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Characterizing social cohesion and gender identity as risk determinants of HIV among cisgender men who have sex with men and transgender women in Côte d'Ivoire

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Abstract

Purpose—HIV prevalence has been previously estimated among cisgender men who have sex with men (MSM) in Côte d'Ivoire; however, limited data exist relating to the role of social cohesion and gender identity within this population. This study aims to examine these factors as risk determinants of HIV among MSM in Côte d'Ivoire.

Methods—We conducted a cross-sectional study using respondent-driven sampling for recruitment with a structured sociobehavioral instrument and testing for HIV. After respondent-driven sampling adjustment, chi-squared tests and bivariate logistic regression and multivariate logistic regression analyses were performed to characterize social and identity-based risk determinants of biologically confirmed prevalent HIV infection.

Results—HIV prevalence was 11.2% ($n = 146/1301$). Transgender woman identity was associated with higher odds of HIV compared with cisgender MSM (aOR = 3.4, 95% CI [2.0–5.8], $P < .001$). Having a combined social cohesion score of medium (aOR = 0.4, 95% CI [0.2–0.8], $P < .01$) or high (aOR = 0.2, 95% CI [0.1–0.3], $P < .001$) was associated with lower odds of HIV compared with a low score.

Conclusion—These data suggest that social cohesion is a determinant of prevalent HIV infection in Côte d'Ivoire among gay men, other cisgender MSM, and transgender women. The differences

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in HIV burden and social cohesion between transgender women and cisgender MSM highlight the need to better target the diversity of people traditionally included in the MSM umbrella to ensure comprehensive HIV prevention and treatment interventions.

Keywords

Côte d'Ivoire; Transgender; Gay; Social cohesion; Gender identity; Stigma

Background

Despite an estimated HIV prevalence of 3.4% among adults in Côte d'Ivoire, estimates suggest an HIV prevalence of up to 18% among men who have sex with men (MSM) [1,2]. In the West and Central African context, social and structural barriers including criminalization and social stigma regarding same-sex practices affect engagement in HIV prevention, treatment, and care programs and potentiate HIV acquisition and transmission risks among cisgender MSM and transgender women [3–7].

Same-sex sexual practices in Côte d'Ivoire, although not legally prohibited, are highly stigmatized [8]. Gay men, other cisgender MSM, and transgender women who have sex with men face discrimination and marginalization based on sexual practices, often leading to limited disclosure of sexual practices as well as sexual and gender identities or avoidance of health care all together given anticipations of stigma [7,9,10]. Consequently anticipated, perceived, and enacted stigmas can individually or collectively limit the uptake of HIV prevention, treatment, and care services, serving to sustain HIV risks among marginalized key populations [10,11].

Gay men, other cisgender MSM, and transgender women experience the effects of social stigmas at various socioecological levels, from the individual through the network and community levels suggesting the utility of supraindividual-level interventions [12]. Intervening at the network and community levels can increase self-efficacy to engage in HIV prevention services and retention in care for those living with HIV [4,12,4]. Elucidating network and community-level factors related to HIV risks, inclusive of social cohesion and social participation in the general community, can identify new points of intervention for gay men, other cisgender MSM, and transgender women, as shown in previous work in eSwatini [13–15].

Social cohesion, a bonding, intragroup social capital construct which can refer to “mutual aid, trust and solidarity” [16], plays a distinctly important role in HIV prevention [13,15]. Fonner et al. [16] show that social capital, especially social cohesion, has a significant association with behaviors, social discrimination, and collective action among socially disadvantaged groups. Previous findings indicate positive association of stronger social cohesion with HIV testing and prevention service engagement broadly among key populations, although there are limited data characterizing social cohesion and outcomes among transgender women across sub-Saharan Africa [16–19].

We aimed to elucidate the association between social cohesion and HIV infection among cisgender MSM and transgender women in Côte d'Ivoire with the goal of improving

engagement of key populations in HIV prevention, treatment, and care services. Although cisgender MSM and transgender women are distinct populations with different HIV risk profiles, transgender women have often been included in MSM studies. Only recently have researchers begun to disaggregate data to assess gender identity as a determinant of HIV infection [1,10,20–22]. As there is limited work recognizing transgender women, assessments of HIV infection among transgender women in West Africa are of high importance.

Methods

We recruited a cross-sectional sample of participants through respondent-driven sampling (RDS). This method is described in detail elsewhere [23–26]. Briefly, RDS is useful in accessing marginalized populations through their social networks by incentivizing the participants to refer a limited number of their network associates into the study. RDS adjustments weight participants based on recruitment probability to generate weighted estimates (e.g., of HIV prevalence) for the networked target population. Surveys were conducted in French from March 2015 to February 2016 in Abidjan, Agboville, Bouake, Gagnoa, and Yamoussoukro, Côte d’Ivoire. Eligibility criteria included minimum age of 18 years, male sex assignment at birth, residence in one of the aforementioned cities in Côte d’Ivoire for at least three months, reported receptive or insertive anal intercourse with a man in the last 12 months, ability to provide consent, presentation at a study site with a valid RDS coupon, and provision of consent. Exclusion criteria included having already participated in the study, being under the influence of drugs or alcohol, and lacking capacity for providing informed consent. There were no restrictions on ethnicity or current gender identity on eligibility of participants allowing for the inclusion of transgender women. Participants were not required to provide proof of residence.

The study began with a total of 16 initial participants (RDS “seeds”) who were recruited across the five sites (three in each city except for Yamoussoukro, in which there were four). Seeds were purposively selected to have varying sociodemographic characteristics within a given city. Each participant was given three coupons to recruit additional participants. These participants were instructed to come to the study sites for possible inclusion into the study and, if they consented and participated, subsequently received three coupons each to distribute to three additional social contacts. This process was repeated until the sample size approached the target sample size of at least 1050. The final sample size was 1301. The maximum number of waves resulting from the most productive seed was 13, and the mean number of waves per seed was 10.3.

Study participants provided verbal consent for survey participation, HIV testing, and syphilis testing. The study received ethics approval in Côte d’Ivoire by the Comité National d’Ethique et de la Recherche. Approval for secondary data analysis of deidentified data was given by the Johns Hopkins School of Public Health.

The primary outcome was HIV serostatus determined by rapid blood test. A preliminary determination of HIV status was made with the Determine HIV-1/2 test (Alere International Limited, Ballybrit, Ireland) and preliminary positive results were confirmed with the

STATPAK HIV 1/2 test (Chembio Diagnostic Systems, Inc., Medford, NY). Individuals who refused the test were considered to be missing for these analyses we did not impute the missing data.

Possible explanatory factors were identified for these analyses and can be categorized into sociodemographic, sexual history and sexual activity in the last 30 days, HIV risk knowledge, stigma, social participation, and social cohesion indicators. Stigma, social participation, and social cohesion were captured with indicators validated in similar settings measuring perceived, anticipated, and enacted stigma, a composite social cohesion score, and a social participation measure, respectively [13,27]. Perceived stigma, anticipated stigma, and enacted stigma were measured separately; each stigma variable is a composite of binary yes/no questions asked of participants. These specific questions are described in detail by Risher et al. [28].

Social cohesion was measured through a composite indicator which was derived from four questions from Grover et al. [13] asking participants about the closeness of their relationships with other MSM. Responses were measured on a five-point scale from strongly disagree (zero points) to strongly agree (four points). The four questions were “you can count on other men who have sex with other men if you need to borrow money,” “you can count on other men who have sex with other men to accompany you to the doctor’s office or hospital,” “you can count on other men who have sex with other men if you need a place to stay,” and “you can trust the majority of men who have sex with other men in your area.” Responses to all four questions were summed as a continuous composite social cohesion measure from 0 to 16. Responses were further divided into low (0–9), medium (10–11), and high (12–16) based on the lowest 25th percentile, the middle 50% of responses and the highest 25th percentile observed in the data we collected.

The social participation measure is a composite measure derived from the responses to four questions asking about the level of involvement in church or religious groups, student or sports clubs, art and cultural activities, and community activities. Responses were measured on a four-point scale from “do not participate” (zero points) to “group leader” (three points). The percentage of participants missing data for the aforementioned key measures was less than 10% and it was considered appropriate to exclude these participants with missing responses from the multivariate analysis without imputing missing data.

All statistical analyses were completed in Stata 14 (StataCorp, College Station, TX) [29]. All key measures were analyzed in a bivariate logistic fashion on the outcome of HIV serostatus with a χ^2 test. Unweighted and RDS-adjusted estimates of association between exposures and the primary outcome were created. Individual survey weights were applied in Stata using the RDS package (University of Waterloo, Waterloo, Canada). RDS-adjusted estimates were derived using bootstrapped estimates with 1000 repetitions [25]. Homophily, or the degree to which individuals recruited within-group, was calculated in Stata with the RDS package [23]. Factors consistent with previous literature and our conceptual framework and for which χ^2 test *P*-values were less than or equal to .25 were considered for the multivariable logistic regression model [12]. In addition, all sociodemographic indicators

were considered for the multivariable logistic regression model irrespective of χ^2 test P -value.

Among background characteristics including education, employment status, and weekly income, a backward stepwise selection method retained employment status in the model. Among sexual risk history indicators, sexual identity was removed from the model due to high correlation with “sex of partners”; “Number of sexual events with a casual male partner” and “sex of partners” indicators were retained. All indicators related to stigma and social cohesion were retained in the final multivariate model as there was no observed collinearity. The final multivariate model included age in years, employment status, gender identity, number of sexual events with a casual male partner, sex of partners, perceived stigma, anticipated stigma, enacted stigma, and the combined social cohesion score.

Collinearity was assessed by calculating the variance inflation factor (VIF) for variables which were suspected to be collinear based on past literature and thematic similarity [12]. All variables suspected to be collinear with each other were assessed with linear regression on HIV positivity and subsequently assessed for VIF. Those with high VIF (>10) were collinear, and one variable within each group of variables assessed was retained. Generally, this was the variable with the lowest VIF, but decisions were also based on guiding conceptual framework and past literature.

We also used blockwise multivariable regression, in which blocks were determined a priori, to analyze the possible role of social cohesion as a mediator of the association between stigma and HIV positivity. We first observed the associations between individual stigma variables (perceived stigma, anticipated stigma, and enacted stigma) and HIV positivity after controlling for demographic variables only (age, employment status and gender identity). We then observed the associations between stigma and odds of living with HIV after controlling for demographic variables and the social cohesion variable together.

Results

Among the 1301 participants, the mean age was 24.1 years (IQR: 21–26) with ages ranging from 18 to 54 years. A total of 40 participants (3.1%) refused the HIV test. Most participants who refused were from Abidjan ($n = 34$, 85%), reported an urban origin ($n = 34$, 85%), or were more highly educated ($n = 22$, 55%). Fewer refusals were observed among students than among employed or unemployed participants. Table 1 reports crude and RDS-weighted estimates of various sociodemographic characteristics of the participants.

About 9% (93/1010) of participants with male partners in the last 30 days reported always using condoms with those male partners. Seventy-four percent (74%, 505/687) of those who had a casual male partner in the last 30 days, 75% (693/930) of those who had a regular male partner in the last 30 days, and 70% (521/900) of those who had any female partner in the last 30 days reported using a condom at last sex.

Less than half of the participants reported having had an HIV test in the last six months (43.3%, 562/1298) and only about 18% (237/1301) of participants had participated in a peer education session in the last three months, despite the fact that about 74% (962/1301) of

participants had received HIV prevention information in the past. About 5% (62/1301) of participants answered all four risk questions in Table 2 correctly. The most common responses for the four risk questions were that all types of sex (vaginal, anal, and oral sex) carry equal risk (44.0%, 572/1301), that insertive and receptive anal sex carry equal risk (61.2%, 796/1301), that water-based lubricant is the safest to use with latex condoms (54.3%, 706/1301), and that HIV can be contracted through the reuse of needles used for injecting drugs or substances (98.8%, 1285/1301).

Table 3 describes crude and RDS-weighted estimates for stigma, social cohesion, and social participation indicators. 68.9% (897/1301) of participants reported experiencing some degree of enacted stigma. Forty-six percent (46%, 599/1301) of participants reported experiencing some degree of perceived stigma and 32.3% (420/1301) of participants reported experiencing some degree of anticipated stigma. Social cohesion was categorized as high for 43.7% (569/1301) of participants and as low for 31.4% (408/1301) of participants. Social participation varied among participants with 6.4% (83/1301) of participants reporting no social participation and 13.8% (179/1301) of participants reporting very high social participation.

The multivariate model examining demographic variables and variables about sex partners in the last 30 days (Table 4) showed statistically significant associations with HIV seropositivity and included both crude and RDS-weighted estimates. Notably, identifying as a woman or as transgender (aOR = 2.9, 95% CI [1.5–5.7], $P < .01$) compared with identifying as a man, and having three or more sexual events with casual male partners in the last 30 days (aOR = 2.5, 95% CI [1.0–5.8], $P < .05$) compared with fewer than three events were both associated with higher odds of HIV seropositivity. Notably, the unweighted aOR for identifying as a woman or as transgender was 3.5 (95% CI [2.3–5.2], $P < .001$).

Social cohesion and stigma were analyzed in a blockwise fashion, in which stigma variables were analyzed while controlling for demographic variables (Table 5, model A), and in which social cohesion variables were analyzed while controlling for demographic and stigma variables (Table 5, model B). There was no significant association between stigma variables (perceived, anticipated, or enacted) in either multivariate analysis. High social cohesion scores were significantly protective of HIV positivity in both weighted and unweighted analyses (aOR = 0.3, 95% CI [0.1–0.5] and aOR = 0.4, 95% CI [0.2–0.6], respectively) compared with low scores, and medium social cohesion scores were protective of HIV positivity scores in unweighted analyses (aOR = 0.5, 95% CI [0.2–0.6]).

There was no evidence of mediation due to social cohesion on the relationship between stigma and HIV positivity, as shown through blockwise modeling (Table 5). In model A, we controlled only for demographic variables and observed no significant association between stigma and HIV. When we controlled for both demographic variables and the social cohesion variable in model B, we also observed no significant association between stigma and HIV, suggesting that the relationship between stigma and HIV positivity is not mediated by the social cohesion variable.

Discussion

This cross-sectional study describes HIV prevalence among both MSM and transgender women in Côte d'Ivoire and its associations with gender identity, stigma, social participation, and social cohesion. Self-identifying as transgender or as a woman was found to be independently associated with HIV seropositivity among participants. In addition, both medium and high social cohesion were found to be statistically significantly protective, with lower odds of HIV seropositivity observed among study participants with medium and high social cohesion scores compared with those with low social cohesion scores. Given the large sample size, high number of transgender respondents and RDS recruitment method, this study works to elucidate some important associations between sexual identity, social cohesion, and HIV prevalence.

As has been previously described, transgender women are exposed to different HIV risks than gay men and other MSM [21,30]. In addition, transgender women experience increased stigma compared with the general population and compared with cisgender gay men and other MSM, not only related to HIV status but also related to gender identity [21,22]. Given that odds of living with HIV is higher among trans women when controlling for demographic factors and sexual history in the last 30 days, the need for transfriendly services among health care providers to influence HIV prevention education and policy is urgent [31]. Rather than relying on more broadly focused key population interventions, transgender women should be engaged and recognized in HIV programming to effectively build trust, enhance social cohesion, and improve HIV prevention efforts in the community [32].

Better visibility of and focus on transgender populations in the West and Central African regions remains a distinct priority for preventing HIV transmission [33,34]. The collection of important social cohesion indicators, paired with the collection of data on sex assignment at birth and sexual and gender identities, serves to further the understanding of social cohesion among MSM and transgender women, and how these factors may vary among MSM and transgender women. These findings suggest the need for more highly tailored programs to reach communities with the lowest social cohesion. Social cohesion was predictive of significantly lower odds of living with HIV when controlling for all other demographic, sexual history, and stigma variables, suggesting the utility of strategies to build multiple levels of social cohesion among particularly marginalized groups including gay men, other men who have sex with men and transgender women as a component of comprehensive HIV prevention programs.

The limitations associated with this study are primarily due to the cross-sectional design. Although we controlled for known confounders including education and employment status, potential unmeasured confounders, such as culture and childhood family dynamics, might still confound the relationship between sexual and gender identity and HIV prevalence. Social desirability bias may also confound the observed relationships, although we made every effort to minimize this. In addition, there is limited generalizability to all MSM and transgender women in Côte d'Ivoire although we did sample from multiple sites. Finally,

temporal relationships and ultimate causality cannot be established due to the cross-sectional study design.

Côte d'Ivoire has more people affected by and living with HIV than other countries in West and Central Africa. The data presented here reinforce the heterogeneity of HIV acquisition and transmission risks among different populations in Côte d'Ivoire including among transgender women, gay men, and other cisgender MSM in Côte d'Ivoire. Moreover, these data demonstrate the profound role of community and network level determinants in driving the odds of living with HIV. While the understanding of the diversity of gender identities is nascent in many settings around the world, our data demonstrate the utility in studying gender identity as a potential determinant of HIV infection in Côte d'Ivoire consistent with previous studies in countries across sub-Saharan Africa. The goals of ending HIV transmission by 2030 are commonly used by normative technical and funding agencies alike. Data such as those presented here suggest that ending HIV transmission is only possible when we understand the diversity of HIV acquisition and transmission risks and address those risks with specific, evidence-based, and human rights affirming strategies.

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Table 1
Sociodemographic and health characteristics and association with HIV status among men who have sex with men in Côte d'Ivoire (March 2015–February 2016)

Variable	Categories	n	RDS-weighted		Unweighted		Homophily	
			%	95% CI	%	OR (outcome = HIV+)	95% CI	
Demographics								
Site location								
	Abidjan	351	10.9	[8.9–13.3]	27.0	—	—	N/A
	Agboville	200	18.2	[14.9–22.0]	15.4	—	—	N/A
	Bouake	350	35.0	[31.0–39.3]	26.9	—	—	N/A
	Gagnoa	150	17.5	[14.5–21.0]	11.5	—	—	N/A
	Yamoussoukro	250	18.4	[15.2–22.1]	19.2	—	—	N/A
Urban or rural origin	Urban (city)	1216	92.5	[89.8–94.4]	93.5	1	—	0.128
	Rural (village)	85	7.5	[5.6–10.2]	6.5	1.55	[0.9–2.7]	–0.022
Age (in years)	Under 21	267	24.1	[20.5–28.0]	20.5	—	—	0.169
	21 to 23	391	31.5	[27.6–35.7]	30.1	2.46 [‡]	[1.4–4.4]	0.024
	24 to 26	319	21.6	[18.4–25.1]	24.5	3.20 [‡]	[1.8–5.7]	0.107
	27 and older	324	22.9	[19.4–26.8]	24.9	3.79 [‡]	[2.1–6.7]	0.208
Education	Less than secondary school	138	8.7	[6.7–11.2]	10.6	1	—	0.095
	Some secondary school	701	60.9	[56.6–65.0]	53.9	0.62	[0.4–1.0]	–0.043
	Secondary school complete and beyond	462	30.4	[26.6–34.6]	35.5	0.89	[0.5–1.5]	0.193
Literacy (n = 1300)	Yes	1221	96.0	[94.6–97.1]	93.9	1	—	–0.322
	No	79	4.0	[2.9–5.4]	6.1	1.19	[0.6–2.2]	0.148
Employment status (n = 1300)	Unemployed	191	14.2	[11.5–17.4]	14.7	1	—	0.069
	Employed	447	28.3	[24.7–32.2]	34.4	0.92	[0.6–1.4]	0.222
	Student	662	57.5	[53.2–61.6]	50.9	0.43 [‡]	[0.3–0.7]	0.084
Weekly income (in CFA Franc [XOF])	No Income	841	70.1	[66.0–73.8]	64.6	1	—	0.001
	Less than or equal to 15,000	264	21.4	[18.0–25.2]	20.3	1.59 [*]	[1.1–2.3]	0.049
	Greater than 15,000	196	8.5	[6.7–10.7]	15.1	1.76 [‡]	[1.2–2.7]	0.182
Sexual identity	Gay or homosexual	499	35.0	[31.0–39.3]	38.4	1	—	0.141
	Bisexual	775	64.1	[59.8–68.1]	59.6	0.60 [‡]	[0.4–0.8]	–0.002

Variable	Categories	<i>n</i>	RDS-weighted		Unweighted		Homophily	
			%	95% CI	%	OR (outcome = HIV+)	95% CI	
Marital status (with a woman)	Heterosexual	27	0.9	[0.4–1.9]	2.1	0.78	[0.3–2.3]	0.152
	Single or never married	1279	98.5	[97.3–99.2]	98.3	1	—	–0.172
	Not single, widowed, or divorced	22	1.5	[0.8–2.7]	1.7	1.78	[0.7–4.9]	–0.013
Number of children	Zero	1132	88.1	[85.0–90.5]	87.0	1	—	0.006
	One or more	169	11.9	[9.4–15.0]	13.0	1.29	[0.8–2.0]	0.098
Gender identity	Man	962	85.0	[82.1–87.5]	73.9	1	—	–0.470
	Woman or transgender	339	15.0	[12.5–17.9]	26.1	3.44 [‡]	[2.5–4.7]	0.265

^{*} $P < .05$.

[†] $P < .01$.

[‡] $P < .001$.

Table 2

Prevalence of sexual history and HIV risk knowledge responses and association with HIV status among men who have sex with men, Côte d'Ivoire, March 2015–February 2016

Variable	Categories	n	RDS-weighted		Unweighted	
			%	95% CI	%	OR (outcome = HIV+) 95% CI
Sexual history						
Age at first anal sex with a man (age in years)	Less than or equal to 16	322	17.8	[14.8–21.3]	24.8	1 —
	17 to 21	675	56.2	[51.8–60.4]	51.9	0.4 [‡] [0.3–0.6]
	Greater than 21	304	26.0	[22.4–30.1]	23.5	0.4 [‡] [0.2–0.5]
Years having sex with men	Fewer than or equal to 1	234	26.4	[22.6–30.7]	18.0	1 —
	2 to 4	496	40.2	[36.1–44.4]	38.1	1.3 [0.7–2.4]
	More than 4	571	33.4	[29.5–37.5]	43.9	4.4 [‡] [2.48–7.6]
Ever STI diagnosis	No	1167	93.7	[91.4–95.5]	89.7	1 —
	Yes	134	6.3	[4.5–8.6]	10.3	2.0 [‡] [1.27–3.0]
Sex partners in the last 30 d						
Number of sexual events with a casual male partner (both active and/or passive)	0	840	75.9	[72.1–79.3]	64.6	1 —
	1 to 2	237	15.3	[12.4–18.7]	18.2	2.4 [‡] [1.7–3.6]
	3 or more	224	8.8	[6.8–11.2]	17.2	3.1 [‡] [2.1–4.6]
Number of regular male partners (both active and passive)	0	365	30.9	[26.8–25.4]	28.1	1 —
	1	468	41.6	[37.4–45.9]	36.0	1.1 [0.7–1.6]
	2	235	16.2	[13.5–19.4]	18.1	1.5 [0.9–2.4]
	3 or more	233	11.3	[9.1–13.8]	17.9	2.3 [‡] [1.4–3.6]
Number of female partners (both casual and regular, vaginal, and anal combined)	0	661	48.1	[43.8–52.4]	50.8	1 —
	1	169	12.4	[10.1–15.1]	13.0	0.7 [0.4–1.2]
	2	142	11.3	[9.0–14.0]	10.9	0.5 [*] [0.3–0.8]
	3 or more	329	28.2	[24.5–32.3]	25.3	0.5 [‡] [0.3–0.8]
Sex of partners	Only male partners	483	32.5	[28.6–36.7]	37.1	1 —
	Male and female partners	527	41.2	[37.2–45.4]	40.5	0.5 [‡] [0.4–0.7]
	Only female partners	113	10.7	[8.1–14.0]	8.7	0.3 [‡] [0.2–0.7]

Variable	Categories	n	RDS-weighted		Unweighted	
			%	95% CI	%	OR (outcome = HIV+) 95% CI
Condom use	No sexual partners	178	15.5	[12.3–19.4]	13.7	0.5* [0.3–0.9]
	Always condom use with all male partners in the last 30 d (n = 1297)					
	Yes	93	5.9	[4.2–8.2]	7.2	1 —
	No	917	67.9	[63.5–72.0]	70.5	0.6 [0.4–1.1]
Condom at last sex with a casual <i>male</i> partner (n = 1298)	No male partners in last 30 days	291	26.2	[22.3–30.6]	22.4	0.4 [†] [0.2–0.8]
	No	182	9.8	[7.6–12.4]	14.0	1 —
	Yes	505	28.4	[24.8–32.4]	38.9	0.7 [0.5–1.1]
	No Casual Male Partners	611	61.8	[57.6–65.8]	47.1	0.3 [‡] [0.2–0.4]
Condom at last sex with a regular <i>male</i> partner (n = 1295)	No	237	13.4	[11.0–16.3]	18.3	1 —
	Yes	693	55.6	[51.2–59.9]	53.5	0.5 [‡] [0.4–0.8]
	No Regular Male Partners	365	31.0	[26.9–35.5]	28.2	0.4 [0.3–0.7]
	No	379	26.3	[22.8–30.0]	29.3	1 —
Condom at last sex with any <i>female</i> partner (n = 1294)	Yes	521	46.8	[42.5–51.1]	40.3	0.5 [‡] [0.3–0.7]
	No Female Partners	394	26.9	[23.2–31.0]	30.5	1.2 [0.8–1.7]
HIV service uptake	No	736	61.7	[57.4–65.8]	56.7	1 —
	Yes	562	38.3	[34.2–42.6]	43.3	1.3 [0.95–1.8]
	No	339	32.6	[28.5–36.9]	26.1	1 —
	Yes	962	67.4	[63.1–71.5]	73.9	1.6* [1.1–2.3]
Participation in a peer education session in the past three months	No	1064	85.6	[82.2–88.5]	81.8	1 —
	Yes	237	14.4	[11.5–17.8]	18.2	2.30 [‡] [1.6–3.3]
HIV risk knowledge questions	Anal sex	198	10.5	[8.0–13.6]	15.2	1 —
	Vaginal sex	496	42.9	[38.8–47.2]	38.1	0.1 [‡] [0.1–0.2]
	Oral sex	30	1.4	[0.8–2.5]	2.3	0.9 [0.3–2.1]
	All carry equal risk	572	44.7	[40.4–49.1]	44.0	0.6* [0.4–0.9]
What type of anal sex puts you most at risk for HIV infection?	Don't know	5	0.5	[0.1–1.8]	0.4	1.9 [0.3–11.5]
	Passive/receptive	321	20.6	[17.6–24.0]	24.7	1 —

Variable	Categories	n	RDS-weighted		Unweighted	
			%	95% CI	%	OR (outcome = HIV+) 95% CI
Which is the safest lubricant to use during anal or vaginal sex with latex condoms?	Active/insertive	160	15.3	[12.6–18.6]	12.3	0.4 [†] [0.2–0.7]
	Insertive and Receptive carry equal risk	796	61.3	[57.1–65.3]	61.2	0.7 [*] [0.5–0.9]
	Don't know	24	2.7	[1.6–4.6]	1.8	0.6 [0.2–2.1]
	Water-based lubricant	706	36.4	[32.5–40.4]	54.3	1 —
	Body cream/fatty cream	24	3.1	[1.9–5.1]	1.8	0.5 [0.2–1.8]
	Jelly or vaseline	110	13.8	[11.0–17.1]	8.5	0.2 [‡] [0.1–0.4]
	Saliva	24	2.6	[1.5–4.3]	1.8	0.2 [0.02–1.2]
	Other oil-based products	95	8.8	[6.4–12.0]	7.3	0.1 [‡] [0.04–0.4]
	No lubricant use	39	6.3	[4.2–9.3]	3.0	0.1 [*] [0.01–0.7]
	Don't know	303	29.0	[25.2–33.1]	23.3	0.3 [‡] [0.2–0.5]
Can you contract HIV by using a needle to inject drugs or substances after someone has already used it?	Yes	1285	98.0	[95.7–99.1]	98.8	1 —
	No	14	1.9	[0.8–4.2]	1.1	0.5 [0.1–3.5]
	Don't know	2	0.1	[0.03–0.6]	0.2	N/A
Health indicators						
HIV diagnosis	Negative	1115	93.8	[91.9–95.3]	85.7	—
	Positive	146	4.7	[3.5–6.4]	11.2	—
	Refused test	40	1.5	[0.8–2.6]	3.1	—
	Negative	1282	99.2	[97.6–99.7]	99.3	—
Syphilis diagnosis (<i>n</i> = 1291)	Positive	6	0.7	[0.2–2.4]	0.5	—
	Refused test	3	0.1	[0.02–0.4]	0.2	—

* $P < .05$.[†] $P < .01$.[‡] $P < .001$.

Table 3

Prevalence of stigma and association with HIV status among men who have sex with men in Côte d'Ivoire (March 2015–February 2016)

Variable	Categories	n	RDS-weighted		Unweighted	
			%	95% CI	%	OR (outcome = HIV+) 95% CI
Stigma						
Perceived stigma	Zero	702	57.6	[53.3–61.7]	54.0	1 —
	One or higher	599	42.4	[38.2–46.7]	46.0	1.8 [†] [1.3–2.4]
Anticipated stigma	Zero	881	69.4	[65.4–73.1]	67.7	1 —
	One or higher	420	30.6	[26.9–34.6]	32.3	1.6 [*] [1.2–2.2]
Enacted stigma	Zero	404	36.6	[32.5–40.9]	31.1	1 —
	One or higher	897	63.4	[59.1–67.5]	68.9	2.1 [†] [1.4–3.1]
Social cohesion						
Composite social cohesion score	Low (0–9)	408	27.5	[23.9–31.5]	31.4	1 —
	Medium (10–11)	324	25.5	[22.0–29.4]	24.9	0.4 [†] [0.3–0.6]
	High (12–16)	569	46.9	[42.6–51.3]	43.7	0.3 [†] [0.2–0.4]
Social participation						
Community activity measure (church, sports, art, community participation)	0 (Not at all active)	83	5.6	[3.9–8.0]	6.4	1 —
	1	271	21.8	[18.3–25.7]	20.8	1.1 [0.6–2.0]
	2	405	30.1	[26.3–34.1]	31.1	0.7 [0.4–1.3]
	3	363	28.4	[24.6–32.5]	27.9	0.6 [0.3–1.1]
	4 (Most active)	179	14.1	[11.6–17.1]	13.8	0.3 [*] [0.1–0.7]

* $P < .05$.† $P < .01$.

Table 4

Bivariate and multivariate analyses on outcome of HIV serostatus for selected demographic and sexual risk indicators among men who have sex with men in Côte d'Ivoire (March 2015–February 2016)

Variable	Categories	Bivariate analyses			Multivariate analysis (<i>n</i> = 1260)		
		RDS-weighted OR (outcome = HIV+)	95% CI	Unweighted OR (outcome = HIV+)	RDS-weighted aOR (outcome = HIV+)	95% CI	Unweighted aOR (outcome = HIV+)
Demographics							
Age (in years)							
	Under 21	1	—	1	1	—	1
	21 to 23	3.3 [*]	[1.3–8.4]	2.5 [†]	2.0	[0.7–6.0]	1.7
	24 to 26	3.4 [*]	[1.3–8.8]	3.2 [†]	2.3	[0.8–6.3]	2.5 [†]
	27 and older	3.6 [†]	[1.4–9.1]	3.8 [†]	2.8 [*]	[1.0–7.8]	3.1 [†]
Employment status (<i>n</i> = 1260 for bivariate)							
	Unemployed	1	—	1	1	—	1
	Employed	1.0	[0.4–2.3]	0.9	1.2	[0.5–2.9]	0.8
	Student	0.5	[0.2–1.1]	0.4 [†]	1.0	[0.5–2.2]	0.6
Gender identity							
	Man	1	—	1	1	—	1
	Woman or transgender	3.4 [†]	[2.0–5.8]	3.4 [†]	2.9 [†]	[1.5–5.7]	3.5 [†]
Sex partners in the last 30 d							
	0	1	—	1	1	—	1
	1 to 2	2.9 [†]	[1.5–5.8]	2.4 [†]	2.0	[0.8–4.8]	1.8 [*]
	3 or more	4.3 [†]	[2.0–9.0]	3.1 [†]	2.5 [*]	[1.0–5.8]	2.4 [†]
Genders of partners							
	Only male partners	1	—	1	1	—	1
	Male and female partners	0.5	[0.3–1.0]	0.5 [†]	0.6	[0.3–1.4]	0.6 [*]
	Only female partners	0.4	[0.1–1.3]	0.3 [†]	0.4	[0.1–2.0]	0.6
	No sexual partners	0.3 [†]	[0.2–0.7]	0.5 [*]	0.8	[0.3–2.2]	1.1

^{*} *P* < .05.

[†] *P* < .01.

[‡] *P* < .001.

Table 5

Two multivariate analyses

Variable	Categories	A: Controlling for demographics and stigma only				B: Controlling for demographics, social cohesion and stigma			
		Multivariate analysis (<i>n</i> = 1260)				Multivariate analysis (<i>n</i> = 1260)			
		RDS-Weighted		Unweighted		RDS-Weighted		Unweighted	
		aOR (outcome = HIV +)	95% CI	aOR (outcome = HIV +)	95% CI	aOR (outcome = HIV +)	95% CI	aOR (outcome = HIV +)	95% CI
Stigma									
Perceived stigma	Zero	1	—	1	—	1	—	1	—
	One or more	1.0	[0.4–2.3]	1.2	[0.8–1.9]	1.1	[0.5–2.3]	1.2	[0.8–1.8]
Anticipated stigma	Zero	1	—	1	—	1	—	1	—
	One or more	1.7	[0.8–3.9]	1.4	[1.0–2.1]	1.5	[0.7–3.5]	1.4	[1.0–2.1]
Enacted stigma	Zero	1	—	1	—	1	—	1	—
	One or more	1.4	[0.6–3.4]	1.4	[0.9–2.2]	1.3	[0.6–3.1]	1.3	[0.8–2.1]
Social cohesion									
Combined social cohesion score	0 to 9 (low cohesion)	N/A		N/A		1	—	1	—
	10 to 11 (medium cohesion)					0.5	[0.2–1.2]	0.5*	[0.2–0.6]
	12 to 16 (high cohesion)					0.3 [†]	[0.1–0.5]	0.4 [†]	[0.2–0.6]

Model A shows multivariate association with HIV positivity when controlling for all demographic variables (presented in Table 4) and for stigma variables.

Model B shows multivariate association with HIV positivity when controlling for all demographic variables, social cohesion variables, and stigma variables.

* $P < .05$.

[†] $P < .01$.