Sexual Stigma, Depressive Symptoms, and HIV Vulnerability Among Gay, Bisexual, and Other Men Who Have Sex with Men in Kenya

Christine J. Korhonen

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Reading Committee:
Susan M. Graham, Chair
Stephen E. Hawes
Michele P. Andrasik

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Abstract

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Christine J. Korhonen

Chair of the Supervisory Committee:

Susan M. Graham

Departments of Global Health, Medicine, and Epidemiology

The studies within this dissertation address sexual stigma and its associations with HIV behavioral vulnerability among gay, bisexual, and other men who have sex with men (GBMSM). GBMSM experience stigma and discrimination due to their sexual minority status. This work: 1) establishes the magnitude of reported depressive symptoms and alcohol use among GBMSM at three sites in Kenya, 2) assesses the validity and reliability of a sexual stigma scale targeted toward GBSMSM in Kenya, 3) describes the association between depressive symptoms and sexual behaviors, and 4) assesses associations between sexual stigma, depressive symptoms, alcohol use and sexual behaviors.

Among 1,476 participants, 31% reported moderate to severe depressive symptoms (PHQ-9 ≥10), 44% hazardous alcohol use (AUDIT ≥8), and 51% problematic substance use (DAST-6 ≥1). Using exploratory and confirmatory factor analysis, an 8-item sexual stigma scale tailored for use among GBMSM in Kenya was validated to represent two factors: perceived sexual stigma

and enacted sexual stigma. Depressive symptoms were found to be associated with condomless receptive anal intercourse and condomless insertive anal intercourse. Direct associations were found between enacted sexual stigma and number of male partners and enacted sexual stigma and condomless receptive anal intercourse (RAI). Indirect associations through alcohol use were found between both perceived and enacted sexual stigma and condomless RAI.

This research contributes to the growing body of knowledge on sexual stigma among GBMSM in Kenya. It provides information on sexual stigma, its measurement, and direct and indirect associations with HIV behavioral vulnerability. Prevention programs for GBMSM should consider the effects of sexual stigma on this population and address these multiple pathways to reduce vulnerability to HIV in this population.

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Chapter 1: Introduction

Introduction

Despite enormous advancements in HIV testing and treatment, there were 1.3 million people newly diagnosed with HIV in 2022 (1). Gay, bisexual, and other men who have sex with men (GBMSM) are more vulnerable to HIV globally and are 11 times more likely to acquire HIV compared to the adult population (2). Vulnerability to HIV occurs due to structural, social, and biological factors. Access to HIV treatment is extremely important for prevention of new infections, and men living with HIV in sub-Saharan Africa are significantly less likely to access treatment compared to women (2). HIV is efficiently transmitted though condomless anal intercourse, with condomless receptive anal intercourse providing 34 times the risk of acquiring HIV compared to condomless insertive penile-vaginal intercourse (3). The number of partners and size of one's sexual network also play a role, with more dense networks providing more opportunity for HIV exposure with each new partner (4,5). Male sex workers and other GBMSM who engage in sex work are more vulnerable to HIV as condom use negotiations with clients are particularly difficult (6).

Sixty percent of new HIV diagnoses occur in sub-Saharan Africa, where many GBMSM are targets of discrimination, violence, and blackmail (7). Several countries in Africa, including Kenya, criminalize same-sex sexual activity (8). The resulting stigma and discrimination can increase vulnerability to HIV for GBMSM through complex pathways. For example, because GBMSM may face discrimination from health care facilities, access to HIV prevention and treatment services and other health services targeting their specific needs is reduced (9,10). GBMSM are vulnerable to sexual violence, including rape, with more GBMSM experiencing sexual violence than their non-GBMSM male peers. Younger GBMSM are particularly

vulnerable (11). GBMSM also report high levels of depressive symptoms and alcohol use (12), both of which can impair decision making and lead to increased HIV behavioral vulnerability.

The Minority Stress Model proposed by Meyer states that stigma against a minority status, such as sexual orientation, creates a hostile environment. The experience and expectation of this hostility, along with hiding one's identity and internalized homophobia, results in chronic stress leading to poor health outcomes (13). This model divides homophobic stigma, also known as sexual stigma, into three categories: perceived stigma, or fear of negative attitudes of others; enacted stigma, or experiences of overt violence or discrimination; and internalized stigma, or acceptance of negative beliefs about oneself (14). These stigma types have each been associated with negative health consequences and are usually assessed separately even though they are experienced simultaneously by individuals.

Repetitive, ongoing experiences of sexual stigma are a form of chronic stress, which affects multiple biological processes (15,16). Chronic stress has been shown to increase cortisol which leads to increased anxiety, depression, and insomnia (17,18). Chronic stress also releases pro-inflammatory cytokines which increases inflammation and can lead to higher blood pressure and subsequent cardiovascular disease, and trigger depressive symptoms (19,20). Stress due to stigma can activate emotional dysregulation and often leads to maladaptive coping strategies such as increased alcohol consumption (12,21). With chronic stress resulting in multiple increased vulnerabilities, evaluating sexual stigma promises a better understanding of sexual minority health and reducing sexual stigma has the potential for improving associated health disparities.

There is no universal method used to measure sexual stigma, but several tools are in use. The Internalized Homonegativity Inventory (IHNI) developed by Mayfield is commonly used to

assess internalized homonegativity (IH) (22). The Experiences of Homophobia Scale developed by Diaz and colleagues measures both perceived stigma and enacted stigma as a single factor (23). The Neilands MSM Stigma Scale is based on the Diaz scale but measures perceived stigma and enacted stigma as two separate factors (24). The Diaz and Neilands instruments have been adapted for use in South Africa (25), Jamaca (26), and Vietnam (27), as well as globally online (28). The Neilands scale was chosen for the work in this dissertation based on its previous use in sub-Saharan Africa and its ability to evaluate perceived and enacted stigma separately.

To develop more effective HIV prevention interventions for GBMSM and other sexual minority populations, efforts to better measure sexual stigma and understand the pathways through which sexual stigma may increase HIV vulnerability are needed. This dissertation focuses on stigma and its relationship with several behavioral and psychological factors for HIV acquisition which have the potential to improve HIV acquisition outcomes for GBMSM experiencing sexual stigma. Using a large survey of depressive symptoms and alcohol and other substance use among GBMSM at three research sites in Kenya, I evaluate a tailored sexual stigma scale, and, using that scale, investigate associations between sexual stigma and several factors for HIV acquisition including depression, number of partners, and condom use among Kenyan GBMSM. The background and specific aims are outlined below:

- In Chapter 2, I evaluate depressive symptoms and disordered alcohol use among GBMSM at three sites in Kenya and assess associations between these two predictors with transactional sex, childhood abuse, and recent trauma. This work has been published in AIDS (2018, 32:1507-1515).
- In Chapter 3, I assess a sexual stigma survey instrument tailored for use among Kenyan GBMSM. Using exploratory and confirmatory factor analysis, I hypothesize that the

scale measures two factors, perceived stigma and enacted stigma. This work has been published in BMC Public Health (2022, 22:754-764).

- In Chapter 4, I evaluate the associations between depressive symptoms and increased vulnerability for HIV, including number of male sexual partners and condomless receptive anal intercourse among GBMSM.
- In Chapter 5, I evaluate associations between perceived and enacted sexual stigma and sexual behaviors, including number of male sexual partners and condom use, among GBMSM. In addition, I test possible mediation effects from depressive symptoms and disordered alcohol use.

My findings provide new evidence on the effects of sexual stigma on behavioral and psychological risk factors for HIV among Kenyan GBMSM. By focusing my work on this population, I have ensured that these findings are applicable to a vulnerable population in need of supportive HIV prevention strategies. Improved understanding of sexual stigma and the pathways between stigma and the behaviors that increase vulnerability for HIV acquisition among GBMSM will inform the development of targeted interventions to reduce HIV vulnerability among this population.

Chapter 2: Depressive symptoms and problematic alcohol and other substance use in 1,476 gay, bisexual, and other men who have sex with men at three research sites in Kenya

Depressive symptoms and problematic alcohol and other substance use in 1476 gay, bisexual, and other men who have sex with men at three research sites in Kenya

Christine Korhonen,[1] Makobu Kimani,[2] Elizabeth Wahome,[2] Fredrick Otieno,[3] Duncan Okall,[3] Robert C. Bailey,[3,4] Gary W. Harper,[5] Robert R. Lorway,[6] Monika Doshi,[6,7] John Mathenge,[8] Joshua Kimani,[9] Eduard J. Sanders,[2,10] Susan M. Graham[1,2]

[1]University of Washington, [2]Kenya Medical Research Institute, [3]Nyanza Reproductive Health Society, [4]University of Illinois at Chicago, [5]University of Michigan, [6]University of Manitoba, [7]SAATH, [8]Health Options for Young Men on HIV/AIDS and STIs, [9]University of Nairobi, [10]University of Oxford

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Abstract

Objective: Information on mental health and substance use challenges among gay, bisexual and other men who have sex with men (GBMSM) is needed to focus resources on these issues and optimize services for HIV prevention and care. We determined characteristics associated with depressive symptoms and problematic alcohol and other substance use among GBMSM in Kenya.

Methods: Self-identified GBMSM in three HIV research studies in Kenya provided information on depressive symptoms (PHQ-9), alcohol use (AUDIT), and other substance use (DAST). Associations with these outcomes were evaluated using mixed effects Poisson regression.

Results: Of 1,476 participants, 452 (31%) reported moderate to severe depressive symptoms (PHQ-9 ≥10), 637 (44%) hazardous alcohol use (AUDIT ≥8), and 749 (51%) problematic substance use (DAST-6 ≥1). In multivariable analysis, living with HIV was not associated with these outcomes. Transactional sex was associated with hazardous alcohol use (adjusted prevalence ratio [aPR] 1.34, 95% confidence interval [CI] 1.12–1.60). Childhood abuse and recent trauma were associated with moderate to severe depressive symptoms (aPR 1.43, 95% CI 1.10–1.86 and aPR 2.43, 95% CI 1.91–3.09, respectively) hazardous alcohol use (aPR 1.36, 95% CI 1.10–1.68 and aPR 1.60, 95% CI 1.33–1.93, respectively), and problematic substance use (aPR 1.32, 95% CI 1.09–1.60 and aPR 1.35, 95% CI 1.14–1.59, respectively).

Conclusions: GBMSM in rights-constrained settings need culturally appropriate mental health services. Mental health screening and treatment or referral should be an integral part of programs, including HIV prevention and treatment programs, providing services to GBMSM.

Introduction

Male-male sexual behavior is illegal in several African countries, including Kenya (8), where gay, bisexual, and other men who have sex with men (GBMSM) are targets of discrimination, blackmail, and violence (11,29). This hostility can lead to high levels of distress, contributing to depression, alcohol use, and other substance use (12,30–32). The minority stress theory posits that gay and bisexual individuals experience stress due to social stigma, and attributes poor mental health to this stress (33). Stressors may be more acute among people with intersecting minority status, such as GBMSM living with HIV and those engaging in transactional sex (34). In addition, GBMSM recruited into HIV prevention studies in sub-Saharan Africa report high levels of childhood abuse and more recent abuse (11,12,30), each of which may contribute to adverse psychosocial outcomes.

Depressed mood, alcohol use, and other substance use are important predictors of behavioral vulnerability for HIV among GBMSM in sub-Saharan Africa (32,35,36). Information on psychosocial and contextual factors leading to these conditions is needed in order to develop and target effective prevention strategies tailored to this population (36). We hypothesized that living with HIV and engaging in transaction sex would be associated with increased depressive symptoms, alcohol use, and other substance use among Kenyan GBMSM. Using cross-sectional data from three Kenyan research sites, the present study examines two questions. First, how prevalent are depressive symptoms, alcohol use, and substance use in a diverse population of GBMSM? Second, to what extent are HIV status, transactional sex, and childhood or recent abuse associated with these three conditions?

Methods

Study sites

This is a secondary analysis of data abstracted from three studies of self-identified GBMSM conducted in Nairobi, coastal Kenya, and Kisumu by members of the MSM Health Research Consortium, a collaboration focused on improving HIV prevention and care services for GBMSM in Kenya. The geographic areas covered represent three distinct regions containing the majority of Kenya's multiethnic population. Studies in Nairobi and Coastal Kenya targeted recruitment towards GBMSM engaged in transactional sex.

Nairobi. Participants were recruited for a cross-sectional mixed-methods study sponsored by the Canadian Institutes of Health Research to understand vulnerability to HIV in this population. Recruitment took place between January and May 2016 at two clinics providing tailored services to GBMSM.

Coastal Kenya. Participants were enrolled in cohorts at the Kenya Medical Research Institute-Wellcome Trust Research Programme in Mtwapa (12,37,38). Socio-demographic data were collected at cohort enrollment. Mental health data were collected at enrollment or follow-up visits between December 2015 and October 2016.

Kisumu. Participants were recruited for a find, test, link, and retain in care study called "*Anza Mapema*" (Kiswahili for "start early"), sponsored by the U.S. Centers for Disease Control and Prevention. GBMSM living with HIV already linked to care were excluded. Baseline mental health data were collected at enrollment visits between August 2015 and September 2016.

Data collection

Data were collected by audio computer-assisted self-interview (ACASI) or computer-assisted personal interview (CAPI) in English, Kiswahili, or Dholuo. A version of the Patient Health Questionnaire (PHQ-9) depression module validated in Kiswahili was used at all sites (39). Other questions were translated from English to Kiswahili or Dholuo by staff at each site, with back-translation to ensure retained meaning. Questions considered unclear or difficult to translate were edited according to each site's local review process.

Trained interviewers explained procedures, answered questions, and assisted with technical problems. After completing the ACASI/CAPI, participants debriefed with a counsellor, and were provided referrals for mental health services as needed. HIV counseling and testing was then conducted according to Kenyan guidelines (40).

Measures

Outcomes

Depressive symptoms. The Patient Health Questionnaire (PHQ-9),with 9 items rated on a 4-point Likert scale, was used to assess depressive symptoms (Supplemental Table 1) (41). The standard PHQ-9 responses of "Not at all," "Several days," "More than half the days," and "Nearly every day" were used in Kisumu, while the Nairobi and coastal Kenya sites used a revised response set: "Not at all," "A few days," "Several days," and "Nearly all the days." Both response sets were summed for a total score ranging from 0–27. Based on PHQ-9 scoring guidelines, a score ≥10 defined moderate to severe depressive symptoms (41).

Alcohol use. The Alcohol Use Disorder Identification Test (AUDIT) rates 10 items on a 5-point scale (Supplemental Table 2) (42). In Nairobi and coastal Kenya, if a participant answered "Never" to question 1 on the frequency of drinking, the final two items were asked (see Supplemental Table 2). In Kisumu, no skip pattern was used. In Nairobi and coastal Kenya, the responses "Never," "A few days a year," "Every month," "Every week," and "Every day" were used for questions 3–8. In Kisumu, the responses for these items were modified: "Never," "Monthly or less," "2–4 times a month," "2–3 times a week," and "4 or more times a week." Both response sets were summed for a total score ranging from 0 to 40. A score ≥8 defined hazardous drinking (42).

Other substance use. The Drug Abuse Screening Test (DAST-10) was used in Nairobi and coastal Kenya to measure problematic use of non-prescription substances other than alcohol or tobacco (43). In Kisumu, a shortened instrument omitted four DAST-10 items (Supplemental Table 3). In Kisumu, a skip pattern was employed so that participants reporting no non-medical substance use were asked no further items. For this analysis, only the 6 items (DAST-6) asked at all sites were used. A positive response on any item defined problematic substance use.

Primary Exposures

HIV status. Self-reported HIV status was compared to HIV test results and separated into three categories: living with HIV (i.e. self-reported positive/tested positive), newly diagnosed (i.e. self-reported negative or unknown/tested positive) and living without HIV (i.e. tested negative).

Transactional sex. Engagement in transactional sex was dichotomized to any engagement vs none. Questions about transactional sex varied across sites (Supplemental Table 4).

Additional Exposures

Childhood abuse. Childhood abuse was measured using the four-item Childhood Experience of Care and Abuse (CECA) scale (Supplemental Table 5) (44). A positive response to any item was classified as childhood abuse.

Recent trauma. Recent trauma was assessed using the four-item USAID Health Policy Initiative MSM Trauma Screening Tool (Supplemental Table 6) (45). In Nairobi and coastal Kenya, the questions were asked about trauma in the past year. In Kisumu, questions were asked about trauma in the past 3 months. A positive response to any item was classified as recent trauma.

Confounders

Socio-demographics. Sites asked about age, religion, education, and marital status.

Data analysis

De-identified data from each site were standardized and merged into a unified dataset. For categorical variables, number and percent were calculated and Pearson's chi-square test performed to compare across HIV status groups. For continuous variables, median and interquartile range (IQR) were calculated and the Kruskal-Wallis test used to compare across HIV status groups. Spearman's rank-order correlation between outcomes was calculated. "Don't know," "refused" and missing responses were relatively frequent (>10%) for engagement in transactional sex, childhood abuse, and recent trauma. Because participants may have refused or

skipped questions for a reason, these responses were coded as a separate category, and data were not imputed.

Mixed effects Poisson regression with a random effect for site was used to produce prevalence ratios (PR) in both univariable and multivariable analyses. HIV status, engagement in sex work, childhood abuse, and recent trauma were included a priori in all multivariable analyses. Age, marital status, education, and religion were included in multivariable analysis when associated with the outcome of interest at $p < 0.20$. P-values for categorical variables were calculated using Wald tests. Data were analyzed using Stata version 14 (StataCorp, College Station, Texas).

Ethics statement

All participants provided written informed consent. Research protocols were approved by the Kenyatta National Hospital and University of Manitoba (Nairobi); Maseno University, University of Illinois at Chicago, and University of Washington (Kisumu); and Kenya Medical Research Institute and University of Washington (coastal Kenya). All sites formally agreed to share data.

Results

Study population

Results were available for 1,476 participants: 537 (37%) from Nairobi, 241 (16%) from Coastal Kenya, and 698 (47%) from Kisumu (Table 1). Median age was 25 years (IQR 22–29). A majority (932, 63%) reported engagement in transactional sex, as expected due to recruitment targeting GBMSM engaging in transactional sex at two sites. Two hundred eighty-one

participants (19%) reported living with HIV, of whom 264 (94%) tested positive and 17 (6%) tested negative, contrary to their self-reported status. Among 1,195 participants who self-reported as living without HIV or status unknown, 128 (11%) had a positive HIV test. Across HIV status categories, hazardous alcohol use was less common among men living with HIV (p=0.001). Men living without HIV had a higher frequency of reported childhood abuse (p=0.01).

Depressive symptoms, alcohol use, and other substance use

Median PHQ-9 score was 7 (IQR 3–11), and 452 participants (31%) had PHQ-9 ≥10, compatible with moderate to severe depressive symptoms. Median AUDIT score was 6 (IQR 0–14), and 637 participants (44%) had AUDIT ≥8, suggestive of hazardous drinking. Median DAST-6 score was 1 (IQR 0–4), and 749 participants (51%) had at least one positive DAST-6 item (DAST-6 ≥1), indicating problematic substance use. AUDIT and DAST-6 scores were weakly correlated with PHQ-9 scores (PHQ-9/AUDIT $\rho = 0.27$, $p<0.001$; PHQ-9/DAST-6 $\rho = 0.34$, $p<0.001$). AUDIT and DAST-6 scores were moderately correlated ($\rho = 0.42$, $p<0.001$).

Associations with moderate to severe depressive symptoms

In univariable analysis, childhood abuse and recent trauma were associated with PHQ-9 ≥10 (Table 2). In multivariable analysis adjusted for religion and education, childhood abuse (adjusted prevalence ratio [aPR] 1.43, 95% confidence interval [CI] 1.10–1.86) and recent trauma (aPR 2.43, 95% CI 1.91–3.09) were associated with PHQ-9 ≥10.

Associations with hazardous alcohol use

In univariable analysis, engagement in transactional sex, childhood abuse, and recent trauma were associated with AUDIT ≥8 (Table 3). In multivariable analysis adjusted for age and education, transactional sex (aPR 1.34, 95% CI 1.12–1.60), childhood abuse (aPR 1.36, 95% CI 1.10–1.68), and recent trauma (aPR 1.60, 95% CI 1.33–1.93), were associated with AUDIT ≥8.

Associations with problematic substance use

In univariable analysis, childhood abuse and recent trauma were associated with DAST-6 ≥1. In multivariable analysis adjusted for religion, childhood abuse (aPR 1.32, 95% CI 1.09–1.60) and recent trauma (aPR 1.35, 95% CI 1.14–1.59) were associated with DAST-6 ≥1.

Discussion

Given the multiple stressors faced by GBMSM across sub-Saharan Africa, a better understanding of factors influencing their mental health and substance use is needed. In a large, diverse population of GBMSM from three research sites in Kenya, we found that 31% reported moderate to severe depressive symptoms, 44% reported hazardous alcohol use, and 51% reported problematic substance use. Surprisingly, living with HIV was not associated with any of these outcomes. Transactional sex was associated only with hazardous alcohol use. In contrast, both childhood abuse and recent trauma were associated with each of the outcomes studied, highlighting the importance of structural interventions to protect the rights of GBMSM.

The prevalence of moderate to severe depressive symptoms we found (31%) is much higher than the 4.4% prevalence of major depressive disorder or dysthymia found in general population of

males (46), but similar to the prevalence of moderate to severe depressive symptoms among Kenyan men and women living with HIV (34%) (47). In addition, the 44% prevalence of hazardous alcohol use we found is higher than the 5.8% prevalence reported for men in the general Kenyan population (48). We could find no comparable data on other substance abuse in Kenyan men.

Transactional sex was associated with hazardous alcohol use, but not with depressive symptoms or problematic substance use. In qualitative research, men engaging in transactional sex in Kenya have reported drinking to excess as part of their work, which often involves meeting clients in bars (6). Given the health effects of substance use, including increased vulnerability for HIV acquisition, the high levels of both alcohol and other substance use we found suggest that interventions to address these problems and underlying factors are sorely needed (36).

Over 70% of study participants reported physical or sexual abuse in childhood. Similar to our findings, the 2010 Kenya Violence Against Children Study found that 18% of males reported sexual violence and 73% reported physical violence prior to age 18 (49). We found that both childhood abuse and recent adult trauma were associated with moderate to severe depressive symptoms, hazardous alcohol use, and problematic substance use. These problems have profound and wide-ranging effects, and abuse counseling should be integral to GBMSM-focused services in Kenya and other rights-constrained settings (50).

The WHO and Kenya's National AIDS Control Council have called for reducing stigma and discrimination against GBMSM to improve health outcomes (51,52). The illegality of same-sex

behavior, which provides a license to harass and discriminate, is unacceptable. While a case has been filed in the Kenyan high court by the National Gay and Lesbian Human Rights Commission contesting these laws (53), the laws hold. Although Kenya's Ministry of Health supports programs for GBMSM (52), GBMSM still face hostility and discrimination in many healthcare settings (9). Sensitivity training has been shown to reduce homoprejudice in Kenyan health care workers (54), and should be scaled up. Interventions to improve resilience and coping strategies have reduced internalized homophobia among U.S. GBMSM but have not been assessed among African GBMSM.

This study has several limitations. First, ACASI/CAPI differences across sites likely increased variability. We attempted to address this problem by including a random effect for site in analyses. Second, since the scales used to measure outcomes have not been validated among GBMSM in East Africa, applying standard cut points to identify moderate to severe depressive symptoms, hazardous alcohol use, and problematic substance use may overestimate or underestimate prevalence. Validation of mental health measures in this population is needed. Third, we did not assess symptoms of anxiety or post-traumatic stress, which may overlap with depressive symptoms assessed in the PHQ-9. We also did not assess resilience or other factors mitigating mental health problems. Fourth, participants reporting transactional sex may not identify as sex workers. We did not have information on self-identification as a sex worker at all sites, so could not analyze this predictor. Fifth, Kenyan GBMSM are highly mobile, and it is possible that a small number of men participated at more than one site. Fingerprint scans are used at two sites, but double enrolments could not be checked due to software incompatibility. Sixth, participants were recruited using snowball sampling and peer recruitment, biasing the

sample in favor of men known to be GBMSM. Therefore, this population may not be representative of all Kenyan GBMSM. Finally, this is a cross-sectional study and therefore associations cannot be interpreted as causal.

In conclusion, GBMSM in rights-constrained settings need tailored mental health services, in addition to human rights advocacy. Culturally appropriate and affirming mental health screening and treatment or referral should be an integral part of programs, including HIV prevention and treatment programs, providing services to GBMSM.

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Table 1. Characteristics of participants by HIV status (n= 1,476)

Characteristic	Overall n (%) or median (IQR)	Living with HIV n (%) or median (IQR)	Newly HIV diagnosed n (%) or median (IQR)	Living without HIV n (%) or median (IQR)	p-value
Number of participants	1,476	264 (17.9)	128 (8.7)	1084 (73.4)	-
Transactional sex					0.09
Any	932 (63.1)	165 (62.5)	90 (70.3)	677 (62.5)	
None	504 (34.2)	87 (33.0)	34 (26.6)	383 (35.3)	
Non-response*	40 (2.7)	12 (4.6)	4 (3.1)	24 (2.2)	
Childhood abuse					0.01
Any	1042 (70.6)	175 (66.3)	84 (65.6)	783 (72.2)	
None	396 (26.8)	85 (32.2)	44 (34.4)	267 (24.6)	
Non-response*	38 (2.6)	4 (1.5)	0	34 (3.1)	
Recent trauma[1]					0.15
Any	756 (51.2)	138 (52.3)	58 (45.3)	560 (51.7)	
None	612 (41.5)	115 (43.6)	58 (45.3)	439 (40.5)	
Non-response*	108 (7.3)	11 (4.2)	12 (9.4)	85 (7.8)	

Characteristic	Overall	Living with HIV	Newly HIV diagnosed	Living without HIV	p-value
Age (years)	25 (22–29)	28 (24–32)	26 (23–31)	24 (21–28)	<0.001
Currently married to a woman[2]	135 (9.2)	24 (9.1)	10 (7.9)	101 (9.3)	0.86
Education[3]					0.17
Primary or less	513 (34.8)	105 (39.8)	44 (34.4)	364 (33.6)	
Completed secondary	505 (34.2)	79 (29.9)	38 (29.7)	388 (35.8)	
Some higher education	457 (31.0)	80 (30.3)	46 (35.9)	331 (30.6)	
Religion					0.08
Christian	1,058 (71.7)	200 (75.8)	99 (77.3)	759 (70.0)	
Muslim	186 (12.6)	32 (12.1)	17 (13.3)	137 (12.6)	
Other	112 (7.6)	14 (5.3)	9 (7.0)	89 (8.2)	
None	120 (8.1)	18 (6.8)	3 (2.3)	99 (9.1)	
Depressive symptoms (PHQ-9)[4]					0.76
Minimal (<5)	478 (32.4)	78 (29.6)	46 (35.9)	354 (32.7)	
Mild (5–9)	545 (37.0)	95 (36.0)	45 (35.2)	405 (37.4)	
Moderate (10–14)	258 (17.5)	51 (19.3)	20 (15.6)	187 (17.3)	

Characteristic	Overall	Living with HIV	Newly HIV diagnosed	Living without HIV	p-value
Moderately severe (15–19)	132 (9.0)	25 (9.5)	10 (7.8)	97 (9.0)	
Severe (≥20)	62 (4.2)	15 (5.7)	7 (5.5)	40 (3.7)	
Alcohol use risk level (AUDIT)[5]					0.001
Zone I (0–7)	828 (56.5)	166 (63.6)	76 (59.4)	586 (54.5)	
Zone II (8–15)	328 (22.4)	65 (24.9)	22 (17.2)	241 (22.4)	
Zone III (16–19)	97 (6.6)	14 (5.4)	8 (6.3)	75 (7.0)	
Zone IV (≥20)	212 (14.5)	16 (6.1)	22 (17.2)	174 (16.2)	
Any problematic substance use (DAST-6≥1)[6]	912 (61.9)	205 (78.0)	85 (66.4)	622 (57.5)	0.06

Note: Living with HIV was defined as both self-reported and tested positive. New HIV diagnosis was defined as self-reported negative and tested positive. Living without HIV was defined as tested negative.

IQR = Interquartile range

* Non-response included “don’t know,” “refused to answer,” and missing responses.

[1] Recent trauma was assessed over the past year in Nairobi and Coastal Kenya and in the past 3 months in Kisumu.

[2] In Kenya, legal marriage is restricted to heterosexual relationships. Marital status was missing for 4 participants.

[3] Education was missing for 1 participant.

[4] PHQ-9 score was missing for 1 participant.

[5] AUDIT score was missing for 11 participants.

[6] DAST-6 score was missing for 3 participants.

Table 2. Characteristics associated with PHQ-9 score ≥ 10

	Univariable		Multivariable	
	Prevalence Ratio (95% CI)	**p-value**	**Adjusted Prevalence Ratio* (95% CI)**	**p-value**
Primary exposures				
HIV status†		0.64		0.37
Living with HIV	1.14 (0.86 – 1.49)		1.18 (0.94 – 1.49)	
New HIV diagnosis	0.97 (0.69 – 1.37)		1.03 (0.73 – 1.46)	
Living without HIV	ref		ref	
Transactional sex		0.06		0.51
Any	1.29 (1.05 – 1.59)		1.10 (0.89 – 1.35)	
Non-response‡	1.28 (0.71 – 2.30)		1.33 (0.75 – 2.37)	
None	ref		ref	
Secondary exposures				
Childhood abuse		<0.001		0.02
Any	1.97 (1.53 – 2.54)		1.43 (1.10 – 1.86)	
Non-response	2.08 (1.16 – 3.73)		1.62 (0.92 – 2.86)	
None	ref		ref	
Recent trauma		<0.001		<0.001
Any	2.76 (2.19 – 3.48)		2.43 (1.91 – 3.09)	
Non-response‡	2.35 (1.58 – 3.50)		1.99 (1.35 – 2.93)	
None	ref		ref	

Confounders				
Age	1.01 (0.99 – 1.02)	0.25	-	
Currently married to a woman	0.92 (0.66 – 1.28)	0.62	-	
Education		0.11		0.30
Primary or less	ref		ref	
Completed secondary	0.76 (0.58 – 0.99)		0.83 (0.66 – 1.05)	
Some higher	0.85 (0.58 – 1.27)		0.94 (0.75 – 1.18)	
Religion		0.19		0.41
Christian	ref		ref	
Muslim	1.19 (0.91 – 1.56)		1.13 (0.86 – 1.49)	
Other	0.98 (0.68 – 1.42)		0.97 (0.67 – 1.39)	
None	1.37 (1.00 – 1.88)		1.27 (0.93 – 1.73)	

* Adjusted model includes engaged in transactional sex, childhood abuse, recent trauma, education and religion.

† Known HIV-positive was defined as self-reported positive and tested positive. Newly diagnosed HIV-positive was defined as self-reported negative and tested positive. HIV-negative was defined as tested negative.

‡ Non-response included “don’t know,” “refused to answer,” and missing responses.

Table 3. Characteristics associated with AUDIT score ≥ 8

	Univariable		Multivariable	
	Prevalence Ratio (95% CI)	**p-value**	**Adjusted Prevalence Ratio* (95% CI)**	**p-value**
Primary exposures				
HIV status†		0.49		0.17
Living with HIV	0.87 (0.68 – 1.11)		0.80 (0.62 – 1.02)	
Newly HIV diagnosed	0.90 (0.68 – 1.21)		0.87 (0.64 – 1.16)	
Living without HIV	ref		ref	
Transactional sex		<0.001		0.01
Any	1.47 (1.23 – 1.75)		1.34 (1.12 – 1.60)	
Non-response	1.01 (0.55 – 1.83)		0.96 (0.53 – 1.76)	
Secondary exposures				
Childhood abuse		<0.001		0.01
Any	1.63 (1.33 – 2.00)		1.36 (1.10 – 1.68)	
Non-response	1.17 (0.64 – 2.16)		0.98 (0.53 – 1.80)	
None	ref		ref	
Recent trauma		<0.001		<0.001
Any	1.81 (1.52 – 2.15)		1.60 (1.33 – 1.93)	
Non-response	1.53 (1.11 – 2.10)		1.47 (1.06 – 2.04)	
None	ref		ref	

Confounders				
Age	1.02 (1.01 – 1.03)	<0.001	1.02 (1.01 – 1.03)	0.01
Currently married to a woman	0.99 (0.75 – 1.29)	0.92	-	
Education		0.04		0.07
Primary or less	ref		ref	
Completed secondary	0.91 (0.75 – 1.11)		0.99 (0.81 – 1.20)	
Some higher	1.16 (0.96 – 1.41)		1.21 (1.00 – 1.47)	
Religion		0.94		
Christian	ref		-	
Muslim	1.06 (0.84 – 1.35)		-	
Other	1.07 (0.80 – 1.42)		-	
None	1.03 (0.77 – 1.39)		-	

* Adjusted model includes engaged in transactional sex, childhood abuse, recent trauma, age, and education

† Known HIV-positive was defined as self-reported positive and tested positive. Newly diagnosed HIV-positive was defined as self-reported negative and tested positive. HIV-negative was defined as tested negative.

‡Non-response included “don’t know,” “refused to answer,” and missing responses.

Table 4. Characteristics associated with DAST-6 score ≥ 1

	Univariable		Multivariable	
	Prevalence Ratio (95% CI)	**p-value**	**Adjusted Prevalence Ratio* (95% CI)**	**p-value**
Primary exposures				
HIV status†		0.38		0.50
Known positive	0.91 (0.74 – 1.10)		1.07 (0.78 – 1.48)	
Newly diagnosed positive	0.85 (0.64 – 1.13)		1.16 (0.87 – 1.53)	
Negative	ref		ref	
Transactional sex		0.20		0.58
Any	1.15 (0.98 – 1.35)		1.07 (0.91 – 1.26)	
Non-response‡	1.21 (0.78 – 1.88)		1.21 (0.78 – 1.88)	
None	ref		ref	
Secondary exposures				
Childhood abuse		<0.001		0.01
Any	1.48 (1.24 – 1.78)		1.32 (1.09 – 1.60)	
Non-response‡	1.55 (1.01– 2.39)		1.39 (0.89 – 2.15)	
None	ref		ref	
Recent trauma		<0.001		0.002
Any	1.47 (1.26 – 1.72)		1.35 (1.14 – 1.59)	
Non-response‡	1.27 (0.92 – 1.75)		1.18 (0.85 – 1.65)	
None	ref		ref	

Confounders				
Age	1.00 (0.98 – 1.01)	0.98	-	
Currently married to a woman	1.00 (0.77 – 1.29)	0.98	-	
Education		0.69		
Primary or less	ref		-	
Completed secondary	1.08 (0.91 – 1.28)		-	
Some higher	1.05 (0.87 – 1.27)		-	
Religion		0.02		0.03
Christian	ref		ref	
Muslim	1.36 (1.11 – 1.66)		1.35 (1.11 – 1.65)	
Other	0.97 (0.72 – 1.31)		0.95 (0.70 – 1.28)	
None	1.10 (0.84 – 1.43)		1.08 (0.82 – 1.39)	

*Adjusted model includes engaged in transactional sex, childhood abuse, recent trauma, and religion

† Known HIV-positive was defined as self-reported positive and tested positive. Newly diagnosed HIV-positive was defined as self-reported negative and tested positive. HIV-negative was defined as tested negative.

‡Non-response included “don’t know,” “refused to answer,” and missing responses.

Supplemental Table 1. Patient Health Questionnaire-9 (PHQ-9) items by HIV status (n=1,475)

Each item was prefaced with "Over the last two weeks, how often have you..."

	Overall	Living with HIV	New HIV Diagnosis	Living without HIV
	n (%)	n (%)	n (%)	n (%)
Experienced little interest or pleasure in doing things				
Not at all*	431 (29.2)	88 (33.3)	43 (33.6)	300 (27.7)
A few days	675 (45.7)	109 (41.3)	52 (40.6)	514 (47.4)
Several days	189 (12.8)	41 (15.5)	9 (7.0)	139 (12.8)
Nearly all the days	180 (12.2)	26 (9.9)	24 (18.8)	130 (12.0)
Felt down, depressed, or hopeless				
Not at all	489 (33.1)	72 (27.3)	42 (32.8)	375 (34.6)
A few days	614 (41.6)	117 (44.3)	56 (43.8)	441 (40.7)
Several days	231 (15.7)	52 (19.7)	15 (11.7)	164 (15.1)
Nearly all the days	142 (9.6)	23 (8.7)	15 (11.7)	104 (9.6)
Had trouble falling or staying asleep, or sleeping too much				
Not at all	541 (36.7)	84 (31.8)	37 (28.9)	420 (38.8)
A few days	596 (40.4)	117 (44.3)	63 (49.2)	416 (38.4)
Several days	195 (13.2)	46 (17.4)	14 (10.9)	135 (12.5)
Nearly all the days	144 (9.8)	17 (6.4)	14 (10.9)	113 (10.4)
Felt tired or had little energy				
Not at all	499 (33.8)	66 (25.0)	43 (33.6)	390 (36.0)
A few days	651 (44.1)	136 (51.5)	61 (47.7)	454 (41.9)
Several days	214 (14.5)	35 (13.3)	16 (12.5)	163 (15.0)
Nearly all the days	112 (7.6)	27 (10.2)	8 (6.3)	77 (7.1)
Had poor appetite or have overeaten				
Not at all	646 (43.8)	106 (40.2)	56 (43.8)	484 (44.7)
A few days	562 (38.1)	105 (39.8)	53 (41.4)	404 (37.3)
Several days	172 (11.7)	38 (14.4)	12 (9.4)	122 (11.3)
Nearly all the days	96 (6.5)	15 (5.7)	7 (5.5)	74 (6.8)
Felt bad about yourself—or that you are a failure or have let yourself or your family down				
Not at all	675 (45.7)	108 (40.9)	59 (46.1)	508 (46.9)
A few days	465 (31.5)	83 (31.4)	40 (31.3)	342 (31.6)
Several days	172 (11.7)	41 (15.5)	17 (13.3)	114 (10.5)
Nearly all the days	164 (11.1)	32 (12.1)	12 (9.4)	120 (11.1)
Had trouble concentrating on things, such as reading the newspaper or watching television				
Not at all	694 (47.0)	124 (47.0)	61 (47.7)	509 (47.0)
A few days	480 (32.5)	83 (31.4)	40 (31.3)	357 (32.9)
Several days	154 (10.4)	34 (12.9)	13 (10.2)	107 (9.9)
Nearly all the days	148 (10.0)	23 (8.7)	14 (10.9)	111 (10.2)

Experienced moving or speaking so slowly that other people could have noticed? Or the opposite—being so fidgety or restless that you have been moving around a lot more than usual				
Not at all	798 (54.1)	139 (52.7)	67 (52.3)	592 (54.6)
A few days	451 (30.6)	78 (29.6)	41 (32.0)	332 (30.6)
Several days	140 (9.5)	30 (11.4)	13 (10.2)	97 (9.0)
Nearly all the days	87 (5.9)	17 (6.4)	7 (5.5)	63 (5.8)
Thought that you would be better off dead or of hurting yourself in some way				
Not at all	978 (66.3)	169 (64.0)	81 (63.3)	728 (67.2)
A few days	301 (20.4)	51 (19.3)	32 (25.0)	218 (20.1)
Several days	122 (8.3)	27 (10.2)	8 (6.3)	87 (8.0)
Nearly all the days	75 (5.1)	17 (6.4)	7 (5.5)	51 (4.7)

*Responses in Kisumu: Not at all; Several days; More than half the days; Nearly every day.

Supplemental Table 2. Alcohol use disorders identification test (AUDIT) items by HIV status (n=1,476)

	Overall	Living with HIV	New HIV Diagnosis	Living without HIV
	n (%)	n (%)	n (%)	n (%)
How often do you have a drink containing alcohol				
Never	495 (33.5)	85 (32.2)	53 (41.4)	357 (32.9)
Monthly or less	256 (17.3)	70 (26.5)	20 (15.6)	166 (15.3)
2-4 times a month	303 (20.5)	58 (22.0)	21 (16.4)	224 (20.7)
2-3 times a week	264 (17.9)	29 (11.0)	17 (13.3)	218 (20.1)
4 or more times a week	156 (10.6)	22 (8.3)	17 (13.3)	117 (10.8)
Non-response	2 (0.2)	0	0	2 (0.2)
How many drinks containing alcohol do you have a on typical day when you are drinking				
1 to 2	453 (30.7)	87 (33.0)	31 (24.2)	335 (30.9)
3 to 4	339 (23.0)	62 (23.5)	25 (19.5)	252 (23.3)
5 to 6	137 (9.3)	22 (8.3)	9 (7.0)	106 (9.8)
7 to 9	25 (1.7)	4 (1.5)	3 (2.3)	18 (1.7)
10 or more	25 (1.7)	3 (1.1)	7 (5.5)	15 (1.4)
Non-response	497 (33.7)	86 (32.6)	53 (41.4)	358 (33.0)
How often do you have six or more drinks on one occasion				
Never	565 (38.3)	90 (34.1)	42 (32.8)	433 (39.9)
A few days a year	228 (15.5)	47 (17.8)	18 (14.1)	163 (15.0)
Every month	202 (13.7)	21 (8.0)	17 (13.3)	164 (15.1)
Every week	173 (11.7)	25 (9.5)	12 (9.4)	136 (12.6)
Every day	55 (3.7)	4 (1.5)	9 (7.0)	42 (3.9)
Non-response	253 (17.1)	77 (29.2)	30 (23.4)	146 (13.5)
How often during the last year have you found that you were not able to stop drinking				
Never	686 (46.5)	101 (38.3)	54 (42.2)	531 (49.0)
A few days a year	195 (13.2)	45 (17.1)	14 (10.9)	136 (12.6)
Every month	137 (9.3)	17 (6.4)	10 (7.8)	110 (10.2)
Every week	108 (7.3)	18 (6.8)	10 (7.8)	80 (7.4)
Every day	95 (6.4)	5 (1.9)	10 (7.8)	80 (7.4)
Non-response	255 (17.3)	78 (29.6)	30 (23.4)	147 (13.6)
How often during the last year have you failed to do what was expected of you because of drinking				
Never	753 (51.0)	108 (40.9)	57 (44.5)	588 (54.2)
A few days a year	231 (15.7)	51 (19.3)	13 (10.2)	167 (15.4)
Every month	123 (9.3)	12 (4.6)	17 (13.3)	94 (9.7)
Every week	74 (5.0)	10 (3.8)	6 (4.7)	58 (5.4)
Every day	42 (2.9)	5 (1.9)	5 (3.9)	32 (3.0)
Non-response	253 (17.1)	78 (29.6)	30 (23.4)	145 (13.4)
How often during the last year have you needed a first drink in the morning				
Never	788 (53.4)	135 (51.1)	67 (52.3)	586 (54.1)

A few days a year	171 (11.6)	33 (12.5)	10 (7.8)	128 (11.8)
Every month	71 (4.8)	6 (2.3)	7 (5.5)	58 (5.4)
Every week	91 (6.2)	7 (2.7)	2 (1.6)	82 (7.6)
Every day	102 (6.9)	6 (2.3)	12 (9.4)	84 (7.8)
Non-response	253 (17.1)	77 (29.2)	30 (23.4)	146 (13.5)
How often during the last year have you had a feeling of guilt after drinking				
Never	688 (46.6)	96 (36.4)	65 (50.8)	527 (48.6)
A few days a year	268 (18.2)	63 (23.9)	13 (10.2)	192 (17.7)
Every month	104 (7.1)	13 (4.9)	8 (6.3)	83 (7.7)
Every week	92 (6.2)	5 (1.9)	5 (3.9)	82 (7.6)
Every day	70 (4.7)	10 (3.8)	7 (5.5)	53 (4.9)
Non-response	254 (17.2)	77 (29.2)	30 (23.4)	147 (13.6)
How often during the last year have you been unable to remember the night before				
Never	732 (49.6)	109 (41.3)	63 (49.2)	560 (51.7)
A few days a year	251 (17.0)	60 (22.7)	11 (8.6)	180 (16.6)
Every month	79 (5.4)	7 (2.7)	7 (5.5)	65 (6.0)
Every week	93 (6.3)	7 (2.7)	9 (7.0)	77 (7.1)
Every day	68 (4.6)	4 (1.5)	8 (6.3)	56 (5.2)
Non-response	253 (17.1)	77 (29.2)	30 (23.4)	146 (13.5)
Have you or someone else been injured because of your drinking				
No	1091 (73.9)	217 (82.2)	93 (72.7)	781 (72.1)
Yes, but not during the last year	179 (12.1)	23 (8.7)	12 (9.4)	144 (13.3)
Yes, during the last year	205 (13.9)	24 (9.1)	23 (18.0)	158 (14.6)
Non-response	1 (0.1)	0	0	1 (0.1)
Has someone been concerned about your drinking or suggested you cut down				
No	974 (66.0)	176 (66.7)	94 (73.4)	704 (64.9)
Yes, but not during the last year	198 (13.4)	39 (14.8)	10 (7.8)	149 (13.8)
Yes, during the last year	302 (20.5)	48 (18.2)	24 (18.8)	230 (21.2)
Non-response	2 (0.1)	1 (0.4)	0	1 (0.4)

* Non-response included “don’t know,” “refused to answer,” missing responses, and participants who answered “never” to AUDIT item 1.

Supplemental Table 3. Drug Abuse Screening Test (DAST-6) items by HIV status (n=1,476)

	Overall n (%)	**Living with HIV** n (%)	**New HIV Diagnosis** n (%)	**Living without HIV** n (%)
Have you used drugs other than those required for medical reasons				
Yes	506 (34.3)	68 (25.8)	40 (31.3)	398 (36.3)
No	970 (65.7)	196 (74.2)	88 (68.8)	686 (63.3)
Non-response*	0	0	0	0
Have you used more than one drug at a time				
Yes	374 (25.3)	79 (29.9)	19 (14.8)	276 (25.5)
No	613 (41.5)	159 (60.2)	71 (55.5)	383 (35.3)
Non-response	489 (33.1)	26 (9.9)	38 (29.7)	425 (39.2)
Have you always been able to stop using drugs when you want to				
Yes	517 (35.0)	108 (40.9)	32 (25.0)	377 (34.8)
No	466 (31.6)	128 (48.5)	58 (45.3)	280 (25.8)
Non-response	493 (33.4)	28 (10.6)	38 (29.7)	427 (39.4)
Have you engaged in illegal activities in order to obtain drugs				
Yes	195 (13.2)	29 (11.0)	17 (13.3)	149 (13.8)
No	792 (53.7)	208 (78.8)	73 (57.0)	511 (47.1)
Non-response	489 (33.1)	27 (10.2)	38 (29.7)	424 (39.1)
Have you ever experienced withdrawal symptoms when you stopped taking drugs				
Yes	267 (18.1)	48 (18.2)	19 (14.8)	38 (29.7)
No	718 (48.6)	188 (71.2)	71 (55.5)	459 (48.6)
Non-response	491 (33.3)	28 (10.6)	38 (29.7)	425 (39.2)
Have you had medical problems as a result of your drug use?				
Yes	193 (13.1)	36 (13.6)	16 (13.6)	141 (13.0)
No	794 (53.8)	201 (76.1)	74 (57.8)	519 (47.9)
Non-response	489 (33.1)	27 (10.2)	38 (29.7)	424 (39.1)

* Non-response included “don’t know,” “refused to answer,” missing responses, and participants who answered “no” to DAST item 1 in Kisumu.

Supplemental Table 4. Questions used to assess engagement in transaction sex by site

Nairobi: How long have you exchanged sex for money, food, clothes or other gifts?
Kisumu: In the last three months, how often have you had sex with someone in order to get money, food or housing?
Coastal Kenya: In the last three months, have you been paid for sex with cash, living expenses, or goods?

Supplemental Table 5. Childhood Experience of Care and Abuse (CECA) items by HIV status (n=1,476)

	Overall	**Living with HIV**	**New HIV Diagnosis**	**Living without HIV**
	n (%)	n (%)	n (%)	n (%)
When you were a child or teenager, were you ever hit repeatedly with an implement (such as a belt or stick) or punched, kicked, or burnt by someone in the household?				
Yes	882 (59.8)	146 (55.3)	67 (52.3)	669 (61.7)
No	559 (37.9)	114 (43.2)	61 (47.7)	384 (35.4)
Non-response*	35 (2.4)	4 (1.5)	0	31 (2.9)
When you were a child or teenager, did you ever have any unwanted sexual experiences?				
Yes	513 (34.8)	90 (34.1)	35 (27.3)	388 (35.8)
No	928 (62.9)	170 (64.4)	93 (72.7)	665 (61.4)
Non-response	35 (2.4)	4 (1.5)	0	31 (2.9)
Did anyone force you or persuade you to have sexual intercourse against your wishes before age 17?				
Yes	447 (30.3)	83 (31.4)	36 (28.1)	328 (30.3)
No	997 (67.6)	177 (67.1)	92 (71.9)	728 (67.2)
Non-response	32 (2.2)	4 (1.5)	0	28 (2.6)
Can you think of any upsetting sexual experiences before age 17 with a related adult or someone in authority (e.g. a teacher)?				
Yes	398 (27.0)	81 (30.7)	37 (28.9)	250 (27.0)
No	1046 (70.9)	179 (67.8)	91 (71.1)	776 (71.6)
Non-response	32 (2.2)	4 (1.5)	0	28 (2.6)

*Non-response included “don’t know,” “refused to answer,” and missing responses

Supplemental Table 6. USAID Health Policy Initiative GBMSM Trauma Screening Tool items* by HIV status (n=1,476)

	Overall	Living with HIV	New HIV Diagnosis	Living without HIV
	n (%)	n (%)	n (%)	n (%)
Has anyone forced or coerced you to have sexual relations against your will?				
Yes	279 (18.9)	62 (23.5)	26 (20.3)	191 (17.6)
No	1147 (77.7)	198 (75.0)	94 (73.4)	855 (78.9)
Non-response**	50 (3.4)	4 (1.5)	8 (6.3)	38 (3.5)
Has anyone slapped you, punched you, hit you, or caused you any other type of physical harm?				
Yes	350 (23.7)	72 (27.3)	30 (23.4)	248 (22.9)
No	1080 (73.2)	186 (70.5)	90 (70.3)	804 (74.2)
Non-response	46 (3.1)	6 (2.3)	8 (6.3)	32 (3.0)
Has anyone insulted you, humiliated you, made you feel inadequate, or yelled at you?				
Yes	628 (42.6)	105 (39.8)	45 (35.2)	478 (44.1)
No	770 (52.2)	152 (57.6)	75 (58.6)	543 (50.1)
Non-response	78 (5.3)	7 (2.7)	8 (6.3)	63 (5.8)
Has anyone made you feel threatened, fearful, or in danger?				
Yes	508 (34.4)	104 (39.4)	39 (30.5)	365 (33.7)
No	963 (65.2)	156 (59.1)	89 (69.5)	718 (66.2)
Non-response	5 (0.3)	4 (1.5)	0	1 (0.1)

*Nairobi and Coastal Kenya questions prefaced with "In the past year," Kisumu questions with "In the past three months."

**Non-response included "don't know," "refused to answer," and missing responses

Supplemental Table 7. Other substances used by site

Substance	**Overall** n=1476 n (%)	**Coastal Kenya** n=241 n (%)	**Kisumu** n=698 n (%)	**Nairobi** n=537 n (%)
Khat	231 (15.7)	63 (26.1)	100 (14.5)	68 (12.7)
Marijuana	261 (17.7)	45 (18.7)	152 (22.1)	64 (11.9)
Hashish	13 (0.9)	6 (2.5)	N/A	7 (1.3)
Inhalants	5 (0.3)	1 (0.4)	N/A	4 (0.7)
Heroin	28 (1.9)	7 (2.9)	14 (2.0)	7 (1.3)
Cocaine	12 (0.8)	2 (0.8)	4 (0.6)	6 (1.1)
Pain medications	29 (2.0)	13 (5.4)	N/A	16 (3.0)
Sleeping medications	33 (2.2)	9 (3.7)	N/A	24 (4.5)
Other	15 (1.0)	8 (3.3)	N/A	7 (1.3)
Rohypnol	3 (0.2)	N/A	3 (0.4)	N/A

N/A: Participants not asked about use of specific substance

Chapter 3. Validity and reliability of a sexual stigma scale among Kenyan gay, bisexual, and other men who have sex with men

Validity and reliability of a sexual stigma scale among Kenyan gay, bisexual, and other men who have sex with men

Christine J. Korhonen,[1] Brian P. Flaherty,[1] Elizabeth Wahome,[2] Pascal Macharia,[3] Helgar Musyoki,[4] Parinita Battacharjee,[5,6] Joshua Kimani[5,6] Monika Doshi, [6,7] John Mathenge,[3] Robert R. Lorway,[6] Eduard J. Sanders,[2,8] Susan M. Graham[1,2,]

[1]University of Washington, Seattle, USA

[2]Kenya Medical Research Institute-Wellcome Trust Research Programme, Kilifi, Kenya

[3]Health Options for Young Men on HIV/AIDS and STIs, Nairobi, Kenya

[4]National AIDS and STI Control Programme, Ministry of Health, Nairobi, Kenya

[5]Partners for Health and Development in Africa, Nairobi, Kenya

[6]University of Manitoba, Canada

[7]Saath, Connecticut, USA

[8]University of Oxford, UK

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Abstract

Background: We evaluated the validity and reliability of the Neilands sexual stigma scale administered to 871 gay, bisexual, and other men who have sex with men (GBMSM) at two research locations in Kenya.

Methods: Using cross-validation, exploratory factor analysis (EFA) was performed on a randomly selected subset of participants and validated using confirmatory factor analysis (CFA) on the remaining participants. Associations of the initial and final stigma scale factors with depressive symptoms, alcohol use, and other substance use were examined for the entire dataset.

Results: EFA produced a two-factor scale of perceived and enacted stigma. The CFA model fit to the two-factor scale was improved after removing three cross-loaded items and adding correlated errors (chi-squared=26.5, df 17, p=0.07). Perceived stigma was associated with depressive symptoms (beta=0.34, 95% CI 0.24, 0.45), alcohol use (beta=0.14, 95% CI 0.03, 0.25) and other substance use (beta=0.19, 95% CI 0.07, 0.31), while enacted stigma was associated with alcohol use (beta=0.17, 95% CI 0.06, 0.27).

Conclusions: Our findings suggest enacted and perceived sexual stigma are distinct yet closely related constructs among GBMSM in Kenya and are associated with poor mental health and substance use.

Introduction

Gay, bisexual, and other men who have sex with men (GBMSM) experience stigma and discrimination in Kenya and other countries, especially where same-sex sexual behavior is criminalized (8,55). Chronic stress from experiences of sexual stigma contributes to mental and physical health disparities among GBMSM, and can be compounded, for some individuals, by intersecting stigmas such as those surrounding living with HIV or engaging in transactional sex (34,56–63). While the World Health Organization (WHO) and Joint United Nations Progamme on HIV/AIDS (UNAIDS) recommend stigma reduction and anti-discrimination measures as part of a comprehensive HIV and STI prevention approach (64,65), a better understanding of stigma surrounding same-sex sexual behavior in the Kenyan context is needed in order to develop effective, multi-pronged approaches.

Stigma is multi-dimensional and has been classified into perceived, enacted, and internalized forms (14). Perceived stigma refers to expectations of negative opinions of one's own group, along with fears of experiencing future discrimination. Enacted stigma includes direct encounters of violence or discrimination. Internalized stigma refers to the incorporation of discrediting social views into one's own beliefs and opinions about oneself. Several instruments have been developed to assess each of these dimensions, such as Krieger's Experiences of Discrimination and Mayfield's Internalized Homonegativity Inventory (22,66).

A 10-item scale evaluating perceived and enacted sexual stigma among men who have sex with men (referred to here as GBMSM to reflect the diversity of sexual orientation in this population (67)) was adapted by Neilands et al. (24) from a scale developed by Diaz et al. (23). The

Neilands sexual stigma scale has been used globally, including in South Africa and Kenya (12,25,28). In coastal Kenya, higher Neilands sexual stigma scores were correlated with alcohol abuse, other substance abuse, and depressive symptoms (12).

The present study evaluated the reliability and validity of the Neilands sexual stigma scale adapted for use among GBMSM in Kenya. The specific aims were to describe the scale's factorial structure and assess associations of this scale with self-reported levels of depressive symptoms, alcohol use, and substance use.

Methods

Study setting and participants

This secondary analysis used cross-sectional data from two research studies by members of the Kenya MSM Health Research Consortium, a collaboration focused on improving HIV prevention and care services for GBMSM in Kenya, and by Health Options for Young Men on HIV/AIDS and STIs (HOYMAS), the National AIDS and STI Control Programme (NASCOP), and Partners for Health and Development in Africa (PHDA).

Data from the Nairobi and coastal Kenya studies were pooled, as in previous research (68), to improve generalizability and to inform use of this scale in future research across multiple sites within Kenya. Mobility between locations is common, so care was taken to avoid duplicate enrollment.

Participants in both studies were at least 18 years of age. Researchers obtained written informed consent from all participants. This analysis was approved by the University of Washington Institutional Review Board.

Nairobi. Participants were recruited for a cross-sectional study on HIV vulnerability sponsored by the Canadian Institutes of Health Research, described previously (69). This study grew out of a larger community-based research project, the South-to-South study, coordinated and supervised by HOYMAS community leaders with technical support from PHDA and the University of Manitoba. Recruitment took place at two health clinics providing services for GBMSM, one of which specifically targeted those who identified as sex workers, between January and May 2016. Men were eligible for participation if they were enrolled for services at either of the clinics and reported ever having had anal sex with a man. This study was the first evaluation of mental health and sexual stigma at these clinical sites using the measures described below.

Coastal Kenya. Participants were members of two ongoing cohort studies (one for HIV-positive and the other for HIV-negative adults at high risk for HIV transmission) based at the Kenya Medical Research Institute-Wellcome Trust Research Programme (KEMRI-WTRP) in Mtwapa (12,70). Recruitment was conducted at voluntary counseling and treatment centers adjacent to the research clinics or by peer recruiters at social venues such as night clubs, as described previously (37). Sociodemographic data were collected at enrollment. Mental health data were collected at enrollment or at a follow-up visit from December 2015 through November 2017. Men were eligible for the current analysis if they reported having had anal sex with a man in the past three months.

Measures

Neilands Sexual Stigma Scale. The Neilands sexual stigma scale consists of ten items (for example, "How often have you heard that homosexuals are not normal?" and "How often have you been hit or beaten up because you have sex with men?") with response choices of 'Never,' 'Once or twice,' 'A few times,' or 'Many times.' Neilands' exploratory factor analysis found two factors, perceived and enacted stigma, with one item (Item 3, "How often have you been made fun of or called names for being homosexual?") loading on both factors. This item was dropped from Neilands' final model (24).

Changes to Neilands Sexual Stigma Scale. The Neilands sexual stigma scale was adapted for use in the KEMRI-WTRP cohorts in preparation for a planned trial of an adherence support intervention for GBMSM living with HIV (71). Based on feedback from translators and study staff, the tag 'for being homosexual' was changed to 'because you have sex with men' on each item since many participants did not identify as gay or homosexual. An additional item, 'How often have you experienced police harassment because you have sex with men?' was added due to criminalization of same-sex sexual behavior in Kenya and was *a priori* expected to load on the enacted stigma factor. The Cronbach's alpha for this scale was 0.85 in a previous study among the KEMRI-WTRP cohorts, indicating good internal consistency between items (12).

Additional measures. Depressive symptoms were assessed using the Patient Health Questionnaire 9 (PHQ-9) depression module, which has been validated for use in Kiswahili in Kenya (72). Responses were revised from the PHQ-9 standard 'Not at all,' 'Several days,' 'More than half the days,' and 'Nearly every day' to 'Not at all,' 'A few days,' 'Several days,' and

‘Nearly all the days’ based on translator feedback. Summed responses from the nine items ranged from 0 to 27 (73). Previous studies of the KEMRI-WTRP cohorts found Cronbach’s alpha of 0.86 for the PHQ-9, indicating good internal consistency (12,68).

Alcohol use was assessed using the Alcohol Use Disorder Identification Test (AUDIT). Each statement was rated on a five-point scale ranging from ‘Never’ to ‘Daily or almost daily.’ Summed responses for the 10 items ranged from 0 to 40 (74). Previous studies of the KEMRI-WTRP cohorts found Cronbach’s alphas ranging from 0.87 to 0.88 for the AUDIT, indicating good internal consistency (12,68).

Other substance use was evaluated using the Drug Abuse Screening Test 10 (DAST-10). Participants either agreed or disagreed with each statement, and summed responses ranged from 0 to 10 (75). Commonly reported substances used included *khat* (an addictive stimulant typically chewed), marijuana, and pain medications (68). A Cronbach’s alpha of 0.78 was found in the KEMRI-WTRP cohorts for the DAST-10, indicating acceptable internal consistency (12).

Translations

Questionnaires were translated from English to Kiswahili by two staff members, then back translated by two different staff members fluent in both languages. To ensure equivalence in meaning, a committee of researchers and translators held a harmonization meeting where discrepancies were resolved by consensus. At the Nairobi site, questionnaires were additionally translated and back translated by a community-based research team including GBMSM to ensure wording would be understood by study participants.

Data collection

The sexual stigma items and other measures were asked at both the Nairobi and coastal Kenya locations using audio computer-assisted self-interview (ACASI) in English or Kiswahili. After completing the ACASI, participants debriefed with a counselor and were provided referrals for mental health services as needed.

Data Analysis

Descriptive statistics and Cronbach's alphas were calculated for the summed Neilands sexual stigma scale score overall and separately for each site. Spearman's rank-order correlation coefficients were calculated for correlations between the summed Neilands sexual stigma scores and the summed scores for the mental health and substance use variables (i.e., PHQ-9, AUDIT, DAST-10).

We divided participants into two groups using the random number generator, ensuring equal numbers from each site. For cross-validation, exploratory factor analysis (EFA) was performed on one subset of participants and validated using confirmatory factor analysis (CFA) on the remaining participants. Polychoric correlations were used as appropriate for ordinal Likert responses. We used oblique rotation for EFA and weighted least squares with adjustment for means and variances estimation for categorical variables (WLSMV) for CFA (76,77).

EFA factors were assessed using scree plots and factor loadings. Following standard guidelines, we considered loadings of 0.40 or greater for to be significant. Items with significant loadings on

multiple factors were considered cross-loaded. For differences between cross-loadings of 0.20 or more, we assigned the item to the factor where it loaded most strongly (78).

We used currently recommended model fit criteria to guide CFA model selection: root mean square error of approximation (lower is better), comparative-fit index (higher is better), standardized root mean squared residual (lower is better), and chi-square statistic (non-significance is better) (76). We tested both a one-factor and a two-factor model using all 11 items. To determine if results would have differed by site, we also conducted CFAs for each site separately, using all 11 items. Finally, post-hoc alterations were made on the model using the CFA sample, in order to improve model fit and reduce misspecification, as unmodeled measurement error can produced unpredictably biased results (76,79). Fit statistics from all CFA models were compared.

Structural equation modeling was used to calculate associations between the factors in the final sexual stigma model and the summed scores for depressive symptoms, alcohol use, and other substance use using the complete dataset. We compared those associations to associations calculated using the initial 11-item model before post-hoc alterations were made.

Descriptive statistics were calculated using Stata version 14.2 (StatCorp, College Station, TX, USA), while factor analyses and associations were conducted using MPlus version 8.4 (Muthen & Muthen, Los Angeles, CA, USA).

Results

From the two locations, 880 participants completed the questionnaire. Nine who did not fully answer the stigma items were excluded, for a total of 871 participants (550 participants from Nairobi and 321 from coastal Kenya). Descriptive statistics are shown in Table 5, which presents characteristics overall, for the EFA and CFA samples, and for each site. Participants' ages ranged from 18 to 64, with an average age of 27. Sixty-three percent (n=548) had completed secondary school or had some higher education. Among participants, 54% (n=466) reported engaging in transactional sex, and 30% (n=258) were HIV positive. Cronbach's alpha assessing internal consistency of the summed Neilands sexual stigma score was 0.86 overall, 0.88 in Nairobi, and 0.85 in coastal Kenya. The summed sexual stigma scale was weakly correlated with the mental health and substance use measures (PHQ-9, r_s=0.40; AUDIT, r_s=0.27, and DAST r_s=0.24).

Table 5. Descriptive statistics	Total N=871	EFA Sample N=435	CFA Sample N=436	Nairobi N=550	Coastal Kenya N=321
Site*					
Nairobi	550	275	275	550	-
Coastal Kenya	321	160	161	-	321
Age (mean, range)	27.1, 18–64	27.0, 18–55	27.1, 18–64	27.5, 18–64	26.4, 18–49
Married	59 (7%)	26 (6%)	33 (8%)	47 (9%)	12 (3%)
Religion					
Muslim	119 (14%)	70 (16%)	49 (11%)	50 (9%)	69 (22%)
Catholic	225 (26%)	108 (25%)	117 (27%)	142 (26%)	83 (26%)
Protestant	397 (46%)	204 (47%)	193 (44%)	307 (56%)	90 (28%)
None	91 (10%)	41 (9%)	50 (12%)	18 (3%)	73 (23%)
Other	39 (4%)	12 (3%)	27 (6%)	33 (6%)	4 (1%)
Education					
Less than primary to some secondary	323 (37%)	161 (37%)	162 (37%)	142 (26%)	179 (56%)
Completed secondary	289 (33%)	154 (36%)	135 (31%)	182 (33%)	107 (33%)
Some or completed higher education	259 (30%)	119 (27%)	140 (32%)	224 (41%)	35 (11%)
Transactional Sex	466 (54%)	241 (55%)	225 (51%)	383 (75%)	83 (42%)
Living with HIV	258 (30%)	141 (32%)	117 (27%)	226 (41%)	32 (11%)

*Sample distribution was restricted by site.

Table 6. Neilands sexual stigma scale items

Item	Question	Ever Experienced N (%)
1	How often have you heard that homosexuals are not normal?	701 (80.5)
2	How often have you felt that you hurt and embarrassed your family because you have sex with men?	479 (55.0)
3	How often have you been made fun of or called names because you have sex with men?	507 (58.2)
4	How often have you been hit or beaten up because you have sex with men?	211 (24.2)
5	How often have you had to pretend that you are not homosexual in order to be accepted?	622 (71.4)
6	How often has your family not accepted you because you have sex with men?	274 (31.5)
7	How often have you lost your friends because you have sex with men?	453 (52.0)
8	How often have you been kicked out of school because you have sex with men?	130 (14.9)
9	How often have you lost a place to live because you have sex with men?	315 (36.2)
10	How often have you lost a job or career opportunity because you have sex with men?	245 (28.1)
11	How often have you experienced police harassment because you have sex with men?	269 (30.9)

*Response choices: ‘Never,’ ‘Once or twice,’ ‘A few times,’ or ‘Many times.’

Exploratory Factor Analysis

The percent of respondents who reported experiencing each item are shown in Table 6. Among the 435 participants included in the EFA sample, the screeplot indicated a one- or two-factor solution, with an Eigenvalue of 1.1 for two factors (Figure 1). Using two-factors, three items (1, 2, and 5) loaded on the perceived stigma factor and five items (4, 8, 9, 10, and 11), including the new item on police harassment, loaded on the enacted stigma factor (Table 7).

Three items (item 3, “How often have you been made fun of or called names because you have sex with men,” item 6, “How often has your family not accepted you because you have sex with men?” and item 7 “How often have you lost your friends because you have sex with men?”) had loadings of more than 0.40 on both factors. The difference between loadings was 0.20 or more for all three items (item 3 difference=0.23, item 6 difference=0.20, item 7 difference=0.21, Table 3). All three loaded more strongly on the enacted stigma factor. The final hypothesized model is depicted in Figure 2.

Figure 1. Exploratory factor analysis scree plot of the sexual stigma scale, n=435

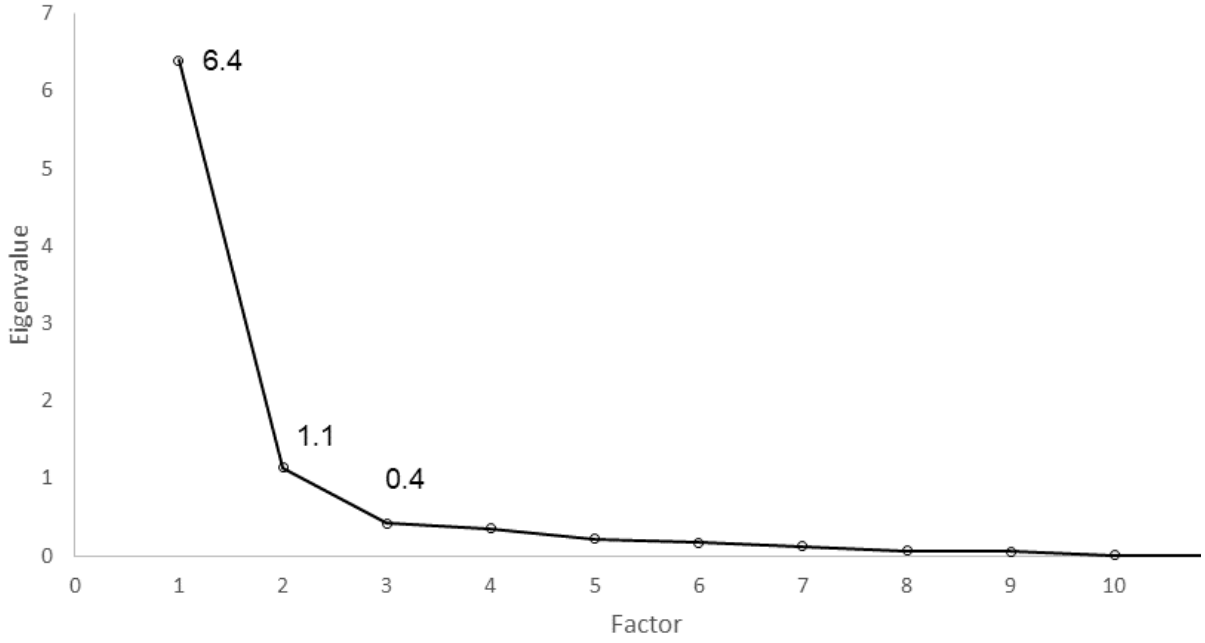
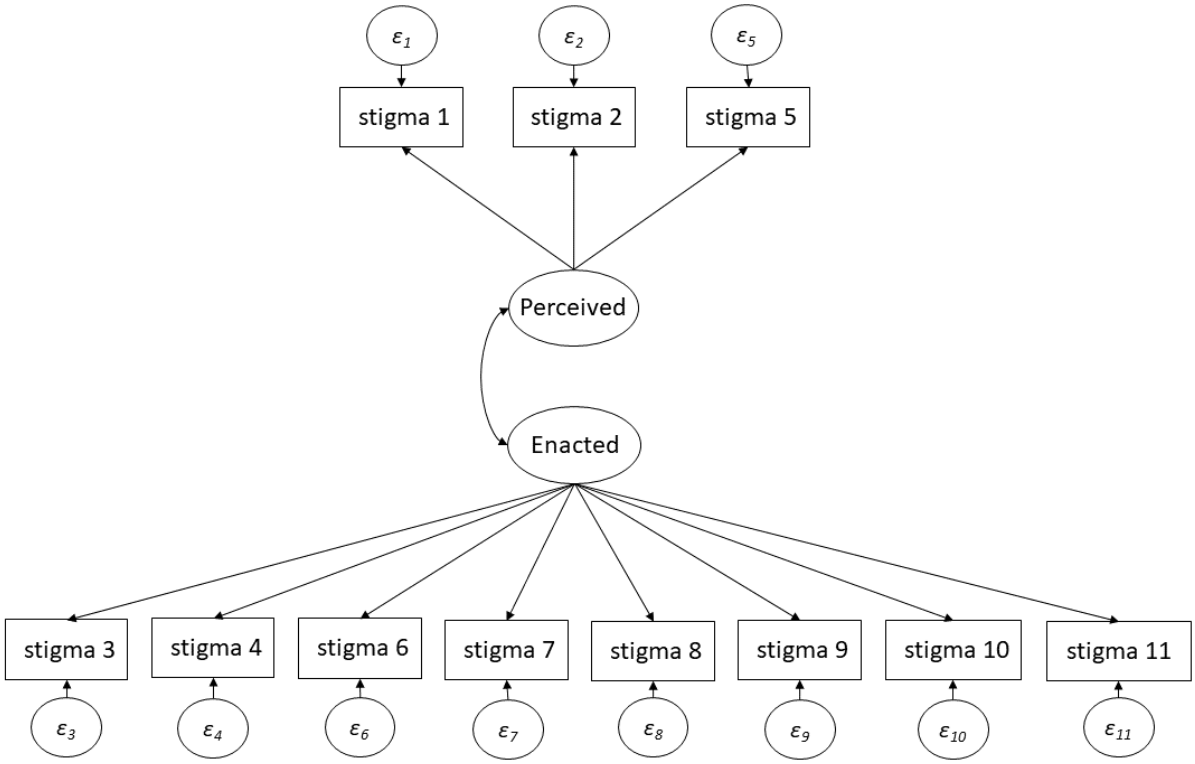


Table 7. Factor loadings for the Neilands sexual stigma scale, n=435

Item	Factor Loading	
	Perceived Stigma	**Enacted Stigma**
1. How often have you heard that homosexuals are not normal?	0.64	0.17
2. How often have you felt that you hurt and embarrassed your family because you have sex with men?	0.67	0.38
3. How often have you been made fun of or called names because you have sex with men?	0.48	0.71
4. How often have you been hit or beaten up because you have sex with men?	0.21	0.80
5. How often have you had to pretend that you are not homosexual in order to be accepted?	0.63	0.06
6. How often has your family not accepted you because you have sex with men?	0.50	0.70
7. How often have you lost your friends because you have sex with men?	0.50	0.71
8. How often have you been kicked out of school for being homosexual?	0.07	0.84
9. How often have you lost a place to live because you have sex with men?	0.22	0.84
10. How often have you lost a job or career opportunity because you have sex with men?	0.19	0.84
11. How often have you experienced police harassment because you have sex with men?	0.25	0.76

Figure 2. Hypothesized sexual stigma scale



Confirmatory Factor Analysis

A two-factor CFA was conducted using the random sample of 436 participants not included in the EFA. Items cross-loading on both factors were included on the enacted stigma factor, where they loaded most strongly. Fit statistics for the initial two-factor model indicated an acceptable fit for all measures except the chi-squared, which was significant at $p<0.01$, indicating a poor fit. A one-factor CFA conducted on the same sample indicated a similar fit to the two-factor model, while site-specific two-factor CFAs had similar fit to that of the two-factor CFA using the randomly selected CFA sample. Table 4 presents fit statistics for these models. Cronbach's alpha for the CFA sample was 0.58 for the perceived factor, indicating questionable internal consistency, and 0.88 for the enacted factor, indicating good internal consistency.

Model re-specification

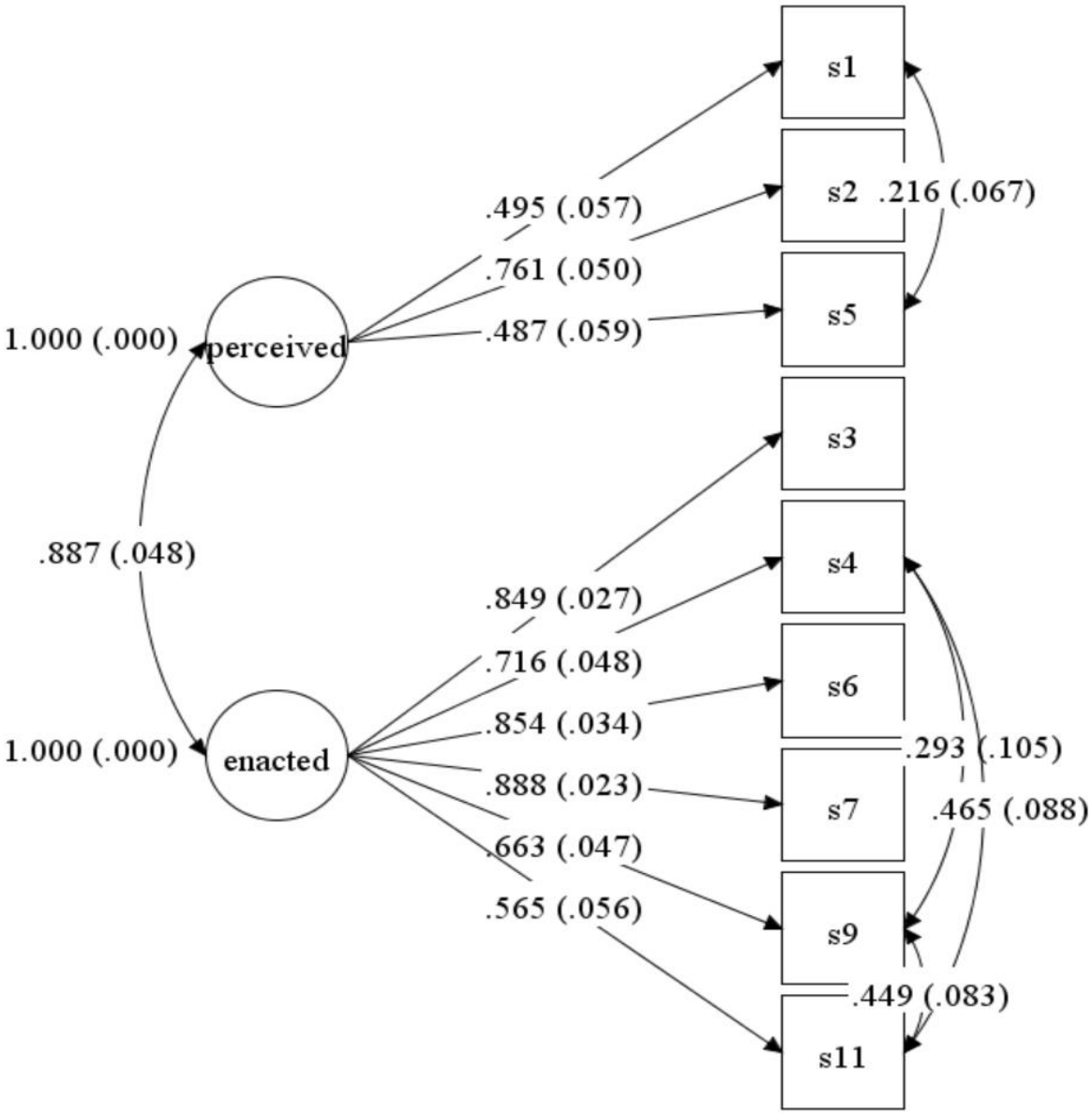
To improve model fit, we considered cross-loading and modification indices indicating high residual correlation to identify changes in the model. Item 3 cross-loaded on both factors, so was removed and the fit statistics re-run. This change produced a chi-squared of 136.7 (df 32), $p<0.01$. The other two cross-loaded items (item 6 and item 7), which also had the highest modification indices, were subsequently removed to further improve model fit. After adding error correlation, the final 8- item model had a chi-squared value of 26.5 with 17 df, $p=0.07$ and good fit on the other indices (Table 8, Figure 3).

Table 8. Model fit statistics for the Neilands sexual stigma scale

	CFA Sample			Nairobi	Coastal Kenya
	One factor 11-item model	Two factor 11-item model	Two factor 8-item model*	Two factor 11-item model	Two factor 11-item model
Chi-squared (df) p-value	240.9 (44) p<0.01	209.7 (43) p<0.01	26.5 (17) p=0.07	246.0 (43) p<0.01	158.4 (43) p<0.01
Root mean square error of approximation (RMSEA)	0.10	0.09	0.04	0.10	0.09
Comparative-fit index (CFI)	0.95	0.96	0.996	0.97	0.96
Standardized root mean squared residual (SRMR)	0.07	0.06	0.03	0.06	0.07

* Items and item correlations show in Figure 3.

Figure 3. Final sexual stigma scale with standardized loadings



Construct Validity Associations

Eleven participants who did not answer one or more items on the PHQ-9, AUDIT, or DAST-10 were excluded from the construct validity analysis, leaving 860 participants. For the final 8-item model, perceived stigma was associated with PHQ-9 score (beta=0.34, 95% CI 0.24, 0.45), alcohol use (beta=0.14, 95% CI 0.03, 0.25), and other substance use (beta=0.19, 95% CI 0.07, 0.31), while enacted stigma was associated with AUDIT score (beta=0.17, 95% CI 0.06, 0.27 (Table 9). Using the initial 11-item model, perceived stigma was associated with PHQ-9 score (beta=0.35, 95% CI 0.20, 0.51), and enacted stigma was associated with AUDIT score (beta=0.21, 95% CI 0.07, 0.33).

Table 9. Association of the perceived and enacted factors of the Neilands sexual stigma scale with depressive symptoms (PHQ-9), alcohol use (AUDIT), and other substance use (DAST-10), comparing the final 8-item model and initial 11-item model, n=860.

β (95% CI)	PHQ-9	AUDIT	DAST-10
Final 8-item model			
Perceived stigma	0.34 (0.24, 0.45)	0.14 (0.03, 0.25)	0.19 (0.07, 0.31)
Enacted stigma	0.10 (-0.01, 0.20)	0.17 (0.06, 0.27)	0.10 (-0.01, 0.21)
Initial 11-item model			
Perceived stigma	0.35 (0.20, 0.51)	0.09 (-0.07, 0.24)	0.17 (-0.01, 0.34)
Enacted stigma	0.07 (-0.08, 0.22)	0.21 (0.07, 0.33)	0.11 (-0.05, 0.26)

Discussion

These results provide validation of an adapted version of the Neilands sexual stigma scale with perceived and enacted stigma measures tailored for use with Kenyan GBMSM. Reliability, or internal consistency, of the summed sexual stigma scale was good both overall and at each research site. Exploratory analysis revealed a two-factor structure, while confirmatory analysis showed that using all items resulted in suboptimal model fit. Post-hoc analysis, in which three enacted stigma items which cross-loaded on both factors were removed and correlated errors added, produced a better fitting model. Construct validity analysis demonstrated associations between perceived stigma and PHQ-9, AUDIT, and DAST-10 scores, and between enacted stigma and AUDIT score, further supporting the validity of the scale.

Perceived stigma relates to one's beliefs about others' opinions. Items representing the perceived stigma factor asked about opinions held by others (i.e., item 1, "How often have you heard that homosexuals are not normal?"), one's actions based on those opinions (i.e., item 5, "How often have you had to pretend that you are not homosexual in order to be accepted?"), and other's reactions based on their opinions, (i.e., item 2, "How often have you felt that you hurt and embarrassed your family because you have sex with men?"). The perceived stigma factor, which contained only three items, had poor reliability. More items addressing community opinions about GBMSM and reactions to those opinions should be tested in order to increase the comprehensiveness of this factor. For example, Logie and Earnshaw (80) added two items to their perceived stigma scale for sexual minority women: "How often have you heard that lesbian, bisexual and queer women grow old alone?" and "How often have you felt you had to stop associating with your family because you are lesbian, queer or bisexual?" Adding items such as

these to the Neilands sexual stigma scale may better represent the concept of perceived stigma among GBMSM as well, making this factor more stable and distinct from the enacted stigma factor.

Enacted stigma relates to actions of others. Items loading on this factor measured experiences of violence, discrimination, and loss of opportunity. Individuals endorsing these items may have a greater need for assistance and support. In coastal Kenya, 67% of GBMSM had experienced emotional, physical, or sexual abuse in the previous year, demonstrating the vulnerability of this population (25). Disclosure of sexual orientation is particularly fraught and has been associated with blackmail and abuse in other rights-constrained African settings (7,81). While structural- and community-level interventions are needed to address stigma and discrimination (82,83), individual-level interventions, such as learning about resilience from positive outliers, can help support GBMSM who have experienced enacted stigma (84).

In our analysis, three items loaded significantly on both the perceived and the enacted factors. These items, (3, 6, and 7) all represent perceptions of other's actions and were dropped from our final model. Similarly, item 3 cross-loaded in Neilands' initial factor analysis and was subsequently dropped (24). Our changes to the model, including the addition of correlated error, resulted in a chi-squared test statistic indicating a good model fit. Using the chi-squared statistic to assess model fit has limitations, as the statistic is sensitive to sample size, and larger samples decrease the chi-squared p-value (76). However, since poor model fit likely indicates misspecification, and misspecified models can be unpredictably biased, the conservative option is to adjust the model to improve chi-square fit (76).

Our analysis of construct validity looked at associations between each factor and both mental health and substance use outcomes, comparing the final 8-item model and the initial 11-item model. The enacted sexual stigma factor was associated with only alcohol use in both the initial and final model. This supports the conclusion that the enacted stigma factor is a good representation of its construct. However, the perceived stigma factor was less consistent. There was an association between perceived stigma and depressive symptoms using both models. For alcohol use and other substance use, the association point estimates (betas) were similar, but the associations were statistically significant in the final model only. This indicates that the perceived stigma factor is less stable, a conclusion also reached by Tucker et al., who found insufficient reliability in the perceived stigma scale (85).

This study had several limitations. First, while perceived and enacted sexual stigma were both measured, internalized sexual stigma was not. Internalized sexual stigma, or internalized homophobia, is a personalized endorsement of negative beliefs against GBMSM and has been associated with numerous negative mental health outcomes (86). Not including this factor in the analysis may have overestimated the effects of the perceived and enacted stigma factors. Second, many participants experience additional stigmas from sources not measured here, such as HIV status or sex work, and stigmatizing experiences attributed by the participant to their other identities may underestimate the effects of sexual stigma (14). Third, we did not measure "outness" in this study, and GBMSM who are more out to society may experience more enacted stigma compared to those who are not yet out. It is possible that outness could be considered as a potential confounder or modifier of the association between sexual stigma and health outcomes

(87). Fourth, participants were volunteers who were engaged in HIV care and prevention services targeting GBMSM, including those who sell sex, and are not representative of all GBMSM in Kenya. Finally, cross-sectional data were used, so the causal directionality of associations cannot be determined.

Despite these limitations, our study has several strengths. First, this is one of the few studies in sub-Saharan Africa to look at two types of sexual stigma, both perceived and enacted. Second, the study had a relatively large sample size that included a diverse population of GBMSM from Nairobi, the capital and largest city of Kenya, and from smaller communities in coastal Kenya north of Mombasa, Kenya's second largest city. Third, collaboration fostered by the Kenya MSM Health Research Consortium (msmhealthresearch.org) allowed inclusion of the same item wording in cohort studies in two locations, allowing for a more comprehensive view of sexual stigma among GBMSM in Kenya.

Conclusions

Sexual stigma is commonly reported among GBMSM in Kenya, and can result in a substantial burden of physical, mental, and emotional abuse. Our exploratory factor analysis of the Neilands sexual stigma scale as modified for use in Kenya produced two factors: perceived and enacted sexual stigma. Confirmatory factor analysis corroborated two distinct factors, and three cross-loading items were dropped from the enacted factor to improve fit. Enacted and perceived stigma were associated with important measures of health: perceived stigma with depressive symptoms, alcohol use, and other substance use and enacted stigma with alcohol use. The enacted stigma factor showed more stability than the perceived factor when looking at associations using the initial and final model. Overall, the Neilands sexual stigma scale is a valid measure of sexual stigma among Kenyan GBMSM.

Declarations

Abbreviations

ACASI: Audio computer-assisted self-interview

AUDIT: Alcohol Use Disorder Identification Test

CFA: Confirmatory factor analysis

CFI: Comparative-fit index

DAST: Drug Abuse Screening Test 10

EFA: Exploratory factor analysis

GBMSM**:** Gay, bisexual, and other men who have sex with men

HIV: Human immunodeficiency virus

HOYMAS: Health Options for Young Men on HIV/AIDS and STIs

KEMRI-WTRP: Kenya Medical Research Institute-Wellcome Trust Research Programme

MSM: Men who have sex with men

NASCOP: National AIDS and STI Control Programme (Kenya)

PHDA: Partners for Health and Development in Africa

PHQ-9: Patient Health Questionnaire 9

RMSEA: Root mean square error of approximation

SRMR: Standardized root mean squared residual

UNAIDS: Joint United Nations Progamme on HIV/AIDS

WHO: World Health Organization

WLSMV: Weighted least squares with adjustment for means and variances estimation for categorical variables

Ethics approval and consent to participate

The parent studies that collected the information analyzed here obtained written informed consent from all participants. This analysis was approved by the University of Washington Institutional Review Board.

Consent for publication

The authors provide consent for publication.

Availability of data and material

Data and data dictionary is available through public access on-line repository at https://dataverse.harvard.edu/dataverse/kwtrp.

Competing interests

The authors declare they have no competing interests.

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Authors' contributions

EJS, EW, RRL, MD, PM, HM, PB, JK, JM and SMG designed the parent studies and oversaw data collection. SMG, CJK, and BPF designed the analysis. CJK conducted the analysis and wrote the first draft of the manuscript. SMG, BPF, ES, MD, CJK, and RRL contributed to the interpretation of the results. All authors reviewed subsequent versions of the manuscript and approved the final version for submission.

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Disclaimer: The views expressed in this publication are those of the authors only.

Chapter 4: HIV behavioral vulnerability and depressive symptom scores among GBMSM in Kenya

HIV behavioral vulnerability and depressive symptom score among GBMSM in Kenya

Introduction

In addition to pre-exposure prophylaxis (PrEP), HIV prevention strategies for gay, bisexual, and other men who have sex with men (GBMSM) rely heavily on reducing HIV vulnerability through encouraging condom use. The effectiveness of these behavioral interventions is heavily influenced by external and internal factors including substance use and experiences of depressive symptoms. Depression is of particular concern considering the high prevalence of depression among GBMSM (88).

Studies addressing the association between depression and HIV behavioral vulnerability such as condomless sex have shown inconsistent results. While several studies have observed an increase of condomless sex among GBMSM with depression, other studies found no such association (89). A potential explanation for these inconsistent findings is that the relationship between depression and HIV behavioral vulnerability may not be linear, but instead be a non-linear quadratic or otherwise curvilinear association (90,91). Researchers have hypothesized that individuals with moderate levels of depression may be the least likely to use condoms. Individuals with no or low levels of depression may be better able to use condoms, while those with the highest levels of depression may engage in less sex overall.

The current analysis evaluates associations between depressive symptoms and several behavioral vulnerabilities, including partner numbers and condomless sex, among GBMSM participating in a research cohort in Coastal Kenya, in an effort to better understand these associations. To analyze this hypothesis, it was separated into two parts: 1) the odds of engagement in sexual

intercourse will decrease with increased depressive symptoms and 2) the odds of condomless sex will increase with increased depressive symptoms.

Methods

Study setting and participants

Participants were members of two ongoing prospective cohort studies among adults living with and without and HIV at the Kenya Medical Research Institute-Wellcome Trust Research Programme (KEMRI-WTRP) in Mtwapa (12,70). The initial study started in 2005 (37), and annual mental health assessments started in 2015, after a pilot study in 2014 (12). Recruitment was conducted at voluntary counseling and treatment centers adjacent to the research clinics or by peer recruiters at social venues. Adults 18 years of age and over were eligible for enrollment if they reported any of the following criteria: transactional sex work, recent STI, multiple sexual partners, anal sex, or sex with a partner living with HIV in the previous 3 months. The current study is of GBMSM participants only, defined as men who reported having had anal sex with another man at any point during the follow-up. Only men with at least one mental health assessment were included. Study staff obtained written informed consent from all participants, and research protocols were approved by the Kenya Medical Research Institute (KEMRI) Ethical Review Board and the University of Washington Institutional Review Board.

Data collection

Mental health data were from the first visit on which these data were collected (i.e., first visit on or after December 2015 or upon enrollment if at a later date). Participants in the cohort living without HIV who reported receptive anal intercourse were followed monthly. All others were

followed quarterly. Demographic data were collected at enrollment. Physical exam and behavioral information were collected at enrollment and follow-up visits. Data on sexual behavior were from the next study visit, 1 week to 4 months after the initial visit, to ensure that stigma exposures preceded behavioral outcomes.

Data were collected using audio computer-assisted self-interview (ACASI) in English or Kiswahili. This data collection method is well-suited for sensitive topics such as HIV status, substance use, and sexual behaviors (92). After completing the ACASI, participants debriefed with a counselor and were provided referrals for mental health services as needed.

Measures

Depressive symptoms. Depressive symptoms were assessed using the Patient Health Questionnaire 9 (PHQ-9) depression module, which has been validated for use in Kiswahili in Kenya (72). Responses were revised from the PHQ-9 standard 'Not at all,' 'Several days,' 'More than half the days,' and 'Nearly every day' to 'Not at all,' 'A few days,' 'Several days,' and 'Nearly all the days,' based on and feedback from research team members fluent in Kiswahili during the translation process (68). Responses to the PHQ-9 were summed to form a PHQ-9 score, ranging from 0 to 27. Previous studies of the KEMRI-WTRP cohorts have found a Cronbach's alpha for the PHQ-9 score of 0.86, indicating good internal consistency (12,68).

Sexual behavior. Five self-reported sexual behavior outcomes were used in this analysis, as described below.

1. Any reported sex in the past week, regardless of partner, based on the question, "Have you had sex in past week?"

2. Number of male sex partners in the past month based on the questions, “In the past month, with how many different people, including your spouse, have you had sex?” and “How many of your sex partners were male?”
3. Number of condomless sex acts with regular partner(s) in the past week, calculated by subtracting “How many times did you have sex using a condom with your regular partner(s)?” from “How many times did you have sex with your regular partner(s)?”
4. Condomless receptive anal intercourse (RAI) in the past week, determined from the questions “In the past week, how many times have you done receptive anal intercourse (bottom)?” and “In the last week, how often do you use condoms for receptive anal sex/going bottom?” Participants reporting ‘Never’, ‘Sometimes’, or ‘Frequently’ using condoms were considered as having condomless RAI.
5. Condomless insertive anal intercourse (IAI) in the past week, determined from the questions, “In the last week, how many times have you done insertive anal intercourse (top) with a man?” and “In the last week, how often did you use condoms for insertive anal sex/going top?” Results were dichotomized as for RAI.

Data analysis

For this analysis, the mental health visit when the PHQ-9 was first assessed was considered the baseline visit. Future PHQ-9 assessments were not included in this study. Outcomes were assessed for visits within four months of the mental health visit. The four-month cut off was used to maintain relevance to baseline PHQ-9 score. Generalized estimation equations (GEE) with exchangeable correlation was conducted. Binomial distribution with logit link was used for binary outcomes and Poisson distribution with log link was used for the count outcomes.

The primary predictor, PHQ-9 score, was modeled in two different ways to assess associations with each outcome. Model 1 used the depressive symptom score as a continuous variable. Model 2 included both the continuous depressive symptom score and the depressive symptom score squared to allow for a non-linear quadratic association between depressive symptoms and each outcome. A joint F-test was performed for non-linear models to determine statistical significance and p-values reported. The quasi-likelihood under the independence model criterion (QIC) was used to determine the better fitting model, based on the lowest QIC score, with a difference of more than 10 points between two models' scores considered meaningful.

Engagement in transactional sex and HIV status, collected at baseline, were included in all models as confounders. Analyses were performed using STATA v.14.2 statistical software.

Results

In the study period, 306 participants completed the PHQ-9 questionnaire and provided information on sexual behavior outcomes (Table 9). Participants had a maximum of five follow-up visits within the included timeframe (median visits 3, interquartile range 2–5). The average age of participants was 26 (range 18 to 61), 12% (36) were living with HIV, and 46% (141) reported engaging in sex work. Participants had the full range of PHQ-9 scores, from 0 to 27, with an average score of 9.1 (SD 6.1). The number of participants differed for each outcome as questions covered different time periods and participants who did not report having sex were excluded from questions regarding condom use. There were five outcomes in this analysis: any sex in past week (n=306), number of male partners in past month (n=306), number of condo(mless sex acts with regular partner(s) in past week (n=206), condomless receptive anal intercourse in past week (n=171), and condomless insertive anal intercourse in past week (n=153).

Any sex in past week

No association was found between *Any sex in past week* and PHQ-9 score in either model. The QIC indicated neither model was a better fit (Figure 4, Table 10).

Number of male partners

No association was found between *Number of male partners* and PHQ-9 score in either model. The QIC score indicated a better fit using the non-linear model (Figure 5).

Number of condomless sex acts with regular partner(s)

For the outcome *Number of condomless sex acts with regular partner(s)*, there were 206 responses. No association was found between *Number of condomless sex acts with regular partner(s)* and PHQ-9 score. The QIC indicated neither model was a better fit (Figure 6)

Condomless receptive anal intercourse

For the outcome *Condomless receptive anal intercourse*, there were 171 responses. A positive association was found between condomless RAI and PHQ-9 score for the linear model only, with the probability of RAI increasing as PHQ-9 score increased. The QIC indicated neither model was a better fit (Figure 7).

Condomless insertive anal intercourse

For the outcome *Condomless insertive anal intercourse*, there were 153 responses. Both the linear and non-linear models showed a positive association between PHQ-9 and condomless IAI, with the probability of IAI increasing as PHQ-9 score increased. The QIC indicated neither model was a better fit.

Discussion

The hypothesis for this study is that depressive symptoms would have a non-linear association with behavior. I hypothesized that those who are least depressed would be most likely to use condoms while those who are most depressed would be least likely to have sex. To analyze this hypothesis, it was separated into two parts: 1) the odds of engagement in sexual intercourse will decrease with higher PHQ-9 scores and 2) the odds of condomless sex will increase with higher PHQ- scores.

No association was found between depressive symptoms and engagement in sex. While the graph of the linear model shows a decrease in *Any sex* as PHQ-9 scores increase, the graph of the non-linear model shows the opposite. The margin of error is especially wide in the higher PHQ-9 scores, indicating the smaller number of participants reporting these higher levels. While it was controlled for in the models, the high proportion of men engaging in sex work (46%) possibly contributed to this result, as choosing to not engage in sex may not have been an option for them due to financial constraints.

For the second part of the hypothesis, I found condomless sex increase as depressive symptoms increased for both condomless IAI and condomless RAI, supporting the hypothesis. *Number of condomless sex acts with regular partner(s)* did not increase with depressive symptoms, so type of partner likely played a role in this association. In a sensitivity analysis looking only at participants reporting engagement in sex work (n=102), depressive symptoms remained significantly associated with condomless IAI but not condomless RAI.

Looking at model fit, the differences between the models were slight for most outcomes. Only *Number of male partners* showed a better fit using the non-linear model, although no association was found for this outcome with depressive symptoms.

There are several limitations to these findings. First, data on sexual behavior is self-reported, and may be subject to social desirability bias. Second, since depressive symptoms were only reported at baseline, they may not be a good representation of depressive state at visits up to four months later. Third, since there were multiple outcomes in this analysis, issues of multiple testing arise. To counteract this, the p-value of significance can be lowered. Using a p-value significance cut-off of 0.01 retains all associations. Fourth, mediators such as condom use self-efficacy and alcohol use were not included in these models.

Conclusion

Following previous research, this study found no association between depressive symptoms and engagement in sex. However, it did find positive associations between depressive symptoms and *Condomless receptive anal intercourse* and *Condomless insertive anal intercourse*. Depression is common among GBMSM in Kenya, and among GBMSM engaging in sex work, and should be addressed to improve health and wellbeing. Factors contributing to higher-risk sexual behaviors are complex. Addressing depression may have a small but positive impact on condom use.

Table 10. Descriptive statistics at baseline visit, N = 306

Age (mean, range)	26.6, 18–61
Never married	265 (87%)
Completed primary school	253 (83%)
Religion	
Muslim	71 (23%)
Catholic	75 (25%)
Protestant	85 (27%)
Other/None	75 (25%)
Engaged in transactional sex	141 (46%)
HIV positive	36 (12%)
PHQ-9 score (mean, SD)	9.1, 6.1
Depressive symptoms group	
Minimal (0–4)	57 (19%)
Mild (5–9)	103 (34%)
Moderate (10–14)	72 (23%)
Moderately severe (15–19)	48 (16%)
Severe (20–27)	26 (8%)

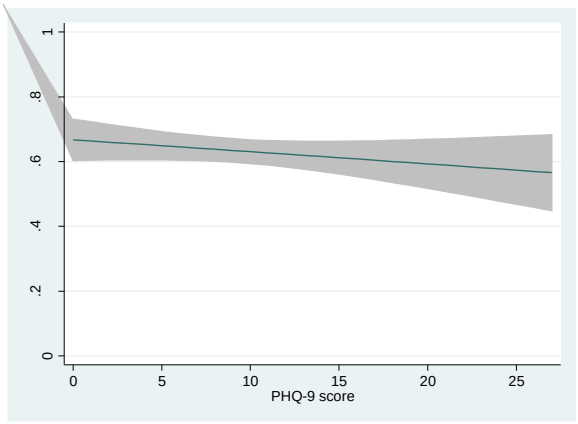
Table 11. Quasi-likelihood under the independence model criterion (QIC) for the association between PHQ-9 score as a linear or quadratic term and each outcome in longitudinal analysis

Outcome	PHQ-9 score Coefficient, (95% CI)	p-value*	QIC
Any sex in past week (N=306)			
Model with linear PHQ-9 term			
PHQ-9	-0.17 (-0.05, 0.01)	0.22	1072.6
Model with quadratic PHQ-9 term			
PHQ-9	0.04 (-0.05, 0.12)	0.20	1073.3
$PHQ\text{-}9^2$	-0.01 (-0.01, 0.01)		
Number of male partners (N=306)			
Model with linear PHQ-9 term			
PHQ-9	-0.01 (-0.04, 0.01)	0.31	3162.5
Model with quadratic PHQ-9 term			
PHQ-9	-0.01 (-0.09, 0.09)	0.36	3177.4
$PHQ\text{-}9^2$	-0.01 (-0.01, 0.01)		
Number condomless sex acts with regular partner(s) (N=206)			
Model with linear PHQ-9 term			
PHQ-9	0.01 (-0.03, 0.03)	0.23	513.7
Model with quadratic PHQ-9 term			
PHQ-9	0.07 (-0.06, 0.21)	0.24	523.0
$PHQ\text{-}9^2$	-0.01 (-0.01, 0.01)		
Condomless receptive anal intercourse (N=171)			
Model with linear PHQ-9 term			
PHQ-9	0.05 (0.01, 0.09)	**0.01**	453.6
Model with quadratic PHQ-9 term			
PHQ-9	0.08 (-0.07, 0.22)	0.13	457.2
$PHQ\text{-}9^2$	-0.01 (-0.01, 0.01)		
Condomless insertive anal intercourse (N=153)			
Model with linear PHQ-9 term			
PHQ-9	0.08 (0.03 0.13)	**0.01**	330.9
Model with quadratic PHQ-9 term			
PHQ-9	0.05 (-0.09, 0.20)	**0.01**	332.5
$PHQ\text{-}9^2$	0.01 (-0.01, 0.01)		

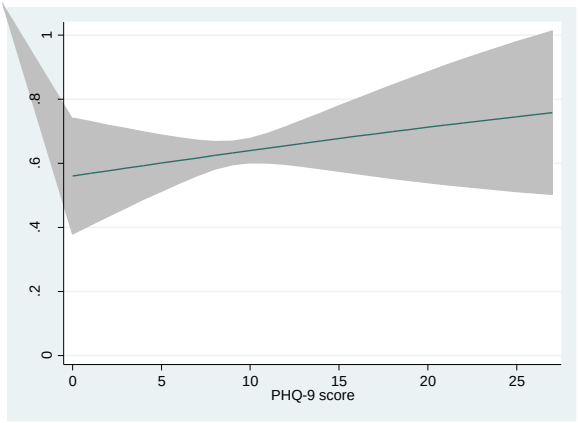
All models adjusted for engagement in transactional sex and HIV status

* For models with quadratic terms, the joint F-test p-value is show

Figure 4. Predicted probability of any sex in past week by PHQ-9 score, n=306

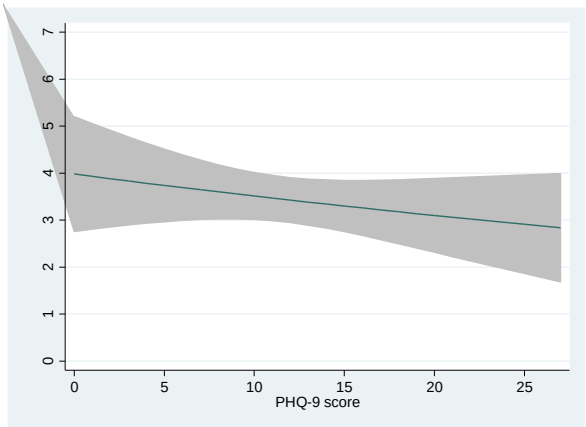


Model 1. Linear PHQ-9 term

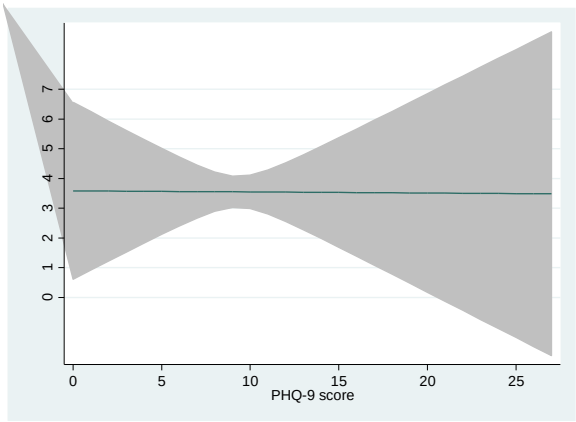


Model 2. Linear and quadratic PHQ-9 terms

Figure 5. Predicted average number of male partners by PHQ-9 score, n=306

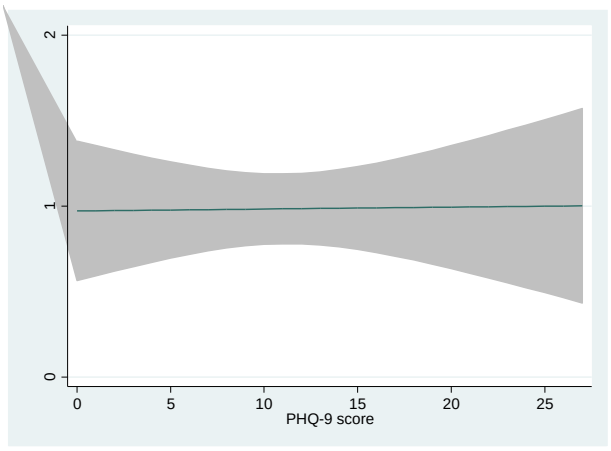


Model 1. Linear PHQ-9 term

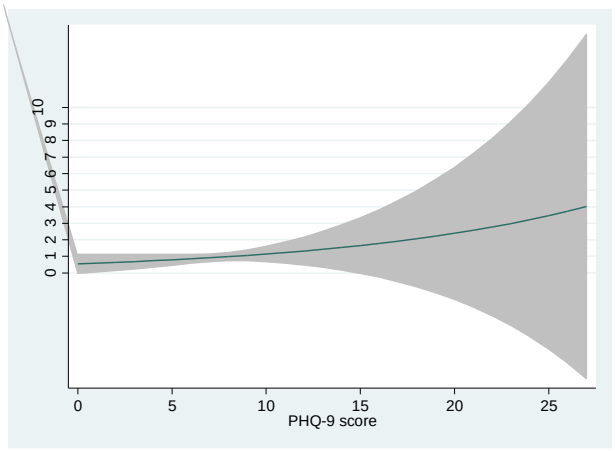


Model 2. Linear and quadratic PHQ-9 terms

Figure 6. Predicted average number of condomless sex acts with primary partner(s) by PHQ-9 score, n=206

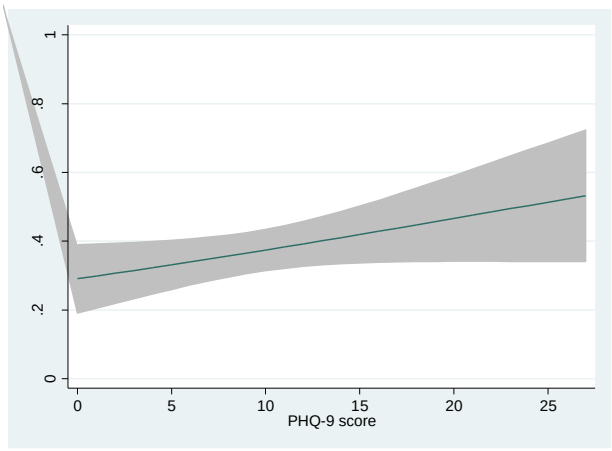


Model 1. Linear PHQ-9 term

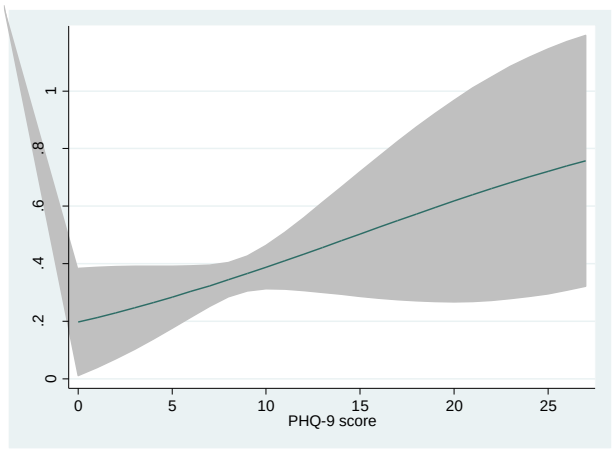


Model 2. Linear and quadratic PHQ-9 terms

Figure 7. Predicted probability of any condomless receptive anal intercourse by PHQ-9 score, n=171

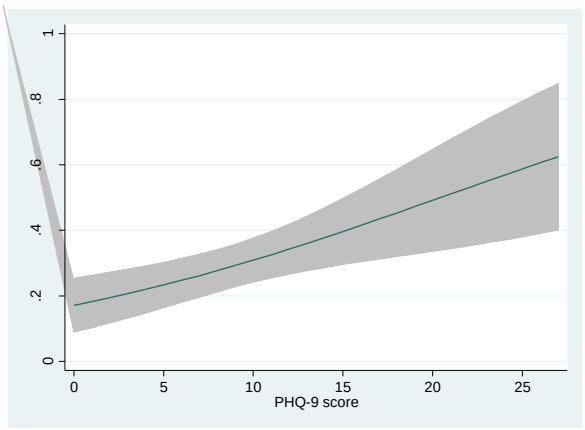


Model 1. Linear PHQ-9 term

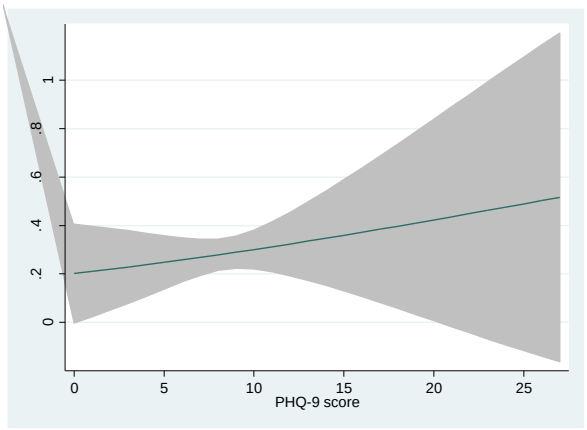


Model 2. Linear and quadratic PHQ-9 terms

Figure 8. Predicted probability of any condomless insertive anal intercourse by PHQ-9 score, n=153



Model 1. Linear PHQ-9 term



Model 2. Quadratic PHQ-9 terms

Chapter 5. Enacted sexual stigma is directly associated with sex partner numbers and condom use among gay, bisexual, and other men who have sex with men in Kenya

Enacted sexual stigma is directly associated with sex partner numbers and condom use among gay, bisexual, and other men who have sex with men in Kenya

Introduction

HIV disproportionately affects gay, bisexual, and other men who have sex with men (GBMSM) (1). In countries such as Kenya, where same-sex sexual practices are criminalized, there is widespread discrimination against GBMSM in personal, community, and healthcare settings. Kenyan GBMSM report high levels of family rejection and community- and police-based violence (93). GBMSM also experience stigma and discrimination in healthcare settings, which can reduce healthcare-seeking behaviors and uptake of HIV prevention methods including routine HIV testing and care (9,94,95).

Sexual stigma includes both the social and structural devaluation of sexual minorities (14,96). Pervasive discrimination and experiences of anti-GBMSM stigma can have long-lasting effects, many of which may increase vulnerability to HIV (8,55). The association between sexual stigma and sexual behaviors among GBMSM has been well established in the U.S. (86,97). Experiences or perceptions of sexual stigma have been associated with increased partner numbers, decreased condom use, and reduced uptake of and adherence to pre-exposure prophylaxis (26,85,98,99). Sexual stigma can also affect mental health, by increasing depressive symptoms and alcohol use, which have also been associated with HIV behavioral vulnerability (26,85).

However, not all stigma is the same. Stigma can be divided into at least two types: perceived stigma, or fear of negative attitudes; and enacted stigma, or experiences of violence or

discrimination. Experiences of each form of stigma differ among individuals and can be expected to have different effects on behavior. In addition, sexual stigma has been less well studied in sub-Saharan Africa. A better understanding is needed of the types of sexual stigma experienced by GBMSM in Kenya, and the contribution of these stigmas to behaviors that increase vulnerability to HIV.

The objective of this analysis is to evaluate associations between perceived and enacted sexual stigma and sexual behaviors including number of male sexual partners and condom use among GBMSM participating in two research cohorts in Coastal Kenya. In addition, we tested possible mediation effects from risk of disordered alcohol use and depressive symptoms within these associations.

Methods

Study setting and participants. This analysis used data from two cohort studies for people living with and without HIV at the Kenya Medical Research Institute-Wellcome Trust Research Programme (KEMRI-WTRP) in Mtwapa, a small town on the Kenyan coast 15 kilometers north of Mombasa (12,70). Recruitment was conducted by peer recruiters at social venues or at voluntary counseling and treatment centers adjacent to the research clinics starting in 2005 (37). Participants were at least 18 years of age and reported having had anal intercourse with a man in the past three months.

Ethical oversight. Written informed consent was obtained from all participants in accordance with the relevant guidelines and regulations. Data collection was approved by the ethical review

boards of the Kenya Medical Research Institute and the University of Washington. This analysis was approved by the University of Washington Institutional Review Board.

Study procedures. Sociodemographic data were collected at enrollment. Mental health data were from the first visit on which these data were collected (i.e., first visit on or after December 2015 or upon enrollment if at a later date) and annually during follow-up between December 2015 through November 2017. Data on sexual behavior were from the next study visit, 1 week to 4 months after the initial visit, to ensure that stigma exposures preceded behavioral outcomes. Questions were asked using audio computer-assisted self-interview (ACASI) in English or Kiswahili, as appropriate for sensitive topics such as sexual behaviors (92). Participants debriefed with a counselor after completing the ACASI and were provided referrals to mental health and substance use services as needed. HIV treatment and prevention services, and screening and treatment for sexually transmitted infections were available to all participants if indicated.

Sexual stigma. Sexual stigma was measured using a modified Neilands sexual stigma scale for use in this population, as described previously (93). The Neilands scale consists of ten items (for example, “How often have you heard that homosexuals are not normal?”) with response choices of ‘Never,’ ‘Once or twice,’ ‘A few times,’ or ‘Many times’ (24). The adapted scale used seven of the original 10 items, and added one item, ‘How often have you experienced police harassment because you have sex with men?’ Perceived and enacted stigma were used as latent variables with polycholoric correlations appropriate for ordinal Likert responses. In our previous analysis, exploratory factor analysis separated items into perceived and enacted sexual stigma factors (93).

The resulting three-item factor for perceived sexual stigma and five-item factor for enacted sexual stigma were the predictors of interest for the current analysis.

Potential Mediators. Depressive symptoms and risk of disordered alcohol use were considered potential mediators. Depressive symptoms were assessed using the Patient Health Questionnaire 9 (PHQ-9) depression module, which has been validated for use in Kiswahili in Kenya (100). Responses were revised from the PHQ-9 standard 'Not at all,' 'Several days,' 'More than half the days,' and 'Nearly every day' to 'Not at all,' 'A few days,' 'Several days,' and 'Nearly all the days' based on feedback from research team members fluent in Kiswahili during the translation process (68). The PHQ-9 results were summed to form an overall PHQ-9 score for each participant, ranging from 0 to 27 with a Cronbach alpha of 0.86, indicating good internal consistency (93). Risk of disordered alcohol use was assessed using the Alcohol Use Disorder Identification Test (AUDIT). Each item was rated on a five-point scale (i.e., 'Never,' 'Monthly or less,' '2 to 4 times a month,' '2 or 3 times a week,' and '4 or more times a week') (74). Summed responses for the 10 items ranged from 0 to 40 with a Cronbach's alpha of 0.87, indicating good internal consistency (93).

Sexual behavior. The outcomes used in this analysis are two self-reported sexual behavior outcomes asked of all participants.

1. *Number of male partners.* "In the past month, with how many different people, including your spouse, have you had sex?" If number of partners was greater than zero, "How many of your sex partners were male?"

2. *Any condomless receptive anal intercourse (RAI)*. "In the last week, how many times have you done receptive anal intercourse (bottom)?" and "In the last week, how often do you use condoms for receptive anal sex/going bottom?" Participants reporting 'Never', 'Sometimes', or 'Frequently' instead of 'Always' using condoms were considered as having had any condomless RAI.

Analysis dataset. Sexual stigma and mental health data for this analysis were from the first visit on which these data were collected (i.e., first visit on or after December 2015 or upon enrollment if at a later date). Data on sexual behavior were from the next study visit, 1 week to 4 months after the initial visit, to ensure that stigma exposures preceded behavioral outcomes.

Data analysis. Bivariable analyses were performed to identify unadjusted associations of descriptive variables with the two outcomes of interest: number of male sex partners and condomless RAI. Poisson regression with robust standard errors was performed for the number of male sex partners, and logistic regression with robust standard errors was performed for condomless RAI.

Structural equation modeling (SEM) with weighted least squares estimation and theta parameterization was performed to assess the direct effects of sexual stigma on number of sex partners and condomless RAI, and the indirect effects of sexual stigma on these outcomes through PHQ-9 and AUDIT scores. Separate analyses were conducted for each outcome. Descriptive and bivariate statistics were calculated using STATA version 14.2. SEM analyses

were conducted using M-plus version 8.4. Associations were considered significant with a two-sided p-value <0.05.

Results

Participant characteristics. Table 12 presents the sociodemographic characteristics of the 310 participants. Participants' ages ranged from 18 to 48, with an average age of 26. Eighty-nine percent of participants (N=277) had never been married. Eighty-five percent of participants (N = 262) had completed primary school. Forty-nine percent (N = 151) reported engaging in transactional sex, and 33% (N = 102) were HIV positive. The average summed sexual stigma score was 10.9 (SD 7.5) out of 33. The average PHQ-9 score was 9.5 (SD 6.2) out of 27, and the average AUDIT score was 8.2 (SD 8.9) out of 40. The average number of male sex partners in the past three months was 4.0 (SD 5.6), with a range of 0 to 35. Fifty-eight percent (N = 179) of participants reported engaging in condomless receptive anal intercourse.

Bivariable analysis Table 2 shows results from bivariable analyses for both outcomes. Engaging in transactional sex, HIV status, and AUDIT score were associated with both number of male sex partners and condomless RAI at the p<0.05 level. Religion was associated with both outcomes at the p<0.20 level. Marital status was associated with number of male sex partners at p=0.09 but was not associated with condomless RAI (p=0.73). Based on these results, engagement in transactional sex, HIV status, religion, and marital status were included in the final model as confounders for both outcomes to maintain consistency. AUDIT score and PHQ-9 score were included a priori as mediators.

Number of male sex partners

Figure 11 shows the SEM model with standardized coefficients and standard errors for the association between perceived and enacted sexual stigma and number of male sex partners. There was a significant direct effect between enacted stigma and number of male sex partners (β=0.20, 95% CI 0.03 to 0.37). Enacted sexual stigma was associated with AUDIT score (β=0.24, 95% CI 0.08 to 0.39) and PHQ-9 score (β=0.34, 95% CI 0.20 to 0.48). Perceived stigma was not associated with number of male partners or either mediator. There were no significant indirect effects.

Condomless receptive anal intercourse

Figure 12 shows the SEM model with standardized coefficients and standard errors for condomless receptive anal intercourse (RAI). There was a significant direct association between enacted sexual stigma and condomless RAI (β=0.24, 95% CI 0.06 to 0.43). Perceived and enacted sexual stigma were associated with AUDIT score (perceived β=0.15, 95% CI 0.01 to 0.29; enacted β=0.22, 95% CI 0.10 to 0.34) and PHQ-9 score (perceived β=0.19, 95% CI 0.07 to 0.34; enacted β=0.28, 95% CI 0.17 to 0.40). Both perceived and enacted sexual sigma were indirectly associated with condomless RAI through AUDIT score.

Discussion

In this study of GBMSM in coastal Kenya, we assessed the association between perceived and enacted sexual stigma and two sexual behaviors related to HIV transmission risk: number of male sex partners and condomless receptive anal intercourse. Using structural equation modeling, we found a direct positive association between enacted sexual stigma and the two

outcomes, with more experiences of enacted stigma associated with more male sexual partners and with more experiences of condomless RAI. Both enacted and perceived sexual stigma were indirectly associated with condomless RAI through risk of disordered alcohol use. More experiences of sexual stigma were associated with a higher risk of disordered alcohol use, and a higher risk of disordered alcohol use was associated with more experiences of condomless RAI. No indirect associations through depressive symptoms were found with either outcome. These findings support previous research demonstrating the negative impacts of sexual stigma on HIV risk behavior among GBMSM in sub-Saharan Africa (85,99).

This is one of the few studies using SEM to evaluate enacted and perceived sexual stigma as separate predictors in the same model. Knox and colleagues in South Africa assessed associations between external and internalized sexual minority stigma and condomless anal intercourse (CAI) using SEM (99). External sexual stigma included verbal and physical harassment from others, similar to our enacted stigma factor. Internalized sexual stigma included items on internalized homophobia and sexual orientation confusion, which we did not assess. Knox et al. found that both stigma types were indirectly associated with CAI through a combined information-motivation-behavioral skills variable that included items on attitude, capacity, and social norms around condom use. They found no indirect associations from either type of stigma to CAI through alcohol use or through a combined depression and anxiety variable (measured using the Depression Anxiety Stress Scales).

We chose to use condomless receptive anal intercourse (RAI) instead of condomless anal intercourse (CAI) as our outcome. CAI combines both condomless receptive and condomless

insertive anal intercourse (IAI) into one measure. However, RAI and IAI may have different correlates. In our study, condom use was less common for RAI than for IAI, with 58% of those engaging in RAI sometimes or never using a condom compared to 28% of those engaging in IAI. Moreover, RAI carries a higher risk for HIV acquisition and tends to be more stigmatized than IAI (3,101). Our focus on condomless RAI as an outcome may have contributed to differences in findings between our study and previous studies, particularly our finding of a direct association between enacted stigma and condomless RAI.

Most studies assessing sexual stigma among GBMSM used models which included only enacted sexual stigma or a combination of enacted and perceived sexual stigma in a single variable. In South Africa, Tucker and colleagues, using only the enacted sexual stigma factor from the Neilands' sexual stigma scale, found an indirect association with CAI through depressive symptoms and condom use self-efficacy (85). Logie and colleagues in Jamacia used the sexual stigma scale developed by Diaz et al. (23), the precursor to the Neilands' stigma scale, and combined perceived and enacted stigma into a single, summed score. They found that depressive symptoms and condom use self-efficacy mediated the association between this sexual stigma score and inconsistent condom use (26). Both of these studies used condomless anal intercourse as their outcome, combining condomless RAI and condomless IAI.

In our study, disordered alcohol use was found to be a mediator between both types of sexual stigma and condom use. Alcohol use has been shown to affect condom use among GBMSM (102–105), but the effects of sexual stigma on alcohol use has not been as well studied. Increased alcohol use has been associated with sexual stigma in the U.S. (106) and Central and Eastern

Europe (107). In South Africa, Knox et al. found an association between external, but not internalized, stigma and alcohol use, but no mediation through alcohol use to condom use (108). Both hazardous alcohol use and high levels of depressive symptoms are prevalent among GBMSM in Kenya (68). Interventions targeting mental health including alcohol use and depressive symptoms have the potential to improve the quality of life for many GBMSM, and interventions addressing alcohol use may also be useful in reducing behavioral risk in this population.

In this analysis, predictors and outcomes were collected at two different study visits at least one week apart to ensure predictors were measured prior to outcome assessments, but caution should still be used when considering causality. Our findings of a direct association between enacted sexual stigma and both partner numbers and condomless RAI suggests that experiencing enacted stigma may lead to more risky sexual behaviors through multiple pathways and may increase HIV vulnerability among GBMSM. However, having a larger number of sexual partners or more frequent engagement in condomless sex may put people in situations where they experience more stigma and discrimination.

Sexual minority stigma is not the only stigma experienced by participants in this study. Stigma affects many minority identities, including sex workers and those with HIV. We assessed sexual minority stigma in this analysis. Those experiencing multiple forms of stigma may have attributed some of those experiences to their sexual minority status. We attempted to control for these particular multiple stigmatized identities by adjusting for engagement in transactional sex and HIV status.

This study has several implications. Experiences of sexual stigma affect the lives of not only GBMSM, but also and lesbian, gay, bisexual, trans, queer, and people of other (LGBTQ+) sexual identities. Institutionalized stigma must be removed, including repealing discriminatory laws and criminalization of same-sex sexual behaviors. These laws allow arbitrarily firing, expulsion from school, and denial of health services. They also promote violence against GBMSM with no recourse (109,110). The 2019 Lancet Commission on Legal Determinants of Heath has called for the global health community to oppose laws that stigmatize and discriminate against marginalized populations (111). This call to action reflects that of the UNAIDS strategy on human rights, stigma, and discrimination, which works toward decriminalization of same-sex sexual behaviors, sexual orientation, and gender identity (112).

While advocating for legal change, stigma reduction can additionally be approached through multiple levels. As recommended by the Kenya Guidelines for Integrating Mental Health into Key and Vulnerable Populations, individual interventions such as support groups for individuals, building family support, and peer-based online and group meetings can connect GBMSM who may be socially isolated and provide screening tools for mental health interventions (113). Training for health care workers and policy makers can also reduce stigma in institutional settings in addition to screening and addressing depression and alcohol use (9).

This study has several limitations. First, the political attitudes toward GBMSM in Kenya may limit generalizability of these findings outside of Kenya or areas more permissive to GBMSM. Second, we included both people living with HIV and people living without HIV in our analysis,

although did include this information as a confounder to mitigate effects. Third, we did not include treatment status for people living with HIV, which affects transmissibility and subsequent behaviors. Fourth, participants were recruited through non-random sampling so findings should not be generalized to all GBMSM in Kenya. Fifth, data were self-reported and may be influenced by recall bias or social desirability. Sixth, our perceived sexual stigma factor only contained three items, so was less stable than the enacted sexual stigma factor containing five items (93). Seventh, data were collected from 2015 to 2017, prior to PrEP availability in Kenya, so do not represent the situation after PrEP availability. Strengths of this study include its specificity. By separating enacted sexual stigma from perceived sexual stigmas and using condomless receptive anal intercourse instead of any condomless anal intercourse, we were able to assess these factors independently. Use of SEM allowed us to include both perceived and enacted sexual stigma in the same model along with depressive symptoms and alcohol use to assess mediation.

Conclusion

This analysis expands the literature by providing further evidence of the negative effects of sexual stigma. We identified pathways through which sexual stigma impacted HIV risk behavior by demonstrating direct associations between enacted sexual stigma and number of male sex partners and between enacted sexual stigma and condomless receptive anal intercourse. We also found indirect associations between enacted and perceived stigma to condomless receptive anal intercourse through alcohol use, but not through depressive symptoms. These findings suggest that reducing or mitigating sexual stigma has the potential to reduce behaviors and lower the risk of HIV transmission. Interventions to reduce sexual stigma and its impact on GBMSM should be included as part of an integrated behavioral, biomedical, and structural HIV prevention effort.

Table 12. Demographics, N = 310

Age (mean, range)	26.3, 18–48
Never married	277 (89%)
Completed primary school	262 (85%)
Religion	
Muslim	72 (23%)
Catholic	83 (27%)
Protestant	81 (26%)
Other/None	74 (24%)
Engaged in transactional sex	151 (49%)
HIV positive	102 (33%)
Summed stigma score (mean, SD)	10.9, SD 7.5
PHQ-9 score (mean, SD)	9.5, SD 6.2
AUDIT score (mean, SD)	8.2, SD 8.9
Number of male sex partners in past month (mean, range)	4, 0–35
Engaged in condomless receptive anal intercourse	179 (58%)

SD = standard deviation

Table 13. Bivariable associations of demographics and mediators with number of male sex partners and condomless receptive anal intercourse (RAI), N = 310

	Number of male sex partners		Condomless RAI	
	IRR (95% CI)	p-value	OR (95% CI)	p-value
Age	0.99 (0.97, 1.02)	0.81	0.99 (0.95, 1.04)	0.82
Never married	1.40 (0.94, 2.08)	0.09	0.88 (0.42, 1.83)	0.73
Religion		0.11		0.07
Muslim	1.47 (0.99, 2.18)		0.95 (0.50, 1.82)	
Protestant	1.34 (0.89, 1.99)		1.12 (0.59, 2.11)	
Catholic	1.47 (1.04, 2.08)		2.08 (1.08, 4.01)	
Completed primary school	1.11 (0.76, 1.62)	0.59	1.19 (0.64, 2.21)	0.59
Engaged in transactional sex	2.4 (1.83, 3.26)	<0.05	2.78 (1.74, 4.43)	<0.05
HIV positive	1.51 (1.08, 2.11)	0.01	2.08 (1.28, 3.37)	<0.05
PHQ-9 score	1.01 (0.99, 1.03)	0.39	1.02 (0.98, 1.05)	0.39
AUDIT score	1.02 (1.01, 1.03)	0.02	1.04 (1.01, 1.07)	<0.05

IRR = incidence rate ratio, OR = odds ratio, CI = confidence interval

Figure 9. Associations between perceived and enacted sexual stigma and number of male sex partners with PHQ-9 and AUDIT scores as mediators

Standard coefficients (standard errors [SE]) are reported and statistically significant paths are indicated by an asterisk. Model includes HIV status, engagement in transactional sex, religion, and never married as confounders. The covariance between PHQ-9 score and AUDIT score was 0.15 (SE 0.06) and is not depicted in the figure to improve clarity.

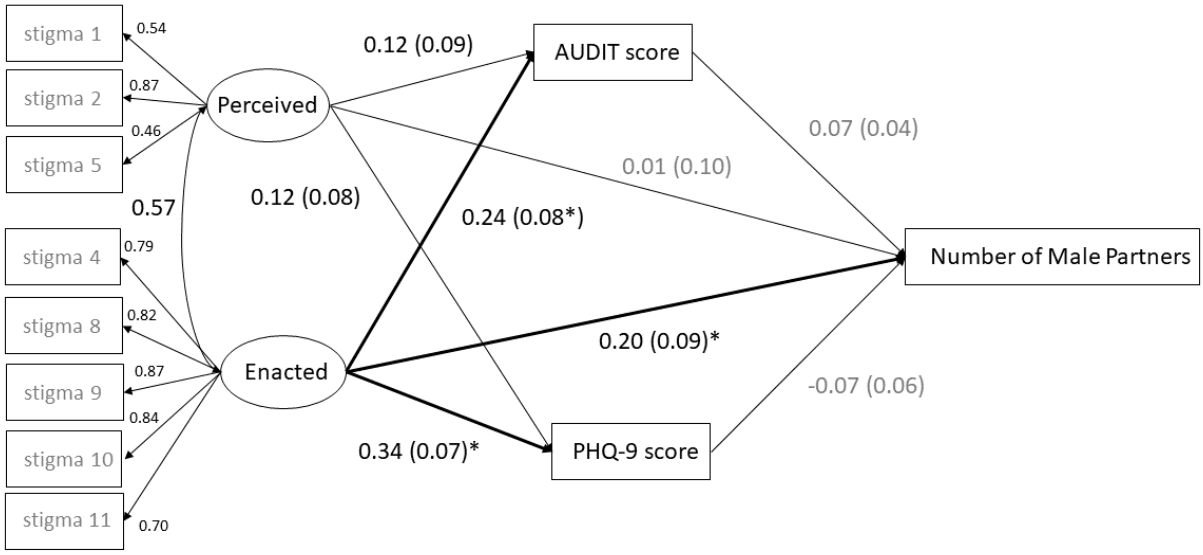
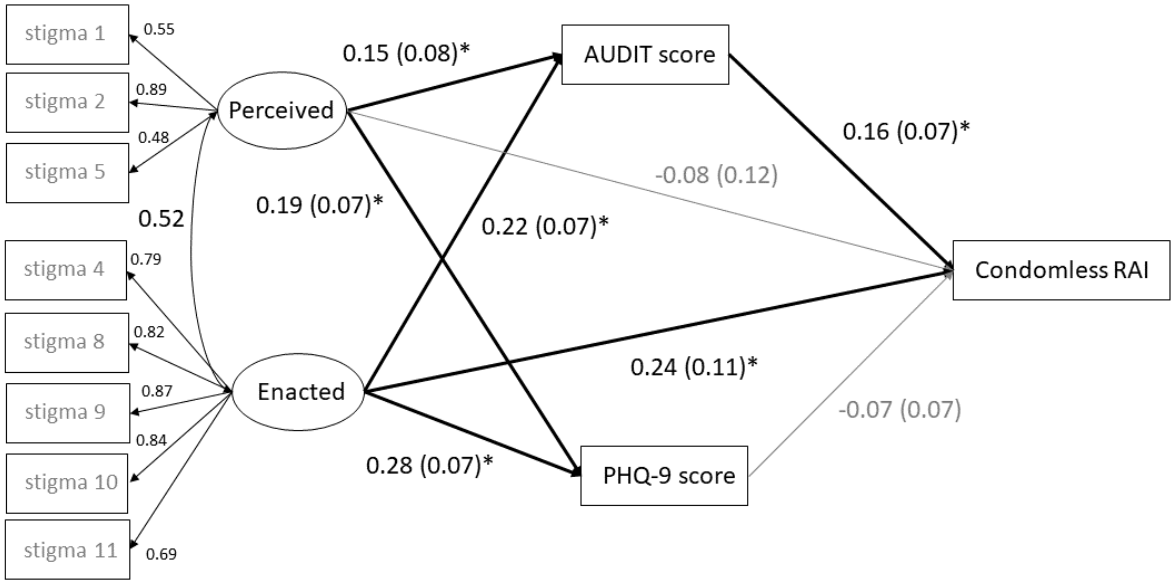


Figure 10. Associations between perceived and enacted sexual stigma and condomless receptive anal intercourse (RAI) with PHQ-9 and AUDIT scores as mediators

Standard coefficients (standard errors [SE]) are reported and statistically significant paths are indicated by * Model includes HIV status, engagement in transactional sex, religion, and never married as confounders. The covariance between PHQ-9 score and AUDIT score was 0.15 (SE 0.08) and is not depicted in the figure to improve clarity.



Chapter 6: Discussion

Discussion

The work included in this dissertation explores the impact of perceived and enacted stigma and depressive symptoms on GBMSM in Kenya and contributes to better understanding of their effects on sexual behaviors and HIV vulnerability. A better understanding of the links between sexual stigma, both perceived and enacted, and HIV behavioral vulnerability among GBMSM in Kenya can inform new approaches to improve the effectiveness of GBMSM-tailored HIV prevention and public health improvement programs.

Chapters 2 and 4: Depressive symptoms and behaviors

The work presented in Chapter 2, "Depressive symptoms and problematic alcohol and other substance use" found that GBMSM across Kenya report high levels of both depressive symptoms and alcohol use. Nearly one-third (31%) of the over 1,400 GBMSM participants reported moderate to severe depressive symptoms (PHQ-9 $\geq$10) while over forty percent (44%) reported hazardous alcohol use (AUDIT $\geq$8). The high levels of depressive symptoms and alcohol use seen among GBMSM in this study are consistent with levels found both globally and in other areas in Africa. A recent global meta-analysis found a pooled prevalence of depression to be 35% among GBMSM, three times higher than heterosexual men (88), with similar findings of 34% in Africa. High alcohol use has been reported among GBMSM in the U.S. (114) and across Africa (36). In South Africa, 44% of study participants reported hazardous alcohol use based on AUDIT score (115). These findings call attention to the need for both mental health and substance use treatment for GBMSM. Left untreated, depression and heavy alcohol use can have a high mental, physical, and financial burden on individuals.

Studies assessing the association between depression and HIV behavioral vulnerability have found mixed results (89–91). Chapter 4 of this work assessed the association between

depressive symptom levels and several behaviors involved with HIV vulnerability, including condom use. Depressive symptoms were positively associated with both condomless receptive and condomless insertive anal intercourse. Those reporting higher levels of depression also reported more condomless intercourse. No association was found between depressive symptoms and any sexual activity, number of male partners, or condomless sex with primary partners. These findings highlight the need for tailored and multi-pronged interventions. Since the prevalence of depression among GBMSM is so high, it should be addressed for its own sake, particularly for those engaging in transactional sex. Based on the results of these studies, interventions to reduce depression may have the potential to affect condom use in some situations.

Chapter 3 and 5: Sexual Stigma Scale

Chapter 3 details the evaluation of a tailored sexual stigma scale for use in Kenya through exploratory and confirmatory factor analysis. Responses to eight items formed two factors: perceived sexual stigma and enacted sexual stigma. Enacted stigma was associated with alcohol use such that participants who reported more enacted stigma also reported more alcohol use. Increased levels of perceived stigma were associated with more depressive symptoms and more alcohol use.

In order to evaluate sexual stigma, it is necessary to have an instrument that is available in local languages and meets the needs of the target population. In Kenya, police harassment is unfortunately a wide-spread stigma experience. The police harassment item added to the sexual stigma scale provided additional information and improved the fit for the enacted stigma factor (12). Questions about name-calling, family acceptance, and losing friends did not perform as expected. These items were expected to fall on the enacted stigma factor, but instead cross-

loaded on both the enacted and perceived factors. It is possible that these actions are relatively vague ("made fun of," "family not accepted you" and "lost friends") and their motivations less clear and more based on perceptions, compared to items loading more strongly on the enacted scale ("hit or beaten up," "lost a place to live"). Our final perceived stigma factor was based on only three items, producing a less stable factor than the five-item enacted stigma factor. Future work to improve the measurement of perceived stigma among GBMSM in Kenya should focus on developing more items that fall squarely on the perceived stigma factor, to make the scale more robust. Results from the factor analysis in Chapter 3 emphasize the importance of evaluating scales for the population of use.

Chapter 4 continued this investigation of perceived and enacted sexual stigma by assessing associations between the two sexual stigma factors and two sexual behaviors: number of male partners and condomless receptive anal intercourse (RAI). Mediation through depressive symptoms and alcohol use was assessed. This study found that enacted stigma was directly associated with number of male partners, such that more experiences of enacted stigma were associated with higher numbers of male partners. Enacted stigma was also directly associated with condomless RAI. Both perceived stigma and enacted stigma were associated with condomless RAI through alcohol use. While depressive symptoms were not associated with either outcome, both enacted and perceived stigma were associated with depressive symptoms. These findings demonstrate that stigma experiences have a measurable effect on both sexual behavior and mental health and that stigma needs be addressed to improve mental health among Kenyan GBMSM and reduce HIV and other sexually transmitted infections.

In Chapter 4, alcohol use but not depressive symptoms was associated with condomless RAI. Alcohol use is widespread in Kenya, especially among men, and plays a large role in

building and sustaining social networks (116,117). In Kenya, both male and female sex workers have a high prevalence of alcohol dependence, with 33% of GBMSM sex workers reporting alcohol dependence (118). Our findings imply that sexual stigma may be an additional contributor to the high rate of hazardous alcohol use among GBMSM and related risky sexual behaviors.

Gaps and Future Directions

Overall, the studies included in this dissertation provide valuable insight in describing the pathways from sexual stigma to depression and from sexual stigma to HIV behavioral vulnerability, both directly and through alcohol use. However, gaps in understanding remain.

1. Internalized sexual stigma. While these studies assessed two types of sexual stigma, perceived and enacted, a third type of sexual stigma was not included: internalized stigma. Internalized sexual stigma involves accepting negative beliefs about oneself. As with perceived and enacted stigma, internalized stigma has been associated with negative mental health outcomes and with sexual behaviors that put one at higher risk for HIV (86,119). Since internalized stigma involves one's own negative beliefs about oneself, this type of stigma may be more amenable to change through individual-level interventions.
2. Intersecting stigmas. Sexual minority stigma is not the only stigma experienced by GBMSM. Individuals are a totality of all their identities, and differing stigmas such as those toward sexual minorities, HIV, mental health, and sex worker are not experienced in isolation. One person can have several minority identities, and individuals may experience multiple forms of stigma which may interact in unique ways.

There are several directions for future research on sexual stigma and mental health suggested by these findings. Research to assess intersecting stigmas impacting sexual minority individuals in African settings is just beginning (120), and there is a paucity of published research on the effects of or interventions to address multiple intersecting stigma experiences. Stigma can occur at multiple levels, including the individual (e.g., internalized stigma), the interpersonal or community (e.g., perceived stigma, enacted stigma), and institutional (e.g., structural stigma). Interventions affecting structural stigmas are especially difficult yet important since individual-level interventions alone cannot overcome structural impediments. However, individual-level interventions such as developing personal resiliency and establishing ties with the LGBTQ+ community through the use of trained peer support have shown promise in ameliorating the negative effects of stigma experiences (109,121).

Experiencing sexual stigma is damaging and must be reduced to improve the lives of GBMSM and all lesbian, gay, bisexual, trans, queer, asexual and people of other sexual (LGBTQA+) identities. An important step toward reducing sexual minority stigma is by changing discriminatory laws to provide equal rights and prohibit institutionalized discrimination based on sexual orientation. In an increasingly intolerant climate, it is even more important to advocate for the decriminalization of consensual same-sex sexual behavior, in order to reduce both perceived and enacted stigma and support those experiencing these stigmas. Efforts to reduce stigma among healthcare professionals in Kenya have met with some success (54). Additional efforts are needed to reduce sexual stigma among community members and religious leaders and to remove unjust laws.

A limitation of this work is the inclusion of both gay, bisexual, and other men who have sex with men and transgender women together in the study population. Because the study

inclusion criterion was based on sex at birth, the important role played by gender identity was overlooked in our study design. The experiences of transgender women are very different than those of cisgender GBMSM (122). The transgender community has long been excluded from health research and has unique needs that are not addressed by interventions targeted at cisgender GBMSM. In order for their unique needs to be known, transgender women should be and are assessed separately from GBMSM in the future. In addition, participants in these studies were GBMSM from only three locations in Kenya so results may have limited generalizability to GBMSM elsewhere in East Africa or in other areas of the world. Finally, qualitative research is needed to better understand the lived experiences of GBMSM who have been subjected to enacted and perceived sexual stigma and to more accurately understand connections between sexual stigma, alcohol use, and sexual behaviors as part of lived experiences.

Addressing mental health and substance use among GBMSM can have many benefits to individuals and the community. Recent research proposes provision of mental health services for all individuals, not just those who meet criteria for mental disorders (123). With the high levels of depressive symptoms and alcohol use seen among GBMSM, this population has a great need for these services. Providing services to all reduces mental health stigma and makes it more likely that those who could benefit from services obtain them.

Conclusion

This dissertation has contributed to the understanding of sexual stigma among Kenyan GBMSM by identifying direct associations between enacted sexual stigma and two types of higher-risk behaviors for HIV. Indirect associations between enacted and perceived sexual stigma and these behaviors through alcohol use, but not depression, were also found, although perceived and enacted sexual stigma were both associated with depressive symptoms. Public health programs for GBMSM, including HIV programs, should consider the impact of sexual stigma on the GBMSM population, particularly as it relates to alcohol use and depression. These conditions should be addressed in the short term directly through mental health and substance abuse screening, services, and other supports, and in the long term through the reduction and eventual elimination of sexual and other forms of stigma against GBMSM from healthcare workers, the community, and the broader social and legal environment.

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