

Depression, Substance Abuse, and Stigma among Kenyan Men Who Have Sex with Men

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Abstract

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Objective(s): Mental health conditions can have a severe impact on quality of life and interfere with health-related behaviors such as medication adherence. We aimed to determine the prevalence and correlates of depression and other psychosocial characteristics among self-identified men who have sex with men (MSM) in coastal Kenya.

Design: Psychosocial and sociodemographic characteristics were determined for 112 MSM participating in two ongoing HIV-positive and -negative cohorts in Mtwapa, Kenya.

Methods: We used multivariable linear regression to assess associations with depression score. Bivariate correlation coefficients were used to assess correlations between model covariates.

Results: One-third of participants met criteria for major depressive disorder (16.1%, 95% CI: 9.8%-24.2%) or other depressive disorder (15.2%, 95% CI: 9.1%-23.2%). Alcohol abuse was reported by 45% (95% CI: 35.2%-54.3%) of respondents and other substance abuse by 59.8% (95% CI: 50.1%-69.0%). Sexual and HIV stigma were moderate at 11 (IQR 6-17) and 25 (IQR 23-29), respectively. There were significant correlations between alcohol use, other substance use, sexual stigma, and childhood and recent abuse. In the multivariable linear regression model, depression score was associated with sexual stigma (beta=0.17, 95% CI 0.03-0.32) and marriage to a woman (beta=-2.41 95% CI -4.74 - -0.09).

Conclusions: We found moderate-to-high levels of depression, alcohol and other substance abuse, and low-to-moderate levels of sexual and HIV stigma. These mental health conditions and psychosocial factors are highly inter-correlated and are exacerbated by experience of trauma or abuse. Comprehensive mental health services are needed in this population to address these issues.

Background

Globally, mental health and substance use disorders account for 7.4% of all disability adjusted life years (DALYs) and 175.3 million years lived with disability (YLDs) [1]. Depression, alcohol abuse, and other substance abuse account for the majority of this morbidity, with roughly 61% of all mental health and substance use associated DALYs attributed to them [1]. Despite this heavy burden of disease, mental health services have been neglected, especially in low and middle income countries where less than 1% of health budgets go to services for these conditions [2]. This neglect has led to a mental health treatment gap estimated at greater than 90% in some developing countries [3].

Men who have sex with men (MSM) are a highly marginalized population with particular health needs. They face many psychosocial challenges, including stigma, social and legal discrimination, lack of social support, and abuse [4–6]. These factors are intersecting and synergistic, and often result in social ostracization, reduced resiliency, decreased access to healthcare, and, ultimately, worse health outcomes. Fear of social and legal repercussions due to stigma may lead to non-disclosure of sexual risk behavior and HIV serostatus. Non-disclosure has been linked to risky sexual behavior, reduced medication adherence, and poor engagement with health care services [6,7].

These psychosocial challenges can often lead to mental health issues, with MSM showing a higher prevalence of mental health conditions than other men. Studies in the US and Europe have shown that compared to general population males, MSM have up to a threefold greater risk of major depression and dysthymia [8,9]. A study of common mental disorders among MSM in Cape Town, South Africa, found high levels of depression, alcohol and other substance abuse,

and personality disorders (e.g., borderline personality) [10]. Although limited in number, other studies among MSM in sub-Saharan Africa have found similar results [5,11].

Syndemic theory has been used to explain the reciprocal interaction among stigma, mental health, substance abuse, and HIV risk [12,13]. Individual, social, and structural level factors combine to produce a system of mutually reinforcing epidemics that drive risky sexual behavior. Depression and substance abuse have been associated with unprotected intercourse, group sex, and transactional sex, in turn increasing HIV risk [13–15]. Low resiliency and social support, exacerbated by stigma, may reduce the ability of MSM to mitigate these factors and decrease their HIV risk. These intertwining factors have led to high HIV prevalence and incidence among MSM. In coastal Kenya, HIV prevalence is 24.5% among MSM compared to 5.4% among non-MSM Kenyan males [16]. A report by the Kenya National AIDS Control Council estimated that MSM accounted for 15.2% of all new HIV infections in 2009, and over 20% of new infections on the coast [17].

These synergistic conditions and a lack of tailored care can have serious negative effects on health and on care engagement. In addition to the innate reduction of quality of life associated with mental health conditions, HIV-positive MSM with mental health and substance abuse issues have been shown to have delayed initiation of ART, lower ART adherence, and decreased engagement with health providers [10]. For HIV-negative MSM, these syndemic issues can lead to increased risk for HIV and other sexually transmitted infections, as well as to other health problems and safety risks.

Despite a growing body of evidence showing a high burden of mental health conditions and HIV infection among MSM in low and middle income countries (LMICs), there has generally not been a focus on surveillance, prevention, or treatment programs targeted at MSM

populations in these settings [16,18]. For example, there are few MSM-specific psychosocial or HIV prevention or care interventions in Kenya, although recently small-scale interventions driven by external funding have begun concentrating on MSM [17,19,20]. Limited national and provincial budgets for most at-risk populations (MARPS), undertrained staff, and an over-reliance on civil society organizations for these services have been cited as primary causes for this service gap [17,20].

Few studies have explored mental health conditions and associated psychosocial factors among MSM in sub-Saharan Africa. To the best of our knowledge, no such studies have been conducted among Kenyan MSM. The primary objective of this study was to determine the prevalence of depression and associated factors, such as substance abuse, stigma, poor social support, and abuse, among coastal Kenyan MSM. We predicted that the psychosocial factors would be intercorrelated and associated with depression. Specifically, we predicted that alcohol and other substance abuse, sexual and HIV stigma, HIV status, and childhood and recent abuse would be positively associated with depressive symptoms. Social support was predicted to have a negative association. Further, we hypothesized that commonalities between HIV-positive men and MSM in Kenya, such as high levels of discrimination and non-disclosure of sexual orientation or HIV status, would lead to similar associations with mental health conditions and psychosocial factors for both HIV and sexual stigma, a hypothesis supported by evidence showing similarly heightened levels of depression among the two groups [5,8–11,21,22].

Methodology

Recruitment and Data Collection

This cross-sectional study was conducted between March and September 2014. Study participants were 112 self-identified MSM (defined as men who reported engaging in sex with a man within the past year) drawn from on-going HIV-seropositive and seronegative cohorts active through the KEMRI-UW HIV/STD clinic in Mtwapa, Kenya. The HIV/STD clinic is a joint research clinic allowing collaborative study between Kenyan and University of Washington researchers. Mtwapa, located in Kilifi County approximately 15 kilometers north of Mombasa, is home to a large population of MSM and is therefore ideal for this study.

The ongoing cohort studies collect data related to sexual risk behavior, substance use, and current health problems and symptoms. The present study was used to pilot test questions for a deeper assessment of mental health and substance abuse. Participants were recruited when they presented at the clinic for enrollment or follow-up appointments. Our participants were invited to complete an additional psychosocial questionnaire via self-administered Audio Computer Assisted Self-Interview (ACASI) in either English or Swahili. Of note, we have used ACASI successfully with this population during prior studies [23]. A dedicated ACASI mentor assisted with test administration and was available to answer questions from participants. Only one person refused to participate.

Measures

Dependent Variable

Depression: The Patient Health Questionnaire (PHQ) was developed as a self-administered version of the Primary Care Evaluation of Mental Health Disorders (PRIME-MD), a tool developed to identify mental disorders in clinical settings [24,25]. The PHQ-9 is a depression-specific subset of the PHQ based on the nine DSM criteria for major depressive disorder [26,27].

A tenth question was later added to measure overall functional impairment but was not included in the summary score calculation. The survey has been validated in Western and African populations regarding internal reliability (Cronbach's alpha 0.78-0.90) [22,26,28–30], test-retest reliability [22,26,28,30], construct validity [22,26,31], criterion validity [26,28,30], and sensitivity and specificity for diagnosing MDD using the diagnostic algorithm (sensitivity=73%, specificity=94%) [26]. It has been used in a wide variety of populations, including African HIV-seropositive adults [22,32–34], Kenyan populations [21,28,31], and MSM [35–37]. The PHQ-9 comprises nine questions rated on a 4-point Likert scale ('Not at all'; 'Several days'; 'More than half the days'; and 'Nearly every day'), which are summed for a total score from 0-27. The score can be interpreted using a diagnostic algorithm to generate a tentative diagnosis of major depressive disorder or other depressive disorder, as a continuous summary score, or as a severity scale: minimal (0-4); mild (5-9); moderate (10-14); moderately severe (15-19); and severe (20-27) [26].

Independent Variables

Alcohol Abuse: Alcohol abuse was measured using the Alcohol Use Disorder Identification Test (AUDIT). This measure was developed and validated by the WHO from a six-country study, including Kenya, for use in international settings [38]. It was developed to identify hazardous or harmful drinking behavior, allowing for timely preventive intervention prior to development of full-blown alcoholism. The AUDIT survey has been used previously in stigmatized groups in East Africa (e.g. male sex workers in Mombasa) [38–41]. The survey has ten questions scored 0-4 with potential scores ranging from 0-40. A score above 7 was considered indicative of hazardous drinking. This cut-point has been shown to have a sensitivity of 95% and specificity

of 81% in prior studies in Kenya [38]. A categorical severity scale was used to further describe alcohol use: Zone I (0-7); Zone II (8-15); Zone III (16-19); Zone IV (20-40) [42].

Substance Abuse (non-alcohol, non-tobacco): Non-alcohol and non-tobacco substance abuse (referred to in this thesis as “other substance abuse”) was measured using an abridged ten-question version of the Drug Abuse Screening Test (DAST). The DAST-10 survey was developed to provide a brief screening survey for problematic substance use. It has been validated in a variety of populations, including those with mental illnesses [43,44]. The survey consists of ten ‘Yes/No’ questions with scores ranging from 0-10. A validated cut-off score of ≥ 3 was used to identify harmful substance use [44]. A categorical severity scale was employed for descriptive purposes: None (0); Low (1-2); Moderate level (3-5); Substantial level (6-8); Severe level (9-10) [45].

Sexual Stigma: Sexual stigma was measured using an abridged version of Logie et al’s modified China MSM Stigma Scale [46]. The scale measures two dimensions: perceived stigma and enacted stigma. Perceived stigma involves the perception of social censure of homosexuality, and enacted stigma deals with direct experience of homophobia. Logie et al modified the measure to reflect the difference between homosexuality and MSM terminology. Specifically, ‘because of your homosexuality’ was changed to ‘because you have sex with men’ to make the terminology more reflective of the participants’ context. It consists of eleven questions scored 0-3 (never; once or twice; a few times; many times). Potential scores ranged from 0-33, with a higher score representing greater perceived sexual stigma.

HIV Stigma: The ACASI questionnaire included a skip function such that only HIV-positive respondents took the HIV stigma survey. We used two domains, negative self-image and disclosure concern factors, drawn from Kaai et al's abridged Berger HIV stigma scale [47,48]. A third domain, public attitudes, was dropped as our primary concern was internalized stigma. Questions are graded on a 4-point Likert scale (strongly disagree; disagree; agree; strongly agree). Potential scores ranged from 11-44, with a higher score indicating higher HIV stigma.

Perceived Social Support: The Medical Outcomes Survey - Social Support Survey (MOS-SSS) was used to measure perceived social support [49]. The survey covers four domains: emotional/informational support, tangible support, affectionate support, positive social interaction, with one additional item dealing with social activities. The domains were collapsed to calculate one summary score which was then transformed onto a 0-100 scale. Higher scores indicate higher perceived social support.

Abuse: Both childhood and recent (within the past year) abuse were measured using abridged surveys. Childhood abuse was measured using four questions drawn from the Childhood Experience of Care and Abuse (CECA) interview tool developed by a research team at Middlesex University in London. This scale has been independently validated in both clinical and community populations in the UK [50,51]. The assessment of recent abuse used four items from the USAID HPI MSM Trauma Screening Tool [52]. For both surveys scores ranged from 0-4 and were recoded to a binary wherein 0=0 and >0=1 to indicate ever experiencing childhood or recent abuse. For the four items in the MSM Trauma Screening Tool participants were

allowed to select “no response.” “No response” selections were coded as “no” to reduce likelihood of a false positive.

Potential Confounders

Sociodemographic and behavioral characteristics were collected both to describe the cohort and to explore as potential confounders in multivariable regression. The following characteristics were gathered: age; earned income (monthly, in Kenya Shillings); socioeconomic status (based on a count of personal assets, such as having a private water source); religion (none, Catholic, Protestant, Muslim); marital status (single, married, divorced/separated); education (years completed); sex work (in last 3 months); and gender of sexual partners (men only, men and women, or women only). These characteristics are described in Table 1.

Translation

Surveys used in the questionnaire (e.g., AUDIT) were independently translated from English to Swahili by two staff members fluent in both languages. Disagreements between translators were discussed and rectified. The surveys were then back translated into English to ensure they retained their original meaning. A validated Swahili translation was used for the PHQ-9 [31].

Statistical Analysis

Spearman correlation was used to calculate correlations between continuous variables, the rank biserial correlation (Somers' D) for correlations between a continuous and a binary variable, and the phi coefficient (four-fold correlation) for correlations between two binary variables. Analysis involving HIV stigma was made using seropositive data only as seronegative

participants did not have an HIV stigma score. Bivariate linear regression models were used to assess the association between individual variables and PHQ-9 depression score. Variables with a significance level ≤ 0.20 were included in the multivariable linear regression model.

Ethics Statement

The ongoing cohort studies are approved by the ethical review boards of the Kenya Medical Research Institute and the University of Washington. All men gave written informed consent to participate in the ongoing cohorts and verbal consent to participate in the pilot test of additional mental health assessment questions. Participants were asked to debrief with a counselor after completing the survey in order to identify any problems or questions that had been upsetting to them.

Results

As the ACASI questionnaire does not allow question skipping, there were no missing data for psychosocial questionnaires. One HIV-positive participant did not have HIV stigma data due to having erroneously selected HIV-negative status on the survey. This participant was excluded from HIV stigma analysis. For the 17 participants who completed the ACASI on a different date from their scheduled study visit, data on transactional sex and gender of sexual partners were imported from the next nearest clinic visit. Moderate to high Cronbach's alphas (0.7-0.9) suggest good internal consistency and reliability of the survey items within our population.

Table 1 presents descriptive characteristics of the study population as well as prevalence and summary statistics for psychosocial characteristics. The majority of participants were young (median age 26), unmarried (92.9%), had at least some secondary education (66.1%), earned

<10,000 KES (\$109) per month (73.2%), and had sex with men exclusively (62.5%). Forty-nine percent of respondents were HIV-positive and 32% had engaged in sex work in the past three months. Religious affiliation was divided between none (30.4%), Catholic (29.5%), Protestant (17.9%), and Muslim (22.3%).

Roughly one-third of respondents met criteria for either major depressive disorder (16.1%, 95% CI: 9.8% to 24.2%) or other depressive disorder (15.2%, 95% CI: 9.1% to 23.2%), and 42.0% had moderate to severe depressive symptoms. Forty-five percent engaged in hazardous or harmful drinking behavior (95% CI: 35.2% to 54.3%) and 59.8% in harmful use of other substances (95% CI: 50.1% to 69.0%). Sexual and HIV stigma were moderate with median scores of 11 (range 0-33) and 25 (range 17-40) respectively. Perceived social support had a median score of 68 (range 19-95). The majority of participants reported abuse in childhood (77.7%) and within the past year (67.0%).

Table 2 presents bivariate associations between regression model predictors using Spearman's correlation coefficients, rank biserial correlation coefficients, and phi coefficients. There was significant intercorrelation between alcohol use, other substance use, sexual stigma, childhood abuse, and recent abuse. For the most part, these relationships were of moderate strength, with correlation coefficients ranging from 0.27 to 0.64. HIV status, HIV stigma, and perceived social support were not significantly correlated with any other measures.

Table 3 presents the unadjusted and adjusted linear regression analysis of factors associated with depressive symptoms in this study population. Continuous summary scores were used for PHQ-9 (outcome), and for the AUDIT, DAST-10, sexual stigma, HIV stigma, and perceived social support (predictors). HIV status and abuse were analyzed as binary predictors of depression. In bivariate analysis, higher scores for alcohol use were significantly associated with

higher PHQ-9 scores (beta=0.19, 95% CI: 0.07 to 0.31), as was sexual stigma (beta=0.31, 95% CI: 0.19 to 0.44). Childhood and recent abuse were also significantly positively associated with higher PHQ-9 scores (beta=5.09, 95% CI: 2.67 to 7.51, and beta=4.77, 95% CI: 2.48 to 7.07, respectively). The association between other substance and higher PHQ-9 score was of borderline significance (beta=0.43, 95% CI: -0.01 to 0.86). Socioeconomic status (calculated through median personal asset count), marital status, and gender of sexual partners were included in the multivariable model as they had associations with PHQ-9 score that met the $p < 0.2$ criteria for inclusion. In the adjusted model only two factors remained statistically significantly associated with PHQ-9 score: sexual stigma (beta=0.17, 95% CI 0.03 to 0.32) and marriage to a woman (beta=-2.41, 95% CI -4.74 to -0.09).

Discussion

This study is the first to explore depressive symptoms and related psychosocial factors among Kenyan MSM. We found high levels of alcohol and other substance abuse and of both childhood and recent abuse, as well as moderate levels of sexual stigma, in our study population. These factors were shown to be highly intercorrelated and associated with PHQ-9 score, our measure of depressive symptoms. This is in keeping with other research which has shown that adverse childhood events can lead to increased risk of depression and substance abuse conditions as well as abuse later in life [53]. There is also a wealth of research showing associations between violence and alcohol and other substance abuse [54].

Participants exhibited high levels of depression, with roughly one-third meeting criteria for a tentative diagnosis of major depressive disorder (16.1%) or dysthymia (15.2%). This is significantly higher than the reported national prevalence in Kenya of 5.2% [55]. MSM cohorts

in the U.S., Netherlands, South Africa, and Tanzania have also displayed similarly increased risk of depression [5,8–11]. These data support our hypothesis that there are factors particular to MSM that increase their risk for depression.

While many participants did not meet the diagnostic criteria for a depressive disorder, the majority still suffered from depressive symptomology. Many participants gave positive responses to specific PHQ-9 questions (data not shown in results section). For example, 75.0% of respondents reported anhedonia and 75.9% depressed mood, with 63.4% reporting both. These symptoms can still have a negative impact on quality of life as well as on sexual risk and health-seeking behavior [11,56]. Furthermore, thirty-eight percent of depressed participants reported ideation of suicide or self-harm on more than half the days in the last two weeks. Due to this surprisingly high result, the research clinic provided additional training to clinicians and counselors on how to screen for and manage suicidality.

We have previously documented both high HIV prevalence and incidence among MSM participating in this research cohort [16,20]. Contrary to our hypotheses, HIV status and HIV stigma were not associated with either depression, substance abuse, or any other psychosocial factors among our participants. This result was unexpected, as prior research has found significant associations between HIV status, HIV stigma, and mental health conditions [21,22,57]; of note, however, a recent study in India also found no such connection [58].

Although further research will be necessary to fully understand these results, we hypothesize that sexual stigma may have a larger impact than HIV stigma among Kenyan MSM due to greater social censure related to same-sex behavior. Antiretroviral therapy has transformed AIDS from an often visible death sentence to a treatable chronic condition, and destigmatization efforts have been included in a number of HIV/AIDS programs in Kenya and

across East Africa [59]. There have not been corresponding anti-homophobia or otherwise MSM-focused destigmatization campaigns. Criminalization of same-sex practices and unions have either remained intact or become harsher, as was the case with the Ugandan Anti-Homosexuality Act of 2014. In Kenya, same-sex activities can carry jail terms of up to 14 years [60]. While not officially prohibited by law, same-sex marriage is not practiced or accepted. Rumors of a same-sex marriage lead to an attack on the Mtwapa research clinic in 2010, which resulted in a one-month closure of the clinic [61].

High rates of childhood abuse were particularly concerning. Roughly one-half of respondents (47.3%) reported either forced sexual intercourse or an upsetting sexual experience with a related adult or authority figure before the age of 17, with 22.3% reporting both. This is significantly higher than Kenyan national averages according to a UNICEF report of childhood abuse and neglect [62]. The report found that 17.5% of male respondents self-reported sexual abuse prior to the age of 18; physically forced sex was reported by 1.4%. Childhood abuse is associated with a wide range of negative outcomes. In a sample of general population Kenyans, childhood abuse and neglect were found to be significant predictors of criminal tendencies, depressive symptoms, and borderline personality symptoms [63]. As a highly prevalent and strong predictor of mental health conditions, childhood abuse counseling should be an integral component of MSM-focused interventions.

In the multivariable model, after adjusting for sociodemographic, behavioral, and psychosocial factors, only two factors remained statistically significant. Being married to a woman was protective against depression. A stable relationship could be a source of social support and positive reinforcement, although, counter-intuitively, perceived social support as an independent factor was not associated with depression. Marriage to a woman can also help MSM

hide their sexual orientation and be more socially accepted. Marital status was not associated with sexual or HIV stigma, income, or socioeconomic status, all of which were anticipated pathways through which marital status might mediate depressive symptoms. Further study into sociodemographic and psychosocial differences between married and unmarried MSM is necessary to fully understand these findings.

Sexual stigma was a risk factor for depression. There has been considerable research into the association between sexual stigma and depression. Studies have shown that high levels of sexual stigma can lead to internalized homophobia, low resiliency, and poor social support, all of which are risk factors for mental health conditions [46,64]. The minority stress model has been used to describe this relationship, arguing that stigma and discrimination against sexual minorities acts as a source of sustained stress which can result in negative health outcomes, such as mental health issues [64]. Resiliency and social support, which can act as protective mediators between stress and health outcomes, are often reduced for sexual minorities, resulting in greater negative impacts on health. MSM in Kenya are often isolated due to the fear of negative consequences of coming out, although organizations and other civil society groups are just recently forming to provide additional social support and training to increase resiliency and other skills.

Our study had some limitations, including a limited sample size and sampling population, which may limit generalizability of the results to other MSM groups. Participants were drawn from those attending the clinic for routine follow-up in ongoing cohort studies with monthly or quarterly visits. MSM who agree to participate in HIV prevention research may be different from those who do not. It is possible that our results underestimate the true prevalence and burden of these conditions, as health-seeking behavior and research participation are likely to be negatively

associated with mental health and substance abuse conditions. On the other hand, the MSM who are willing to self-identify as such and participate in this research may be different in unknown ways from MSM who choose to remain hidden. Moreover, the cross-sectional nature of this study limits inference of causality (e.g. substance abuse leading to depression). Additional, longitudinal data collection will be necessary to determine causal pathways.

Psychosocial measures (e.g. feelings of unhappiness) introduce a level of subjectivity as they depend on subjective experiences and scales which may result in some misclassification error. Well-validated surveys were chosen to reduce such error. Moderate to high Cronbach's alphas show good internal reliability of the survey items within our population. Furthermore, ACASI was selected as it has been shown to reduce response bias and underreporting due to perceived social stigma in studies of psychological conditions and substance abuse among stigmatized populations, including among MSM sex workers in this same cohort [23]. The audio component has also been shown to reduce the negative effects of illiteracy on data collection [65,66].

Conclusion

With high rates of mental health conditions, negative psychosocial factors, and HIV infection being reported among MSM cohorts in both developing and developed countries, it is our hope that continued research and interest in the subject will drive intervention development, national and international policy, and overall global commitment to mental health screening and treatment, especially among marginalized groups such as MSM. Our data adds to the growing body of evidence showing that, in order to be effective, interventions will have to address interrelated and synergistic factors at the individual, societal, and structural level.

In response to our findings, we have begun integrating regular mental health and substance abuse screening and counseling programs at the study research clinic. Mental health issues are generally not a priority training area for HIV counselors in Kenya [20], and we have had to provide supplemental training to our clinic staff. We are also working to export use of the screening tool used for this study to other MSM cohorts in Kenya. While small steps, we hope that these efforts represent a beginning for targeted mental health programs for MSM in Kenya.

Psychosocial components should be integrated into ongoing HIV prevention and treatment programs. In particular, these programs should seek to address alcohol and substance abuse, childhood abuse, and sexual stigma, in addition to HIV stigma as many now do. Regardless of HIV status, mental health and substance abuse programs should be developed to respond to the dearth of services for both MSM and the general population. National and municipal policy should be adapted to prioritize these changes.

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Table 1: Demographic and psychosocial characteristics and internal test consistency (n=112)

Characteristic	n (%) or med (IQR)	Cronbach's alpha
Age	26 (23.5, 30)	
Earned income		
≤ KSh 2,000	8 (7.1%)	
KSh 2,000 - 5,000	28 (25.0%)	
KSh 5,000 - 9,000	46 (41.0%)	
KSh 10,000 - 19,000	23 (20.5%)	
≥ KSh 20,000	7 (6.3%)	
Personal assets		
Private water source	22 (19.6%)	
Private toilet	24 (21.4%)	
Electricity	72 (64.3%)	
Radio	85 (75.9%)	
Television	54 (48.2%)	
Mobile phone	78 (69.6%)	
Median asset count	3 (1.5, 4)	
Religion		
None	34 (30.4%)	
Catholic	33 (29.5%)	
Protestant	20 (17.9%)	
Muslim	25 (22.3%)	
Marital status		
Single	97 (86.6%)	
Married (to a woman)	8 (7.1%)	
Divorced/Other	7 (6.3%)	
Education		
Primary (< 8 years)	13 (11.6%)	
Primary (8 years)	25 (22.3%)	
Secondary	56 (50.0%)	
Tertiary	18 (16.1%)	
Sex work (in last 3 months)		
Yes	35 (31.3%)	
Gender of sexual partners		
Men only	70 (62.5%)	
Women only	5 (4.5%)	
Women and Men	37 (33.0%)	
Depression		0.86

Minimal (0-4)	26	(23.2%)	
Mild (5-9)	39	(34.8%)	
Moderate (10-14)	21	(18.8%)	
Mod. Severe (15-19)	20	(17.9%)	
Severe (≥ 20)	6	(5.4%)	
Major depressive disorder	18	(16.1%)	
Other depressive disorder	17	(15.2%)	
Alcohol abuse			0.87
Zone I (0-7)	62	(55.4%)	
Zone II (8-15)	28	(55.4%)	
Zone III (16-19)	6	(5.4%)	
Zone IIII (20-40)	16	(14.3%)	
Alcohol abuse (≥ 8)	50	(44.6%)	
Substance abuse			0.78
None (0)	2	(1.8%)	
Low (1-2)	43	(38.4%)	
Moderate (3-5)	42	(37.5%)	
Substantial (6-8)	15	(13.4%)	
Severe (9-10)	10	(8.9%)	
Substance abuse (≥ 3)	67	(59.8%)	
Sexual stigma (range: 0-33)	11	(6, 17)	0.85
HIV stigma* (range: 0-40)	25	(23, 29)	0.61
Perceived social support (range: 0-100)	68	(57, 78.5)	0.93
Childhood abuse (yes)	87	(77.7%)	0.70
Recent abuse (yes)	75	(66.9%)	0.76
HIV-positive (yes)	55	(49.1%)	

* Among seropositive participants only. One participant had missing data for HIV stigma due to an error entering his HIV status.

Table 2: Correlation between regression model predictors

	1	2	3	4	5	6	7	8
1. Alcohol use	-							
2. Other substance use	0.40 ^{†***}	-						
3. Sexual stigma	0.41 ^{†***}	0.27 ^{†**}	-					
4. HIV stigma [#]	-0.06 [†]	-0.14 [†]	0.01 [†]	-				
5. Social support	0.01 [†]	0.05 [†]	0.02 [†]	0.13 [†]	-			
6. Childhood abuse	0.36 ^{‡***}	0.43 ^{‡***}	0.56 ^{‡***}	-0.04 [‡]	0.03 [‡]	-		
7. Recent abuse	0.48 ^{‡***}	0.44 ^{‡***}	0.64 ^{‡***}	0.11 [‡]	0.10 [‡]	0.64 ^{‡***}	-	
8. HIV status	0.01 [‡]	0.04 [‡]	0.21 [‡]	-	0.17 [‡]	0.03 [^]	0.01 [^]	-

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.0001$; # Seropositives only

[†] Spearman's rho [‡] Rank biserial correlation coefficient [^] Phi coefficient ($\sqrt{X^2/n}$)

Table 3: Linear Regression on PHQ score

	Unadjusted Beta	p-value	Adjusted Beta	p-value
Age	0.02 (-0.23 to 0.26)	0.89		
Earned income		0.69		
≤ KSh 2,000	Reference	-		
KSh 2,000 - 5,000	-1.32 (-4.76 to 2.12)	0.45		
KSh 5,000 - 9,000	0.25 (-3.22 to 3.72)	0.89		
KSh 10,000 - 19,000	0.40 (-3.25 to 4.05)	0.83		
≥ KSh 20,000	1.46 (-6.28 to 9.20)	0.71		
Personal assets (median asset count)	0.54 (-0.15 to 1.23)	0.13	0.56 (-0.17 to 1.30)	0.13
Religion		0.40		
None	Reference	-		
Catholic	0.71 (-2.18 to 3.61)	0.63		
Protestant	-1.64 (-4.71 to 1.44)	0.29		
Muslim	-1.38 (-4.47 to 1.69)	0.37		
Marital status		0.05		
Single	Reference	-	Reference	-
Married (to a woman)	-3.70 (-6.76 to -0.65)	0.02	-2.41 (-4.74 to -0.09)	0.04
Divorced/Other	-1.86 (-6.07 to 2.35)	0.38	-1.60 (-5.28 to 2.08)	0.39
Education		0.91		
Primary (< 8 years)	Reference			
Primary (8 years)	0.48 (-3.56 to 4.52)	0.81		
Secondary	-0.16 (-3.72 to 3.40)	0.93		
Tertiary	1.06 (-3.81 to 5.92)	0.67		
Sex work (in last 3 months)				
Yes	1.04 (-1.33 to 3.42)	0.39		
Gender of sexual partners		0.14		
Men only	Reference	-	Reference	-
Women only	-1.19 (-8.71 to 6.34)	0.76	2.40 (-4.29 to 9.09)	0.48
Women and men	-2.23 (-4.45 to -0.003)	0.05	-1.28 (-3.30 to 0.73)	0.21
Alcohol abuse	0.19 (0.07 to 0.31)	0.002	0.06 (-0.07 to 0.20)	0.36
Substance abuse	0.43 (-0.01 to 0.86)	0.05	-0.05 (-0.52 to 0.42)	0.84
Sexual stigma	0.31 (0.19 to 0.44)	<0.001	0.17 (0.03 to 0.32)	0.02
HIV stigma*	-0.01 (-0.32 to 0.15)	0.48		
Perceived social support	0.01 (-0.06 to 0.08)	0.70		

Childhood abuse (yes)	5.09 (2.67 to 7.51)	<0.001	2.63 (-0.72 to 5.98)	0.12
Recent abuse (yes)	4.77 (2.48 to 7.07)	<0.001	1.42 (-1.92 to 4.78)	0.40
HIV-positive status (yes)	-0.13 (-2.27 to 2.01)	0.90		-

* Seropositives only