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High-risk motorcycle taxi drivers in the HIV/AIDS era: a respondent-driven sampling survey in Kampala, Uganda

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Abstract

We evaluated motorcycle taxi ('boda-boda') drivers in Kampala for the prevalence of HIV/sexually transmitted infections. We used respondent-driven sampling to recruit a cross-sectional sample of boda-boda drivers. We collected data through audio computer-assisted self-administered interviews. Men were tested for HIV, syphilis serology using Rapid Plasma Reagin and enzyme immunoassay, and *Chlamydia* and gonorrhoea using urine polymerase chain reaction. We recruited 683 men. Median age was 26 years; 59.4% were single. The prevalence of HIV was 7.5% (95% CI 5.2– 10.0), of positive syphilis serology was 6.1% (95% CI 4.3–8.1), of *Chlamydia* was 1.1% (95% CI 0.4–2.0), and of gonorrhoea was 1.2% (95% CI 0.1–1.2). Many men (67.8%) had both casual and regular partners, sex with other men (8.7%), and commercial sex (33.1%). Factors associated with having HIV included reporting a genital ulcer (odds ratio [OR] = 2.4, 95% CI 1.4–4.4), drinking alcohol during last sex (OR 2.0, 95% CI 1.1–3.7), having 4–6 lifetime partners (OR 2.2, 95% CI 1.0–4.8), and having one's last female partner be >24 years of age (OR 2.8, 95% CI 1.2–6.6). Independent predictors of HIV included age ≥31 (adjusted OR (aOR) 5.8, 95% CI 1.5–48.5), having 4–6 partners (aOR 2.2, 95%CI 1.0–5.1), and self-report of a genital ulcer (OR 2.3, 95% CI 1.2–4.1). Only 39.2% of men were circumcised, and 36.9% had been HIV tested in the past. Male boda-boda drivers have a higher prevalence of HIV than the general population, and low frequency of preventive behaviours, such as circumcision and HIV testing. Targeted and intensified interventions for this group are warranted.

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Ethical review

The protocol underwent ethical review by the Uganda Virus Research Institute's Science and Ethics Committee, by CDC Atlanta, and the Uganda National Council on Science and Technology. All procedures strictly adhered to the highest ethical standards.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Keywords

Men; HIV; AIDS; sexually transmitted infections; prevalence; screening; transportation; taxi drivers; boda-boda; Uganda; Africa; epidemiology

Introduction

Uganda has a generalized mature HIV epidemic that has remained relatively stable over the last decade based on seroprevalence and other data.[1,2] The national prevalence among sexually active adults aged 15–49 years is 7.3% according to the most recent AIDS Indicator Survey[1](AIS) and is higher among women (8.3%) than men (6.1%); the prevalence among men in the capital city of Kampala is lower, at 4.1%. Those who are older, divorced, widowed or separated, and with less education are also more likely to be infected. Despite significant PEPFAR (U.S. President's Emergency Plan for AIDS Relief) and other funding for prevention and care, the HIV prevalence has risen from 6.4% in 2004/2005.[2] However, it is difficult to interpret seroprevalence data, as stable HIV prevalence could be due to increasing numbers of people who are living for longer periods of time on antiretroviral treatment, with declining or stable HIV incidence. Some modelled estimates suggest that HIV incidence might also be rising,[3] although there is a paucity of recent incidence data from cohort studies in Uganda. HIV prevalence and surveillance data have focused almost entirely on the general population and little is known about population subgroups that may be at particularly high risk. These 'key populations' include commercial sex workers (CSW), men who have sex with men (MSM), clients of sex workers, female partners of MSM,[4] and fishermen.[5]

Long-distance truckers and other transport workers are known to be at risk of HIV acquisition, and are considered to be contributing to the spread of HIV along trucking routes. Studies of long haul truckers have been done in Asia,[6] Latin America[7] and Africa,[8–11] including Uganda.[12] Their high risk is attributed to transactional sex that occurs due to prolonged time away from families or partners. However, comparatively little information has been obtained on local transportation workers, such as taxi drivers. Taxicab drivers are sometimes seen as informants about other sexual networks such as clients of sex workers. However, there are only a few surveys among taxicab drivers themselves.[13] The data that do exist suggest that many are engaged in high-risk behaviour themselves. One study from Cambodia[14] found that 15% of motorcycle taxi drivers were having unprotected sex with both high- and low-risk partners, and therefore could be considered a 'bridge population'. Another study from Benin-city, Nigeria found that two-thirds had multiple sexual partners and one quarter had had a sexually transmitted infection (STI), but less than one-half used condoms regularly.[15] Commercial bus drivers and motor park attendants in Lagos were found to have a sexual network that included CSWs, female hawkers, schoolgirls and market women; three quarters had multiple sexual partners but only a little more than 10% used condoms regularly.[16] Among rural to urban migrant taxi drivers in Bangladesh, 64% had sex with multiple commercial sex partners, largely unprotected.[17]

There have been anecdotal and media reports that motorcycle taxi drivers in Kampala, Uganda, might also be at increased risk for HIV, but no empirical data are available. We performed a respondent-driven sampling (RDS) survey of motorcycle transportation workers called boda-boda drivers in Kampala to obtain information on self-reported risk behaviour, as well as on the prevalence of HIV and STIs. This study was part of a larger evaluation of several key populations called the Crane Survey which was conducted from 2008 to 2009 by Makerere University, the Ugandan Ministry of Health (MoH), and the US Centers for Disease Control and Prevention (CDC). The overall goal of this study was to inform Uganda's public health system about groups at higher risk of HIV infection so that prevention activities, related services, and ongoing surveillance could be implemented.

Methods

Study procedures have been described in detail previously.[4] Formative research was conducted prior to the survey to inform instruments, language, and procedures and to ensure that study seeds and survey groups, including boda-boda drivers, were sufficiently networked to sustain referral chains.

Study setting

Kampala is the capital of Uganda, and has a population of 1.4 million. It is also the commercial hub of the country. The roads are often highly congested and boda-boda drivers are a frequently used form of transportation in all parts of the city. The exact number of boda-boda drivers in Kampala is unknown but is believed to exceed 10,000; typically, boda-boda drivers are males.

Study population and sampling

RDS methodology is well described elsewhere and represents an advanced statistical version of chain referral sampling.[18,19] While RDS is typically used for hard-to-reach populations, it may be suitable for any population that is networked. It has been used in the past to sample both hidden and highly visible populations. Motorcycle taxi drivers are not a hidden population; however, they are highly mobile which complicates alternative sampling designs such as cluster-based sampling. We initiated sampling with eight seeds, purposively selected by age and geographic location in Kampala. Each seed was given three coupons to give to three other boda-boda drivers whom the seed knew. Referred persons presented their coupons to the single survey site near the city centre. If they were eligible and consented, recruits completed study procedures and were given four coupons to recruit other boda-boda drivers they personally knew. Inclusion criteria for seeds and study participants were age ≥18 years, male gender, residence in greater Kampala, and having their main source of income be boda-boda driving. Exclusion criteria included coupon receipt from a stranger, and not speaking either English or Luganda.

Study procedures

Boda-boda drivers were screened for eligibility and provided verbal informed consent. Information was given about specific terms used in the interview, such as the definition of sexual intercourse, frequency of sex, partner types and commercial sex. Men then

participated in a short computer-based tutorial about audio-computer assisted self-interviewing (ACASI) before completing a standardised interview, using Questionnaire Design Studio (QDS v2.5) software (NOVA, Bethesda, Maryland, USA). The interview took 30–60 min to complete, and included approximately 100 questions on the following domains: basic demographics; history of alcohol and drug use; sexual attraction; sex with women, men, steady partners, casual partners, boda customers and commercial sex; condom use including at last sex; self-report of STIs and symptoms; HIV testing history and beliefs and attitudes about HIV. Following the interview, subjects received HIV pre-test counselling and information about STI testing, and then provided venous blood and urine samples. Staff also provided participants a brief training on how to use the coupons and refer peers to the study site.

Recruits returned to the survey office two weeks later to receive their HIV and STI test results, post-test counselling, and STI treatment if necessary. Treatment for syphilis, gonorrhoea and/or *Chlamydia trachomatis* urethritis was according to the Uganda Ministry of Health guidelines and was done on site. Persons identified as HIV-infected were referred to specified health care providers for follow-up care.

At both visits to the survey office, compensation of the equivalent of US $3.00 was provided for time and transportation; the equivalent of $1.00 was also provided to participants for each eligible peer successfully recruited.

Laboratory testing

HIV and STI testing of samples were performed at Mulago Hospital, Kampala and the CDC laboratory in Entebbe, Uganda. Blood specimens were stored at 2 to 8°C and transported twice daily to the laboratory. Testing for HIV antibodies was performed through a parallel testing algorithm using Vironostika® HIV Uniform II plus O_2 (bioMeriéux, Marcy l'Etoile, France) or Murex® HIV Ag/Ab Combination (Abbott Laboratories, Abbott Park, IL); discordant results were resolved through the use of HIV 1/2 STAT-PAK rapid test (Inverness Medical, Princeton, NJ). Plasma was also tested for antibodies specific for *Treponema pallidum* infection, using the anti-syphilis IgG ELISA (Biotec Laboratories, Suffolk, UK) for screening, and the Rapid Plasma Reagin (RPR) Syfacard-R Test (Murex Biotech, Dartford, UK). A positive result for syphilis serology was defined as a positive ELISA test and a positive RPR at any dilution. Urine specimens were tested for the presence of *Neisseria gonorrhoeae* and *Chlamydia trachomatis* based on a commercial polymerase chain reaction (PCR) test kit (Cobas Amplicor or Amplicor PCR, Roche Diagnostics, Branchburg, NJ).

Data management and analysis

For sample size calculations, we assumed an HIV prevalence of 14.0%, twice the observed HIV prevalence for urban Ugandan men aged 15–49 in a 2004/2005 population-based survey.[2] Expecting a design effect of 2.0 and aiming for an effective sample size of 300, we adjusted the target sample size to 600. The 95% confidence intervals (CI) were calculated in EpiInfo (http://wwwn.cdc.gov/epiinfo/) and the target sample size was divided by the

assumed design effect; in turn, the 95% CIs reflect a random sample accounting for smaller sample sizes.

We tracked survey events (enrolments, recruiter– recruit links, coupon numbers issued, unique codes) with in-house software developed specifically for the Crane study. Interview data were exported from QDS into Statistical Analysis Software – SAS v9.2 (SAS Institute, Cary, NC) and cleaned after checking for errors and inconsistencies.

Our principal outcome of interest was HIV infection. Primary predictor variables of interest included demographics, STIs, alcohol use, sexual behaviour with different partner types, condom use and commercial sex. We present weighted data except for continuous data (www.respondentdrivensampling.org). We generated HIV sampling weights in RDSAT and exported them to R. Univariate analyses were conducted in RDSAT version 6.0. 1. (Cornell University, Ithaca, NY); bivariate analyses were conducted in R 2.2.1 (http://www.r-project.org/). We identified the covariates that had a significant bivariate test, using a Wald test and a p value cut off of <0.20. We performed stepwise multivariable logistic regression including the following variables: age, religion, circumcision, alcohol during last sex, drink history in last 30 days, number of female partners in lifetime, age of last female sex partners, and having both steady and casual female partners in last six months (all variables with $p <$ 0.20 in bivariate analyses). If the variable was determined not to be a confounder (as determined by its effect on other covariates in the models) and did not retain statistical significance ($p < 0.10$), it was removed from the model.

Human subjects, confidentiality and ethical considerations

The survey protocol was approved by the Uganda Virus Research Institute's Science and Ethics Committee, the Uganda National Council of Science and Technology and the CDC in Atlanta, Georgia. The survey was conducted anonymously; informed consent was obtained verbally and no personal identifiers were collected. Using scanners and Griaule software (Griaule Biometrics, San Jose, CA), recruits' fingerprints were imaged (without being stored) to generate unique alphanumeric codes and thus facilitate linking recruits' return visits to their initial visits and laboratory results, to detect recruits attempting to enrol multiple times, and those presenting coupons that had already been issued. In addition to this survey, we sampled four other groups concurrently using the same survey office, and hence masked the group identity of any survey respondent attending the survey site to preserve confidentiality.

Results

A total of 686 eligible recruits including eight seeds participated in the survey. We recruited participants over 20 waves of referral (successive recruiter–recruit linkages); the longest recruitment chain included 79 respondents over 12 waves. After removing three participants due to missing survey data, the sample size we used for analysis was 683 participants. Equilibrium (a stable pattern in the distribution of a given characteristic across successive waves) for having HIV was reached after three waves. The average network size for each participant with HIV was 12.5, and 11.0 for participants without HIV.

The characteristics of the study participants and the estimated population proportions are given in Table 1. The largest proportion (36.8%) were between the ages of 21–25 years; almost all were Ugandan (96.8%) (data not shown). Although nearly all had attended some school, 35.9% had only primary education or less. All religions were represented; the majority was Christian, and about one quarter (23.9%) was Muslim. A substantial majority (59.4%) had never been married; only 1.3% were separated, widowed or divorced; 51.3% had a child (data not shown). A little more than one-third (39.2%) of boda-boda drivers were circumcised. Only 30.1% (95% CI 24.9– 34.5) owned the motorcycle that they used for transportation; the remainder rented their motorcycle (data not shown).

About half of boda-boda drivers indicated they were less careful about HIV because of the availability of anti-retroviral treatment (ART). A substantial proportion had more than one steady (29.0%) or casual female partner (25.7%) in the last six months; 67.8% reported having both casual and steady partners during this time period. More men used condoms all the time with casual partners (31.9%) than with steady partners (17.9%). A total of 29 men (4.3%; 95% CI 2.6–6.0) reported being attracted to other men, although a larger proportion ($n = 134$) (19.3%; 95% CI 15.7– 23.0) reported having sex (oral or anal) with a man in their lifetime (data not shown); 8.7% had a casual male partner in the last six months. About a third of men had paid for sex (33.1%) and 28.7% had sex with one of their customers; 26.5% had sex with a customer in exchange for a fare.

Only 36.9% of boda-boda drivers had been HIV tested in the past. The overall prevalence of laboratory-confirmed HIV was estimated to be 7.5% (95% CI 5.2–10.0). Although we identified a total of 56 persons with HIV infection, only four participants reported knowing they were HIV positive. The prevalence of syphilis was 6.1% (95% CI 4.3–8.1), *Chlamydia* was 1.1% (95% CI 0.4–2.0), and gonorrhoea was 1.2% (95% CI 0.1–1.2). Table 2 shows STI symptoms and laboratory diagnoses and their association with HIV infection. Those who were HIV-infected were more likely to have reported having a genital ulcer, genital discharge or an STI symptom in the last 12 months (OR = 1.92; 95% CI 1.08–3.49). Confirmed laboratory diagnoses of syphilis and gonorrhoea were associated with HIV infection, but estimates of OR were imprecise due to small numbers. Table 3 shows socio-demographic and behavioural factors associated with HIV infection ($n = 56$). Men over 30 years old had 5.7 times higher odds of being diagnosed with HIV compared to men 18–20 years old (95% CI 1.48–46.92). Men of Muslim faith were 59% less likely to be diagnosed with HIV than Catholic men (OR = 0.41; 95% CI 0.13–0.1.0). Other factors associated with having HIV included drinking alcohol during the last sexual encounter (OR = 2.04; 95% CI 1.10–3.68). Drinking alcohol daily or weekly (OR = 1.75, 95% CI 0.96–3.18), and having 4–6 lifetime female partners (OR = 2.16; 95% CI 0.98–4.81) did not quite reach statistical significance. Men whose last female partner was older than 24 years had nearly three times the odds of being diagnosed with HIV or an STI than men whose last female partner was less than 20 years old (OR = 2.78; 95% CI 1.23–6.56). Other factors listed in Table 1 that are not shown in Table 3 were not associated with the outcome variable in regression analysis. In multivariable logistic regression, only three variables were significantly retained, and included age ≥31 years (OR 5.83; CI 1.48–48.52), having four to six female partners in a lifetime compared to one to three (OR 2.24; 95% CI 1.00–5.07), and self-report of a genital ulcer in the last 12 months (OR 2.25; 95% CI 1.23–4.13).

Conclusion

In this study, we found that commercial motorcycle drivers in Kampala had a higher HIV prevalence than recent population estimates for men. Overall, 7.5% were infected compared to an HIV prevalence of 4.5 % and 4.1% for men in Kampala in 2004–2005 and 2011, respectively.[1,2] The prevalence of syphilis, 6.2%, was about twice that of the syphilis prevalence of 3% among men and women in the 2004–2005 survey.[2] This indicates that these men are at greater risk for acquiring and transmitting HIV than the general population, and could benefit from targeted prevention efforts.

These men reported numerous types of risky behaviour. More than two-thirds had both casual and steady partners. In addition, condom use was low – only one-third used condoms during their last sex act, and the proportion who always used condoms with casual partners in the last six months was about 30%. Men who had four to six female partners in their lifetime were more likely to be HIV infected. Men were also engaging in commercial sex, sex with their customers, and sex in exchange for the boda-boda fare.

A substantial proportion of boda-boda drivers may be bisexual. Some boda-boda drivers reported having sex with men as well as with CSW, steady and casual partners, meaning they could be a bridge population between high-risk groups and the general population.[14,20] Having male–male sex is greatly stigmatized in Uganda.[21] It was surprising that about 5% of men were willing to report that they were attracted to men, and about twice that many had a casual male sex partner the last six months; nearly 20% had had sex with another man in their lifetime. It is possible that men were willing to admit to this behaviour because the ACASI interview technique ensured anonymity and did not require face-to-face interviewing. The larger CRANE survey, of which the current study was a part, also evaluated MSM in Kampala using respondent-driven sampling.[4] That study found that the prevalence of HIV among MSM (13.7%, 95% CI 7.9–20.1) was significantly higher than the general population. These results and the finding of our study indicate that male–male sex is taking place and appropriate intervention efforts ideally should be instituted to address HIV and STI risk among these men. Unfortunately, targeted prevention may prove very difficult given the current criminalization of homosexual behaviour in Uganda. The issues of stigma and illegality could have a significant impact on the success of HIV prevention nationally.

Diagnosed STIs were not strongly associated with HIV infection in this study but self-reported symptoms of genital ulcer disease (GUD) and STIs were. The point estimates or ORs for the association of confirmed syphilis and gonorrhoea with HIV varied between 1.7 and 2.4, although the confidence intervals were large and not statistically significant. The significant association between reported symptoms, particularly between GUD and HIV may be because herpes simplex virus-2 (HSV-2) is the most prevalent GUD and STI in the region and is known to be associated with HIV, but was not tested for in this study.[22] Based on the 2004– 2005 survey, 44% of Ugandan adults had HSV-2, but this was much higher among the older population, particularly women, with as many as 75% infected in the age group 45–49.[2]

Other factors associated with HIV infection included older age and using alcohol. Slightly older age among men has been found in the last two Ugandan serosurveys to be associated with HIV infection, with a peak in prevalence from ages 35 to 44 years. As HIV is a prevalent infection, this is not unexpected, as older men would have had longer to have had more exposures. Alcohol use at last sex, was associated with a greater risk of HIV in our study in bivariate analysis. Alcohol use has been shown in multiple contexts to be associated with risky behaviour and HIV, which could be due to disinhibition, failure to remember or be able to use a condom when inebriated, or even increased immunological susceptibility.[23–26]

In addition to high-risk behaviours, these men displayed a lack of preventative behaviours, including low rates of circumcision (39%). There have been wide-spread efforts to scale up safe male circumcision in Uganda, although the primary scale up was only just beginning at the time this survey was conducted. Promotion of HIV testing has been taking place for much longer, but only a little more than one-third of boda-boda drivers reported having been tested. This is lower than the proportion of men in Kampala who reported being tested in the last 12 months (58%) according to the most recent population survey.[1] Of the 56 men who were identified as HIV infected in this survey, more than 90% were unaware of their status. This is concerning because early testing and referral to treatment, as well as disclosure, are mainstays of HIV prevention. About one-half of men indicated that they were less careful about HIV because of the availability of ART. In Kenya, beliefs about ART being able to cure AIDS were associated with higher risk behaviour, including having sex for money and being less likely to use a condom.[27] In that study, a belief that HIV was more controlled because of ART was associated with greater numbers of partners among women. It is important that the strides being made by reducing viral load through treatment, thereby reducing the risk of transmission, are not eroded by increased risk taking.

There are several limitations to this study. Despite the use of ACASI, there may have been significant self-reported bias in disclosing high-risk behaviour. We have reported that the HIV prevalence among bodaboda drivers is higher than among men in the general population from the same area, Kampala. Although the comparison of AIS surveys and this RDS study was performed using different methods, both are adjusted for their non-random sampling design, and are therefore considered representative. While RDS is considered a superior method of convenience sampling, results should be interpreted cautiously. It is possible that the confidence intervals generated by RDS may be too narrow.[28] Recent research suggests that bias may still be present in RDS inference methods.[29] Because truly representative data are rarely available for hidden populations, evaluations of the bias in RDS estimates are difficult. McCreesh et al.[29] found that as a result of groups being under or over-recruited, and because groups all generally had similar network sizes (regardless of the group size), RDS methods may not reduce bias.

In conclusion, boda-boda drivers in Kampala appear to be at higher risk of HIV infection and STI than the general population. They exhibit both high-risk behaviour with multiple partner types, including men, as well as low rates of preventive behaviours such as condom use, circumcision and HIV testing. Targeted prevention efforts for this group may be warranted in an effort to reduce HIV prevalence and incidence in Uganda.

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Table 1.

Background and behavioural characteristics.

Attribute	*n*	Estimated population proportions, % (95% CI)
Demographics		
Age (years)		
18–20	63	10.1 (7.6–13.7)
21–25	229	36.8 (31.9–41.2)
26–30	205	27.0 (22.3–30.8)
31 or older	186	26.2 (22.3–30.8)
Years in school		
None	39	5.4 (3.6–7.3)
1–7	196	30.5 (25.9–35.1)
8–11	186	27.2 (23.4–31.3)
12 or more	262	36.8 (32.2–41.6)
Religion		
Catholic	219	31.8 (27.4–36.5)
Other Christian	305	42.5 (37.6–47.2)
Muslim	147	23.9 (19.4–28.3)
Other	7	1.0 (0.2–1.9)
Current marital status		
Single	388	59.4 (54.0–63.5)
Married/cohabitating	278	38.4 (34.4–43.7)
Divorced, sep, or widowed	11	1.3 (0.5–2.3)
Circumcised		
Yes	256	39.2 (34.0–44.5)
No	417	60.8 (55.5–66.0)
Sexual partners and condom use		
Not as careful about HIV because of anti-retroviral treatment		
Yes	291	50.4 (45.2—55.6)
No	313	49.6 (44.4–54.8)
Lifetime number of partners		
1–3	233	36.1 (31.6–40.9)
4–6	128	19.5 (16.1–22.9)
7 or more	234	31.8 (27.8–36.2)
Steady female partners in last 6 months		
0	286	43.1 (38.4–47.1)
1	201	27.9 (24.1–32.1)
2–5	172	26.2 (22.2–30.6)
6 or more	24	2.8 (1.6–4.3)
Use of condoms with steady partner		
Always	62	17.9 (12.7–23.6)
Sometimes	41	38.7 (33.1–45.2)

Attribute	*n*	Estimated population proportions, % (95% CI)
Never	166	43.4 (36.8–49.5)
Casual female sex partners in last 6 months		
0	440	63.5 (59.0–67.9)
1	76	11.8 (9.0–14.8)
2–5	127	18.5 (15.1—22.3)
6 or more	40	7.2 (4.1—8.4)
Use of condoms with casual partner		
Always	69	31.9 (24.5–39.4)
Sometimes	92	39.2 (31.8–46.9)
Never	74	29.0 (22.9–35.3)
Both casual and steady female sex partners in last 6 months		
Yes	469	67.8 (63.7–72.2)
No	214	32.2 (27.8–36.3)
Used condom last time sex with a female		
Yes	226	42.2 (36.9–47.4)
No	345	57.8 (52.6–63.1)
HIV status of last female partner		
Negative	413	63.2 (58.8–67.4)
Positive	36	5.8 (3.8–8.5)
Don’t know	209	31.0 (26.8–35.0)
Male casual sex partners in last 6 months		
Zero	629	91.2 (88.2–93.9)
1 male partner	16	2.8 (1.1–5.1)
2–5 male partners	33	5.2 (3.3–7.3)
6 or more	5	0.7 (0.2–1.5)
Ever paid for sex?		
Yes	228	33.1 (28.6–37.7)
No	455	66.9 (62.3–71.4)
Did you ever sell sex for money, goods, or services?		
Yes	74	12.2 (8.8–15.8)
No	609	87.8 (84.2–91.2)
Sex with boda customers		
Had sex with boda customer		
Yes	200	28.7 (24.5–33.1)
No	466	71.3 (66.9–75.5)
Customer pay for fare with sex		
Yes	173	26.5 (21.8–30.7)
No	475	73.5 (69.3–78.2)
Bought sex from customers		
Yes	145	22.0 (18.0–26.1)
No	502	78.0 (73.9–82.0)
HIV testing		

Attribute	*n*	Estimated population proportions, % (95% CI)
Tested for HIV in the past		
Yes	272	36.9 (32.3–41.7)
No	389	63.1 (58.3–67.7)
Results of most recent test		
Negative	251	91.9 (87.4–95.6)
Positive	4	1.4 (0.2–3.3)
Didn't get results	16	6.7 (3.2–10.9)
HIV and STI laboratory results		
HIV test		
Positive	56	7.5 (5.3–10.0)
Negative	624	92.5 (90.0–94.7)
Syphilis		
Positive	47	6.1 (4.3–8.1)
Negative	633	93.9 (91.9–95.7)
Ct-Urethritis		
Positive	8	1.1 (0.4–2.0)
Negative	671	98.9 (98.0–99.6)
Ng-Urethritis		
Positive	5	1.2 (0.1–1.2)
Negative	674	98.8 (98.8–99.9)

HIV and STIs of 683 motorcycle boda-boda drivers in Kampala, Uganda, Crane Survey, 2008–2009. *n* is unweighted, % values are weighted. Denominators vary due to missing values.

Ng: *Neisseria gonorrhoeae*; Ct: *Chlamydia trachomatis*.

Table 2.

STIs and their association with HIV among boda-boda drivers, Kampala, Uganda (*N* = 683).

	HIV (%)[a]					
	No (*N* = 627)[b]		Yes (*N* = 56)			
STI	***N***	**% (CI)**	***N***	**% (CI)**	**OR[b]**	**95% CI**
Self report GUD in last 12 months						
No (*n* = 430)	402	67.8 (63.3–72.5)	26	48.4 (32.6–63.2)	Ref	–
Yes (*n* = 227)	198	32.2 (27.6–37.0)	29	51,6 (36.8–67.4)	2.42	1.35–4.36
Genital discharge in last 12 months						
No (*n* = 442)	411	69.2 (65.0–74.2)	29	54.9 (37.5–71.8)	Ref	–
Yes (*n* = 196)	174	30.8 (25.8–35.0)	22	45.1 (28.2–62.5)	1.77	0.97–3.20
Anal warts in last 12 monthss						
No (*n* = 575)	527	90.8 (87.3–94.0)	46	81.2 (69.9–94.6)	Ref	–
Yes (*n* = 53)	46	9.2 (6.0–12.7)	7	18.8 (5.4–30.1)	2.04	0.87–4.32
Any STI symptom						
No (*n* = 368)	345	54.4 (49.7–59.3)	20	36.7 (26.0–47.0)	Ref	–
Yes (*n* = 315)	279	38.8 (23.2–52.6)	36	63.3 (53.0–74.0)	1.92	1.08–3.49
Syphilis test						
Negative (*n* = 633)	583	94.1 (92.1–96.0)	50	89.1 (80.4–97.3)	Ref	–
Positive (*n* = 47)	41	5.9 (4.0–7.9)	6	10.9 (2.7–19.6)	1.72	0.57–4.25
Chlamydia urethritis						
Negative (*n* = 671)	615	98.6 (97.8–99.5)	56	100 (–)	Ref	–
Positive (*n* = 8)	8	1.4 (0.5–2.2)	0	0.0 (–)	–	–
Gonococcal urethritis						
Negative (*n* = 674)	619	98.9 (98.8–99.9)	55	94.6 (95.6–100)	Ref	–
Positive (*n* = 5)	4	1.1 (0.1–1.2)	1	5.4 (0–4.4)	2.24	0.03–20.94

Crane Survey, 2008–2009. Denominators vary due to missing values. *N* is unweighted, % values are weighted.

[a] RDSAT estimates

[b] Weighted logistic regression; GUD, genital ulcer disease.

Table 3.

Demographic and sexual behavioural variables and their relationship to HIV (*N* = 683), Kampala, Uganda.

	HIV (%)[a]					
	No (*n* = 627)[b]		Yes (*n* = 56)			
Variable	***n***	**% (CI)**	***n***	**% (CI)**	**OR[b]**	**95% CI**
Demographics						
Age (years)						
18–20 (*n* = 63)	61	10.9 (8.3–14.6)	2	2.9 (0.0–8.4)	Ref	–
21–25 (*n* = 229)	216	37.6 (32.2–41.5)	12	26.3 (13.1–39.2)	2.26	0.55–19.04
26–30 (*n* = 205)	189	27.1 (23.1–31.4)	15	24.5 (11.9–35.9)	2.45	0.59–20.77
> = 31 (*n* = 186)	158	24.4 (20.1–29.1)	27	46.3 (33.9–65.7)	5.69	1.48–46.92
Education (years)						
None (*n* = 39)	36	5.5 (3.6–7.4)	3	7.8 (0.0–14.9)	Ref	–
1–7 (*n* = 196)	177	29.7 (24.6–34.4)	18	33.7 (18.9–48.6)	1.02	0.33–4.42
8–12 (*n* = 186)	173	27.9 (24.4–32.8)	13	21.8 (10.3–34.9)	0.67	0.20–3.00
> 12 (*n* = 262)	238	36.9 (31.9–41.5)	22	36.7 (22.1–53.8)	0.91	0.29–3.91
Religion						
Catholic (*n* = 219)	201	32.2 (27.7–37.0)	18	31.5 (17.4–48.6)	Ref	–
Protestant (*n* = 305)	273	41.9 (36.9–46.3)	31	52.3 (37.8–69.4)	1.31	0.70–2.52
Muslim (*n* = 147)	140	25.1 (21.1–30.2)	6	10.6 (2.3–21.2)	0.41	0.13–1.05
Other (*n* = 7)	6	0.8 (0.1–1.6)	1	5.6 (0.0–12.3)	4.99	0.62–26.55
Marital status						
Married (*n* = 388)	363	60.6 (54.7–64.9)	24	49.4 (32.8–64.4)	Ref	–
Married/cohabitating (*n* = 278)	247	38.1 (33.9–44.0)	30	48.2 (34.8–64.6)	1.42	0.80–2.54
Div/separated/widowed (*n* = 11)	9	1.3 (0.4–2.5)	2	2.4 (0.0–5.6)	1.81	0.10–10.23
Circumcised						
Yes (*n* = 256)	239	40.6 (34.5–45.8)	16	28.4 (16.0–42.6)	Ref	–
No (*n* = 417)	377	59.4 (54.2–65.5)	39	71.6 (57.5–84.2)	1.72	0.93–3.36
Alcohol and condom use						
Drank alcohol last sex						

Variable	HIV (%)[a]					
	No (*n* = 627)[b]		Yes (*n* = 56)			
	n	% (CI)	*n*	% (CI)	OR[b]	95% CI
No (*n* = 526)	491	78.8 (73.8–82.9)	33	65.9 (48.7–79.7)	Ref	–
Yes (*n* = 145)	122	21.2 (17.2–26.2)	23	34.1 (20.5–51.5)	2.04	1.10–3.68
Drank alcohol last 30 days						
None (*n* = 399)	374	59.3 (54.6–64.5)	22	46.1 (29.5–62.7)	Ref	–
< weekly (*n* = 47)	42	6.7 (4.4–9.0)	5	8.6 (1.8–17.8)	1.52	0.43–4.19
Daily/weekly (*n* = 237)	208	34.0 (28.7–39.3)	29	45.3 (30.7–62.3)	1.75	0.96–3.18
Used a condom last sex with female						
Yes (*n* = 226)	207	42.2 (36.1–46.6)	16	32.6 (16.1–47.1)	Ref	–
No (*n* = 345)	315	57.8 (53.4–63.9)	32	67.4 (53.2–84.1)	1.46	0.77–2.92
Sexual behaviour						
Total number lifetime female partners						
1–3 (*n* = 233)	219	41.9 (36.8–47.7)	13	30.0 (16.4–44.0)	Ref	–
4–6 (*n* = 128)	112	21.4 (17.4–25.4)	15	33.8 (18.6–48.4)	2.16	0.98–4.81
7 or more (*n* = 234)	215	36.7 (31.7–41.7)	19	36.2 (22.5–51.8)	1.38	0.64–3.00
Both steady and casual female partners last 6 months						
Yes (*n* = 469)	430	68.7 (64.7–73.7)	38	57.3 (42.7–74.8)	Ref	–
No (*n* = 214)	194	31.3 (26.4–35.3)	18	42.7 (25.4–57.3)	1.61	0.89–2.86
Age of last female sex partner						
20 (*n* = 223)	213	40.3 (34.9–45.0)	9	25.1 (9.3–41.5)	Ref	–
20–24 (*n* = 249)	230	38.1 (33.4–42.8)	18	37.3 (23.0–54.1)	1.52	0.67–3.60
> 24 (*n* = 148)	130	21.6 (17.6–26.8)	18	37.6 (22.4–52.2)	2.78	1.23–6.56
# Casual male partners in last 6 months						
0 (*n* = 629)	572	90.5 (87.5–93.8)	54	92.8 (89.6–100.0)	Ref	–
1 (*n* = 16)	16	3.2 (1.2–5.6)	0	1.2 (–)	–	–
2–5 (*n* = 33)	32	5.7 (3.6–7.8)	1	1.7 (0.0–3.9)	0.25	0.01–1.42
6 or more (*n* = 5)	4	0.7 (0.0–1.4)	1	4.3 (0.0–8.8)	4.50	0.39–28.13
Ever paid for sex						
Yes (*n* = 228)	213	33.7 (29.1–38.3)	15	25.1 (12.9–37.5)	Ref	–

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Variable	HIV (%)[a]					
	No (*n* = 627)[b]		Yes (*n* = 56)			
	n	% (CI)	*n*	% (CI)	OR[b]	95% CI
No (*n* = 455)	411	66.3 (61.8–70.9)	41	74.9 (62.6–87.2)	1.50	0.80–2.99
Not as careful about HIV because of treatment						
Agree (*n* = 291)	265	49.9 (44.6–55.5)	26	53.7 (37.5–70.3)	Ref	–
Disagree (*n* = 313)	289	50.1 (44.6–55.5)	24	46.3 (29.9–62.5)	0.87	0.48–1.58

Crane Survey , 2008–2009. Denominators vary due to missing values. *N* is unweighted, % values are weighted.

[a] RDSAT estimates.

[b] Weighted logistic regression.