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HIV Prevalence and Related Risk Factors in Men Who Have Sex with Men in Bamako, Mali: Findings from a Bio-behavioral Survey Using Respondent-Driven Sampling

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Abstract

Using respondent driven sampling, we conducted a cross-sectional bio-behavioral survey among men who have sex with men (MSM) in Bamako, Mali. Eligibility criteria included age ≥18 years and having had sex with another man in the last 6 months. We enrolled 552 MSM, 99.6% were tested for HIV. MSM in Bamako were young (69.6% ≤24 years) and educated (63.7% ≥secondary). HIV prevalence among MSM in Bamako was 13.7; 90.1% of HIV-infected men were unaware of their HIV status. Almost one-third had never been tested for HIV. Factors associated with higher odds of HIV included younger age, being receptive with last partner, condom breaking during anal sex in last 6 months, talking to peer educator about HIV, and having sexually transmitted infection symptoms in past year. The results suggest the need for enhanced HIV prevention and treatment services targeted at MSM in Bamako, with emphasis on repeated HIV testing.

Resumen Usando un muestreo dirigido por los encuestados, llevamos a cabo una encuestra transversal bio-comportamental con hombres que tienen sexo con hombres (HSH) en Bamako, Mali. Los criterios de inclusion eran tener 18 años o más y haber tenido sexo con otro hombre en los últimos 6 meses. Reclutamos 552 HSH, 99.6% recibieron un test de VIH. Los HSH en Bamajo eran jóvenes (69.6% ≤ 24 años) y estaban formados (63.7% tenían al menos educación secundaria). La prevalencia de VIH en los HSH en Bamako era 13.7% y 90.1% de los hombres infectados con el VIH no tenían conocimiento de su estado. Casi un tercio nunca había recibido un

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test de VIH. Los factores asociados con mayor probabilidad de VIH incluyeron ser más joven, ser el receptivo con la última pareja, tener un condom que se rompió durante sexo anal en los últimos 6 meses, haber hablado con un educador de par sobre el VIH y haber tenido síntomas de una infección de transmisión sexual en el último año. Los resultados sugieren la necesidad de reforzar los servicios de prevención y tratamiento del VIH destinados a los HSH en Bamako, con énfasis en la repetición del test de VIH.

Keywords

Men who have sex with men; HIV-risk behaviors; Mali; Awareness of HIV status

Introduction

Mali has an HIV epidemic similar to that in other West African countries, with an estimated HIV prevalence of 1.1% among adults and approximately 100,000 people in the country living with HIV [1]. The HIV epidemic in Mali is largely concentrated among key populations who are at higher risk for HIV infection [2]. Although men who have sex with men (MSM) are disproportionally affected by HIV [3], until 2014 routine HIV surveillance activities in Mali included only pregnant women at antenatal care facilities, female sex workers, ambulatory vendors, taxi/bus ticket touts, and truck drivers [2].

HIV prevalence among MSM in sub-Saharan Africa is estimated at 18% [4]. Behavioral risk factors for HIV among sub-Saharan African MSM include having engaged in receptive anal intercourse [5–8], having higher number of sexual partners [9, 10], having been paid for sex [9, 11, 12], having experienced violence [11, 13], and hazardous drinking [14]. HIV infection among MSM is also associated with social vulnerability, including lower levels of education [6, 15], and being unemployed or having low income [5, 16].

In 2004, a qualitative survey of 30 MSM in Mali recruited through snowball sampling revealed that the MSM population is heterogeneous and includes individuals of disparate ages, marital status, religion, education level, and professional status [17]. In 2006, another survey used snowball sampling to recruit 417 MSM. The results showed that MSM were young (mean 25 years old), had their first sexual encounter with another man at a relatively young age, and that their first sexual encounter with another man was usually with a relative or a friend [18]. Condom use was not systematic and it was less frequent with female partners than with male partners [18].

In 2014, given the lack of representative estimates on the HIV prevalence and risk behaviors among MSM in Mali, the Mali *Cellule Sectorielle de Lutte Contre le SIDA* (Coordinating Committee for HIV/AIDS) at the Ministry of Health, the United States Centers for Disease Control and Prevention (CDC), ICAP at Columbia University and International Center for Excellence in Research (ICER) at the University of Sciences, Techniques and Technologies of Bamako in Mali conducted a bio-behavioral survey among MSM in Bamako, Mali using respondent driven sampling.

Methods

Study Design and Population

We conducted a cross-sectional bio-behavioral survey of MSM in Bamako, Mali between October 2014 and February 2015. Eligibility criteria for participation included: being biologically male, having engaged in anal or oral sex with a man in the past six months, age ≥18 years, being a resident of Bamako or its suburbs in past six months, speaking French or Bambara, able to provide written consent and in possession of a valid recruitment coupon. Exclusion criteria included being under the influence of alcohol or drugs at the time of survey.

The target sample size of 550 was calculated to estimate an HIV prevalence of 20% among MSM, a 95% confidence interval with a ± 5% error margin and a design effect of 2.0.

Recruitment

The study used respondent-driven sampling (RDS) for recruitment of participants. RDS is a version of snowball sampling that, once responses are weighted based on network size and recruitment patterns, generates a sample that is considered representative of the population in the absence of a population sampling frame [19–22]. A formative assessment was conducted prior to the survey to determine feasibility and acceptability of this survey among MSM in Bamako [23]. Recruitment began with six initial MSM participants (referred to as “seeds”) that were purposively selected by the investigators as they were well-connected with MSM networks in Bamako and diverse in regards to age, marital status, education level, engagement in non-governmental organizations (NGOs) in Bamako and known HIV status. One additional seed was added halfway through the study in an attempt to access older MSM. In addition, sensitization activities were conducted by peer educators at local NGOs providing services to MSM to increase participation of MSM.

All seeds completed the survey process and were given three coupons and asked to recruit three MSM from among their peers. All coupons included tracking numbers to link participants to their recruiters. Recruitment was tracked on an RDS Coupon Manager database developed in Excel. The study team rotated between two sites, one located on each side of the Niger River. MSM referred to the study with a coupon could choose the site most convenient to them to participate in the study.

Data Collection

Once a candidate participant was determined to have a valid coupon, he was screened for eligibility to participate in the study. If a candidate participant was confirmed as eligible, he received information on the study and was asked to provide informed consent before participating in an interview conducted in French or Bambara by trained interviewers using tablets programmed in SurveyCTO (Version 1.23, Dobility, 2015, Cambridge, MA, USA).

Participants who consented to HIV testing received pretest counseling and rapid testing according to Mali’s national HIV testing algorithm. Determine® rapid test (Alere, MA, USA) was used as first line and reactive specimens were confirmed using the Clearview®

rapid test (Alere, MA, USA). In case of discordant results, OraQuick ADVANCE® Rapid HIV-1/2 Antibody Test (OraSure Technologies, Inc, PA, USA) was used as a tie breaker. Dried blood spots (DBS) were collected for quality control. All of the HIV-positive cases and 10% of the HIV-negative cases were retested for quality control following the national algorithm for DBS for HIV surveillance studies in Mali, which uses in parallel Vironostika (Biomerieux, Durham, NC, USA) and ImmunoComb (Alere, MA, USA), performed and interpreted following manufacturer's instructions. Western Blot was used in case of discrepant results. Participants were then given an initial compensation of 4000 CFA (about US$8) for transportation and their time during the first visit. They were also offered condoms, lubricants, and information on HIV prevention and treatment. Participants then received their test result and post-test counseling. HIV-positive MSM were referred to free HIV care and treatment clinics that had staff members trained by the study team to provide MSM-friendly services.

Participants were asked to return to the study site for a second visit to provide information about the number and characteristics of peers they approached with a coupon for recruitment and to obtain their secondary compensation for recruitment efforts. Participants received a second compensation of 1000 CFA (about US$2) for each successful recruit (up to three) and 2000 CFA (about US$4) for transport up to a total maximum of 3000 CFA (about US $10).

Measures

The first visit questionnaire collected information on recruiter characteristics, participant's background characteristics, network size, sexual identity and history, male sex partners, female sex partners, sex work, stigma, violence and mental health, knowledge, opinions and attitudes towards HIV/AIDS, HIV information and services, uptake of HIV testing, care and treatment, and sexually transmitted infections. Alcohol use was evaluated using the Alcohol Use Disorders Identification Test (AUDIT-C) screen tool to help identify hazardous drinkers [24]. The two-item questions from the Patient Health Questionnaire (PHQ-2) were used to screen for major depression episodes [25]. High internalized homophobia was defined based on higher than mean responses to five questions regarding their feelings about their sexual attraction to men. Concurrent sexual activity was defined as having sex or knowing the partner was having sex with other people during the same period. Unprotected anal intercourse (UAI) was defined as having had receptive or insertive anal intercourse without a condom in the past 6 months with one's most recent partner, since pre-exposure prophylaxis is not available in Mali. Comprehensive HIV knowledge was defined using the UNAIDS definition, correctly answering three questions and rejecting two myths regarding HIV.

Statistical Analysis

Responses to questions about personal network size were used to weight the data using RDS Analyst (version 0.52, Los Angeles, California, USA). This allows use of weighted point estimates and confidence intervals as representative estimates of the population of MSM in Bamako. All data presented are adjusted population estimates unless otherwise indicated. For the tables presented, the counts may not sum to the total number of participants due to missing data or multiple response options.

Survey logistic procedures in SAS (Cary, NC), using weights imported from RDS Analyst, were used to identify factors associated with HIV in bivariate and multivariate analyses. Only complete cases were included in the models. Variables were considered for inclusion in the model based on the published literature and those significant at the 0.20 level in the bivariate analysis were included in the multivariate analysis and, using a manual backward stepwise procedure, retained if significant at the 0.05 level based on the Type 3 Analysis of Effect. We tested for collinearity and interactions between variables, and variables with collinearity at the 0.05 *p* value level were removed from the final model. Adjusted odds ratio (OR) and their 95% confidence interval (CI) are presented. A p-value < 0.05 was considered statistically significant.

Ethical Considerations

This study was approved by the CDC Associate Director of Science in the Division of Global HIV and Tuberculosis, the Columbia University Medical Center Institutional Review Board, and the Malian Ethical Committee of the Facility of Medicine, Pharmacy and Dentistry as a research activity involving human subjects. No personal identifiers were collected.

Results

Sampling

Between October 2014 and February 2015, 1551 coupons were distributed to participants, of which 608 (39.2%) were returned to the study sites by potential participants. Among these, 56 (9.2%) were not eligible to participate and 552 (90.8%) were enrolled in the study. Nearly all (550, 99.6%) were tested for HIV. All participants reported their personal network size except for one, to which we assigned the average weight.

Participants' Characteristics

The characteristics of MSM in Bamako are presented in Table 1. MSM in Bamako were young, with 69.6% being ≤24 years old. While very few (5.2%) had never attended school, 47.3% had completed secondary education and 16.4% had university education. The majority (91.8%) were never married. A large proportion (43.3%) of MSM were students, and 12.7% were not working at the time of the study. Only a few were from other African countries other than Mali (5.5%). In terms of their sexual identity, 45.2% self-identified as homosexual. According to the PHQ-2 scale, 8.0% screened positive for depression. Regarding alcohol use, 19.8% had problematic consumption of alcohol according to the AUDIT-C score. A mere 4.2% had used non-injectable drugs in the past 6 months and 0.3% had ever used injectable drugs.

Sexual Behaviors and Condom Use

MSM had a median of 2 male sexual partners (interquartile range 1–4) in the last 6 months, with 43.5% having only one male partner during this period (Table 2). The majority (85.8%) had sex with a woman at least once in their lifetime and 52.5% had one or more female partners in the past 6 months. At last sex with a male partner, 57.2% of MSM were the insertive partner, 24.6% receptive and 18.2% both. More than half (60.6%) had concurrent

sexual activity with last male partner. While 30.4% have ever given money, goods or services to a man in exchange of sex, 10.2% had ever received one of these three things in exchange for sex.

About 28.2% of MSM had unprotected insertive anal intercourse with their most recent partner the last time they had sex, and 19.0% had unprotected receptive intercourse. With male partners, 76.0% used condoms during last sexual encounter, while only 43.3% used a condom with last female partner for the entire time. In the last 6 months, 14.7% had a condom break during anal sex with a man. While 45.2% used free condoms in the last 6 months, 27.8% were unable to get condoms when needed during the same period.

Disclosure of Sexual Orientation, Stigma, and Discrimination

Besides their male sexual partners, 73.7% of MSM had disclosed to someone else their sexual orientation (Table 3). Among those that had disclosed their sexual orientation to someone besides their sexual partner, 93.6% disclosed to other MSM/lesbian/trans friends, 9.7% to other friends and 8.9% to other family members besides their spouse.

Although there are no laws against homosexuality in Mali, 72.7% of MSM thought that homosexuality is illegal. More than one-third (37.0%) had experienced discrimination or abuse in the past due to their same sex behavior:4.1% had been arrested, 15.8% had been blackmailed and 23.3% had suffered harassment or abuse because they had sex with men. An estimated 15.1% were ever forced to have sex: of which 39.3% was forced by sex partner and 46.2% by other people they know, among others.

HIV Knowledge, Testing History, and Prevalence

More than half of MSM (56.7%) had comprehensive knowledge of HIV and 49.9% thought they could be HIV-positive (Table 4). While 71.6% had ever tested for HIV, only 47.1% had tested in the past 12 months. More than two-thirds (71.8%) had a contact with a peer educator in the past. About 13.4% reported having symptoms of sexually transmitted infections (STI) in the past 12 months and 8.4% know other HIV-positive MSM.

The prevalence of HIV in this study among MSM in Bamako was 13.7%. Among those infected with HIV, 90.1% were unaware of their HIV-positive status prior to the survey. No discordance of results were observed for the 79 HIV-positive samples and 47 HIV-negative samples retested for quality control. The observed design effect was 2.4.

Factors Associated with HIV Infection

The weighted bivariate and multivariate analyses are presented in Table 5. In the bivariate analysis, the following variables were associated with higher odds of HIV infection: older age (being 25–29 and ≥30 years old vs. 18–24 years old), having receptive anal intercourse with last sexual partner, having unprotected receptive anal intercourse, having a condom break during anal sex with a man in the last 6 months, using free condoms in the last 6 months, unable to get condoms when needed one in the last 6 months, having ever tested for HIV, testing for HIV in the past 12 months, having STI symptoms in the past 12 months, and having had contact with a peer educator. Several factors were also associated with lower

odds of HIV infection as presented in Table 5, such as problematic consumption of alcohol, high number of female partners in the past 6 months, and having given a man money, goods or services in exchange for sex in the past 12 months, and having used a condom last time with most recent male partner. Several correlations were found, such as those between age and education or between education and employment. For correlated variables the variable more strongly associated with HIV infection was included in the multivariate model.

In the multivariate model, the following factors were associated with HIV infection: being 25–29 years old (aOR 6.4, 95% CI 2.9–14.0), being ≥30 years old (aOR 8.6, 95% CI 2.7–27.2) versus 18–24 years old, being the receptive partner with last partner in the past 6 months (aOR 12.0, 95% CI 4.5–31.9) or being both receptive and insertive with the last sexual partner (aOR 4.9, 95% CI 1.5–15.7), having had a condom break during anal sex in the past 6 months (aOR 3.6, 95% CI 1.5–8.6), having talked to a peer educator about HIV (aOR 3.1, 95% CI 1.1–9.3), and having STI symptoms in the past 12 months (aOR 3.4, 95% CI 1.5–8.1).

Discussion

As the first bio-behavioral survey of MSM using respondent driven sampling in Mali, we found that HIV prevalence was 13.7% (95% CI 9.2–18.1%) among MSM, nine times higher than that among men in the general population in Bamako (1.6%) [1]. Among those who were HIV-positive, the majority (90.1%) were unaware of their HIV status. A significant proportion of MSM (28.4%) had never been tested for HIV. Several factors were independently associated with HIV infection, including older age (25–29 and ≥30 vs 18–24), having receptive anal intercourse, condom breaking during anal sex in last 6 months, talking to peer educator about HIV and having STI symptoms.

In order to achieve by 2020 the UNAIDS 90–90–90 targets, it is crucial to ensure that people living with HIV know their HIV status. The high proportion of HIV-positive MSM who were unaware of their HIV status is highly concerning and similar to what has been reported by other studies among MSM in Africa [16, 26, 27], indicating a need to better target HIV services to MSM, especially given their increased risk of HIV infection. The low proportion of MSM who had been tested for HIV in the last 12 months indicates need for increased testing among MSM. In fact, the Mali HIV national guidelines recommend repeat testing among key populations every 3 months, indicating a large gap between practice and guidelines [28]. Increased frequency of HIV testing might require new methods such as self-testing or couples testing for HIV [29]. The high proportion of MSM unaware of their HIV-positive status has negative implications for HIV-positive individuals if they initiate antiretroviral treatment late as well as for the risk of onward transmission to others when their viral load is not suppressed.

Similar to other studies, older age was associated with HIV infection in our study given that HIV is a chronic infection [5, 11]. Sexual position (receptive vs. insertive) and symptoms of STI in the past 12 months were associated with higher odds of HIV infection in multivariate analysis [5, 11]. Receptive anal intercourse compared to insertive and STI presents a higher

risk of HIV transmission due to increased exposure to blood and mucosal secretions when not using a condom.

Although the majority of MSM were not married, more than half reported having one or more female partners in the last 6 months. This finding is similar to other studies in West Africa that have found a high proportion of MSM had female partners [11, 15, 27], but different from a study among MSM in South Africa where the proportion who had female partners in the past 6 months was as low as 8% [16]. The high rates of sex with opposite sex partners found among MSM in Bamako could be due to the less favorable social and legal contexts and the highly stigmatized nature of homosexuality in Mali as compared to South Africa.

Having a condom break in the past 6 months was associated with HIV infection in the multivariate model. Although the cross-sectional nature of this survey does not allow assessing causality, this finding highlights the high risk for onward transmission given the lack of pre-exposure prophylaxis (PrEP) in Mali. Interestingly, condom use with female partners was significantly lower than among male partners (43 vs. 76%, respectively), emphasizing the need to reinforce condom use with both male and female partners among MSM in Bamako. Several studies have demonstrated the efficacy of PrEP as a new promising biomedical intervention to prevent HIV infection among HIV-negative MSM [30, 31]. The results of this study also emphasize the potential impact that roll-out of PrEP could have to prevent HIV infection among MSM in Mali, especially if suitable adherence is achieved [29]. The roll-out of PrEP in sub-Saharan Africa has been considerably slow and additional efforts will be needed to reach sufficient coverage for this intervention to be fully effective [29].

One of the strengths of this study was the high acceptability and smooth roll out and implementation of the study without any incidents, despite homosexuality being highly stigmatized in Mali. Additionally, this study provided representative data on HIV prevalence and risk behaviors and built capacity of national stakeholders on respondent driven sampling. However, as other surveys conducted among MSM, one of the limitations of this study was the inability to reach older MSM, who might be less likely to participate in such a study given the larger stakes associated with being married or employed [15]. Given that HIV prevalence is higher in older MSM, and that this survey is representative of the younger network component of MSM in Bamako, our estimate of HIV prevalence may be an underestimate. Despite its potential limitations, RDS has been described as the preferred sampling method for populations without a readily available sampling frame [32]. Time Location Sampling would not have been possible in this context given the lack of public venues where MSM socialize in Bamako. Another limitation is that this was a cross-sectional study, and as such, the analyses are exploratory and the resulting associations cannot be assumed to be causal. Finally, this study was conducted in Bamako and the findings cannot be generalized for the whole country.

Conclusions

This is the first bio-behavioral survey among MSM using respondent driven sampling in Mali. The findings from this study are important in that they provide an estimate of the MSM HIV prevalence and risk factors in Bamako and will provide useful information to the MOH and NGOs working with MSM in Bamako to adapt and tailor HIV-related programs to their needs. In particular, the results of this study highlight the need for enhanced HIV services targeted toward MSM, including increasing MSM-friendly HIV/STI testing services with emphasis on repeated HIV testing and with routine screening of STI symptoms. In order to achieve the 90–90–90 target, more efforts will be needed to ensure that key populations such as MSM have appropriate prevention and treatment services.

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Table 1

Socio-demographic characteristics and substance use among MSM in Bamako, 2014–2015 (N = 552)

	n	Weighted %	95% CI
Age (years)			
18–24	362	69.6	64.0–75.2
25–29	89	13.4	9.3–17.5
≥30	101	17.0	12.4–21.6
Highest level of education			
Never attended school	29	5.2	2.0–8.5
Primary	153	31.0	25.0–37.0
Secondary	254	47.3	41.1–53.6
University	115	16.4	12.5–20.4
Marital status			
Never married	498	91.8	88.5–95.1
Married, divorced, separated, or widowed	54	8.2	4.9–11.5
Main occupation			
No work	68	12.7	8.3–17.2
Student	220	43.3	37.1–49.6
Unskilled labor[a]	29	5.9	3.0–8.9
Professional/services[b]	135	22.0	16.8–27.1
Other (Includes military and civil service)	100	16.0	11.6–20.5
Money earned last month			
<49,999 CFA ($84 USD)	352	72.3	67.0–77.6
50,000–149,999, CFA ($84–251 USD)	103	15.4	11.2–19.6
More than 150,000 CFA ($251 USD)	90	12.3	8.5–16.0
Don’t know	7	0.9	0.1–1.8
Nationality			
Malian	535	94.5	91.0–98.0
Other African nationalities	17	5.5	2.0–9.0
Religion			
Muslim	487	88.3	84.0–92.6

	n	Weighted %	95% CI
Christian	28	8.5	4.5–12.5
Other (Animist/No religion)	26	3.2	1.4–5.0
Self-identifies as homosexual[c]	267	45.2	38.9–51.5
Screened positive for depression	53	8.0	4.8–11.2
Problematic consumption of alcohol (AUDIT-C score greater than or equal to 4)	123	19.8	14.7–24.8
Recreational use of non-injectable drugs in the last 6 months	29	4.2	2.0–6.4
Recreational use of injectable drugs, ever	2	0.3	0–0.8

[a]Unskilled labor includes hawker, street vendor, casual laborer, mechanic, and factory worker

[b]Professional/services include teacher, banker, accountant, hairdresser, waiter, bar manager, taxi/bus driver, security, artisan, musician, dancer, and performer

[c]Participants were asked whether they would describe themselves as homosexual, bisexual, straight/heterosexual or other

Table 2

Sexual behaviors and condom and lubricant use among MSM in Bamako, 2014–2015 (N = 552)

	n	Weighted %	95% CI
Sexual behaviors			
Number of male sexual partners in past 6 months			
1	194	43.5	37.1–49.8
2	137	23.9	18.6–29.1
3+	221	32.6	27.1–38.2
Most recent type of partner			
Main partner	411	75.3	69.8–80.6
Casual partner	91	17.7	12.9–22.4
Commercial	49	7.1	4.0–10.1
Has had oral, vaginal, or anal sex with a woman, ever	454	85.8	82.1–89.5
Number of female sexual partners, last 6 months			
0	283	47.5	41.3–53.7
1	161	29.1	23.3–34.8
2+	108	23.4	17.8–29.0
Sexual position with last male sexual partner, last 6 months			
Insertive	289	57.2	51.0–63.5
Receptive	151	24.6	19.1–30.1
Both insertive and receptive	104	18.2	13.5–22.8
Had concurrent sexual activity with last male partner	352	60.6	54.3–66.9
Has given a man money, goods, or services in exchange for sex, last 6 months	193	30.4	24.5–36.3
Has received money, goods, or services in exchange for sex, last 6 months	78	10.2	6.9–13.6
Condom and lubricant use			
Had unprotected insertive anal intercourse with most recent partner, last time	140	28.2	22.6–33.7
Had unprotected receptive anal intercourse with most recent partner, last time	109	19.0	14.1–23.8
Used a condom last time with most recent male partner	423	76.0	70.8–81.2
Used condom with last female partner the entire time, last 6 months	151	43.3	35.6–50.9
Had a condom break during anal sex with a male partner, last 6 months	72	14.7	10.0–19.3
Used free condoms, last 6 months	261	45.2	29.0–51.5
Unable to get condoms when need one, last 6 months	130	27.8	21.9–33.7

Table 3

Disclosure of sexual orientation, stigma and discrimination among MSM in Bamako, 2014–2015 (N = 552)

	n	Weighted (%)	% (95% CI)
Has disclosed their sexual orientation to someone else other than their sexual partner Disclosed sexual orientation to (multiple response options)	422	73.7	68.0–79.3
MSM/lesbian/trans friends	404	93.6	88.8–98.4
Other friends	45	9.7	5.5–13.9
Spouse	0	-	-
Other family	44	8.9	4.8–13.0
Health care worker	4	0.5	0.0–1.3
Other	2	0.4	0.0–0.91
Thinks it is illegal to have sex with other men in Mali[a]	397	72.7	67.0–78.4
Ever experienced same-sex discrimination[b]	221	37.0	30.9–43.2
Been arrested for having sex with men	24	4.1	1.4–6.8
Been blackmailed for having sex with men	100	15.8	11.1–20.4
Suffered harassment or abuse because they had sex with men	149	23.3	17.7–28.9
Has experienced forced sex, ever[b]	96	15.1	10.6–19.6
By sexual partner	33	39.3	25.0–53.5
By friends or other acquaintances	48	46.2	32.5–60.0
High internalized homophobia	326	60.6	54.5–66.7

[a]There are no laws against homosexuality in Mali

[b]Multiple options allowed for responses, not all presented

Table 4

HIV knowledge, testing history and prevalence among MSM in Bamako, 2014–2015 (N = 552)

	n	Weighted (%)	% (95% CI)
Comprehensive HIV knowledge	320	56.7	50.4–63.0
Perceived possibility of being HIV positive	280	49.9	43.6–56.1
Had been tested for HIV, ever	415	71.6	65.8–77.3
Had been tested for HIV, last 12 months	277	47.1	40.8–53.4
Had contact with HIV peer educator, ever	412	71.8	66.1–77.5
Had STI symptoms, last 12 months	82	13.4	9.0–17.7
Know other HIV+ MSM	67	8.4	5.3–11.6
HIV prevalence: tested HIV-positive during the survey	79	13.7	9.2–18.1

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Table 5

Weighted bivariate and multivariate model for HIV infection among MSM in Bamako, 2014–2015 (N = 550)

	Bivariate			Multivariate		
	OR	**(95% CI)**	**P- value**	**aOR**	**(95% CI)**	**P- value**
Socio-demographic characteristics and substance use						
Age (years)						
18–24	1		<0.001	1		<0.001
25–29	6.3	2.6–15.3		6.4	2.9–14.0	
>=30	2.7	0.9–7.5		8.6	2.7–27.2	
Secondary or higher education versus primary or none	0.7	0.3–1.5	0.34			
Never married versus married, divorced, separated or widowed	2.1	0.6–7.8	0.28			
Not working at the time of the survey versus working	0.6	0.1–1.9	0.39			
From other African nationalities versus Malian	0.2	0.1–1.0	0.06			
Not Muslim versus Muslim	0.4	0.1–2.0	0.28			
Self-identifies as homosexual versus not	1.0	0.5–2.1	0.99			
Screened positive for depression	1.1	0.3–3.8	0.8			
Problematic consumption of alcohol (AUDIT-C score greater than or equal to 4) versus not	0.4	0.2–0.9	0.03			
Recreational use of non-injectable drugs, last 6 months versus not	1.1	0.2–6.7	0.89			
Sexual behaviors						
Number of male sexual partners in past 6 months						
1	1		0.18			
2	0.9	0.3–2.2				
3+	0.4	0.2–1.1				
Most recent type of partner						
Main partner	1		0.93			
Casual partner	0.9	0.4–2.1				
Commercial	1.1	0.3–4.1				
Has had oral, vaginal, or anal sex with a woman, ever	1.0	0.4–2.5	0.9			
Number of female sexual partners, last 6 months						
0	1		<0.001			
1	1.0	0.4–2.3				

	Bivariate			Multivariate		
	OR	**(95% CI)**	**P- value**	**aOR**	**(95% CI)**	**P- value**
2+	0.1	0.1–0.4				
Sexual position with last sexual partner, last 6 months						
Insertive	1		<0.001	1		<0.001
Receptive	7.4	2.7–20.3		12.0	4.5–31.9	
Both insertive and receptive	3.7	1.3–10.3		4.9	1.5–15.7	
Had concurrent sexual activity with last male partner versus not	1.3	0.6–2.8	0.57			
Has given a man money, goods, or services in exchange for sex, last 6 months versus not	0.03	0.1–0.3	0.001			
Has received money, goods, or services in exchange for sex, last 6 months versus not Condom use	1.1	0.4–3.2	0.79			
Had unprotected insertive anal intercourse with most recent partner, last time	0.8	0.3–1.9	0.53			
Had unprotected receptive anal intercourse with most recent partner, last time	2.7	1.2–6.2	0.02			
Used a condom last time with most recent male partner vs not	0.5	0.2–1.0	0.05			
Used condom with last female partner the entire time, last 6 months versus not	0.6	0.3–1.2	0.13			
Had a condom break during anal sex with a male partner, last 6 months vs not	4.0	1.6–10.0	0.003	3.6	1.5–8.6	0.004
Used free condoms, last 6 months versus not	2.6	1.2–5.8	0.02			
Unable to get condoms when need one, last 6 months versus not Disclosure of sexual orientation, stigma and discrimination	2.8	1.3–6.2	0.009			
Has disclosed their sexual orientation to someone else other than their sexual partner versus not	0.5	0.2–1.2	0.12			
Ever experienced same-sex discrimination, ever versus not	1.0	0.4–2.1	0.9			
Has experienced forced sex, ever versus not	2.4	1.0–6.1	0.06			
Internalized homophobia	1.6	0.8–3.4	0.21			
HIV knowledge, testing history and prevalence						
Comprehensive HIV knowledge versus not	0.6	0.3–1.3	0.22			
Perceived possibility of being HIV positive versus not	1.9	0.9–4.1	0.12			
Had been tested for HIV, ever versus not	6.6	2.4–18.6	<0.001			
Had been tested for HIV, last12 months versus not	4.7	1.9–11.6	<0.001			
Had contact with HIV peer educator, ever versus not	2.2	0.9–5.7	0.10	3.1	1.1–9.3	0.04
Had STI symptoms, last 12 months versus not	2.8	1.1–6.8	0.03	3.4	1.5–8.1	0.005
Knows other HIV+ MSM versus not	2.3	0.9–5.7	0.07			