Prevalence and Determinants of Recent HIV Testing among older persons in rural Uganda

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Abstract

Introduction: There is limited research on HIV testing among older persons in Uganda. The aim of this study was to investigate the determinants recent HIV testing among older persons in selected rural districts in Uganda.

Methods: A cross-sectional survey of 649 older men and women age 50 years and older, from central (Masaka district) and western (Hoima district) Uganda was conducted. Frequency distributions, chi-square tests and multivariable logistic regressions were used to examine the association between recent HIV testing and selected explanatory variables.

Results: Prevalence of lifetime HIV testing was 82% and recent (last 12 months) HIV testing was 53%. HIV testing in the last 12 months was associated with age (OR=0.50; 95% CI: 0.31-0.79), self-reported sexually transmitted infections (OR=1.59; 95% CI: 1.00-2.30), male circumcision (OR=1.71; 95% CI: 1.0-2.93), and sexual activity in the last 12 months (OR=2.89; 95% CI: 1.83-4.57).

Conclusion: Recent HIV testing is associated with younger age, self-reported STIs, male circumcision, and sexual activity among older persons in rural Uganda. HIV testing interventions need to target older persons.

Key words: HIV, AIDS, HIV testing, Aging, Elderly, STIs, Uganda, Africa

Introduction

The United Nations (UN) and the African Union framework on Ageing (AU-Plan) define older persons as those age 60 years and older. This definition is used in most sub-Saharan African countries (1). In Uganda, during the drafting of the policy for older persons in 2009, age 60 years and older was used because it coincides with the retirement age of 60 years in civil or public service (2, 3). However, the World Health Organization (WHO) recommended using age 50 and older to define older persons in sub-Saharan Africa (SSA) (4).

Subsequently, several studies (including this paper) adopted age 50 and older, as an appropriate definition of old age in SSA countries including Kenya (5, 6); Uganda (7) and South Africa (8). Such studies include those of the WHO Study on global AGEing and adult health (SAGE) and the INDEPTH network. These have used age 50 years and older to define older persons (9-14). However, the reporting of ageing statistics is based on age 60 years and older.

Globally, the proportion of older persons (age 60 years and older) in 2012 was 11%. This proportion is projected to increase to 30% by 2050. The absolute number of older people increased from 205 million in 1950 to 810 million in 2012 and is anticipated to increase further to 1 billion by 2022 and to 2 billion by 2050 – outnumbering children aged 0-14 years (15-17). The highest proportion of OPs is projected to live developing countries by 2050 (18). In Uganda, the proportion of older persons age 50 years and older was estimated at 7.6% in the 2014 Uganda Population and Housing Census (UBOS, 2014). There has been some growth in the absolute number of older people from 1.1 million in 2002 (4.5% of the population) to 1.3 million in 2010 (out of 30 million) and is expected to increase to 5.5 million (constituting 5.7% of the population) by 2050 (3, 16).

HIV in old age is an emerging public health challenge (19) and considered as a “hidden epidemic” (20). In SSA, only 45% of those who are HIV positive know their status (21). This is far from the UNAIDS ambitious target of ensuring that 90% of those who are HIV positive know their status (22). HIV in old age has two major pathways namely: first, ageing with HIV and second, infections in old age (Scholten et al., 2011). Ageing with HIV is attributed to adherence to antiretroviral therapy (ART) (23-25). Uganda is experiencing an epidemiological transition

characterized by an onset of non-communicable diseases (NCDs) and communicable diseases including HIV and AIDS (26, 27).

Prevalence of HIV among older persons is estimated at 11% - 13% globally (20, 28), 9% in Malawi (age 50-64 years) (29). It was predicted that 50% of HIV cases in the US would be 50 years and older by 2015 (30). HIV in Uganda, HIV prevalence in 2017 was estimated at 6.2% for age 15-64 years (31). However, the analysis is not for those age 50 years and older. In South Africa, HIV prevalence is estimated at 7.6% among OPs age 50 years and older (32).

The prevalence of HIV testing varies across counties. In Uganda, nearly half (48%) of older adults have ever tested for HIV (33). In USA, nearly 4% of the older adults have tested for HIV (34). Over half (54%) of older persons in South Africa (35) and 23% in Zimbabwe (36) have tested for HIV.

HIV testing programmes do not prioritize older persons since they are assumed to be sexually inactive. On the contrary, there is substantial evidence that older people remain sexually active, and are vulnerable to sexual abuse (women) yet many lack information on HIV prevention and rarely test for HIV/AIDS (37-39). In addition, OPs experience stigma while accessing HIV testing services (37).

The determinants of HIV testing have been summarized in the conceptual model adapted from the healthcare utilization model. These include predisposing factors (age, gender, race / ethnicity, education, household income, employment status), enabling factors (health insurance, access to care, previous testing, seeing a doctor) and need factors especially HIV risk behaviours in the past 12 months (34, 40-42). Predisposing factors include both demographic (gender and age) and socio-economic factors (marital status, education level).

Gender is a significant determinant, where women are more likely to test for HIV compared to men. Older women tend to be less informed about HIV (43). Among older persons, advanced age has been associated with reduced odds of HIV testing (44). In settings such as the US, race is a significant determinant of HIV testing with reduced odds among African Americans. The perceived risk of contracting HIV is an important predictor of HIV testing, where a low

perceived risk is associated with reduced odds of HIV testing (45). Among older persons, prior history of testing reduces the odds of subsequent HIV testing (44).

A high level of education increases the odds of HIV testing. Knowledge of HIV transmission and prevention influences HIV testing among both young and older persons (37, 46). With respect to marital status, the likelihood of HIV testing is higher among ever married persons outside union i.e. divorced or separated or widowed and lower among never married persons. In addition, fear, emotional stress of positive HIV sero status results, HIV stigma (47) and HIV transmission knowledge (48) have been associated with HIV testing (37).

Despite the available evidence on HIV testing, there is dearth of information on HIV testing among OPs in developing countries in general and Uganda (49) in particular. In SSA, sources of data on HIV/AIDS such as Demographic and Health Surveys (DHS) and AIDS Indicator Surveys focus on age 15-54 years. The recent Uganda DHS, 2016 and Population and HIV Impact Surveys (PHIA) in 12 African countries also omit OPs (50, 51) (25). In addition, several studies on the health of older people in Uganda have focused on later life problems associated with HIV/AIDS (Scholten et al., 2011; Seeley, Wolff, Kabunga, Tumwekwase, & Grosskurth, 2009) but not their uptake of HIV testing. Over half (53%) of persons age 15-54 years tested HIV during the 12 months preceding the study (52).

Therefore, the aim of this study was to investigate the determinants of access to HIV testing services among older persons in selected rural districts in Uganda. Findings are expected to contribute to understanding of factors associated with HIV testing among OPs (37, 38, 44, 53).

Methods

Study design

The study used a cross-sectional and mixed methods study design. Both survey data and qualitative data were collected. Qualitative data included focus group discussions and in-depth interviews. However, this paper is based on survey results.

Inclusion criteria

Older persons were defined as those age 50 years and older as recommended by the World Health Organization (4). We thus considered older persons 50 years and above who had the capacity to provide informed consent.

Sampling procedures

We adopted a two-stage stratified cluster sampling design. We randomly selected two regions in Uganda namely: central and western regions out of the four administrative ones. Simple random sampling was used to select one district: Masaka (central) and Hoima (western) from each region. We used the sampling frame of the 2014 Uganda Population and Housing Census (54).

Two sub-counties from Masaka and three sub-counties from Hoima were selected using simple random sampling. Masaka has 9 sub-counties namely: Bukakata, Buwunga, Kabonera, Katwe/Butego, Kimanya / Kyabakuza, Kkingo, Kyanamukaaka, Mukungwe, and Nyendo / Senyange, with a total of 399 villages (55). Hoima has 13 sub-counties and 653 enumeration areas. The sub-counties are: Bugambe, Buhanika, Buhimba, Buseruka, Busiisi, Hoima TC, Kabwoya, Kigorobya, Kigorobya TC, Kitoba, Kiziranfumbi, Kyabigambire, and Kyangwali (56). From each sub-county, four enumeration areas or villages were selected using systematic sampling. From each village, a sampling frame of older persons' and their households was constructed in consultation with local leaders and systematic sampling was used to select participants for the survey. In households where older men and women live as couples, both of them were interviewed separately.

Kish's formula (57) was applied to generate a sample size of 649 older persons for the survey. The prevalence of HIV testing for those age 50-59 years was 45% among men and 49% among women (58). We used the lower bound of HIV testing (45%), the $p=0.45$ and the $q=0.55$. The level of confidence was set at 95% ($z=1.96$) and the error at 8% ($e=0.008$). The expected sample size was 148.5. The sample size was multiplied by the design effect of two ($D=2$). Therefore, the expected sample size was 297. The final sample size after adjusting for a response rate of 90% became 330. To allow for small area (district) estimations, the sample size was multiplied by two since the study covered two districts. The overall sample size was 660 older persons. Due to non-response, the final sample size was 649 older persons. The number of older persons selected

from each enumeration area was determined by probability proportionate sampling (PPS) from the 2014 Uganda census sampling frame (54).

Data management using SurveyCTO

Survey data were collected using SurveyCTO (59) application installed on android enabled Tablets. Data were downloaded from the SurveyCTO Server as STATA files on daily basis.

Measure of outcome variable

Participants were asked if they had an HIV test in the last 12 months (yes or no responses). A follow up question was about reception of HIV results during the recent HIV test (yes or no responses). A binary variable called recent HIV testing was recoded to a binary variable (yes and no). Recent HIV testing means HIV testing and reception of results in the last 12 months.

Measures of explanatory variables

Demographic variables included age, sex, and children ever born. Age was recoded into three categories: 50-59, 60-69 and 70 and older. Sex was recoded into male and female. Children ever born was asked as a continuous variable and was recoded into two categories (none to four and five or more children).

Socio-economic variables included: education level (none, primary and secondary or higher), working in the last 12 months (yes and no), religion, marital status or currently in union, number of other wives, and children ever born and those currently alive. Religion was recoded as Catholics, Anglicans, Muslims and Others.

HIV related variables included knowledge about HIV transmission, HIV stigma, and need to test for HIV (yes or no). To measure correct knowledge about HIV transmission, five questions were asked:

1. Can the risk of HIV transmission be reduced by having sex with only one uninfected partner who has no other partners?
2. A person cannot get HIV from mosquito bites?
3. Can a person reduce their risk of getting HIV by using a condom every time they have sex?
4. A person cannot get HIV by sharing food with someone who has HIV?

5. Can a healthy-looking person have HIV?

These questions were recoded as binary variables. Then they were added together to generate an aggregate variable for correct HIV knowledge. The Cronbach's alpha for the five statements of HIV knowledge was 0.43. Correct knowledge about HIV transmission was categorized as agreement to at least four to five statements. Those who had agreement to none to three statements were recoded as not having correct knowledge on HIV transmission.

HIV stigma was measured by eight binary statements (Cronbach's alpha was 0.60):

1. Would not buy fresh vegetables from an HIV positive vendor
2. Children living with HIV should not be allowed to attend school with children who do not have HIV
3. People hesitate to take an HIV test because they are afraid of how other people will react if the test result is positive
4. People talk badly about people living with HIV, or who are thought to be living with HIV
5. People living with HIV, or thought to be living with HIV, lose the respect of other people
6. Fear that one could get HIV if in contact with the saliva of a person living with HIV
7. Would be ashamed if someone in family had HIV
8. Not willing to care for someone living with HIV

These HIV stigma statements were recoded into binary form and added together to form a score (range from 0 – 8). A binary variable called stigma on at least four statements was created (0 = agreement on 0-3 statements; 1= agreement to 4-8 statements).

HIV related behaviour included sexual activity in the last 12 months (yes or no), number of life time sexual partners, transactional sex (life time and recent), alcohol consumption, male circumcision and self-reported STIs. Transactional sex involved giving and receiving of gifts for sex in the last 12 months. Substance use variables included alcohol consumption, smoking and use of tobacco. Males were circumcised to report about their circumcision status (yes, no and not applicable for females).

Self-reported STIs were measured by asking four questions:

1. During the last 12 months, have you had an abnormal discharge from your vagina or experienced pelvic pain (if woman) or penis (if man)?

2. During the last 12 months, have you had an ulcer or sore on or near your vagina (woman) or penis (man)?
3. During the last 12 months, have you had pain on urination?
4. In the last 12 months, did a doctor, clinical officer or nurse tell you that you had a sexually transmitted disease other than HIV?

These questions had three categories (yes, no and don't know). The Cronbach's alpha for the four statements was 0.71. The "don't know" category was merged with the "No" category. The responses to the former were few. After, an aggregate variable – self-reported STIs was created for those who reported an abnormal discharge, ulcer or sore in the genital area, pain during urination and were told to have an STI by a health provider.

Statistical Analysis

Frequency distributions were used to describe the background characteristics of the older persons. Cross-tabulations were used to investigate associations between recent HIV testing (outcome variable) and selected explanatory variables. Pearson's chi-squared (χ^2) tests were used to examine the significant differences between recent HIV testing and the explanatory variables. The level of statistical significance using p-values was set at $p < 0.05$.

Multivariable logistic regression analyses were used to examine the association between recent HIV testing and explanatory variables whose p-values were less than 0.05 during the chi-square tests. Results are presented in the form of Odds Ratios (OR) reporting 95% confidence intervals. The level of statistical significance using p-values was set at $p < 0.05$. All analyses were performed in STATA version 15.

Results

Descriptive characteristics

Table 1 shows the descriptive characteristics of older persons in rural Uganda. About 52% of the respondents were female and 52% were 60 years and older. The majority (75%) had primary or no formal education, were working (53%), either Catholic or Anglican (75%), were either married or cohabiting (60%), had five or more children (78%) and most (74%) had five or more children living.

With respect to HIV knowledge and attitude factors, the majority (65%) had correct knowledge on 4-5 HIV transmission statements, had less or no HIV associated stigma (67%), agreed to the need to test for HIV once a year, and the need for male circumcision to prevent HIV (69%). About half (51%) had sex in the past 12 months. The majority (72%) had had one lifetime sexual partner, had received or given money or gifts for sex (24%), and did so 12 months preceding the study (13%), drunk alcohol (34%) or used tobacco or drugs (13%), self-reported STIs in the past 12 months (29%) and were circumcised (17%). Slightly over half (53%) had tested for HIV in the last 12 months.

Table 1 about here

Association between HIV testing in the past 12 months and independent factors

Table 2 shows the association between recent HIV testing and background factors among older persons in Uganda. HIV testing and receipt of results in the last 12 months preceding the study was associated with age ($p<0.001$), working in the past 12 months ($p<0.001$), current marital status ($p<0.01$), number of spouses ($p=0.01$), correct knowledge of HIV transmission (4-5 statements), the need to test for HIV annually ($p=0.01$), need to for male circumcision ($p=0.01$), actual circumcision ($p<0.01$), sex in the past year ($p<0.001$), transactional sex ($p<0.01$), and self-reported STIs in the past year ($p<0.01$).

HIV testing prevalence declined with increase in age (64% for 50-59 compared to 19% of 80+ year olds). Higher proportion of HIV testing were observed among respondents that worked in the past year (59%), currently in union (57%), polygamous unions (66%), had correct knowledge of HIV transmission on 4-5 aspects (56%), felt the need to test for HIV annually (54%), felt need to for male circumcision (56%), were actually circumcised (67%), had sex in the last 12 months (67%), had transactional sex (67%) in the last 12 months, and self-reported STIs in the past year (62%). Education, religion, stigma, number of lifetime sexual partners, alcohol and drug use were not significantly associated with HIV testing 12 months preceding the study.

Table 2 about here

Multivariable results

Table 3 shows the association between recent HIV testing and background factors among older persons in rural Uganda. We adopted for a step-wise regression for multivariable analysis. The first model includes respondents' background characteristics. In the second model, we added knowledge and attitude factors, and in the third and final model we added behaviour factors.

The results in table 3 show that age was consistently associated with HIV testing in the past 12 months. Older persons age 70 and older consistently had reduced odds of testing for HIV compared to 50-59 year olds after adjusting for background factors (aOR=0.33; 95% CI: 0.22-0.50), adding knowledge factors and attitudes (aOR=0.37; 95% CI: 0.24-0.56) and finally adding behavioural factors (aOR=0.49; 95% CI: 0.31-0.79).

In addition, being circumcised, sexual activity, transactional sex, and self-reported STI in the past year, being circumcised were significantly associated with recent HIV testing. The odds of HIV testing increased (aOR=1.59; 95% CI: 1.0-2.3) among respondents who had a self-reported STI compared to those that did not. Older men who were circumcised compared to those who were not and women were more likely (aOR=1.71; 95% CI: 1.0-2.9) to test for HIV in the last 12 months. Also, those who had sex in past year compared those that did not, had increased odds (aOR=2.89; 95% CI: 1.8-4.6) of HIV testing.

Working in the past year was significantly associated (aOR=1.39; 95% CI: 1.0-1.9) with HIV testing after adjusting or background characteristics but subsequently lost its influence after adjusting for the rest of the explanatory factors (Models 2 and 3). Likewise, the odds of HIV testing among 60-69 year olds reduced in the first and second models compared to 50-59 year olds but were not significant in the third model. The association between sex, number of spouses, knowledge of HIV transmission modes, stigma, acknowledging the need for circumcision among older person and engaging in transactional sex 12 months prior to the study were not significantly associated with HIV testing 12 months prior to the study.

Table 3 about here

Discussion

We set out to establish the prevalence and examine the determinants of HIV testing in the last 12 months among older persons in rural Uganda. Contrary to other studies (37) older persons are as vigilant as younger persons with respect to testing for HIV. Over half of (53%) older persons had tested HIV during the 12 months preceding the study, which surprisingly is in line up with the proportion of younger persons that had tested for HIV. A recent study using Uganda AIDS indicator survey among adults age 45-59 years reported HIV testing prevalence of 48% (33).

The determinants of HIV testing among old persons in the year preceding the study in order of strength of influence were: sexual activity in the past year, male circumcision, having a self-reported STI and advanced age. Sexual activity in the last 12 months increased the odds of recent HIV testing. Among older persons, recent sexual activity increases perceived risk of HIV infection which motivates older persons to have an HIV test (38, 45). This is because sexual activity is one of the main avenues of HIV transmission (60). Older men tend to remain sexually active and engage in extra-marital affairs more than older women (35).

Self-reported STIs were positively associated with HIV testing. Self-reported STIS are indicative of engagement in risky sexual behaviours that increase the odds of HIV infection. HIV testing in such cases is through risk perception or referral by health providers (45).

It is surprising that circumcised older persons had increased odds of HIV testing yet it is expected to reduce chances of HIV infection (61). The possible explanation is that in case of medical circumcision, it is possible that older persons who interacted with the health sector also benefited from HIV relevant health education (62).

Advanced age reduced odds of testing for HIV. Our findings concerning reduced odds of testing among older persons of advanced age are in agreement with studies elsewhere (44). This could be associated with low perceived HIV risk, and lack of associated information (45, 63).

This study merits the following strengths: first, it highlights important findings about the prevalence and determinants of HIV testing among older persons in Uganda. The findings provide a benchmark for conducting further studies in Uganda. None the less, there are some limitations of the data. First, it is cross-sectional data and we cannot easily ascertain the direction

of causality of associations between HIV testing and self-reported STIs and sexual activity in the last 12 months.

Conclusion

Recent HIV testing is associated with younger age, self-reported STIs, male circumcision, and sexual activity among older persons in rural Uganda. HIV testing interventions need to target older persons. These interventions include behavioral risk assessment and routine screening for HIV infection.

Declarations

Ethics approval and consent to participate

The study protocol was reviewed and approved by The AIDS Support Organization (TASO REC), a local Research and Ethics Committee (REC) on July 4th 2017. The approval reference number is TASOREC/30/17-UG-REC-009. Finally, the protocol was registered with the Uganda National Council of Science and Technology (UNCST), with a registration number, SS 4424. Voluntary informed consent was obtained from all participants. Participants were assured of confidentiality. In order to ensure anonymity, participants' names were not be recorded alongside their responses.

Consent for publication

Not applicable

Availability of data and materials

The datasets generated and analysed during the current study are not publicly available due for confidentiality reasons but are available from the corresponding author on reasonable request.

Competing interests

The author(s) declare that they have no competing interests.

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Authors' contributions

SOW conceptualized and developed the study. BK, and FM reviewed the study protocol. BK & FM wrote the background section. BK, PN and SOW reviewed the literature. SOW analysed the data. BK, SOW and SOW interpreted the results and participated in the drafting of the manuscript. All read and reviewed the manuscript. All authors read and approved the manuscript.

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Tables

Table 1 Descriptive characteristics of older persons in rural Uganda

Variables	Number (n)	Percent (%)
Age group		
50-59	312	48.3
60-69	176	27.2
70+	158	24.5
Sex of the respondents		
Female	334	51.5
Male	315	48.5
Education level		
None	111	17.1
Primary	378	58.2
Secondary or higher	160	24.7
Worked in the last 12 months		
No	308	47.5
Yes	341	52.5
Religion		
Catholic	279	43.0
Anglican	208	32.0
Muslim	99	15.3
Others	63	9.7
Currently in union		
No	262	40.4
Yes	387	59.6
Number of wives or husbands		
One	304	46.8
Two plus	83	12.8
Not in union	262	40.4
Children ever born		
0-4 children	130	20.0
Five or more	519	80.0
Living children		
0-4 children	171	26.3
Five or more	478	73.7
Correct knowledge about 4-5 HIV transmission statements		
No	230	35.4
Yes	419	64.6
Stigma on at least 4-8 statements		
No	436	67.2
Yes	213	32.8
Total	649	100.0

562 **Table 1 continued**

Variables	Number (n)	Percent (%)
Need to test for HIV once a year even when you know you are HIV negative		
No	35	5.4
Yes	614	94.6
Do older men who are 50 years older need to be circumcised to prevent HIV in		
No	202	31.1
Yes	447	68.9
Had sex in the last 12 months		
No	314	49.5
Yes	320	50.5
Number of lifetime sexual partners		
One	231	72.4
Two or more	88	27.6
Ever given or received money or gifts for sex		
No	490	75.5
Yes	159	24.5
Gave or received money or gifts for sex in the last 12 months		
No	574	88.4
Yes	75	11.6
Drinks alcohol		
No	426	65.6
Yes	223	34.4
Uses tobacco or drugs		
No	564	86.9
Yes	85	13.1
Self-reported STI in the last 12 months		
No	459	70.7
Yes	190	29.3
Male circumcised		
No	199	30.7
Yes	116	17.9
No, female	334	51.5
Ever tested for HIV and received results		
No	119	18.3
Yes	530	81.7
Tested for HIV and received results in the last 12 months		
No	307	47.3
Yes	342	52.7
Total	**649**	**100**

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Table 2 Association between recent HIV testing and background factors among older persons in Uganda

	Tested for HIV and received results in the last 12 months			
Variables	**No (%)**	**Yes (%)**	**Total**	
Age group				**<0.001**
50-59	36.5	63.5	312	
60-69	49.4	50.6	176	
70+	65.8	34.2	158	
Sex of the respondents				0.21
Female	49.7	50.3	334	
Male	44.8	55.2	315	
Education level				0.10
None	55.9	44.1	111	
Primary	44.4	55.6	378	
Secondary or higher	48.1	51.9	160	
Work in the last 12 months				**<0.001**
No	54.2	45.8	308	
Yes	41.1	58.9	341	
Religion				0.09
Catholic	50.2	49.8	279	
Anglican	50	50	208	
Muslim	37.4	62.6	99	
Others	41.3	58.7	63	
Currently in union				**<0.01**
No	54.2	45.8	262	
Yes	42.6	57.4	387	
Number of wives or husbands				**<0.01**
One	45.1	54.9	304	
Two plus	33.7	66.3	83	
Not in union	54.2	45.8	262	
Correct Knowledge about 4-5 HIV transmission modes				**0.01**
No	53.9	46.1	230	
Yes	43.7	56.3	419	
Stigma on at least 4-8 statements				0.71
No	46.8	53.2	436	
Yes	48.4	51.6	213	
Test for HIV once a year even HIV negative				**0.01**
No	68.6	31.4	35	
Yes	46.1	53.9	614	
Total	**47.3**	**52.7**	**100**	

570 **Table 2 continued**

	Tested for HIV and received results in the last 12 months			
Variables	**No (%)**	**Yes (%)**	**Total**	
Older men need to circumcise to prevent HIV				**0.01**
No	55.4	44.6	202	
Yes	43.6	56.4	447	
Had sex in the last 12 months				**<0.001**
No	61.1	38.9	314	
Yes	33.1	66.9	320	
Number of lifetime sexual partners				0.39
One	34.6	65.4	231	
Two or more	29.5	70.5	88	
Ever given or received money or gifts for sex				0.06
No	49.4	50.6	490	
Yes	40.9	59.1	159	
Gave or received money or gifts for sex in the last 12 months				**0.01**
No	49.1	50.9	574	
Yes	33.3	66.7	75	
Drinks alcohol				0.94
No	47.4	52.6	426	
Yes	47.1	52.9	223	
Uses tobacco or drugs				0.33
No	48	52	564	
Yes	42.4	57.6	85	
Self-reported STI in the last 12 months				**<0.01**
No	51.2	48.8	459	
Yes	37.9	62.1	190	
Male circumcised				**<0.01**
No	51.8	48.2	199	
Yes	32.8	67.2	116	
No, female	49.7	50.3	334	
Total	**47.3**	**52.7**	**100**	

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Table 3 Logistic regression of recent HIV testing against background factors, HIV knowledge and stigma and behavioural factors

Variables	Model 1 Odds	95%	Model 2 Odds	95%	Model 3 Odds	95%
Age group						
50-59	1.00	1.00	1.00	1.00-1.00	1.00	1.00-1.00
60-69	0.61**	0.41-0.89	0.62*	0.43-0.92	0.78	0.52-1.18
70+	0.33***	0.22-0.50	0.37***	0.24-0.56	0.49**	0.31-0.79
Sex (rc = female)	1.10	0.75-1.54	1.10	0.76-1.58	0.79	0.47-1.13
Worked in the last 12 months (rc=No)	1.39*	1.00-1.93	1.39	1.00-1.93	1.34	0.96-1.91
Currently in union	1.35	0.93-1.97	1.36	0.93-1.98	0.81	0.51-1.28
Number of wives or husbands						
One	1.00	1.00	1.00	1.00	1.00	1.00
Two or more	1.442	0.85-2.43	1.44	0.85-2.43	1.39	0.79-2.43
Not in union	1.00	1.00	1.00	1.00	1.00	1.00
Correct knowledge on 4-5 HIV prevention modes			1.25	0.87-1.78	1.10	0.75-1.59
Agreement with on 4-8 stigma statements			1.03	0.72-1.47	1.01	0.69-1.45
Older men need to circumcise to prevent HIV			1.36	0.95-1.94	1.19	0.81-1.75
Self-reported sexually transmitted infections in the last 12					1.59*	1.09-2.30
Male circumcised						
No					1.00	1.00
Yes					1.71*	1.00-2.93
No- female					1.00	1.00
Sexual activity in the last 12 months					2.89***	1.83-4.57
Transactional sex in the last 12 months					1.05	0.60-1.84
Observations (N)	646		646		631	

*Exponentiated coefficients; 95% confidence intervals in second column: * p < 0.05, ** p < 0.01, *** p < 0.001; Model 1, controlling for socio-demographics,*