$ ,  $p < 0.05$ ) and a high level of self-esteem ( $b = -9.67$ ,  $SE = 3.36$ ,  $p < 0.01$ ) were significantly correlated with the score of depression. Other psychological predictors, experienced HIV discrimination ( $b = 0.68$ ,  $SE = 0.40$ ,  $p = 0.097$ ) and experienced sexual minority discrimination ( $b = 0.54$ ,  $SE = 0.34$ ,  $p = 0.12$ ) were not significant in the depression model. Moreover, except for the variable of whether they have health insurance or not ( $b = -4.33$ ,  $SE = 1.78$ ,  $p < 0.05$ ), other demographic variables were significant in the depression model. Regression diagnostics, including a multicollinearity test and normality of residual test, suggested that the quality of this model was good.

In the anxiety model, when self-disclosure, psychological and sociodemographic predictor variables were statistically controlled, the score of overall social support was significant in the model ( $b=-0.04$ ,  $SE=0.02$ ,  $p<0.05$ ). Similar to the depression model, self-disclosure ( $b=-1.10$ ,  $SE=2.10$ ,  $p=0.21$ ) and experienced HIV discrimination ( $b=0.16$ ,  $SE=0.25$ ,  $p=0.21$ ) were not significant in the anxiety model. Other psychological factors, perceived HIV discrimination ( $b=0.21$ ,  $SE=0.07$ ,  $p<0.01$ ), and experienced sexual minority discrimination ( $b=0.48$ ,  $SE=0.20$ ,  $p<0.05$ ) were both significant in the anxiety model. Unlike the depression model, self-esteem was not significant in the anxiety model. None of the demographic variables were significant in the anxiety model. Considering the high proportion of zero values (17%) in the score of GAD-7, the Tobit model was used to take into account the bounded nature of the GAD-7 score. However, the Tobit model did not provide improvements over the linear regression model of anxiety.

**Table 7. Linear regression examining dependence of depression and anxiety on perceived social support and HIV self-disclosure in YBMSM**

Variable	Depression		Anxiety	
	B	SE	B	SE
<b>Social Support</b>	-0.10	0.03**	-0.04	0.02*
<b>HIV Self-Disclosure</b>				
No (reference)				
Yes	-4.52	3.62	-1.10	2.10
<b>Self-Esteem</b>				
Low self-esteem (reference)				
Normal self-esteem	-5.03	3.07	-1.16	1.70
High self-esteem	-9.67	3.36**	-2.67	1.94
<b>Experienced HIV Discrimination</b>	0.68	0.40	0.16	0.25
<b>Perceived HIV Discrimination</b>	0.24	0.11*	0.21	0.07**
<b>Experienced Sexual Minority Stigma</b>	0.54	0.34	0.48	0.20*
<b>Age</b>	-0.30	0.22	-0.20	0.13
<b>Education</b>				
Less than high school (reference)				
High school to some college	0.09	3.02	1.10	1.34
College degree or more	-0.50	3.66	-0.64	1.73
<b>Income</b>				
<10,999 (reference)				
11,000-20,999	-1.23	1.97	0.43	1.11
21,000-30,999	0.74	2.43	-0.53	1.03
>31,000	-1.60	2.33	-0.46	1.57
<b>Homeless (last 6 months)</b>				
No (reference)				
Yes	2.26	1.85	0.83	1.05
<b>Have Health Insurance</b>				
No (reference)				
Yes	-4.33	1.78*	-2.28	1.08*
P value	<0.001		<0.001	
R-squared	0.45		0.40	

<sup>1</sup>GED = Graduate Equivalency Degree

\*p<.05, \*\*p<.01

### **3.1.6 Interaction between HIV Self-disclosure and Education**

To examine whether HIV self-disclosure and education interacted in predicting depression, the CES-D score was regressed on the same variables as the initial regression model in Table 7 and the interaction of self-disclosure and education (Table 8). Model 1 used the overall HIV self-disclosure, while model 2 used the HIV self-disclosure to the specific targets as friends, family members, and sex partners. Both models were significant predictors of depression ( $p < 0.01$ ). In model 1, one of the education levels, high school to some college, was a significant predictor of the depression score. Other education levels, including HIV self-disclosure and the interaction, were not significant in the model. In model 2, three interactions of different disclosure targets and education were not significant predictors of depression score. Similarly, Table 9 shows the two anxiety regression models in which the interaction of self-disclosure and education was added. In anxiety models, both models were significant predictors of anxiety, GD score ( $p < 0.01$ ). However, none of the interactions were significant predictors of the anxiety score.

The interaction between different HIV self-disclosure targets and education is illustrated in figure 1 and figure 2, controlling other predictor variables (See predictive margins table in Appendix D). In the depression model, although disclosure targets were different, for participants who have disclosed, the reported depression score did not have significant change (figure 1). However, the depression score was different in

various educational levels for participants who did not disclose. In figure 1(a), among participants who did not disclose to friends, the depression score decreased when the educational level increased. In figure 1(b), for participants who did not disclose to families, the depression score was higher in high school to some college educational level compared with other educational levels. In terms of disclosure to sex partners, participants who did not disclose were more likely to have a lower depression score when they were high school to some college education level compared with other educational levels (figure 1(c)).

Similarly, in the anxiety model, for participants who have disclosed, the reported anxiety score did not have significant changes among different disclosure targets (figure 2). For those who did not disclose, anxiety scores were various in different educational levels. In figure 2(a), in participants who did not disclose to friends, the anxiety score was the highest in high school to some college educational level compared to other educational levels. In terms of disclosure to friends, participants who did not disclose reported a decreasing anxiety score as the educational level increased (figure 2(a)). When the disclosure target was a sex partner, in figure 2(c), participants who did not disclose reported low anxiety score in high school to some college educational level while the anxiety score increased in high educational level (college degree or more).

**Table 8. Linear regression examining predictors of depression with interaction**

Variable	Model 1		Model 2	
	B	SE	B	SE
<b>Social Support</b>	-0.10	0.03**	-0.10	0.03**
<b>HIV Self-Disclosure</b>				
No (reference)				
Yes	4.24	3.06		
<b>Education</b>				
Less than high school (reference)				
High school to some college	0.46	4.32*	-5.94	7.60
College degree or more	-0.97	3.73	-13.23	14.21
<b>HIV Self-Disclosure × Education<sup>1</sup></b>				
Yes × High school to some college	-9.92	5.07		
Yes × College degree or more	0	(omitted)		
<b>HIV Self-Disclosure to Friends</b>				
No (reference)				
Yes			-6.73	10.62
<b>Self-Disclosure to Friends × Education</b>				
Yes × High school to some college			6.17	11.00
Yes × College degree or more			18.00	11.29
<b>HIV Self-Disclosure to Families</b>				
No (reference)				
Yes			5.09	10.98
<b>Self-Disclosure to Families × Education</b>				
Yes × High school to some college			-4.08	11.11
Yes × College degree or more			-1.02	11.79
<b>HIV Self-Disclosure to Sex Partners</b>				
No (reference)				
Yes			1.92	8.77
<b>Self-Disclosure to Sex Partners × Education</b>				
Yes × High school to some college			2.85	9.15
Yes × College degree or more			-4.23	15.11
<b>Self-Esteem</b>				
Low self-esteem (reference)				
Normal self-esteem	-4.93	3.09	-5.37	3.10
High self-esteem	-9.57	3.39	-9.37	3.50**
<b>Experienced HIV Discrimination</b>	0.67	0.40	0.63	0.41

<b>Perceived HIV Discrimination</b>	0.24	0.12*	0.18	0.12
<b>Experienced Sexual Minority Stigma</b>	0.55	0.34	0.41	0.34
<b>Age</b>	-0.32	0.22	-3.60	0.23
<b>Income</b>				
<10,999 (reference)				
11,000-20,999	-1.24	1.98	-0.18	1.96
21,000-30,999	0.88	2.45	0.88	2.71
>31,000	-1.49	2.34	-0.38	2.27
<b>Homeless (last 6 months)</b>				
No (reference)				
Yes	2.40	1.85	2.85	1.78
<b>Have Health Insurance</b>				
No (reference)				
Yes	-4.29	1.80*	-4.40	1.85*
P value		<0.001		<0.001
R-squared		0.45		0.49

\*p<.05, \*\*p<.01

<sup>1</sup>No observation in HIV Self-Disclosure (No) and Education (College degree or more). HIV Self-Disclosure (Yes) and Education (College degree or more) omitted due to collinearity.



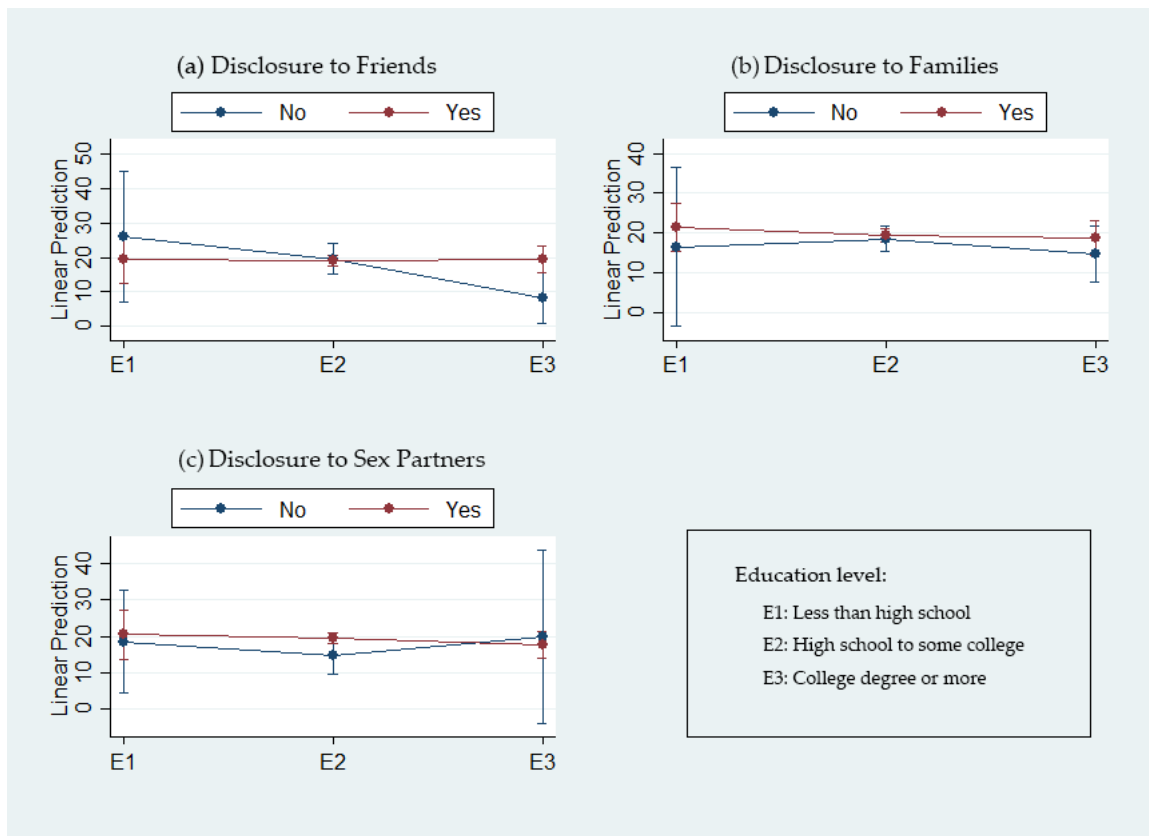
**Table 9. Linear regression examining predictors of anxiety with interaction**

Variable	Model 1		Model 2	
	B	SE	B	SE
<b>Social Support</b>	-0.04	0.02*	-0.04	0.02*
<b>HIV Self-Disclosure</b>				
No (reference)				
Yes	1.24	1.46		
<b>Education</b>				
Less than high school (reference)				
High school to some college	3.61	2.63	-1.47	3.96
College degree or more	-0.76	1.76	2.27	7.39
<b>HIV Self-Disclosure × Education<sup>1</sup></b>				
Yes × High school to some college	-2.65	2.84		
Yes × College degree or more	0	(omitted)		
<b>HIV Self-Disclosure to Friend</b>				
No (reference)				
Yes			3.14	3.06
<b>Self-Disclosure to Friend × Education</b>				
Yes × High school to some college			-2.60	3.39
Yes × College degree or more			-0.81	3.44
<b>HIV Self-Disclosure to Families</b>				
No (reference)				
Yes			-0.39	4.50
<b>Self-Disclosure to Families × Education</b>				
Yes × High school to some college			1.03	4.59
Yes × College degree or more			2.80	4.90
<b>HIV Self-Disclosure to Sex Partners</b>				
No (reference)				
Yes			-0.87	4.62
<b>Self-Disclosure to Sex Partners × Education</b>				
Yes × High school to some college			3.86	4.84
Yes × College degree or more			-5.36	8.02
<b>Self-Esteem</b>				
Low self-esteem (reference)				
Normal self-esteem	-1.13	1.72	-1.36	1.74
High self-esteem	-2.65	1.95	-2.60	2.09
<b>Experienced HIV Discrimination</b>	0.16	0.25	0.11	0.25

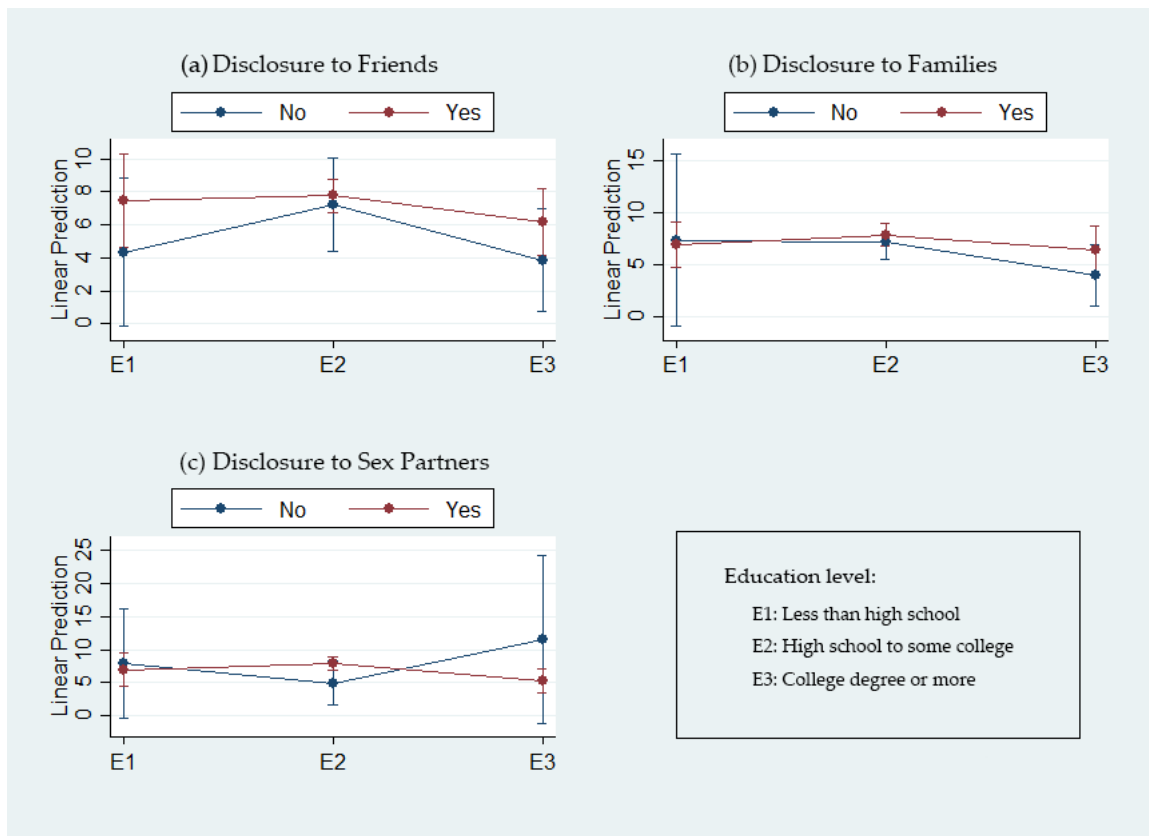
<b>Perceived HIV Discrimination</b>	0.21	0.07**	0.23	0.07**
<b>Experienced Sexual Minority Stigma</b>	0.49	0.20*	0.33	0.20
<b>Age</b>	-0.20	0.13	-0.17	0.13
<b>Income</b>				
<10,999 (reference)				
11,000-20,999	0.43	1.11	1.30	1.05
21,000-30,999	-0.50	1.04	-0.26	1.17
>31,000	-0.43	1.57	0.19	1.71
<b>Homeless (last 6 months)</b>				
No (reference)				
Yes	0.87	1.06	1.61	1.05
<b>Have Health Insurance</b>				
No (reference)				
Yes	-2.27	1.09*	-2.58	1.08*
P value		<0.001		<0.001
R-squared		0.40		0.49

\*p<.05, \*\*p<.01

<sup>1</sup>No observation in HIV Self-Disclosure (No) and Education (College degree or more). HIV Self-Disclosure (Yes) and Education (College degree or more) omitted due to collinearity.



**Figure 1. Predictive Margins of Education and Self-Disclosure to Friends, Family Members, and Sex Partners with 95% CIs in Depression Model.**



**Figure 2. Predictive Margins of Education and Self-Disclosure to Friends, Family Members, and Sex Partners with 95% CIs in Anxiety Model.**

## ***3.2 Qualitative Results***

### **3.2.1 Description of the Sample**

The twelve YBMSM participants in the qualitative interview process had a mean age of 27 years and an age range between 20 and 30 years. The mean duration since diagnosis was 5.9 years (median=6.5; range of 2-12 years). More than half of them (8/12; 66.7%) earned US\$21,000 to US\$31,000 per year. Most of the participants (10/12) were employed part-time or full-time, only two of them were unemployed. One-fourth of them (n=9) reported sexual identity as gay and the rest of them reported bisexual. Almost all, 11 out of 12, were Christian.

### **3.2.2 HIV Self-Disclosure**

Most of the YBMSM participants (7/12) had selectively disclosed to others immediately after the diagnosis. Disclosure targets included a partner, friend, family member, or other individuals including a bishop, pastor's wife, and probation officer. Some of them were very open about their HIV status: "Well, I'm always an open book. When it comes to revealing my status, I'm very open with that because I don't want...I want to give somebody a choice." (Participant 03, age 30).

However, a few participants still had a hard time disclosing to people or still avoided any disclosure conversations years after receiving their diagnosis:

I would never talk about my personal life because sometimes it is hard for me. Because I never really opened up to no one before. I keep everything in. Everything I deal with. And I don't have people to talk to. And the people I do

talk to – like who can I talk to about my HIV status? Nobody. And all the things that I’m going through – I can’t talk to nobody. So, that’s how I learned to keep everything in. Most people say, “Oh, you keep everything in because” – I don’t have people to talk to. (Participant 07, age 24)

### 3.2.2.1 Selecting Disclosure Targets

Selecting disclosure targets was not easy. Most of the participants put an emphasis on the relationship between them and the person to be disclosed to. They preferred to disclose to the person who was considered close to them:

By how close we are. Especially in the beginning. I mean I told more family and friends in the beginning and so now I think I've pretty much told just about all the family that I feel the need to tell ... I don't feel the need to - and I don't think about it as often as I did back then either so, I have it under wraps for myself for the most part and if I need to vent or discuss something about my status with somebody else, then I have my mother. I have my best friend. (Participant 10, age 27)

When selecting disclosure targets, participants also mentioned the importance of trust, perceived positive outcomes and perceived supportive feedback from the person that they disclosed to: “Part of it is the closeness I have to that person and the other part of it is the conversation if I believe they would accept” (Participant 11, age 30).

Family members, friends and sexual partners were the most common targets of HIV self-disclosure. Most of the participants (8 out of 12) disclosed to at least one family member. Female family members, like mothers, aunts, and sisters, were more likely to be disclosed to than male family members like fathers and brothers. Particularly, fathers seem to be one of hardest people to tell. According to one participant: “Probably my

dad, yea, probably my dad was the hardest person to tell because he doesn't really understand anything. He is pretty much really set in his ways" (Participant 04, age 29).

Most of the participants (8 out of 12) told at least one of their friends. They felt it was easier to disclose to friends who they had known for a long time. Some of the participants had their first disclosure with their good friends:

So, she [nurse] told me personally [about HIV positive result] and then that same day I told a very good friend of mine. Later on that night. So, I told her that night. And then from there probably I told – probably a few days, four days later or so, I told another good friend of mine as well. So, that's where I started. (Participant 10, age 27)

Participants showed more caution in disclosure conversations with sexual partners. Some participants mentioned that they only disclosed before sex:

Yeah, and that's only when I think we're going to have sex. I've held relationships with people, six, eight months, no sex, and then when I'm ready to tell them, it's like, they don't want anything to do with me. That's a big part of me why I don't say anything because I want you to love me for me regardless. That's just a medical issue that I deal with. I don't want that to define me, but at the same time, if we're gonna have sex, I need you to know. Not only is it the law that I tell you, but I don't want you to get hurt just from us trying to make love to each other. (Participant 09, age 30)

Another participant said that he would only disclose when his partner brought up the conversation.

You don't bring it up; you don't talk about it; I ain't talking about it neither. I mean, I'm not as comfortable to just talk about it with friends, friend guys of mine. They really got to tell me that they have it, and I be comfortable. (Participant 08, age 25)

### **3.2.2.2 Concerns before Disclosing**

The general concerns for the participants before disclosure were mainly worries about HIV related stigma and other negative responses, including concerns about rejection, privacy, and being asked “millions” of questions like “When and where and how and why and why didn’t you tell me?” (Participant 10, age 27). Referring to HIV stigma, a man mentioned that “I felt like they would look at me like nasty as being sickly, as being...I just thought all these kinds of horrible things” (Participant 03, age 30).

Compared to family members and friends, participants expressed more worries when facing their sexual partners, especially when they considered the relationship serious. They expected to receive support from their partner while at the same time they expressed fear of rejection:

Yeah, I was afraid of the rejection. Afraid of rejection and afraid of judgment ... I think what made me tell him is just the fact that he was so interested in getting to know me more and I – I guess I felt very vulnerable in a way to where I felt like I needed some support from somebody somewhere. (Participant 02, age 24)

They also worried about the confidentiality of their status: “That’s another thing I have to worry about. I didn’t tell you so you can tell 40 other people. I told you so you could be safe” (Participant 09, age 30).

### **3.2.2.3 Disclosure Consequences**

Most participants who had disclosed their HIV status to family, friend, or sexual partners reported that they had at least one supportive response. Detailed results of supportive responses will be described in [Section 4.2.3](#).



Still, some of the participants encountered negative reactions from their family, friends, or sexual partners. The adverse consequences from family members included lack of understanding, lack of acceptance, and the unwanted spread of information about their status. As a participant recalled: “[I told] My mom. And she told the world. Like put it on social media” (Participant 08, age 25). Another participant recalled: “Yes. I told my dad and he told the rest of my family. That’s how my family found out, my dad” (Participant 09, age 30)

Compared to family members, the adverse reactions from friends were fewer.

One participant reported that a friend suddenly “disappeared”:

I told one of my friends and he said he was gonna be there for me. Maybe that was my assumption if umm...correctly. He was like I will be there for you through this time frame. He gave me some faith information; sure, I appreciate it, through some scriptures. He was the first person I went to and I cried on him. He was there and all of sudden he disappeared so I was like whoa, what? (Participant 11, age 31)

The adverse consequences of disclosure to sexual partners were also pervasive.

Six out of twelve participants mentioned at least one negative reaction from their sexual partners. These negative reactions included blaming, being a stalker, and rejection:

Other ones [sexual partners] – which I had one that became a stalker. It was after they found out, they felt as though I owed my life to them, because I told them and I didn’t feel that way. I was letting you know because we were to the point where we were about to have sex and he made more to the point where if you got HIV, then that means I’m gonna have HIV regardless of whether we use a condom. You’re mine now and you ain’t going nowhere. It became more of a stalker situation, which I hurried up and tried my best to get away from that one, but then there’s been others where it’s like, so. (Participant 09, age 30)

### 3.2.3 Social Support (Types and Source)

Following the four categories of social support in Medical Outcomes Study Social Support Survey (MOS-SSS), participants reported at least one type of social support that they received from a positive disclosure experience. The experience of receiving emotional support was mentioned by every participant. Most of the emotional support came from family and friends. In terms of family members, female family members like mothers, aunts, and sisters were still the most frequent source of emotional support.

But the person who I really linked on was my mom because me and moms are really close. So, during that little stage where I was still in I can't believe it, depressed, and you know shut down, shut the world out she was the only person I could talk to so I was mostly close with my mom. (Participant 04, age 29)

Some participants also indicated their family members' attitudes could change from negative to supportive by becoming educated:

I feel part of her [my mother] really doesn't know how to deal with it half the time, but she's very supportive. She's very, very supportive now. My mom did, I know for a fact she did. A lot of the stigmas that she had beforehand, she doesn't have now after talking to some of the people here. (Participant 09, age 30)

Affectionate support and tangible support had similar frequency. Affectionate support mainly came from family and sexual partners. Tangible support mainly came from family and friends:

We talked about it or whatever. She [mother] was like, "Well" – I mean, she really helped me through. We got educated on it. Went to the doctor together, looked up stuff online. Just everything so I wouldn't infect her or anyone else basically. We got schooled on it. (Participant 08, age 25)

Only a few participants mentioned supportive environment as positive social interaction, which was mainly provided by friends:

We are able to educate each other. He told me things about his experience with HIV, you know, before and now. I'm able to tell him things about my experience about HIV. So, we have a great relationship. Nothing has changed you know, even with him, we have been friends since high school and so our relationship is, you know, it's great. (Participant 03, age 30)

### **3.2.4 Associations among HIV Self-Disclosure, Social Support, and Mental Health**

#### **3.2.4.1 HIV Self-Disclosure and Mental Health**

Most of the participants considered that there was an association between HIV self-disclosure and mental health status, as measured by asking questions about depression and anxiety level. One participant described HIV self-disclosure as “a burden's been lifted” (Participant 10, age 27). Without self-disclosure, especially in the early years after diagnosis, participants were more likely to be anxious and worried: “Yea, it does have an impact on your mental capability or your mental capacity because you just always worried about what if, or what do they think” (Participant 04, age 29). Moreover, one participant mentioned that self-disclosure was helping him to build his self-esteem, saying: “I would say that the more people I feel trust that I can tell, and I trust myself and say ‘I don't care what people say,’ the more confident I would feel about my self-esteem” (Participant 07, age 24)

A few participants indicated no or little connection between HIV self-disclosure and mental health:

Honestly probably no - it had very little bearing because I think - I don't think there was anything that she said or did or didn't say or didn't do that would have changed my depression that I went through. I think that was imminent. It was gonna happen. (Participant 10, age 27)

### **3.2.4.2 Social Support and Mental Health**

Most of the participants considered the social support they received to have had positive influence on their mental health status, including reducing their stress and worries, and enhancing their mood. One participant described how he perceived the social support would reduce his worry: "I feel like if I had the support that I needed that I could be more freely and I won't have to worry so much" (Participant 07, age 24). Another participant described the stress that was relieved when his mother's attitude changed to supportive: "It's a big help. It's a big help, because it's less stress on me, because I don't have to worry about, my mom trying to get funeral arrangements" (Participant 09, age 30)

### **3.2.4.3 HIV Self-Disclosure and Social Support**

In regard to the association between HIV self-disclosure and social support, participants had various opinions. Their opinions also depended on to whom they were disclosing. Some participants thought the self-disclosure had no connection with the social support they received: "I feel the same respect from everyone. I mean, everyone doesn't give me harsh respect, so they give me great respect" (Participant 06, age 20). "No. I mean would me have HIV, I still get lots of supports. I mean does my having HIV does not influence that at all" (Participant 03, age 30). Some participants considered

there was positive association between self-disclosure and social support. A participant mentioned that this association was positive with wise choices on disclosure targets:

Absolutely [they connect]. I mean I've been very fortunate in that the people that I've told, because I am mindful of who I tell, and I have a sense of - I can gauge, I think, based on just their personality, their demeanor, disposition towards other topics in life, you know, I know who I can and shouldn't tell. [The disclosure] Much more I feel like a burden's been lifted, like once I disclose it to them and then they say they're fine with it, and so we get to figure out what the relationship will or won't work for any reason. (Participant 10, age 27)

Some participants also mentioned that there could be a negative association between self-disclosure and social support due to stigma:

[Disclosure] It's changed that [received social support]. I believe that I get less support when a person does find out. When they find out, it's like they just push you away and I don't like that and that goes back to the stigmas, though. That goes back to all those stigmas that are out there. (Participant 09, age 30)

## **4. Discussion**

We used both quantitative and qualitative methods to understand the associations among HIV self-disclosure, social support, and mental health, including depression and anxiety. For the association between HIV self-disclosure and mental health, the quantitative and qualitative results were inconsistent, therefore, we are unable to accept hypothesis 1 in this study. For the association between social support and mental health, both quantitative and qualitative results consistently showed positive associations, therefore, we accept hypothesis 2 in this study. For the association between self-disclosure and social support, the quantitative results were not consistent with the qualitative results.

### ***4.1 The Association between HIV Self-Disclosure and Mental Health***

From the quantitative results in our study, the overall disclosure rate was high. This finding is consistent with the study conducted in North Carolina in HIV-positive racial/ethnic minority young MSM, which reported the overall disclosure rate was 97% (Hightow-Weidman et al., 2013). We compared the disclosure rate to different targets for both depression and anxiety. Only the disclosure rate to family members was significantly different between depressed and not depressed YBMSM. This finding could be partially due to adverse disclosure consequences when disclosing to their family members. For adolescents, previous research studies reported that family acceptance was associated with positive mental health and protects against depression

(Ryan, Russell, Huebner, Diaz, & Sanchez, 2010). The misunderstanding or lack of acceptance from family members could have significant impacts on adolescents' mental health. Moreover, female family members such as mothers, aunts and sisters were more likely to be disclosed to than males like fathers and brothers, which is similar to previous studies (D'Angelo et al., 2001; Hightow-Weidman et al., 2013; Kalichman et al., 2003).

Previous studies have reported different consequences of HIV self-disclosure and either positive or negative impacts on mental health (Hult et al., 2012; Zea et al., 2005). In our study, HIV self-disclosure was not significantly associated with either depression or anxiety in linear regression models. This could be due to the low variation in overall disclosure caused by the high overall disclosure rate in this study (93.5%). Hence, findings in qualitative interviews could provide some insights for the association between the HIV self-disclosure and mental health. In the qualitative interviews, most participants reported that self-disclosure had a positive impact on mental health by reducing stress and building self-esteem. The inconsistent findings in quantitative and qualitative results could be partially due to the reactions from different disclosure targets (Levy et al., 1999; Mansergh et al., 1995). For example, the positive reactions of disclosure targets like acceptance and support may have had a positive impact on these young men's mental health, while negative reactions like rejection and discrimination may have had a negative impact. Thus, the lack of significant association found between

self-disclosure and mental health in our study may have been due to the various reactions of the disclosure targets.

The results from Fisher's exact test suggested that HIV self-disclosure was positively associated with severe depression and anxiety. However, multiple linear regression models suggested that HIV self-disclosure was negatively associated with severe depression and anxiety. The disagreement association between HIV self-disclosure and mental health (depression and anxiety) indicated a potential interaction on HIV self-disclosure. An interaction between self-disclosure and education was identified and illustrated using predictive margins plots. As these margins plots showed, the educational level did not have significant impacts on depression and anxiety among participants who have disclosed their HIV status to friends, family members, and sex partners. However, for those participants who did not disclose, different educational levels could either increase or decrease their depression and anxiety level. The direction of the association between educational levels and mental health in people who did not disclose was various among different disclosure targets. We did not conduct further analysis on this interaction due to the data and time limitation. Our findings suggested that the interaction between HIV self-disclosure and education could be a direction for future study.



## ***4.2 The Association between Social Support and Mental Health***

In the subconstructs of social support, perceived social support measures an individual's perception of the general social supports that are available. Received social support measures the specific supportive behaviors that were provided to the recipients by their support system (Sarason, Sarason, & Pierce, 1990). According to previous studies, only perceived social support was consistently associated with better mental health while the effect of received social support was minimal (Cohen, 2004; Cohen & Wills, 1985; Lakey & Orehek, 2011; Wethington & Kessler, 1986). From our quantitative results, a higher score on perceived overall social support was significantly associated with lower depression and anxiety scores. This is consistent with previous findings that greater perceived social support was related to better mental health among HIV-positive individuals (Lam, Naar-King, & Wright, 2007b; McDowell & Serovich, 2007; Zea et al., 2005). Meanwhile, our qualitative findings also showed that received social support was positively associated with better mental health. This may be explained by the social support coping theory (Thoits, 1986). This theory posits that the quality of support depends on the objective match between the provided social support and the support needs of the recipient. A better quality of received support can enhance mental health outcomes (Thoits, 1986). Furthermore, a meta-analytic review found a positive correlation between received and perceived social support (Haber et al., 2007).

### ***4.3 Other Variables Predicting Mental Health***

Comparing the predictor variables in depression and anxiety models, perceived HIV discrimination and experienced sexual minority discrimination were significant in both models and experienced HIV discrimination was non-significant in both models, while self-esteem was only significant in the depression model.

In the depression model, there was a positive linear correlation between perceived HIV discrimination and the depression score. Individuals with greater perceived HIV discrimination were expected to have more severe depressive symptoms. Similarly, in the anxiety model, individuals with greater perceived HIV discrimination were more likely to have a severe level of anxiety. Following Steward et al.'s HIV-related stigma model (2008), two dimensions of HIV stigma include interpersonal stigma and intrapersonal stigma. Interpersonal stigma includes experienced discrimination (enacted stigma) and perceived discrimination (vicarious stigma); intrapersonal stigma includes perceived stigma (felt-normative stigma) and internalized stigma (Steward et al., 2008). Previous studies showed that general perceived discrimination often correlates with several mental disorders including depression and anxiety (Mays & Cochran, 2001; Pascoe & Smart Richman, 2009). Although few studies measured HIV-related experienced and perceived discrimination separately, HIV-related discrimination has been reported to be correlated with depression and anxiety

disorder, emotional well-being, and other mental health conditions (Smit et al., 2012; Steward et al., 2008; Wohl et al., 2013).

For the correlation between experienced sexual minority discrimination and mental health, our study found that individuals who reported more experienced sexual minority discrimination were more likely to have greater depressive symptoms and higher levels of anxiety. A recent study also showed that individuals who had ever experienced discrimination reported higher odds of a lifetime major depressive episode or anxiety disorder (Lee, Gamarel, Bryant, Zaller, & Operario, 2016).

For self-esteem, participants with high self-esteem were more likely to have a lower depression score in the depression model, which is similar to previous studies on adolescents and ethnic minority MSM (De Santis, Colin, Provencio Vasquez, & McCain, 2008; Weber, Puskar, & Ren, 2010). This correlation could be explained by the vulnerability model, which suggested that a negative evaluation of the self could contribute to depression (Beck, 1967; Beck, Steer, Epstein, & Brown, 1990). This vulnerability model was supported by a meta-analysis of 95 studies with available longitudinal data (Sowislo & Orth, 2013). Additionally, this study found that the causation can be symmetric; depression could also contribute to low self-esteem. Similarly, a previous study found that HIV self-disclosure was associated with greater social support and self-esteem, as well as lower levels of depression (Zea et al., 2005). These findings indicated that self-esteem could also be an outcome variable instead of a

predictor variable. Further studies could focus more on the reciprocal relationship between self-esteem and mental health status.

In our anxiety model, the severity of anxiety was not significantly dependent on self-esteem. A previous meta-analysis suggested that there was an association between low self-esteem and anxiety (Sowislo & Orth, 2013). This meta-analysis indicated that the causation can be reciprocal. Self-esteem could be partially predicted by the severity of anxiety. Although some theories have suggested that self-esteem could act as a buffer against anxiety, the relationship between self-esteem and anxiety has rarely been studied and remains unclear (Roberts, 2006). Additional research is needed to explore the differences in predictor variables of depression and anxiety symptoms.

### ***4.3 The Association between HIV Self-Disclosure and Social Support***

Although the quantitative results indicated no correlation between self-disclosure and social support, in the qualitative results, participants had various opinions about the association between self-disclosure and social support. Most of them indicated that this association depended on the disclosure target they chose. In fact, previous studies have shown both positive or negative effects of self-disclosure on social support (Battles & Wiener, 2002; Mansergh et al., 1995). Some studies have suggested that the response of the recipient of disclosure could mediate the association between self-disclosure and social support (O'Brien et al., 2003; Perry et al., 1994). This mediation

could partially explain the non-significant correlation in quantitative results found in our study.

In the previous discussion, we only examined the association between self-disclosure and mental health as well as the association between social support and mental health. Apart from these direct associations, a mediation effect of social support could exist in these associations. Previous studies suggested that self-disclosure was associated with social support (Battles & Wiener, 2002; Chaudoir & Fisher, 2010; Kalichman et al., 2003), which could then affect mental health as a result. A previous study found that social support could act as a mediator in the relationship between disclosure and depression (Zea et al., 2005).

#### ***4.5 Limitations and Recommendations***

There are several limitations in this study that should be noted. First, this study was cross-sectional in design and secondary data were retrieved from the baseline data of HMP. Therefore, this study cannot provide evidence for causative relationships. The second limitation is the generalizability of the findings in this study. Because the secondary data were only collected in North Carolina, the findings should be used cautiously when referring to all YBMSM living in the U.S. Similarly, the participants in the qualitative interviews were recruited through convenience sampling from three cities in NC and the sample size was small, so generalizability across the YBMSM population could be limited. The third limitation is participant bias. Those who were

more comfortable with their sexual identity and HIV status may have been more likely to participate. Additionally, transportation could have been a barrier for low-income individuals or those who live in rural areas. Finally, perceived social support was measured in the quantitative data while received social support was measured in the qualitative interviews. This creates difficulties in comparing the quantitative results with the qualitative results. However, in this study, both overall perceived and received social support were associated with better mental health outcomes.

In spite of these limitations, the results of this study indicated the positive impacts of social support on mental health in YBMSM and different impacts of HIV self-disclosure on their mental health depending on the reactions of disclosure targets. Given the crucial role of disclosure targets, skills training on selecting safe disclosure targets should be incorporated into future interventions. The findings of this study also suggest the need for self-disclosure support programs and social support building programs for YBMSM to improve their mental health status.

Additionally, we found that the relationships among different dimensions of HIV-related discrimination, sexual minority discrimination, and various aspects of mental health status were complicated. However, limited previous studies explored these associations among these comprehensive dimensions of discrimination, stigma, social factors and mental health. Exploring the intricate relationships between the

different dimensions of these psychological variables could be one area for future research.

## **5. Conclusion**

The rate of new HIV infections in YBMSM is growing rapidly. In this study of HIV-positive YBMSM, the associations between mental health conditions and self-disclosure and social support were complex. The findings of this study indicate that careful selection of self-disclosure targets could result in greater social support from their social networks. Improvements in perceived and received social support, self-esteem, and perceived HIV discrimination could reduce the level of depression and/or anxiety among HIV-positive YBMSM. Further research is needed to better understand the mechanisms linking self-disclosure, social support, and mental health to develop effective and tailored mental health interventions for this marginalized population.



## Appendix A

Screening question	Response	Eligible response
1. How did you hear about this study?		(Any response acceptable)
Establish a rapport and give caller study details.		
2. Are you still interested in doing an interview?		Yes
3. To see if you are eligible, I need to ask you a few questions. Is that okay?		Yes
4. What is your age?		18 – 30 years old
5. In terms of gender, how do you identify: --male --female --transgender		Male
6. Do you get any HIV tests?		Yes
7. What is the HIV test result?		Positive
8. Do you identify as Black or non-black?		Black
9. Have you had sex with women?		(Any response acceptable)
10. Have you had sex with men?		Yes
11. Can you communicate in English?		Yes
<p>If eligible, interview scheduled for:</p> <p>Day: _____</p> <p>Date: _____</p> <p>Place: _____</p> <p>_____</p>		

## Appendix B

### Consent Form

Please read this form carefully and ask any questions you may have before agreeing to participate in this study. Please make sure that you understand all the information in this consent form.

#### **Introduction**

Duke Kunshan University (DKU) is a branch of Duke University. Wenting Huang, Master student of global health in DKU, is conducting a fieldwork study to learn more about the experiences of young black men who have sex with men about self-disclosure of HIV status, social support, and mental health like distress, depression, and anxiety.

Dr. Sara LeGrand, at Duke University, is the supervisor of the research team. Under the guidance of Dr. LeGrand, student members of the research team will conduct the interviews. University funding supports the research.

#### **What is this study about?**

The purpose of this study is to learn the experiences of self-disclosure of HIV-positive status, the social support, and mental health (depression and anxiety) among young black men who have sex with men.

#### **What is involved in this study?**

You will be asked to fill out a short paper survey and participate in an interview. In all, this will take about 60-90 minutes. The survey will take about 10 minutes, and the interview will take 50-80 minutes. We will read the survey out loud. Let us know if this is not helpful. We can answer any questions you have but we will let you complete the survey by yourself. We will give you privacy as much as possible. On this survey, there will be questions about your sexual orientation, social support, and religiosity/spirituality. If there is any question you don't want to answer, please leave it blank.

We will also do an interview. We would like to record the interview, so that we do not miss anything you say. If you'd like us not to record the interview or stop the recording at any time during the interview, please just let us know. During the interview, we will ask you to share your experiences about the self-disclosure of your status, the support you get from your family members, friends, sexual partner, and health care workers, as well as your experiences about distress, depression and anxiety.

**How many people will take part in this study?**

Fifteen to twenty people will take part in the interview.

**How long will I be in this study?**

You will be in the study for as long as it takes to do the interview and survey. We think will probably take about 60-90 minutes.

**Will my information be kept confidential?**

We will take many steps to keep your information confidential. We will take notes and record the interview, but we will not take down your name. Remember, if you want to turn off the recorder at any time, please tell us.

Identifying information will not be associated with your answers. In order to keep your answers confidential, we will ask a few questions at the beginning of the survey to make you a unique code. This will allow us to identify your answers from the survey and the interview, without using your name. If you share that you have plans to hurt yourself, hurt someone else, or that someone else is hurting you or a child, we are required to report that information to social services agencies.

You will also be asked not share the identity of others; if another person's identity is shared, we will delete the name from the audio recording, the transcript of the recording, observer notes, and the written survey.

**What will I get if I take part in this study?**

You will receive \$50 gift card.

**What are the risks of the study?**

There are no physical risks associated with this study. It is possible that talking about experiences of self-disclosure and mental health concerns could result in emotional distress for some people. We will keep the survey questions and interview general in nature. You may choose not to answer any question on the survey or in the interview. You can choose to stop at any time.

**What will be the benefits to take part in the study?**

One of the benefits is the knowledge you shared will help us to shape programs we develop in the future about social support that may help other young black men who have sex with men. Another benefit is the list of local resources we will give you.

**What about my rights to decline participation or withdraw from the study?**

You may choose not to participate in the study, or, if you agree to be in the study, you can stop at any time. You may choose not to take the survey. You can choose to skip any

question in the survey or the interview. Your decision not to participate or to stop at any time will not affect your relationship with the Duke Kunshan University research team or any services you may receive from Duke University or Duke hospitals.

**Whom do I call if I have questions or problems?**

The researchers conducting this study are Wenting, Prof. Abu Abdullah of Duke Kunshan University (DKU) and Prof. Sara LeGrand of Duke University. Please ask any questions you have now.

If you have questions later, you may contact me (Wenting Huang) at [wenting.huang@duke.edu](mailto:wenting.huang@duke.edu) or at 0086-18707199854.

If you have any questions or concerns regarding your rights as a subject in this study, you may contact my adviser Prof. Abdullah at [abu.abdullah@dku.edu.cn](mailto:abu.abdullah@dku.edu.cn), my local mentor Prof. Sara LeGrand at [sara.legrand@duke.edu](mailto:sara.legrand@duke.edu), or the Institutional Review Board (IRB) of Duke University at <https://irb.duhs.duke.edu/>.

You will be given a copy of this form to keep for your records.

Statement of Consent: I have read the above information, and have received answers to any questions I asked. I consent to take part in the study.

Your Signature \_\_\_\_\_ Date \_\_\_\_\_

Your Name (printed) \_\_\_\_\_

In addition to agreeing to participate, I also consent to having the discussion audio-recorded.

Your Signature \_\_\_\_\_ Date \_\_\_\_\_

Signature of person obtaining consent \_\_\_\_\_ Date \_\_\_\_\_

Printed name of person obtaining consent \_\_\_\_\_ Date \_\_\_\_\_

This consent form will be kept by the researcher for at least two years beyond the end of the study.

Thank you for agreeing to participate. We are very looking forward to your valuable opinion.

# Appendix C

## Interview Guide

### Opening questions

Thank you for participating in the interview. We are interested in understanding the relationship between HIV self-disclosure, social support, and mental health among people living with HIV. In order to do that, we would like to talk about your experiences living with HIV. If you feel at all uncomfortable with any of these questions, you can choose not to answer. We are deeply grateful for your participation because we cannot do this without working with you.

At the beginning, we would like to briefly talk about you and your family. You know, as a warm up.

- Tell me about yourself
  - Where were you born?
  - Where do you live now? Do you live alone? How long have you lived in there?
  - How many family members do you have? Do you have any siblings?
  - Do you live with any of them? How's the relationship between you and your families? How do you contact each other?
  - How about your relationship with friends? How do you contact them?
  - Do you have any ideas about depression? Have you ever experienced depression? Could you describe some symptoms that you had?
  - How about anxiety? Have you ever experienced anxiety? (will expand on meaning of anxiety as needed)

### Experience with HIV

- When did you find out that you were positive?
  - How did you feel about that?
- How was your mental health (anxiety, depression) before your diagnosis?
- How did your life change after knowing your HIV-positive status?
  - What was your reaction? How did you feel? (Probe: How did your diagnosis impact your mental health?)

### Self-disclosure, social support, and mental health

The next part of the interview questions will be related to your experience of telling someone your HIV status. You may recall some unpleasant memories. If you feel at all uncomfortable with any of these questions, you can choose not to answer.

- (Now let's talk about your first disclosure.)
  - Do you remember the first person you told about your positive status?  
(Do you remember the first time you told someone that you are HIV positive?)  
(Who was the first person you told?)
  - How did you feel before telling him/her, thinking about telling him/her?
  - Did you have any expectation on how they would react?
  - What did this conversation look like?
  - How did you tell them? How much did you tell them? Did you tell them all things (like the number of CD4, on med or not, virus load, under detectable, where did you get it) or only part of it?
  - How was the reaction of \_\_\_\_ (person) after you told him/her? (Did he/she ask questions?)
  - How did you feel right after telling them? (Feel relieved of a burden? More or less depression/anxiety? Did that give you more or less confidence to ever tell your status to others? Could you explain more?  
**Would you just talk a little bit more about that?**)
  - How long did this feeling ("this feeling" will be referred to the phase they used) last? (How did this feeling change over time? Did this feeling dissipate or get overridden by other issues after you disclosed?)
  - How do you think the first disclosure impact your mental health in long-term?
  - How has your relationship with this person changed since you told him/her your HIV status? (How did this disclosure impact on your relationship with \_\_\_?)
  - Has this person given you any support or helped you deal with your HIV status?
    - If yes, can you give me some examples about how they helped you?
    - If no, can you give me some examples about any unsupportive reactions?

- How did you feel about these supportive or unsupportive reactions? (Feel relieved of a burden? More or less depression/anxiety? Did that give you more or less confidence to ever tell your status to others? Since you have mentioned their reaction gave you a feeling of (refer to their phase), how long did the feeling last? Would you just talk a little bit more about that?)
- Were you ever disclosed to, before you disclosed to \_\_\_\_? How did they disclose to you? Do you think that it influenced your strategy? What did you learn from others' disclosure experience?
- How was your mental health before your disclosure? (remind the interviewer of the information we need to obtain in the conversation)
- How did this disclosure impact your mental health? (remind the interviewer of the information we need to obtain in the conversation)
- It sounds like you have talked to a couple of people about your status...
- Besides your \_\_\_\_, who else have you disclosed your status to? (prompts: Did you tell any family members? Friends? Sexual partners? Non-HIV care providers?)
  - Did you tell them in the same way as the first time?
    - If they change strategies: Any reason you changed the disclosure strategy?
  - How did you feel before telling them?
  - How did you feel when you were thinking about telling them?
  - How did you expect them to react? How's their reaction compare to that of the first person? (the difference between their expectation and reality)
  - How did you feel right after the conversation with them? (Feel relieved of a burden? More or less depression/anxiety? Did that give you more or less confidence to ever tell your status to others? Could you explain more?)
  - How long did this kind of feeling last? (How did that feeling change over time? Did this feeling dissipate or get overridden by other issues after you disclosed?)
  - How has your relationship with these persons changed after you told them your HIV status?
  - Have they given you any support or helped you dealing with your HIV status?

- If yes: Can you give me some examples about how they helped you?
  - If no: Can you give me some examples about any unsupportive reactions?
- How did you feel about these supportive or unsupportive reactions? (Feeling relieved of a burden? More or less depression/anxiety? Did that give you more or less confidence to ever tell your status to others? How long does the feeling last? How does it change over time? Could you explain more?)
- How was your mental health before your disclosure? (remind the interviewer of the information we need to obtain in the conversation)
- How did this disclosure impact on your mental health? (remind the interviewer of the information we need to obtain in the conversation)
- Are there any differences when you disclosed to different people?
  - Who is the easiest person to tell?
  - Who is the hardest person to tell?
- How did you decide the person that you disclosed to?
- Are there any differences among the first, second, and third time of disclosure? Why?
  - What did you learn from your disclosure experience?
- Do you see any other doctor except your HIV doctor?
  - If so, did you disclose to them?
- If they have not disclosed to anyone in any of these categories: family/friends/sexual partners/non-HIV care providers.
  - Why haven't you disclosed your status to anyone of your family/friends/sexual partners/non-HIV care providers? (according to their previous answers)
  - What are your fears about telling them your status? How close is your relationship with your family/ friends/sexual partners/non-HIV care providers (according to their previous answers)? Do you think they know your HIV status even if you haven't told them?
  - Do you think you will eventually tell them? Why or why not?
- From your own experience, in general, how has disclosure of your HIV status influenced your mental health or psychological status?



- From your own experience, in general, how has disclosure of your HIV status influenced the social support you received?
- From your own experience, in general, how has social support influenced your mental health?

**Closing Questions**

- Thank you for taking your time to answer these questions. Do you have anything else that you would like to tell me?

Thank you for your participation!

## Appendix D

**Table 10. Predictive Margins of Interaction between Education and HIV Self-Disclosure in Depression model**

	Margin	SE	95% CI	
<b>Model 1</b>				
<b>Education × HIV Self-Disclosure</b>				
E1#No	15.19	1.66	11.91	18.47
E1#Yes	19.43	3.02	13.46	25.39
E2#No	24.64	3.86	17.01	32.28
E2#Yes	18.96	0.74	17.49	20.43
E3#No	(not estimable)			
E3#Yes	18.46	1.98	14.54	22.38
<b>Model 2</b>				
<b>Education × HIV Self-Disclosure to Friends</b>				
E1#No	26.08	9.57	7.15	45.00
E1#Yes	19.35	3.44	12.56	26.15
E2#No	19.61	2.29	15.09	24.14
E2#Yes	19.06	0.82	17.43	20.69
E3#No	8.16	3.73	0.79	15.53
E3#Yes	19.43	2.03	15.43	23.44
<b>Education × HIV Self-Disclosure to Families</b>				
E1#No	16.40	10.15	-3.66	36.46
E1#Yes	21.49	3.04	15.49	27.49
E2#No	18.36	1.62	15.17	21.56
E2#Yes	19.37	0.83	17.73	21.01
E3#No	14.66	3.60	7.55	21.78
E3#Yes	18.74	2.25	14.28	23.19
<b>Education × HIV Self-Disclosure to Sex Partners</b>				
E1#No	18.55	7.10	4.52	32.58
E1#Yes	20.48	3.46	13.64	27.31
E2#No	14.75	2.53	9.74	19.76
E2#Yes	19.51	0.78	17.97	21.05
E3#No	19.93	11.98	-3.76	43.62
E3#Yes	17.62	1.80	14.06	21.19

**Table 11. Predictive Margins of Interaction between Education and HIV Self-Disclosure in Anxiety model**

	Margin	SE	95% CI	
<b>Model 1</b>				
<b>Education × HIV Self-Disclosure</b>				
E1#No	5.54	1.04	3.48	7.60
E1#Yes	6.78	1.27	4.28	9.28
E2#No	9.15	2.32	4.56	13.73
E2#Yes	7.74	0.48	6.78	8.69
E3#No	(not estimable)			
E3#Yes	6.02	1.06	3.91	8.12
<b>Model 2</b>				
<b>Education × HIV Self-Disclosure to Friends</b>				
E1#No	4.36	2.29	-0.17	8.88
E1#Yes	7.49	1.44	4.65	10.33
E2#No	7.23	1.42	4.42	10.05
E2#Yes	7.77	0.52	6.75	8.80
E3#No	3.85	1.58	0.73	6.96
E3#Yes	6.17	1.03	4.14	8.21
<b>Education × HIV Self-Disclosure to Families</b>				
E1#No	7.34	4.19	-0.93	15.62
E1#Yes	6.95	1.09	4.79	9.11
E2#No	7.21	0.88	5.47	8.95
E2#Yes	7.84	0.56	6.73	8.96
E3#No	3.98	1.47	1.08	6.89
E3#Yes	6.39	1.18	4.05	8.73
<b>Education × HIV Self-Disclosure to Sex Partners</b>				
E1#No	7.84	4.16	-0.38	16.06
E1#Yes	6.97	1.30	4.41	9.53
E2#No	4.94	1.71	1.56	8.32
E2#Yes	7.93	0.51	6.93	8.93
E3#No	11.58	6.42	-1.11	24.27
E3#Yes	5.35	0.91	3.55	7.15

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